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SIR Annual Scientific Meeting Program
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SIR 2026 Meeting and Scientific Chair message

Dear colleagues,

Welcome to the *JVIR* special supplement for the SIR 2026 Annual Scientific Meeting, the premier platform for the IR community. Here, this gathering of leading minds from across the specialty converges to celebrate the strength of the interventional radiology community, connecting professionals from around the globe to share knowledge, advance clinical practice, and foster collaboration across the specialty.

The SIR Annual Scientific Meeting Committee was once again impressed and inspired by the exceptional caliber of science submitted this year. The proposals spanned the full breadth of interventional radiology, from foundational treatments at the heart of our specialty to bold and forward-looking explorations. Among them, several particularly captivating submissions highlighted emerging trends such as the integration of artificial intelligence, offering a fascinating glimpse into the directions our field is moving in.

The SIR 2026 scientific program will feature over 350 original scientific presentations and 130 traditional posters that can be viewed in the Poster Hall, located in the Metro Toronto Convention Centre, and more than 90 educational exhibits that will be presented orally at the SIR Annual Scientific Meeting. Each day of the meeting, you can expect to find research topics that appeal to all IRs, no matter what your career stage or practice type.

Because of the incredible submissions this year, we again have expanded the number of top award-winning abstracts, with three Abstracts of the Year and 17 Featured Abstracts. In our plenary sessions, we will celebrate the stars of IR with award presentations and give the podium to thought leaders within our specialty as they explore the topics that are critical to your practice.

We've included content from across the field of interventional radiology and thank the Annual Scientific Meeting Committee chairs and SIR Clinical Specialty Councils for working closely with us to ensure our sessions cover the full spectrum of IR: from arterial and venous interventions, gastrointestinal, pediatric, renal and genitourinary, pain management/musculoskeletal, neurointerventional radiology, and interventional oncology, to peripheral arterial disease, portal hypertension, practice development, and women's and men's health.

At the Expo, explore and get hands-on with the latest technologies and services shaping the future of IR practice and patient care. Be sure to stop by for a Compelling Conversation during one of the breaks in the IRHub, the central hub for networking and connection.

We're thrilled to bring these valuable experiences back to the annual meeting, and there's even more in store for you in Toronto. We can't wait to connect with you at SIR 2026!



**Bulent Arslan
MD, FSIR,**
Chair, SIR
2026 Annual Meeting
Program



**Kumar Madassery
MD, FSIR,**
Chair,
Scientific Program



**Paula Novelli
MD, FSIR,**
Vice-Chair,
Scientific Program

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Interventional Radiology (SIR), and produced
with the assistance of Elsevier

SIR and SIR Foundation organizational structure

JVIR editorial board

2026 honorees

SIR Foundation research awards

Abstract reviewers and scientific abstracts

Abstracts chosen by the Annual Scientific Meeting Committee

Abstracts of the Year

Scientific oral presentations

Sunday, April 12

Session 1: Arterial Interventions

Session 2: Chemoembolization 1

Session 3: Embolization 1

Session 4: IO - Kidney Ablation

Session 5: Men's Health 1

Session 6: Pain Management/MSK 1

Session 7: Practice Development & Management

Session 8: Radioembolization 1

Session 9: Women's Health 1

Monday, April 13

Session 10: Chemoembolization 2

Session 11: Gastrointestinal Interventions

Session 12: General IO 1

Session 13: General IR 1

Session 14: IO - Liver Ablation

Session 15: Men's Health 2

Session 16: Pain Management/MSK 2

Session 17: Peripheral Arterial Disease 1

Session 18: Portal Hypertension 1

Session 19: Radioembolization 2

Tuesday, April 14

Session 20: General IO 2

Session 21: General IR 2

Session 22: General IR 3

Session 23: Neurointerventional Radiology

Session 24: Peripheral Arterial Disease 2

Session 25: Portal Hypertension 2

Session 26: Radioembolization 3

Session 27: Vascular Malformations

Session 28: Venous Interventions 1

Session 29: Women's Health 2

Wednesday, April 15

Session 30: AI & Imaging

Session 31: Dialysis & Transplant

Session 32: Embolization 2

Session 33: General IO 3

Session 34: General IR 4

Session 35: IO - Ablation Science

Session 36: Pediatric Interventions

Session 37: Radioembolization 4

Session 38: Venous Interventions 2

Scientific traditional posters

Author Index by Abstract Number

Abstracts for educational exhibits can be found online
at www.jvir.org/content/sir_supplements*

Disclaimer

SIR assumes no legal liability or responsibility for the completeness, accuracy and correctness of the information presented in the abstracts. Abstracts are published in the Annual Meeting Supplement to the *Journal of Vascular and Interventional Radiology* as submitted by the authors, except for minor stylistic adjustments to ensure consistency of format and adherence to Supplement style.

Dosages, indications and methods of use for products that are referred to in the supplement by the authors may reflect their clinical experience or may be derived from the professional literature or other clinical sources. Because of the differences between in vitro and in vivo systems and between laboratory animal models and clinical data in humans, in vitro and animal data may not necessarily correlate with clinical results.

Content current as of Jan. 12, 2026.

*Available online at www.jvir.org/content/sir_supplements.

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2026 HONOREES

Society of Interventional Radiology honorees

41st Annual Dr. Charles T. Dotter Lecture

This award honors one of the founding fathers of interventional radiology, Dr. Charles T. Dotter. Selection by the SIR president is based on extraordinary contributions to the field, dedicated service to the society and distinguished career achievements in

interventional radiology. Honorees deliver the lecture at SIR's Annual Scientific Meeting.

The 41st Annual Charles T. Dotter Lecture will take place on Sunday, April 12, at 10:30 a.m. at the Metro Toronto Convention Centre.



SIR congratulates the 2026 Dr. Charles T. Dotter Lecturer:

Andrew Holden
MBChB, EBIR, ONZM

2026 Gold Medalists

The Society of Interventional Radiology's Gold Medal is awarded to a member who has helped ensure the future of interventional radiology by advancing the quality of medicine and patient care. The SIR Gold Medal, the society's highest honor, is bestowed for distinguished

and extraordinary service to SIR or to the discipline of interventional radiology.

The Gold Medal presentation will take place on Sunday, April 12, at 10:30 a.m.

SIR congratulates the 2026 Gold Medalists:



Thierry de Baère
MD



Scott Craig Goodwin
MD, MBA, FSIR



Lindsay Machan
MD, FSIR

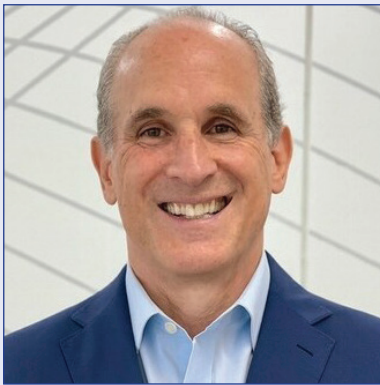
2026 HONOREES

Leader in Innovation Award

The Leader in Innovation Award recognizes and promotes innovation within interventional radiology, continuing IR's historical innovative development that has revolutionized medicine over the last 47 years. This award acknowledges those individuals who have conceptualized and implemented an idea that has had an advantageous impact on the practice

of interventional radiology. The innovation can be a device, technique, approach, clinical practice model, or anything having a significant improvement upon the quality of patient care or economics of interventional practice.

This award will be presented on Sunday, April 12, at 10:30 a.m.



SIR and SIR Foundation congratulate the 2026 Leader in Innovation Award winner:

**Bradford Johns Wood
MD, FSIR**

Dr. Gary J. Becker Young Investigator Award

Supported in part through Medtronic.

The Dr. Gary J. Becker Young Investigator Award promotes excellence in academic research for members early in their careers. This award honors the founding editor of the *Journal of Vascular and Interventional Radiology (JVIR)* by recognizing the importance of the young investigator in developing the interventional solutions for the future.

In 1990, SIR Foundation established the Dr. Gary J. Becker Young Investigator Award as a way to recognize

promising young practitioners of interventional medicine early in their careers and encourage their pursuit of academic careers. Each year an author of the most outstanding clinical science research paper submitted receives this distinguished award.

This award will be presented on Tuesday, April 14, at 9:45 a.m. during the SIR Foundation/JVIR Awards Recognition Ceremony.



SIR and SIR Foundation congratulate the 2026 Dr. Gary J. Becker Young Investigator Award winner:

**Niraj Pandey
MD, DNB, DM**

2026 HONOREES

Frederick S. Keller, MD, Philanthropy Award

This award honors an individual who, through exceptional generosity and through inspiring others to give, demonstrates outstanding commitment to SIR Foundation.

This award will be presented during the SIR Foundation Gala, Presented by Siemens Healthineers at 6:30 p.m. on Sunday, April 12, 2026.



**SIR and SIR Foundation congratulate the
2026 Frederick S. Keller, MD, Philanthropy Award recipient:**

**Barry T. Katzen
MD, FSIR**

Women in Interventional Radiology (WIR) Section

Women in Interventional Radiology Champion Award

The Women in IR Champion Award is presented annually to recognize an individual who has consistently made a significant contribution to the advancement of women in IR, such as in sponsorship, mentorship, teaching, promotion, advocacy and recruitment. The nominee must be a long-term member of SIR.

This award will be presented at the Women in IR InspiRed Lecture and Luncheon at 12:10 p.m. on Monday, April 13.



**SIR and SIR Foundation congratulate the
2026 Women in IR Champion Award recipient:**

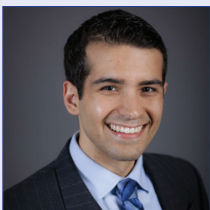
**Sue Hanks
MD, FSIR**

Resident, Fellow and Student (RFS) Section

Clinical Advancement Award

The RFS Clinical Advancement Award recognizes one exceptional resident each year who demonstrates a strong commitment to expanding their clinical skills, dedication to patient care and contributions to interventional radiology during their early postgraduate training.

This award will be presented on Saturday, April 11, at 11:15 a.m. during the RFS Program.



**SIR and SIR Foundation congratulate the 2026 RFS
Clinical Advancement Award recipient:**

**David Mittelstein
MD, PhD**

Journal of Vascular and Interventional Radiology (JVIR) honorees

JVIR Editor's Awards for Outstanding Research

The JVIR Awards for Outstanding Research are made possible through SIR Foundation.

The *Journal of Vascular and Interventional Radiology (JVIR)* grants awards for exceptional research published in the journal in two categories: clinical research and laboratory investigation. The winning manuscripts are selected after a rigorous review of all *JVIR* articles published in the preceding year, voted on by the present editors and decided on by the Editor-in-Chief.

The chosen articles represent research that may substantially impact the IR community at present or in the future. These awards will be presented during the plenary session at 9.45 a.m. on Tuesday, April 14, 2026, during the SIR Foundation/*JVIR* Awards Recognition Ceremony.

SIR and SIR Foundation congratulate the 2026 *JVIR* Editor's Awards for Outstanding Research recipients:

Outstanding clinical studies of the year

Prospective Multicenter Observational Study of Silent Brain Infarction following Transradial Hepatic Intervention (The MOSAIC Study)

Yuji Koretsune, MD, Miyuki Sone, MD, Shintaro Kimura, MD, Shunsuke Sugawara, MD, Yoshihisa Kodama, MD, PhD, Yasushi Kimura, MD, PhD, Kaishu Tanaka, MD, PhD, Yusuke Ono, MD, PhD, Hiroki Higashihara, MD, PhD, Yasuaki Arai, MD, Masahiko Kusumoto, MD, Noriyuki Tomiyama, MD, PhD

<https://doi.org/10.1016/j.jvir.2025.05.033>

Genicular Artery Embolization Using Mesenchymal Stem Cells for the Treatment of Knee Osteoarthritis: A Prospective Study

Hossein Ghanaati, MD, Maedeh Rouzbahani, MD, Jafar Golzarian, MD, Shahriar Kolahi, MD, John David Prologo, MD, Madjid Shakiba, MD, Maryam Barkhordar, MD, Ahmadreza Jamshidi, MD, Ramin Sarami Foroushani, PhD, Masud Yunesian, MD, Ali Ghanaati, BSc, Ardeshir Ghavam Zadeh, MD

<https://doi.org/10.1016/j.jvir.2025.05.031>

The Incidence and Consequences of Endovascular Technical Failure in Patients with Chronic Limb-Threatening Ischemia: Results from the Best Endovascular versus Best Surgical Therapy in Patients with Critical Limb-Threatening Ischemia (BEST-CLI) Trial

Richard J. Powell, MD, Alik Farber, MD, MBA, Gheorghe Doros, PhD, MBA, David Chew, MD, Michael S. Conte, MD, Michael D. Dake, MD, Sharon Kiang, MD, Matthew T. Menard, MD, Kenneth Rosenfield, MD, Peter A. Schneider, MD, Jeffrey J. Siracuse, MD, MBA, Palma Shaw, MD, Michael B. Strong, MA, Thomas Todoran, MD, Christopher J. White, MD, John A. Kaufman, MD, MS

<https://doi.org/10.1016/j.jvir.2025.02.020>

Hysterectomy and Myomectomy versus Uterine Artery Embolization for Symptomatic Fibroids and Adenomyosis: National and Regional Trends and Adverse Events in 70,000 Patients

Amy R. Deipolyi, MD, PhD, Frank Annie, PhD, Stephen H. Bush, II, MD, James Spies, MD, MPH

<https://doi.org/10.1016/j.jvir.2025.02.026>

Gallbladder Cryoablation for Calculous Cholecystitis Initially Treated with Percutaneous Drainage: A Prospective Trial in High-Risk Patients

Hugh McGregor, MD, Gregory Woodhead, MD, PhD, Lucas Struycken, MD, Abdul Khan, MD, David McNiel, MD, PhD, Christopher Brunson, MD, Charles Hennemeyer, MD

<https://doi.org/10.1016/j.jvir.2025.02.021>

First-in-Human Evaluation of a New Resorbable Microspherical Embolic Agent for Genicular Artery Embolization to Treat Pain Secondary to Knee Osteoarthritis

Mark W. Little, MBBS, MSc, Sankalp Agarwal, PhD, Ibrohim M. Khikmatovich, MD, Joan McCabe, BSc, Masum Pandey, PhD, Andrew L. Lewis, PhD, Liam Farrissey, PhD, Sherzod A. Iskhakov, MD

<https://doi.org/10.1016/j.jvir.2025.07.010>

Mesenteric Lymphangiography as a New Diagnostic and Therapeutic Tool for Refractory Chylous Lymphatic Leakages and Protein-Losing Enteropathy

David Yurui Lim, MBBS, Saebeom Hur, MD, Lyo Min Kwon, MD, Maxim Itkin, MD

<https://doi.org/10.1016/j.jvir.2025.08.008>

Outstanding laboratory investigations of the year

Ethiodized Oil Emulsion for Sustained Release of Anti-PD-L1 Antibodies

Hiroki Satomura, MD, Yasushi Kimura, MD, PhD, Norifumi Kennoki, MD, PhD, Kosuke Tomotake, MD, Hiroki Yano, MD, Yuji Koretsune, MD, Daisuke Katayama, MD, PhD, Kaishu Tanaka, MD, PhD, Yusuke Ono, MD, PhD, Hiroki Higashihara, MD, PhD, Noriyuki Tomiyama, MD, PhD

<https://doi.org/10.1016/j.jvir.2025.01.040>

Portal and Hepatic Vein Embolization versus Portal Venous Embolization Alone in Cirrhotic and Noncirrhotic Swine: A Pilot Study

Jonathan Tefera, MD, Tom N. Kuhn, MD, Nickolai J. Matuschewski, Ellen Meister, Jana Nguyenová, Tabea Kao, Martin Mutonga, MD, Ryan Bitar, MD, Vinzent H. Kahl, MD, Xuchen Zhang, MD, PhD, Annabella Shewarega, MD, Julius Chapiro, MD, PhD, David C. Madoff, MD

<https://doi.org/10.1016/j.jvir.2025.02.028>

The Influence of Preablation Embolization Particle Size on the Size of the Microwave Ablation Zone in a Porcine Orthotopic Renal Tumor Model

Samuel L. Rice, MD, Sagine Berry-Tony, MD, Jamaal Benjamin, MD, PhD, Payal Kapur, MD, Wisam Alnablsi, MD, Daniel Lamus, MD, Regina Beets-Tan, MD, PhD, Anil Pillai, MD

<https://doi.org/10.1016/j.jvir.2024.09.027>

Comparison of Liquid with Particle Embolics in a Translational Rat Model of Hepatocellular Carcinoma: Histologic and Radiographic Responses

Alexey Gurevich, MD, MS, Ariful Islam, MSPS, Jonathan Wakim, BS, Eva Yarsky, BS, Ryan Kiefer, MD, Ryan El-Ghazal, MD, George McClung, VMD, David P. Cormode, PhD, Gregory J. Nadolski, MD, MTR, Rony Avritscher, MD, Stephen J. Hunt, MD, PhD, Terence P.F. Gade, MD, PhD

<https://doi.org/10.1016/j.jvir.2024.12.004>

JVIR Editor's Outstanding Reviewer Awards

JVIR honors its outstanding reviewers for their superior editorial service in 2026. These individuals distinguished themselves through the degree of excellence and insight of their reviews, efficiency by which they work and finally the impressive quantity of reviews they performed on behalf of *JVIR*. The journal's

success depends on the dedication and expertise of its reviewers to critically and impartially assess submitted manuscripts for their originality, scientific and educational value and contribution to IR literature.

JVIR Outstanding Reviewer Awards will be presented during the SIR Foundation/*JVIR* Awards Recognition Program at 9.45 a.m. on Tuesday, April 14.



2026 Research Awards

SIR Foundation is dedicated to advancing the clinical needs of interventional radiology by specializing in developing investigators trained in conducting basic and clinical trials research, which provides the foundation for innovative therapies delivered through image-guided techniques. The foundation expands the innovative field of interventional radiology through research that contributes to the advancement of scientific knowledge; training of skilled investigators;

and development of new devices, better medications and enhanced procedures.

Every year, SIR Foundation's award program recognizes outstanding achievements in research and innovation. The 2026 research awards will be presented during the SIR Foundation/JVIR Awards Recognition Program at 9.45 a.m. on Tuesday, April 14.

2026 Awardees

Dr. Gary J. Becker Young Investigator Award

Niraj Pandey, MD, DNB, DM — "Transarterial embolization using imipenem/ cilastatin sodium for chronic painful Achilles tendinopathy refractory to conservative management"

Dr. Barry T. Katzen Master Clinician Award

John Fritz Angle, MD, FSIR

Dr. Constantin Cope Medical Student Research Award

Tamim Kawakibi — "Linking Lower Urinary Tract Symptoms to Sexual Function After PAE: Quantifying the IPSS-SHIM Relationship"

Andrew Warfield, PhD — "Predicting Response to Renal Artery Stenting for Atherosclerotic Stenosis: Regression Analysis of a 20-year Single Center Cohort"

Research Scientist Award

Mohammad Khavandi, MD, PhD — "From Leak to Resolution: Outcomes After Intranodal Lymphangiography and Embolization for Chylous Leaks in Cancer Patients"

Zohaa Faiz, MD — "Target Trial Emulation: A Comparison of Resection, Ablation, and TARE for Early-Stage HCC – A Real-World Analysis"

Resident Research Award

Capt. Tej Mehta, MD — "Multimodal Vision Transformer Modeling of Survival and Transplant Eligibility Following Radioembolization for Hepatocellular Carcinoma"

Nicholas Perkons, MD, PhD — "Intravascular Ultrasound-Guided Transcaval Cisterna Chyli Access for Lymphatic Intervention: A Proof-of-Concept Study in a Porcine Model"

Excellence in Innovation Award

Lin-Zhu Zhang, MD — "Lactate-Modulating Nanoreactors Facilitate Self-Amplifying Pyroptosis and the cGAS-STING Cascade for TACE Therapy"

2026 Scientific Abstracts and Reviewers

Scientific Abstract Reviewers

The Annual Scientific Meeting Committee is indebted to the 2026 Scientific Abstract Reviewers for their valuable contribution to the meeting.

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Scientific abstracts

Abstracts for the SIR 2026 Annual Scientific Meeting are listed by category as scientific oral presentations or posters. Over 350 abstracts will be presented in the scientific and general sessions covering all areas of vascular and nonvascular interventional radiology. 130 abstracts will be on display as posters located in the Poster Hall, as well as over 95 educational exhibits. Attendees are invited to the Scientific Traditional Poster and Educational Exhibit presentations on Monday, April 13, 12:10–1:10 p.m. and 4:45–5:45 p.m., respectively.

Scientific sessions

Scientific sessions will be held Sunday, April 12, through Wednesday, April 15, at the Metro Toronto Convention Centre. During this time, authors representing 30 countries (including the United States) from the global IR community will present the latest scientific research in interventional radiology.

Abstracts of the Year

The Annual Scientific Meeting Committee has identified three Abstracts of the Year to be presented during the Abstracts of the Year Recognition Session, Monday, April 13 at 10:00 a.m.

Featured abstracts

The SIR 2026 Annual Scientific Meeting continues the tradition of designating exceptional abstracts in selected scientific sessions as Featured Abstracts. These abstracts are identified with a shaded background on the following pages.

Scientific poster presentations

Scientific poster presentations are recognized by the Society of Interventional Radiology as an important part of the scientific program and are highly regarded as presentations. Scientific poster presentations and educational exhibits will be on display Sunday–Wednesday and presented on Monday, April 13, in the Poster Hall.

SIR Foundation research grants and awards

Denotes scientific abstracts from research partially or fully funded by SIR Foundation.



ABSTRACTS CHOSEN BY THE ANNUAL SCIENTIFIC MEETING COMMITTEE

In advance of the upcoming annual meeting of the Society of Interventional Radiology, the program committee wishes to highlight the scientific abstracts that will be presented. Abstracts were chosen using blinded review. Authors are congratulated for their contributions.

The abstracts of the year and featured abstracts are designated as such.

Kumar Madassery, MD, FSIR
Chair, 2025 Scientific Program

Paula Novelli, MD, FSIR
Vice Chair, 2025 Scientific Program

Abstracts of the Year

Abstracts of the Year and Late-Breaking Abstracts Presentations

Monday, April 13, 2026
10–11 a.m.

Abstract No. 1

■ ABSTRACT OF THE YEAR

Factors Impacting Post-TIPS Liver Failure (PTLF): A Retrospective Cohort Study



(Article No. 108006)

J. Chansangrat¹, A. Khooblal², L. Khawaja³, M. Neale², L. Worley², Y. Lin⁴, S. Gadani⁵; ¹Medical Institute, Suranaree University of Technology; ²Division of Interventional Radiology, Imaging Institute,

Cleveland Clinic; ³Northeast Ohio Medical University; ⁴Cleveland Clinic; ⁵Cleveland Clinic Foundation

Purpose: To identify clinical and laboratory predictors of PTLF.

Materials and Methods: A retrospective analysis was performed in 950 patients who underwent TIPS. Baseline demographics, pre-TIPS clinical factors, and procedural details were collected. Serial measurements of laboratory data (AST, ALT, bilirubin, albumin, INR, MELD) were obtained at baseline, daily for the first 7 days, and at 1-, 3-, 6-, and 12-months post TIPS. Key dynamic variables included post-TIPS peak and percent change of enzyme values, time to peak, and time to recovery. PTLF was defined according to the criteria proposed by Gaba. Dynamic patterns were compared between PTLF and non-PTLF patients using Mann-Whitney U and X² tests. Predictors were assessed using univariable and multivariable logistic regression. Cox proportional hazards regression was applied to evaluate predictors of AST and ALT recovery.

Results: PTLF occurred in 169 patients (17.8%). Patients with PTLF were older and more likely to have pre-TIPS spontaneous portosystemic shunt (SPSS) (12.4% vs 6.4%, $p=.007$) and celiac stenosis (3.0% vs 0.3%, $p<.001$). PTLF patients showed higher post-TIPS peak AST (144 vs 107 U/L, $p=.001$), peak ALT (178 vs 128 U/L, $p=.001$), greater percent change in AST and ALT (325% vs 206%, $p<.001$, and 303% vs 193%, $p<.001$, respectively). In multivariable regression, independent predictors of PTLF included older age (OR 1.04, $p=.027$), previous hepatic encephalopathy (HE) (OR 0.12, $p<.001$), post-TIPS peak MELD and percent change of INR (OR 1.03, $p=.042$). In Cox regression, PTLF was not independently associated with AST or ALT recovery.

Conclusion: Both baseline factors (age, HE) and post-TIPS peak MELD and percent change of INR independently predicted PTLF. In contrast, Cox regression analyses showed that PTLF was not associated with AST or ALT recovery. These findings highlight potential factors causing PTLF and support the use of combined clinical and dynamic laboratory markers for risk stratification and early transplant evaluation after TIPS.

Disclaimer:

SIR assumes no legal liability or responsibility for the completeness, accuracy or correctness of the information presented in the abstracts. Abstracts are published in the Annual Scientific Meeting Supplement to the *Journal of Vascular and Interventional Radiology* as submitted by the authors, except for minor stylistic adjustments to ensure consistency of format and adherence to Supplement style. Dosages, indications and methods of use for products that are referred to may be derived from the professional literature or other clinical sources. Between laboratory animal models and clinical data in humans, in vitro and animal data may not necessarily correlate with clinical results.

Abstracts current as of Jan. 12, 2026.

*An underline under an author's name designates the presenting author.

All tables are labeled by abstract number.

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1.1.

Predictor	95%CI	P-value
Age	1.04 (1.00-1.08)	.027
Pre-TIPS HE	0.12 (0.04-0.34)	< .001
Post-TIPS peak MELD	1.12 (1.01-1.26)	.045
% change of INR	1.03 (1.01-1.06)	.042

Abstract No. 2**■ ABSTRACT OF THE YEAR**

**Study of Multl-eLectrode
EndovaScular DenervaTiOn in PatieNts
with Type 2 Diabetes Mellitus
(MILESTONE): 6-Month Analysis from
the First-in-Human Proof-of-Concept
Study**



(Article No. 108007)

T. Pan¹, Q. Zhang¹; ¹Zhongda Hospital, Southeast University

Purpose: To assess safety and glycemic indices at 6 months in the study of endovascular denervation (EDN) procedure, in patients with type 2 diabetes mellitus (T2DM).

Materials and Methods: Using a novel six-electrode catheter system, EDN was conducted on the celiac artery (CA), and aorta between CA and the superior mesenteric artery (SMA). The primary outcomes were evaluated by the safety, HbA1c, homeostasis-model assessment of insulin resistance (HOMA-IR), and fasting plasma glucose (FPG). The antidiabetic medication, lifestyle, physical condition, blood pressure (BP), and plasma biochemistry were also recorded.

Results: A total of 11 T2DM patients were included for analysis. The technical success was 100% and no severe treatment-related adverse events or major complications were observed. Both HbA1c and HOMA-IR significantly reduced at 6 months, from 9.9 ± 1.6 to $8.0 \pm 2.4\%$ ($P = 0.005$), and from 13.3 (IQR 5.9-46.1) to 6.0 (IQR 3.1-11.9) ($P = 0.016$), respectively. At 1, 3, and 6 months of follow-ups, FPG levels were 10.2 ± 0.8 , 10.1 ± 1.2 , and 9.6 ± 1.7 mmol/L, respectively, compared to 15.4 ± 1.6 mmol/L at baseline ($P = 0.001$, < 0.001 , and < 0.001 , respectively), and 2hPG levels were 11.8 ± 3.0 , 11.4 ± 4.0 , and 11.0 ± 5.9 mmol/L, respectively, compared to 17.9 ± 6.0 mmol/L at baseline ($P = 0.001$, 0.001 , and 0.002 , respectively). OGTT based 3-hour C-peptide release test showed improved beta-cell function (AUC 0.23 (IQR 0.18-0.32) vs. 0.28 (IQR 0.21-0.38) pmol/mL, $P = 0.046$). A reduction of daily insulin injection was also observed (24 (IQR 15.5-47) vs. 19 (IQR 9-27.5) IU, $P = 0.018$) without changes in lifestyle. Improvements of liver function were observed although physical conditions, BP, plasma norepinephrine, angiotensin II, and blood lipids were not changed during follow-ups.

Conclusion: The 6-month analysis from this trial shows that EDN using the novel six-electrode catheter system at the new sites of CA and aorta between CA and SMA elicits a clinically significant improvement in hyperglycemia in patients with T2DM, with good tolerability.

Abstract No. 3**■ ABSTRACT OF THE YEAR**

**Y90 Glass Microsphere Treatment for
Intrahepatic Cholangiocarcinoma:
Final Results from the Largest
Prospective Real-World Study
(PROACTIF)**



(Article No. 108008)

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Purpose: This study evaluated the effectiveness, safety, and dosimetry of TARE with yttrium-90 (Y90) glass microspheres in a real-world clinical setting. Herein, we present the final data for patients with intrahepatic cholangiocarcinoma (iCCA).

Materials and Methods: All patients treated with Y90 glass microspheres (TheraSphere™) across 34 French institutions who were not opposed to data collection were included and followed prospectively during a 4 year period. Duration of follow-up and overall survival (OS) were assessed by reverse Kaplan-Meier (KM) and KM analysis, respectively. Toxicity was assessed using CTCAE v5 grading for adverse events (AEs).

Results: A total of 207 patients were included, 56.5% were ECOG 0; 31.9% had associated liver fibrosis or cirrhosis; 52.7% had a solitary lesion, median index lesion size was 7.0 cm (interquartile range, 5.0 – 9.5) according to RECIST 1.1. and central read. Patients were either treatment naïve (n=108; 52.2%) or had prior treatment (n= 77; 37.2%, systemic, n=70; locoregional, n=7; surgery, n=10). Concomitant systemic treatment was provided for 70 patients (33.8%) mostly Gemcitabine-cisplatin combination. 56.5% of patients received post progression subsequent treatment including surgery (n=27). 68.1% of patients had multi-compartment dosimetry and 58.9% had selective treatment administration. Median

follow-up was 31.0 months. Median OS (mOS) [95% CI] was 21.9 months (M) [18.2 – 24.3]. By subgroup mOS was 24.2M for patients with a single tumor versus 17.2M for patients with multiple tumors; 23.3M without cirrhosis/fibrosis versus 19.8M with cirrhosis/fibrosis; 21.3M without concomitant systemic treatment versus 21.9M with concomitant treatment, 23.3M in naïve patients versus 11.4M in recurrent disease. Patients with subsequent surgery had the greatest survival benefit (mOS not reached) compared to patients with subsequent treatment

excluding surgery (n=90), patients with no subsequent treatment (n=76), and patients with unknown or missing data (n=14): 21.3M, 17.4M, and 12.7M, respectively. In total, 19 AEs Grade $\geq$ 3 and 18 serious AEs were reported.

Conclusion: This real-world study demonstrates and confirms that Y90 treatment is a key option in patients with iCCA with an acceptable safety profile and meaningful survival including patients with cirrhosis and allowing 13% of subsequent resection or transplantation.

Scientific Session 1

Arterial Interventions

Sunday, April 12, 2026
3–4:30 p.m.

Abstract No. 4

A Retrospective Comparative Study of TAI with Raltitrexed, Irinotecan, and Oxaliplatin in Advanced Pancreatic Cancer Complicated by Obstructive Jaundice



(Article No. 108010)

H. Sun¹; ¹Zhongshan Hospital Affiliated of Fudan University

Purpose: This study aims to investigate the efficacy and safety of a novel three-drug TAI regimen, in which raltitrexed replaces 5-FU/leucovorin and is combined with irinotecan and oxaliplatin, for the treatment of advanced pancreatic cancer patients with obstructive jaundice.

Materials and Methods: This retrospective study enrolled 72 patients with advanced pancreatic cancer and obstructive jaundice who underwent metallic biliary stent placement followed by TAI treatment. Participants were stratified into Group A (gemcitabine plus oxaliplatin) and Group B (raltitrexed combined with irinotecan and oxaliplatin). After 1:1 PSM to balance confounding factors, tumor response, SPT, OS, and treatment-related adverse events (AEs) were compared between groups. Tumor response was assessed by Response Evaluation Criteria in Solid Tumors version 1.1. Kaplan-Meier analysis with log-rank testing was employed to compare SPT and OS, while AEs were graded according to Common Terminology Criteria for Adverse Events version 5.0.

Results: A total of 72 patients underwent 362 TAI sessions. The overall median SPT and OS were 8.75 months (95% CI 7.72–9.77) and 9.80 months (95% CI 9.05–10.54), respectively. After PSM, 23 patients were included in each group with balanced baseline characteristics. Survival analysis demonstrated that median OS was significantly better in Group B than in Group A (10.68 months vs. 9.04 months, $p=0.034$). However, no statistically significant differences were observed between the two groups in median SPT (8.02 months vs. 9.30 months, $p=0.306$), stent restenosis rate (21.7% vs. 34.8%, $p=0.326$), objective response rate (ORR: 13.0% vs. 17.4%, $p=0.681$), or disease control rate (DCR: 52.2% vs. 60.9%, $p=0.552$). Regarding safety, the incidence of grade 1 to 2 diarrhea was significantly higher in Group B than in Group A ($p=0.009$), without any other statistically significant differences in other AEs between the two groups.

Conclusion: The raltitrexed combined with irinotecan and oxaliplatin regimen demonstrated potential survival advantages over the gemcitabine plus oxaliplatin regimen in TAI chemotherapy for advanced pancreatic cancer patients with obstructive jaundice, while demonstrating a higher propensity for mild diarrhea (grade 1 to 2) without exacerbating severe toxicity (grade 3 to 4 AEs). This regimen provided a novel locoregional therapeutic strategy for

advanced pancreatic cancer patients with hepatic impairment or contraindications to systemic chemotherapy.

Abstract No. 5

Clinical Outcome of Endovascular Total Aortic Arch Repair via in Situ Micro-needle–Based Fenestration with Sheath-Pressing Gutter Technique



(Article No. 108011)

P. Ye¹, Y. Chen²; ¹Nanfeng Hospital, Division of Vascular and Interventional Radiology; ²Nanfeng Hospital

Purpose: To assess the early and midterm outcomes of endovascular total aortic arch repair (ETAAR) via in situ micro-needle based fenestration (ISMF) with hardness-enhanced sheath gutter technique for aortic arch pathologies.

Materials and Methods: Between August 2022 to April 2025, a retrospective study was conducted in consecutive patients who underwent ETAAR via ISMF with hardness-enhanced sheath gutter technique for aortic arch pathologies. Operative details, technical success, clinical outcomes and complications were recorded. Continuous data of bilateral RCOS and MAP of bilateral CCA were recorded during procedure. All patients were followed up with computed tomography angiography at 3, 12 months, and yearly thereafter.

Results: A total of 36 patients with aortic arch pathology were included, comprising aortic arch aneurysms ($n=27$; 75%) and non-A non-B aortic dissections ($n=9$; 25%). The technical success rate was 94.4% (34/36). Cervical branches reconstruction were successfully performed in all cases. Immediate type Ia endoleakages were found on final angiogram in 2 (5.6%) patients. The mean clinical follow-up was 18.2 ± 8.7 months (range, 1–32 months). The all cause death rate was 11.1% (4/36). One patient with aortic arch aneurysm died of severe pneumonia despite successful endovascular exclusion, leading to a 30-day mortality of 2.8%. Three additional deaths occurred during follow-up: one died of cerebral hemorrhage at 18 months, one died of liver carcinoma at 24 months, and one died of congestive heart failure at 32 months. The overall stroke rate was 8.3% (3/36). The survival rate at 1 and 3 years was $97.3\% \pm 2.7\%$ and $85.8\% \pm 8.1\%$. The cumulative rate of freedom from reintervention at 1 and 3 years was $87.5\% \pm 5.9\%$ and $83.2\% \pm 7.0\%$.

Conclusion: This study demonstrated the ETAAR via ISMF with hardness-enhanced sheath gutter technique can be performed successfully in aortic arch pathologies with a favorable early and midterm outcome.

Abstract No. 6

Incidence of Aorta-related Adverse Events After TEVAR for Aortic Dissection: Comparative Analysis of Acute, Subacute, and Chronic Phases



(Article No. 108012)

H. Kato¹, N. Kato¹, T. Ouchi¹, T. Higashigawa¹, Y. Yamaoka¹, K. Nakajima², S. Chino², H. Ito³,

T. Tokui⁴, T. Mizumoto⁵, K. Oue⁶, Y. Ichikawa¹, H. Sakuma¹; ¹Mie University Hospital, Radiology; ²Ise Red Cross Hospital, Radiology; ³Mie U Hospital Thoracic & Cardiovascular Surgery; ⁴Ise Red Cross Hospital Cardiovascular Surgery; ⁵Anjo Kosei Hospital, Cardiovascular Surgery; ⁶Kochi Health Sciences Center, Cardiovascular Surgery

Purpose: To compare the incidence of aorta-related adverse events according to the timing of thoracic endovascular aortic repair (TEVAR) for aortic dissection.

Materials and Methods: We retrospectively analyzed patients who underwent TEVAR for aortic dissection at four institutions between 2008 and 2024.

Results: A total of 148 patients (127 men, 21 women) were included. Of these, 36 were treated in the acute phase, 18 in the subacute phase, and 94 in the chronic phase. The 1- and 5-year overall survival rates were 77.7% and 52.9%, respectively. In-hospital mortality and aorta-related adverse events were defined as early aorta-related adverse events (AAE), whereas late aorta-related death and AAEs were defined as late adverse events. The incidence of these events was compared among the acute, subacute, and chronic phase groups. The incidence of early AAEs was 47.2% (17/36) in the acute group, 38.9% (7/18) in the subacute group, and 14.9% (14/94) in the chronic group. Overall comparison showed a significant difference (Fisher's exact test, $p = 0.0003$). Pairwise analysis revealed a significant difference between the acute and chronic groups ($p = 0.0008$, after Bonferroni correction). The incidence of late AAEs was 33.3% (12/36) in the acute group, 38.9% (7/18) in the subacute group, and 40.4% (38/94) in the chronic group. No significant differences were observed in the overall comparison (Fisher's exact test, $p = 0.77$), and no pairwise comparisons reached statistical significance.

Conclusion: TEVAR for aortic dissection was associated with a higher incidence of early AAEs in the acute phase and a lower incidence in the chronic phase. In contrast, the incidence of late AAEs did not differ among groups, and careful postoperative follow-up is required in all patients.

to RAS. This study identified pre-stenting variables which predict benefit following RAS.

Materials and Methods: An institutional review board-approved, retrospective search for patients that underwent RAS at a single institution from January 2004 to December 2023 was performed. Multiple linear regressions (MLR) were constructed for SBP and creatinine (Cr) change at 3 months post-stenting. Significant predictors were visualized with simple linear regression (SLR) against either SBP or Cr change at 3 months and 1-year post-stenting. Predictors included age, sex, bilateral stent, stenosis > 90%, any prior smoking, single functional kidney, and diabetes. Baseline antihypertensive burden and diastolic blood pressure (DBP) were included to predict SBP change. Cr change prior to stenting and baseline SBP were included as predictors of Cr change at 3 months. Variance inflation factors assessed multicollinearity in MLRs. Interactions were not included. Residual plots identified outliers in SLRs. Model validity was assessed by removing outliers and checking for changes in significance.

Results: 99 patients (69.2 ± 11.8 years; 41 men) were stented for atherosclerotic renal artery stenosis. MLR showed higher baseline DBP correlated with a larger decrease in SBP 3 months after stenting ($\beta = -1.10$, $p < 0.001$). Further, larger increases in Cr within a year prior to stenting were associated with greater reduction in Cr 3 months after stenting ($\beta = -0.37$, $p = 0.013$). All other predictors did not significantly correlate with change in SBP or Cr. SLR showed that higher baseline DBP correlated with a larger decline in SBP at 3 months ($\beta = -0.69$, $p < 0.001$, $r^2 = 0.16$) and 1 year ($\beta = -0.58$, $p = 0.009$, $r^2 = 0.09$) after stenting. Change in Cr pre-stenting was inversely related to change in Cr after stenting at 3 months ($\beta = -0.71$, $p < 0.001$, $r^2 = 0.53$) and 1 year ($\beta = -0.69$, $p < 0.001$, $r^2 = 0.47$). The subgroup of patients with stenosis >90% showed similar correlations at 3 months ($\beta = -0.82$, $p = 0.003$, $r^2 = 0.18$ for SBP; $\beta = -0.70$, $p < 0.001$, $r^2 = 0.53$ for Cr). Finally, 73% (16/22) of patients with stenosis >90% and DBP >80 mm Hg had a SBP drop ≥ 20 mm Hg and 61% (14/23) of patients with stenosis >90% and rising Cr ≥ 0.3 mg/dL pre-stenting had Cr decrease by ≥ 0.3 mg/dL at 3 months post-stenting.

Conclusion: High DBP and increasing Cr within a year prior to stenting are significant predictors of lower SBP and Cr following RAS.

Abstract No. 7



Predicting Response to Renal Artery Stenting for Atherosclerotic Stenosis: Regression Analysis of a 20-Year Single-Center Cohort



(Article No. 108013)

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Purpose: Recent data indicate renal artery stenting (RAS) could benefit patients with severe stenosis, high systolic blood pressure (SBP), and/or poor kidney function. However, limited data are available on what variables are predictive of a beneficial response

Abstract No. 8

Endovascular Management of Peripheral Arterial Hemorrhage Using the Low-Profile Braided Occluder (LOBO): A Single-Center Experience



(Article No. 108014)

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Purpose: To evaluate the technical feasibility, safety, and clinical efficacy of the Low-profile Braided Occluder (LOBO) (Okami Medical, Aliso Viejo, California) device in the management of acute peripheral arterial hemorrhage at a single center.

Materials and Methods: This retrospective single-center study included consecutive patients who underwent embolization for peripheral arterial hemorrhage with the LOBO device between June 2023 and May 2025. Patient demographics, etiology of the bleed, target vessel location, device size, number of devices used, technical success, clinical success, and adverse events were analyzed. Technical success was defined as complete angiographic occlusion of the target vessel. Clinical success was defined as cessation of hemorrhage without the need for reintervention or surgery within 30 days of embolization.

Results: Overall, 36 patients (mean age, 60.75 ± 19.2 years; 21 females, 15 males) with a total of 66 embolized vessels were included. Iatrogenic bleeding was the most common etiology, 19 (52.8%), followed by trauma, 8 (22.2%), and gastrointestinal ulcers, 3 (8.3%). The most frequently embolized territory was the gastroduodenal-pancreaticoduodenal arcade, 17 (28.3%). A total of 69 LOBO devices were deployed: LOBO-3, 46 (66.7%); LOBO-5, 17 (24.6%); LOBO-7, 5 (7.3%); and LOBO-9, 1 (1.5%). All target vessels were successfully occluded, resulting in 100% technical success. Three arteries required more than one device, except in pancreaticoduodenal arcade embolization, where two devices are routinely used. Clinical success was observed in 32 (88.9%) of 36 patients. All four patients with failed clinical success underwent repeat embolization, with rebleeding from a second artery—different from the initially embolized vessel—classified as a grade 3 adverse event according to the Society of Interventional Radiology classification. Additionally, there were no device-related adverse events.

Conclusion: The LOBO device demonstrated high technical and clinical efficacy with a favorable safety profile for embolization of arterial hemorrhage across a wide variety of vascular territories. Larger multicenter studies are warranted to further evaluate the role of the device in acute hemorrhage management.

Abstract No. 9

Failure of Initial Management and Delayed Pseudoaneurysm Formation in Splenic Trauma



(Article No. 108015)

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Purpose: To identify variables associated with failure of initial management, including both operative and non-operative approaches, as well as delayed pseudoaneurysm formation in adults with splenic trauma.

Materials and Methods: A retrospective review of patients with traumatic splenic injury was performed using the UCMC Trauma Center Data Registry (2017–2024). An extensive chart review identified mechanisms of injury, initial management strategies, and grades of injury. The two primary outcomes were failure of initial management requiring re-intervention and delayed pseudoaneurysm formation. Inferential statistics were used to identify candidate predictors, which were further evaluated using univariate and multivariate logistic regression.

Results: 257 patients met the inclusion criteria, of which 159 (61.9%) sustained blunt trauma and 98 (38.1%) sustained penetrating trauma. Eighteen (7.0%) patients experienced failure of initial management and required unplanned intervention with interventional radiology or splenectomy. On multivariate logistic regression, both older age (OR 2.06, $p = 0.003$) and higher injury grade (OR 4.24, $p = 0.007$) were independently associated with increased odds of failure, with each age group increment (18–34, 35–49, 50–64, and 65+), doubling the odds and high-grade injuries, grade IV–V, conferring a four-fold risk compared to low-grade, grade I–III. Delayed pseudoaneurysm developed in 8 of 257 patients (3.1%) across all injury grades, including 6 of 62 patients (9.7%) with high-grade (grades IV–V) injuries. Seven were managed with embolization. Two were incidentally detected on angiography, while the remainder were identified on repeat CTA for suspected extravasation or pseudoaneurysm, with only one showing true extravasation on follow-up angiography. Initial management strategy (interventional radiology, non-operative, operative hemostasis, or splenectomy) was not associated with pseudoaneurysm formation ($p = 0.607$) while higher injury grade was independently predictive (OR 18.5, $p = 0.008$), with high-grade injuries nearly 18 times more likely to develop delayed pseudoaneurysm. Median time to pseudoaneurysm formation was 2.15 days, with two outliers at 8 and 12 days.

Conclusion: Higher-grade injury was associated with increased risk of failure of initial management and delayed pseudoaneurysm formation, independent of initial management. This study suggests that adopting a 2-week imaging follow-up protocol may help standardize surveillance for these complications and better define the role of interventional radiology in managing splenic trauma.

Abstract No. 10

Short-Term Clinical Outcomes Comparison of Microspheres Versus N-butyl Cyanoacrylate Glue for Treating Lower Urinary Tract Symptoms with Prostatic Artery Embolization



(Article No. 108016)

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Purpose: To determine how embolic agent choice of microspheres versus n-butyl cyanoacrylate glue impacts short-term clinical outcomes when treating lower urinary tract symptoms (LUTS) with prostatic artery embolization (PAE).

Materials and Methods: Forty consecutive patients undergoing PAE to treat LUTS using 100- to 300-µm microspheres or n-butyl cyanoacrylate glue by a single operator (13 years' experience) from December 2023 to July 2025 were retrospectively reviewed.

Six patients were excluded (urethral stricture, history of prior PAE, inability to quantify symptoms). Baseline patient age, body mass index (BMI), and prostate volume (PV) were recorded for both microsphere (n=17) and glue (n=17) PAE groups. International Prostate Symptom Score (IPSS) and Quality of Life (QoL) data were then tabulated for baseline and 1-, 3-, and 6-months post-PAE time points. Comparisons used Student's t-tests and Mann-Whitney U tests. Adverse events grading used Clavien-Dindo classification.

Results: The microspheres group had mean age of 70.2 ± 6.1 years, BMI of 26.2 ± 4.4 kg/m², and PV of 121 ± 59 mL. Baseline characteristics of the glue group were not significantly different, with mean age of 70.3 ± 6.3 years ($p=0.94$), BMI of 25.4 ± 7.3 kg/m² ($p=0.68$), and PV of 103 ± 41 mL ($p=0.34$). All PAE procedures were technically successful. Clinical outcomes data for both groups are shown in Table 1. IPSS and QoL improved substantially and steadily compared to baseline in both groups ($p < 0.01$ for all), with no differences between groups in IPSS or QoL at baseline or at 1- and 3-month follow-up ($p=NS$ for all). At 6-month follow-up, IPSS trended lower in the microspheres group (IPSS=3 versus 7, $p=0.06$). Ninety-day adverse events included two grade 2 events in the microspheres group (hematoma, skin ulcer), with three grade 2 urine infections and two grade 3 events in the glue group (necrotic tissue sloughing and closure device failure).

Conclusion: PAE successfully treated LUTS in this study. Microspheres and glue delivered equivalent substantial improvements in IPSS and QoL at 1- and 3-months post-PAE. Mildly enhanced IPSS improvements with microspheres at 6 months are of uncertain significance. Larger-scale, longer-term studies are needed to further compare clinical durability and adverse events for the two embolic agents.

10.1. Impact of embolic agent on median IPSS and QoL

	Microspheres Group			Glue Group		
	n	Median IPSS (IQR)	Median QoL (IQR)	n	Median IPSS (IQR)	Median QoL (IQR)
Baseline	17	21 (8)	5 (1)	17	24 (6)	5 (2)
1Month	16	11 (9)	3 (2)	17	12 (5)	3 (1)
3Months	14	6 (8)	1 (2)	12	6 (8)	2 (2)
6Months	10	3 (4)	2 (2)	9	7 (5)	1 (3)

IQR=Interquartile Range

Abstract No. 11

Evaluation of Ultrasound Renal Denervation for Refractory Hypertension



(Article No. 108017)

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Purpose: The aim of this study was to determine early clinical outcomes and renal artery ultrasound changes after ultrasound renal denervation (uRDN) for resistant hypertension.

Materials and Methods: This was an institutional review board-approved single-center retrospective study. Patients who underwent uRDN (Paradise Ultrasound Renal Denervation

System, Recor Medical, Palo Alto, CA) for resistant hypertension on maximal anti-hypertensive therapy and could not achieve their target blood pressure are included. Secondary causes of hypertension prior to intervention were excluded. A total of 8 patients were treated (6 female; mean age: 51.9 ± 15.4 years). Procedural details, as well as pre- and post-intervention blood pressure, imaging and laboratory values were recorded. Changes in blood pressure, number of anti-hypertensive medications, kidney function, and peak systolic velocity (PSV) of the renal artery on duplex ultrasound (US) were analyzed.

Results: Mean follow-up duration was 5.8 ± 4.5 months. A total of 15 renal arteries were treated among 8 patients. One patient had multiple left renal arteries that were too small in diameter to treat with uRDN. Following uRDN, there was a significant decrease in the mean systolic blood pressure (183.1 ± 38.3 mm Hg to 143.8 ± 14.6 mm Hg, $p=0.03$), the mean number of antihypertensive medications (5.5 ± 1.5 to 3.4 ± 1.8 , $p=0.04$), and renal artery PSV (168.4 ± 92.3 cm/s versus 107.4 ± 46.8 cm/s, $p=0.03$). No significant change in renal function was observed ($p=0.92$). There were 3 cases of arterial spasm and 1 case of renal artery dissection which was treated with renal artery stent placement.

Conclusion: This study demonstrated that uRDN can effectively lower blood pressure and the number of antihypertensive medications for patients with refractory hypertension. Duplex US showed a decrease in mean renal artery PSV suggesting uRDN treatment by decreasing sympathetic drive which could be a biomarker for successful uRDN treatment.

Abstract No. 12

Reduction of Hemorrhagic Complications After Nonfocal Renal Biopsy with Pre-Procedure Desmopressin Administration



(Article No. 108018)

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Purpose: To evaluate the safety and efficacy of desmopressin (DDAVP) administration prior to NFRB to mitigate bleeding risk.

Materials and Methods: This retrospective observational study included all 158 patients who underwent NFRB from March 2022 to June 2025, before and after implementation of a DDAVP administration protocol. In July 2023, every patient regardless of renal function received 0.3 mcg/kg intravenous DDAVP immediately before biopsy, involving 18-gauge cores through coaxial guides. Patients who did or did not receive DDAVP were compared using Mann-Whitney U tests for nonparametric data, Student's t tests for parametric data, and chi-square tests for categorical data (alpha level of $P < 0.05$).

Results: Of 158 patients, 79 received DDAVP and 79 did not. Sodium was not significantly different at pre- or post-procedure, $p = 0.61$ and 0.45 , respectively. Hemoglobin values were not different pre-procedure and with fewer post-procedure values, the

12.1. Adverse events and laboratory changes after biopsy

Characteristic	No DDAVP	DDAVP	P value
Number of patients (n)*	79	79	
Sodium after biopsy (mmol/L) median (IQR; range)*	n=69, 138.0 (5; 130-147)	n=64, 137.5 (6; 123-146)	0.45
Hemoglobin after biopsy (g/dL) median (IQR; range)*	n=68, 10.2 (3.7; 6.7-16.6)	n= 65, 9.3 (3.4; 6.5-15.8)	0.03
Blood transfusion within 48 h	8 (10.1%)	8 (10.1%)	1.00
Admission and/or intervention within 1 w	6 (7.6%)	0 (0%)	0.03**
Unplanned admission only	2 (2.5%)	0 (0%)	0.50**
Admission and angiography	3 (3.8%)	0 (0%)	0.25**
Angiography	4 (5.1%)	0 (0%)	0.12**
Surgery for bleeding control	0 (%)	0 (0%)	1.00**
Thromboembolic event within 1 w	2 (2.5%)	3 (3.8%)	1.00**
Myocardial infarction	1 (1.3%)	2 (2.5%)	1.00**
Stroke/transient ischemic attack	1 (1.3%)	1 (1.3%)	1.00**

*n=79 except where noted

**Fisher's exact test

difference pre to post was not significant. Blood transfusion rate (10.1%) was the same for both groups. Six of 79 (8%) patients who underwent NFRB without DDAVP had an unplanned admission and/or angiography within 1 week of biopsy, compared to 0 in the DDAVP group (P=0.03). There was no difference in the rate of thromboembolic events between groups (2 of 79 [2.5%] v.

3 of 79 [3.8%]; P=1.00). All 5 of 158 (3.2%) patients who had stroke or a myocardial infarction within 1 week of NFRB had been on anticoagulant or antiplatelet agents that were held for biopsy.

Conclusion: DDAVP was associated with reduced unplanned hospitalizations and angiography/embolization after NFRB without increasing the risk of thromboembolic events.

Scientific Session 2

Chemoembolization 1

Sunday, April 12, 2026

3–4:30 p.m.

Abstract No. 15

■ FEATURED ABSTRACT Drug-Eluting Bead Transarterial Chemoembolization Treatment of Liver-Dominant Metastatic Leiomyosarcoma



(Article No. 108020)

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Purpose: To analyze the safety and efficacy of drug-eluting bead transarterial chemoembolization (DEB-TACE) for unresectable metastatic hepatic leiomyosarcoma.

Materials and Methods: Medical records of patients with metastatic hepatic leiomyosarcoma who underwent doxorubicin DEB-TACE from December 2014 to September 2024 were retrospectively reviewed to evaluate radiographic response, survival and clinical and biochemical toxicities. The study included 29 patients (9 males, 20 females; average age 60.1 ± 12.7 years). 23 patients (79.3%) had bilobar and 6 patients (20.7%) had unilobar disease. 20 patients (69%) had extrahepatic metastases at the time of the first DEB-TACE. 25 patients (86%) received multiple lines of systemic therapies before DEB-TACE.

The median number of systemic therapies prior to TACE was 3 (range: 1-6 lines) and 48% of patients had high-grade histology. **Results:** The median overall survival from the first DEB-TACE was 16.3 months (95% CI 2.2; 30.4), from diagnosis of liver metastasis was 35.8 months (95% CI 21.0; 50.6), and from primary diagnosis was 67.5 months (95% CI 49.2; 85.8). At 3 months post-DEB-TACE, the objective response was 79% (23 of 29 patients), and the disease control rate was 96% (28 of 29 patients), evaluated by mRECIST. The median liver progression-free survival from the first DEB-TACE was 7.8 months (95% CI 4.5; 11.2). The 1-, 2-, and 3-year survival rates from the diagnosis of liver metastasis were 93%, 69% and 38% respectively. There were two grade 3 clinical toxicities, four grade 3 laboratory toxicities, and 20 grade 1 or 2 laboratory toxicities. There was no 30-day mortality and no mortality related to DEB-TACE.

Conclusion: DEB-TACE was safe and effective treatment in a group of heavily pretreated, chemotherapy-refractory patients with liver-dominant unresectable leiomyosarcoma. DEB-TACE showed promising hepatic disease control and survival benefit with minimal side effects. This study is the largest reported cohort of patients with metastatic leiomyosarcoma treated with DEB-TACE. The results of this study can serve as

the basis for prospective multi-institutional study to prove the benefits of DEB-TACE in chemotherapy-refractory metastatic leiomyosarcoma.



Abstract No. 16

Lactate-Modulating Nanoreactors Facilitate Self-Amplifying Pyroptosis and the cGAS-STING Cascade for TACE Therapy



(Article No. 108021)

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Purpose: To convert intra-tumoral lactate from an immunosuppressive metabolite into a therapeutic fuel, we engineered LOCoF₂ nanoreactors that synchronously trigger pyroptotic cell death and potentiate cGAS-STING signaling, and to validate their efficacy as an in-situ immune primer for TAE/TACE in orthotopic hepatocellular carcinoma (HCC).

Materials and Methods: LOCoF₂ was prepared by electrostatic assembly of lactate oxidase (LOx) on DSPE-PEGylated cobalt fluoride (CoF₂) nanorods. Enzyme-mimetic activity was quantified with DPBF, NBT, TMB, and OPD probes. In vitro: H22 and HuH7 cells were assessed for lactate consumption, ROS, mitochondrial membrane potential, pyroptosis morphology, LDH/ATP release, CRT/HMGB1 exposure, stemness markers, and cGAS-STING phosphorylation. In vivo: murine subcutaneous or bilateral H22 models, humanized HuH7 xenografts, and rat orthotopic N1-S1 HCC were used. LOCoF₂ was injected intratumorally or dispersed in Lipiodol for transarterial embolization (TAE/TACE) with or without oxaliplatin (Oxa) or α-PD-1. Immune profiling by flow cytometry, ELISA, RNA-seq, and MRI-guided tumor monitoring was performed.

Results: LOCoF₂ depleted lactate within 30 min and cascade-generated •OH/O₂•⁻, elevating intracellular ROS 3.8-fold and collapsing mitochondrial potential to 87% monomers. Consequently, cleaved-caspase-1 and GSDMD-N increased 4.1- and 5.3-fold, provoking pyroptotic bubbles, IL-1β surge (240 pg mL⁻¹) and ICD signals (CRT 24%, HMGB1 release 60%). Released mtDNA plus Co²⁺ amplified cGAS-STING phosphorylation (p-TBK1, p-IRF3, p-STING each >2-fold), yielding 1 ng mL⁻¹ IFN-β. In mice, a single 5 mg kg⁻¹ LOCoF₂ dose induced 33.5% mature DCs, 40% CD8⁺ T-cell infiltration, 20% MDSC and 13% Treg reduction, eradicating 40% of primary tumors and 30% of distant lesions. Combination with α-PD-1 achieved 80% complete responses and memory immunity. In the rat orthotopic model, LOCoF₂-Lipiodol TACE reduced tumor volume 4.7-fold versus Lipiodol alone; adding Oxa (TACE) extended median survival from 14 to 32 days with augmented CD45⁺ immune infiltration and no systemic toxicity.

Conclusion: LOCoF₂ transforms lactate into H₂O₂, driving CoF₂-catalyzed ROS overproduction that ignites pyroptosis and releases mtDNA, which together with Co²⁺ sparks a self-amplifying cGAS-STING cascade. The resulting potent catalytic-immunotherapy synergizes with ICB and can be delivered locally via TAE/TACE, offering a clinically translatable strategy to

convert metabolic vulnerability into robust, sustained anti-HCC immunity.

Abstract No. 18

Comparative Survival Outcomes of Radioisotopes Plus Chemotherapy, Radiofrequency Ablation Plus Chemotherapy, and Resection in Localized Intrahepatic Cholangiocarcinoma: A SEER Database Study



(Article No. 108022)

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Purpose: The aim of this study was to compare survival outcomes among radioisotopes with chemotherapy (RI-C), radiofrequency ablation with chemotherapy (RFA-C), and surgical resection for patients with localized intrahepatic cholangiocarcinoma (iCCA) using a population-based dataset.

Materials and Methods: Data were obtained from the Surveillance, Epidemiology, and End Results (SEER) database (2005–2022) using SEER*Stat version 9.0.41.4. Eligible cases included patients treated with RI-C or RFA-C, and those undergoing resection (with or without chemotherapy). Demographic and clinical variables extracted included age, sex, race, year of diagnosis, survival time in months, and cause of death attributable to iCCA. Kaplan-Meier analyses were conducted to estimate overall survival (OS) and cancer-specific survival (CSS), with log-rank tests used for group comparisons. Multivariable Cox proportional hazards regression was performed to identify predictors of OS and CSS, with hazard ratios (HRs) and 95% confidence intervals (CIs) reported.

Results: A total of 188 patients met inclusion criteria, including 96 males, with a median age of 68 years. Treatment groups consisted of 90 patients in RI-C, 34 in RFA-C, and 64 in the resection cohort. Median OS was 26 months for RI-C (95% CI, 20.3–31.7), 32 months for RFA-C (95% CI, 18.0–46.0), and 46 months for resection (95% CI, 29.0–63.0). Log-rank testing showed significant differences only between RI-C and resection ($p=0.027$). Median CSS was 28 months for RI-C (95% CI, 23.2–32.8), 36 months for RFA-C (95% CI, 22.5–49.5), and 92 months for resection (95% CI, 40.0–144.0), with significant differences observed between RI-C and resection ($p=0.001$). Demographic variables (age, sex, race, year of diagnosis) were not significant predictors. On multivariable analysis, resection was associated with improved OS (HR = 1.0, $p=0.036$) and CSS (HR = 1.0, $p=0.010$), while RI-C was associated with inferior outcomes for both OS (HR = 2.0, $p=0.011$) and CSS (HR = 2.6, $p=0.002$).

Conclusion: Surgical resection yielded the longest overall and cancer-specific survival compared with RI-C or RFA-C in patients with localized iCCA. RFA-C demonstrated more favorable outcomes than RI-C, particularly in cancer-specific survival, suggesting that treatment modality is the primary driver of survival differences.

Abstract No. 19

Should Transarterial Chemoembolization Be Applied with Systemic Therapy for Hepatocellular Carcinoma with Hepatic Vein And/or Inferior Vena Cava Tumor Thrombus (CHANCE2505)?: A Multicenter Study



(Article No. 108023)

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Purpose: Systemic therapy with or without radiotherapy is useful for hepatocellular carcinoma (HCC) with hepatic vein and/or inferior vena cava tumor thrombus (HVTT/IVCTT). However, the efficacy of transarterial chemoembolization (TACE) in such a population is still unconfirmed. This study aims to evaluate whether TACE should be applied with systemic therapy for HCC with HVTT/IVCTT, in a first-line therapy setting.

Materials and Methods: This multicenter retrospective cohort study included HCC patients with HVTT/IVCTT treated between June 2018 and March 2024. Patients received either systemic therapy plus TACE (Group A) or systemic therapy alone (Group B). Propensity score matching (PSM) was utilized to balance the baseline characteristics. Four sensitivity analysis, including inverse probability of treatment weighting (IPTW) was performed. The primary outcomes were overall survival (OS) and progression-free survival (PFS). Secondary outcomes included objective response rate (ORR) and safety.

Results: A total of 972 HCC patients with HVTT/IVCTT (696 in Group A and 276 in Group B) were included. The median follow-up time was 32.1 (95% CI: 30.4–33.8) months. After PSM, Group A demonstrated a significantly longer median OS compared to Group B (20.9 vs. 14.3 months; HR=0.65, 95% CI: 0.54–0.77, $P<0.0001$). Group A achieved a significantly longer median PFS compared to Group B (10.7 vs. 7.3 months; HR=0.67, 95% CI: 0.57–0.79, $P<0.0001$, per RECIST v1.1 criteria). Additionally, Group A exhibited a significantly higher objective response rate per RECIST v1.1 (45.3% vs. 28.8%, $P<0.001$) and per mRECIST criteria (53.6% vs. 36.3%, $P<0.001$). Grade ≥ 3 treatment-related adverse events occurred in 238 patients in Group A (34.2%) and 87 patients in Group B (31.5%).

Conclusion: TACE in combination with systemic therapy shows improved survival benefits and manageable safety profiles compared to systemic therapy alone. These results support the use of TACE alongside first-line systemic therapy for HCC patients with HVTT/IVCTT.

Abstract No. 20

Incidence and Factors Predictive of Recurrent Rupture in People with Rupture of Unresectable Hepatocellular Carcinoma



(Article No. 108024)

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Hospital; ³The First People's Hospital of Changzhou; ⁴The Affiliated Cancer Hospital of Nanjing Medical University; ⁵Jiangyin People's Hospital

Purpose: Spontaneous rupture hemorrhage of hepatocellular carcinoma (HCC) has a low incidence and a high risk of death. Unresectable rupture hepatocellular (rHCC) carcinoma has a high early hemostasis rate after transcatheter arterial embolization (TAE). However, there is still a risk of recurrent rupture (RR) during subsequent treatment. There is a lack of studies on the Incidence and factors predictive of recurrent rupture in these patients. Our first aim was to describe the incidence of RR in people with unresectable rHCC. The second aim was to identify RR risk factors and afterwards verify them in a validation cohort.

Materials and Methods: This is a multicenter, retrospective observational study evaluating risk factors for RR in 94 people with unresectable rHCC from January 2010 to December 2023 in four medical centers. In the training cohort, the potential value of parameters to predict RR was analyzed by univariate and multivariate Cox analysis. Findings were validated in 79 individuals with unresectable rHCC.

Results: A total of 173 patients were included in this study. Of the 94 participants in the training cohort, 17 (18.1%) presented recurrent rupture during follow-up (cumulative incidence: 6.6, 13.2, 16.3, and 24.6% at 3, 6, 12, and 24 months, respectively; the mean and median time: 9.6 and 7.0 months, respectively). In addition, MELD score > 15, tumor size > 10 cm and received targeted therapy were the independent factors predicting RR (hazard ratio 8.40, 95% CI 2.25-34.10, $p=0.002$; hazard ratio 3.36, 95% CI 1.05-10.74, $p=0.041$; hazard ratio 5.72, 95% CI 1.78-18.43, $p=0.003$, respectively). Of the 79 participants in validation cohort, 14 individuals (17.7%) presented RR during follow-up (cumulative incidence: 6.9, 15.6, 18.2, and 32.8% at 3, 6, 12, and 24 months, respectively; the mean and median time: 10.9 and 7.0 months, respectively). The predictive value of these factors was showed good stability and prediction accuracy when assessed externally in validation cohort (C-index: 0.872, 95% CI: 0.773-0.972).

Conclusion: People with unresectable rHCC are at risk of recurrent rupture. Factors of MELD score > 15, tumor size > 10 cm and received targeted therapy are independent risk factors for recurrent rupture.

Scientific Session 3

Embolization 1

Sunday, April 12, 2026

3–4:30 p.m.

Abstract No. 21

Retrograde Transvenous Obliteration with Gelfoam for Gastric Varices Without a Sclerosant: Insights from a Single Tertiary Institution: A Retrospective Study



(Article No. 108026)

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Purpose: This study aims to evaluate the effectiveness of Gelfoam-based retrograde transvenous obliteration, performed without Sclerosant, as a treatment strategy for large gastric varices and associated gastro-renal shunts (maximum diameter 20 mm; average 14 mm) in elective as well as emergent clinical settings and describe mid to long-term clinical results.

Materials and Methods: A retrospective analysis was conducted on 45 consecutive patients (34 men, 11 women; mean age, 45 years; range, 16–70 years) who underwent retrograde transvenous obliteration between 2019 and 2025 for the management of massive gastric variceal hemorrhage after obtaining written informed consent and institutional ethics committee clearance. The primary intervention involved the use of Amplatzer Vascular Plugs (AVPs) in conjunction with absorbable gelatin sponge (Gelfoam) as the embolic agent, without the addition of Sclerosants in the majority of cases. Clinical and laboratory data were reviewed to assess procedural outcomes, including technical and clinical success rates, as well as associated complications. The follow-up period was 5 years. The technique of retrograde obliteration with sodium tetradecyl sulfate (STS) sclerosant is an established treatment modality demonstrating high technical and clinical success with a low complication profile. The aim of this study is to evaluate the safety and efficacy of a modified approach—using Gelfoam alone as the embolic agent, eliminating the need for Sclerosants, further making it more safer.

Results: Technical success—defined as complete occlusion of the gastro-renal shunt and full opacification of the gastric varix (GV) with Gelfoam slurry—was achieved in all 45 patients (100%). Clinical success, defined as the absence of upper gastrointestinal bleeding (UGIB) during the follow-up period, was observed in all patients following the procedure. Follow-up CT obtained within 1 wk after PARTO showed complete thrombosis of GVs and portosystemic shunts in all patients (100%). Death due to other causes occurred in 5 patients. There were no immediate procedure-related complications. All cases showed successful clinical outcome during a mean follow-up of 3–5 years evidenced by imaging studies, endoscopy, and clinical data. There were no cases of variceal bleeding or hepatic encephalopathy at the end of follow-up (mean, 3 years).

Conclusion: Retrograde transvenous obliteration using Gelfoam without Sclerosant appears to be a safe and effective technique for the management of gastric variceal hemorrhage achieving a sustained bleed-free period.

Abstract No. 22

Angioembolization in Patients with High-Grade Kidney Injuries May Lower Rates of Acute Kidney Injury and Mortality



(Article No. 108027)

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Purpose: Patients with high-grade kidney injuries are increasingly being managed non-operatively, yet patients remain at high risk for nephrectomy or catheter-based intervention for hemorrhage control. Despite this, the comparative effectiveness of these strategies has not been defined in a national cohort. We hypothesized that angioembolization in initially hemodynamically stable patients with blunt high-grade kidney injuries would be associated with improved outcome compared to nephrectomy.

Materials and Methods: Using the American College of Surgeons Trauma Quality Improvement Project National Trauma Databank (2017–2022), we identified all patients with AAST grade 3–5 kidney injuries after a blunt mechanism of injury. Patients with initial hypotension (systolic blood pressure < 90 mm Hg), hospital stay < 24 hours, non-survivable injuries (any Abbreviated Injury Scale severity of 6), and transfers were excluded. Our primary outcome was in-hospital mortality and secondary outcome was acute kidney injury (AKI). Inverse probability-weighted regression adjustment was used to account for both differences influencing treatment selection (who underwent angioembolization vs. nephrectomy) and differences influencing outcomes: controlling for gender, hospital characteristics, initial vital signs, Glasgow Coma Scale, Injury Severity Score and kidney injury grade.

Results: In 858 cases of blunt AAST Grade 3–5 kidney injuries (75% male, average age 41.1 [±20] years), 470 (55%) underwent angioembolization and 388 (45%) underwent nephrectomy. 15% of patients had a grade 3 injury, 44% grade 4, and 41% grade 5. The overall mortality rate was 11% (5% in the angioembolization group vs. 17% in the nephrectomy group, $p < 0.001$), and the incidence of AKI in the cohort was 8.9% (4.1% in the angioembolization group vs. 15% in the nephrectomy group, $p < 0.001$). On adjusted analysis, nephrectomy was independently associated with an 8.4% increased risk of AKI based on average treatment effect (relative risk 2.27 [95% CI 1.58–2.97, $p = 0.001$]) and 10.6% increased mortality (RR: 2.56 [95% CI 1.84–3.28], $p < 0.001$) compared to angioembolization.

Conclusion: This study demonstrates that angioembolization is associated with both a lower likelihood of AKI and mortality than nephrectomy in initially hemodynamically stable blunt trauma patients with high-grade kidney injuries. A kidney-preservation strategy with angioembolization may be considered for initial management of these patients, though future prospective work is needed to validate these findings.

Abstract No. 23**Frozen Shoulder, Warm Results: Trends and Outcomes for Adhesive Capsulitis Embolization**

(Article No. 108028)

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Purpose: Adhesive capsulitis embolization (ACE) has recently emerged as a novel image-guided therapy for frozen shoulder. We evaluated real-world clinical outcomes of ACE and temporal utilization trends across a large federated electronic health record (EHR) network.

Materials and Methods: The TriNetX Research Network was queried for patients diagnosed with adhesive capsulitis of the shoulder (ICD-10-CM: M75.0). ACE was defined as M75.0 followed by arterial embolization procedures, requiring CPT 37242 (vascular embolization or occlusion, arterial, non-hemorrhage, non-tumor) and CPT 75774 (selective angiography, each additional vessel studied), in combination with at least one of the following codes: CPT 36216 (selective catheter placement, second-order thoracic or brachiocephalic branch), CPT 36217 (third-order or more thoracic/brachiocephalic branch), CPT 36218 (additional second/third-order thoracic/brachiocephalic branch), or CPT 75710 (unilateral extremity angiography). Among adhesive capsulitis patients, ACE annual incidence proportion and prevalence were calculated from 2015 to 2024. Furthermore, ACE patients were evaluated for one-year post-procedural outcomes, including repeat embolization, arthroscopy (29806/29825), manipulation under anesthesia (23700), and joint injections (20610/20611). Risk analyses were conducted.

Results: Of 433,078 patients with adhesive capsulitis, ACE incidence proportions were < 0.05% annually, peaking at 0.037% during 2015–2020 and stabilizing at 0.009–0.016% during 2021–2024. Prevalence increased from 0.039% (2015–2020) to 0.074% (2024). Among 111 ACE patients (mean age 66.1 years, 54% male, 46% female, 16% Black, 9% Hispanic, 72% White), prior interventions included intra-articular injection (53%), manipulation under anesthesia (9%), and arthroscopic capsular release (9%). At 1 year, no patients required arthroscopy or manipulation under anesthesia. Fourteen patients (12.6%) underwent a composite repeat intervention (including embolization, injection, or related procedures).

Conclusion: Adoption of ACE demonstrated modest growth over the past decade with zero surgical conversions, including manipulation under anesthesia or capsular release. Re-intervention was required in 12.6% of patients within one year. These findings confirm that ACE remains an emerging treatment for adhesive capsulitis and has potential as a surgery-sparing therapy. Further prospective studies are warranted to demonstrate long-term efficacy, durability, and optimal patient selection.

Abstract No. 24**AIS-Adjusted Comparative Effectiveness of Embolization Versus Surgery in Traumatic Pelvic Injuries**

(Article No. 108029)

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Purpose: This study aimed to compare the effectiveness of embolization versus surgery for treating pelvic trauma patients.

Materials and Methods: A retrospective analysis was conducted using data from 4053 adult patients with pelvic injuries from the American College of Surgeons' Trauma Quality Improvement Program registry from 2021 to 2023. Embolization (n=2297) and surgery (n=1759) group were propensity score-matched (PSM) using age and sex. Groups were compared with Mann–Whitney U test for numerical variables and the chi-squared test for categorical variables. The embolization and surgery groups were then compared on key outcomes, including hospital length of stay (LoS) and mortality, with logistic and linear regression models with adjusted abbreviated injury scale (AIS).

Results: Following PSM, 1759 patients from each group were matched. There were 1280 (72.8%) females and 478 (27.2%) males in the embolization group and 1293 (73.5%) females and 466 (26.5%) in surgery group (P = 0.64). The median (IQR) age was 51 (33) for embolization group and 44 (25) for surgery group (P < 0.001). LoS (16[19]–18[23]) and mortality (294[16.7%]–481[27.3%]) were significantly different for embolization and surgery groups (All P < 0.001). LoS was significantly lower for embolization group when AIS considered (P < 0.001). Mortality was significantly lower for embolization group with AIS (P < 0.001, 0.003, 0.001, 0.001; All, 3, 4, and 5, respectively).

Conclusion: Embolization, particularly when adjusted for AIS, is associated with superior results in the national trauma registry due to significantly shorter hospital length of stay and lower mortality rates.

24.1.

AIS Grades	Surgery (n=1759)	Embolization (n=1759)	P-value
Length of Stay	18 (23)	16 (19)	< 0.001
AIS 3	18 (21)	16 (18.75)	0.04
AIS 4	19 (22)	15 (17)	< 0.001
AIS 5	15 (32)	18 (21)	< 0.001
Mortality	481 (27.3%)	294 (16.7%)	< 0.001
AIS 3	180 (23.4%)	57 (12.3%)	< 0.001
AIS 4	125 (22.1%)	93 (13.7%)	< 0.001
AIS 5	176 (41.6%)	144 (22.4%)	< 0.001

Abstract No. 25

Efficacy of Microfibrillar Collagen Tract Embolization in Liver Biopsies: A Single-Center Experience



(Article No. 108030)

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Purpose: To evaluate complication rates following percutaneous liver biopsy with routine microfibrillar collagen tract embolization and compare outcomes with published non-embolized cohorts.

Materials and Methods: We retrospectively reviewed 850 patients who underwent percutaneous liver biopsy with routine microfibrillar collagen tract embolization (Avitene) at a tertiary academic center between August 2022 and July 2025. Of these, 695 patients met the inclusion criteria for non-targeted biopsy (excluding mass/metastatic indications). Demographic, clinical, laboratory, and procedural variables were collected. Outcomes included major bleeding, minor bleeding, emergency department (ED) visits within two weeks, CT-confirmed bleeding, and 30-day readmission. Continuous variables were summarized as median (IQR) and categorical variables as counts and percentages.

Results: Among 695 non-targeted biopsies, major bleeding occurred in 1 case (0.14%) and minor bleeding in 1 case (0.14%). Any bleeding complication was observed in 3 patients (0.43%). ED visits within two weeks occurred in 43/695 (6.2%), with CT-confirmed bleeding in 1/44 imaged patients (2.3%; 0.14% overall). Seventeen patients (2.4%) were readmitted within 30 days, with readmissions associated with lower hemoglobin, platelet count, and higher INR at baseline. Compared with published non-embolized cohorts reporting overall complication rates of 1.6–2.4%, major bleeding 0.4–1.4%, and minor bleeding up to 16.2%, our cohort demonstrated substantially lower rates.

Conclusion: Routine microfibrillar collagen tract embolization in percutaneous liver biopsy was associated with extremely low rates of major and minor bleeding, well below published benchmarks for non-embolized procedures. These findings support tract embolization as a safe and effective adjunct. Larger multicenter studies are warranted to validate its protective effect and further assess resource utilization related to ED visits.

Abstract No. 26

Safety and Efficacy of Prostatic Artery Embolization with Cyanoacrylate Glue for Benign Prostatic Hyperplasia: A Systematic Review and Meta-Analysis of Short-Term Outcomes



(Article No. 108031)

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Purpose: Cyanoacrylate glue is an alternative to conventional embolic agents used for prostatic artery embolization (PAE), such as microparticles. However, its therapeutic potential in the treatment of symptomatic benign prostatic hyperplasia (BPH) remains underexplored. This study aims to update and reinforce the current evidence regarding the safety and efficacy of PAE performed with glue in this clinical context, enabling future comparisons between different PAE techniques and contributing to the identification of the most appropriate.

Materials and Methods: A systematic review and single-arm meta-analysis were conducted by searching PubMed, Embase, and CENTRAL for studies involving PAE with cyanoacrylate glue in patients with lower urinary tract symptoms (LUTS) secondary to BPH. Primary outcomes included the International Prostate Symptom Score (IPSS), prostate volume (PV), and quality of life (QoL). Procedural technical aspects were also assessed. A subset analysis was performed for outcomes reported within three months of follow-up, and sensitivity tests were conducted in cases of high heterogeneity. All statistical analyses were performed using RStudio.

Results: Six retrospective studies were included, comprising 490 patients with a mean age of 70.25 ± 8.11 years. Follow-up periods ranged from 7.1 weeks to 6 months. Technical success was achieved in 97% of cases. At the end of follow-up, significant improvements were observed in IPSS (MD -12.52; 95%CI [-15.87 to -9.17]; $I^2 = 95.1\%$), QoL (MD -2.71; 95%CI [-3.09 to -2.33]; $I^2 = 65.8\%$) and PV (MD -28.77; 95%CI [-34.73 to -22.81]; $I^2 = 12.4\%$). Subset analysis within three months also revealed substantial gains in IPSS (MD -10.51; 95%CI [-11.41 to -9.61]; $I^2 = 0\%$), QoL (MD -2.39; 95%CI [-2.71 to -2.07]; $I^2 = 60.2\%$) and PV (MD -16.75; 95%CI [-25.29 to -8.21]; $I^2 = 34.1\%$). PAE with glue demonstrated consistent short-term efficacy and further improvement over time. Sensitivity analysis suggested that high heterogeneity may be associated with baseline differences in PV across studies. No heterogeneity ($I^2 = 0\%$) was observed regarding the type of cyanoacrylate glue. Compared to microparticles, cyanoacrylate glue appears to confer technical advantages while providing similarly effective outcomes.

Conclusion: PAE with cyanoacrylate glue is safe and effective for alleviating symptoms of BPH, offering outcomes comparable to microparticles. Nonetheless, further randomized controlled trials with longer follow-up are warranted to expand and strengthen these findings.

Abstract No. 27

Over Twenty Years of a Single-Center Experience with Elective Transcatheter Coil Embolization of Unruptured Splenic Artery Aneurysms



(Article No. 108032)

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Purpose: To review over 20 years of a single-center experience with elective transcatheter coil embolization of unruptured splenic artery aneurysms (SAA).

Materials and Methods: A retrospective review of unruptured SAA electively treated with transcatheter coil embolization at a single center from October 2002 to June 2025 was performed. Patient records and imaging were reviewed to obtain demographics, SAA number and size, procedural technique, and technical and clinical outcomes. Primary technical success (cessation of flow into aneurysm inflow vessel and no evidence of contrast opacification of the aneurysm sac), secondary technical success (freedom from aneurysm opacification on follow-up imaging), reintervention rates, adverse events, 30-day mortality rate, and freedom from aneurysm rupture were recorded.

Results: A total of 153 unique aneurysms were treated in 127 patients. The mean age was 54.7 years (range, 24-89), and 85 patients (66.9%) were female. Mean aneurysm size was 24 mm (range, 5-80). All SAA were electively treated with transcatheter coil embolization. Twelve (7.8%) required an adjunctive technique or embolic [stents (4), plugs (3), Gelfoam (2), Onyx (2), glue (1)]. Primary technical success was achieved in all but one patient (99.2%). Median follow-up was 25.8 months (range, 1 day-19.9 years). Secondary technical success was achieved in 122 patients (96.0%). Reintervention was required in four patients (3.1%), all of whom remained successfully treated following reintervention. Major splenic infarction occurred in 17 of 127 patients (13.4%), including nine of 27 patients (33.3%) with portal hypertension and eight of 100 (8.0%) without portal hypertension. Thirty-day follow-up was available for 105 patients (82.7%). One mortality (0.8%) occurred within 30 days due to transfusion reaction, unrelated to SAA embolization. There were no cases of SAA rupture in the follow-up period.

Conclusion: This large single-center experience demonstrates that elective transcatheter coil embolization is a safe and effective treatment for unruptured SAA with high rates of technical success and freedom from aneurysm rupture.

Abstract No. 28

Angiographic Embolization for Treatment of Thoracic Wall Hemorrhage: A Single Institution Study



(Article No. 108033)

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Purpose: Transarterial embolization (TAE) is an effective minimally invasive treatment for traumatic hemorrhage and gastrointestinal arterial bleeding, but its use for thoracic wall hemorrhage is less frequently reported in the literature. Open surgery for thoracic wall hemorrhage is more invasive, requiring extensive dissection to locate bleeding vessels, while untreated hemorrhage can lead to significant blood loss. This study aims to evaluate the safety and effectiveness of transarterial embolization for treatment of chest wall hemorrhage.

Materials and Methods: A single-institution retrospective review was performed from April 2015 to April 2024, including a total of 44 adults who underwent TAE for active chest wall hemorrhage. Patient baseline characteristics, procedure metrics, technical success, clinical success, transfusion requirement, and

mortality were reviewed. Factors associated with post-embolization transfusion and in-hospital mortality were evaluated.

Results: Technical success was achieved in 97.7% of patients (43/44). The clinical success rate was 90.7% (39/43). Patients who needed blood transfusions post-TAE had more coagulopathy (6/26 vs. 9/17, $p=0.045$), longer fluoroscopy times (29.6 vs. 16.4 min, $p=0.0002$), higher air kerma (915.5 vs. 325.5 mGy, $p=0.0110$), and greater contrast agent use (159.2 vs. 98.6 mL, $p=0.0011$). Coagulopathy (OR: 9.9, $p=0.004$), baseline hemodynamic stability (OR: 0.046, $p=0.038$), and post-embolization transfusion (OR: 0.19, $p=0.033$) were linked to in-patient mortality. One procedure-related major adverse event occurred, which was a femoral artery pseudoaneurysm.

Conclusion: TAE for active chest wall hemorrhage was safe and effective. Patients with coagulopathy, baseline hemodynamic instability, and higher case complexity were associated with worse post-embolization prognosis

Abstract No. 29

Comparative Outcomes of Particle Versus Ethanol-Lipiodol Embolization for Renal Angiomyolipomas: A 25-Year Experience



(Article No. 108034)

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Purpose: To compare the safety and efficacy of renal angiomyolipoma (AML) embolization using particles and ethanol/Lipiodol.

Materials and Methods: Patients undergoing AML embolization between May 1995 and May 2022 at a large academic center were retrospectively reviewed after institutional review board approval. Patients were grouped based on the type of embolic used. Relevant patient- and tumor-specific variables were extracted via chart and imaging review pre- and post-embolization. Continuous variables were compared using student t-test and categorical variables were compared with chi-squared tests or Fisher's exact test with simulation for small sample size.

Results: A total of 122 patients had 139 AML embolized. Among them, 96 patients (101 tumors) were treated for the first time. Technical success was achieved in all but one patient. Particle embolics (PE) were used alone in 42 patients for 45 tumors, and liquid ethanol/Lipiodol embolic (LE) was used alone in 41 patients with 43 tumors. The median age in the PE group was 48 (IQR: 30.5-59.5) with female predominance (78.6%), and was 46.5 (IQR: 34.75-56.5) and 85.4%, respectively, in the LE group. They had similar proportions of patients with tuberous sclerosis (PE: 10/42, LE 8/41, $p=0.63$). There was no difference in Society of Interventional Radiology grade III or above adverse events (PE: 1/42, LE: 0/41, $p=0.16$) or post-embolization syndrome (PE: 5/

29.1.

	PE			LE		
	Pre	Post	P value	Pre	Post	P value
Tumor size (mean, SD)	6.88 ± 4.02 cm	5.33 ± 4.00 cm	0.003	7.16 ± 3.13 cm	5.29 ± 3.30 cm	< 0.001
Presence of aneurysm or AVF	3/16	NA		6/30	NA	
Emergently performed	1/14	NA		1/30	NA	
Degree of enhancement*						
0-25%	1	5	0.15	5	17	0.001
25-75%	9	5		16	6	
>75%	1	1		3	1	
Evidence of necrosis		4/11			11/24	

*Excluding patients who had non-contrast or US imaging studies.

42, LE: 8/41, $p = 0.34$). The PE group had more repeat procedures (PE: 13/45, LE: 6/43, $p = 0.089$) and higher rates of rebleeding (PE: 4/45, LE 0/43, $p = 0.04$). Among patients with 6-month follow-up (FU) imaging, PE (mean FU 184 days) and LE (mean FU 168 days) initially had similar tumor sizes, rates of aneurysms and/or arteriovenous fistulas, and emergent presentations. Significant tumor size reduction was noted for both groups, without difference in the extent of reduction (1.54 cm vs 1.87 cm). Only the LE group showed a significant reduction in enhancement post-treatment.

Conclusion: This retrospective review showed a high technical success rate and similar safety profile between AML embolizations with particles and embolizations with ethanol/Lipiodol. Greater reduction in tumor enhancement was seen in the ethanol/Lipiodol group which also appeared to have lower retreatment and rebleeding rates.

Abstract No. 30

Embolization Versus Surgery in Splenic Trauma: A Severity-Adjusted Comparative Effectiveness Analysis



(Article No. 108035)

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Purpose: To compare effectiveness of embolization and surgery in patients with splenic trauma.

Materials and Methods: A total of 8856 adult splenic injury patients from American College of Surgeons' Trauma Quality Improvement Program (2021-2023) were included. Patients who underwent embolization ($n=2002$) and surgery ($n=6854$) were propensity-score matched (PSM) using age and sex. Groups were compared with Mann–Whitney U test for numerical variables and

chi-squared test for categorical variables. Length of stay (LoS) with abbreviated injury scale (AIS) stratification was analyzed with linear regression. Logistic regression models were used to analyze mortality and unplanned intensive care unit (ICU) admission with AIS stratification.

Results: Following PSM 2002 patients from each group were matched successfully. There were 1344 (67.1%) females and 658 (32.9%) males in embolization group and 1340 (66.9%) females and 662 (33.1%) in surgery group ($P = .91$). The median (IQR) age was 44.5 (31) for embolization group and 44 (31) for surgery group ($P = 1$). LoS (9[10]-12[16]), unplanned ICU admission rates (78[3.9%]-125[6.2%]) and mortality (129[6.3%]-353[17.6%]) were significantly different for embolization and surgery groups (All $P < .001$). LoS was significantly lower for embolization group with AIS stratification ($P < .001$). Unplanned ICU admission rates were significantly lower for embolization group with AIS stratification ($P = .003, .03, .01$; All, 3 and 5 respectively) except AIS 4 was nonsignificant ($P = .94$). Mortality was significantly lower for embolization group with AIS stratification ($P < .001, .01, .001, .001$; All, 3, 4 and 5 respectively).

Conclusion: Embolization is associated with better results compared to surgery for splenic trauma patients from national trauma registry when severity is adjusted, leading to significantly lower rates of mortality, unplanned ICU admissions, and shorter hospital stays.

30.1.

AIS Grades	Surgery (n=2002)	Embolization (n=2002)	P-value
Length of Stay	12 (16)	9 (10)	< 0.001
AIS 3	13 (17)	9 (10)	< 0.001
AIS 4	10 (14)	9 (11)	< 0.001
AIS 5	11 (9)	9 (9)	< 0.001
Unplanned Intensive Care Unit Admission	125 (6.2%)	78 (3.9%)	< 0.001
AIS 3	41 (8.1%)	24 (4.4%)	0.01
AIS 4	24 (4%)	32 (3.7%)	0.93
AIS 5	60 (6.7%)	22 (3.6%)	0.01
Mortality	353 (17.6%)	127 (6.3%)	< 0.001
AIS 3	92 (18.3%)	50 (9.3%)	< 0.001
AIS 4	111 (18.5%)	46 (5.4%)	< 0.001
AIS 5	150 (16.7%)	31 (5%)	< 0.001

Scientific Session 4

IO–Kidney Ablation

Sunday, April 12, 2026

3–4:30 p.m.

Abstract No. 31

■ FEATURED ABSTRACT Thermal Ablation Versus Partial Nephrectomy for Localized Malignant Renal Cell Carcinoma in Older Adults: A SEER Database Propensity Score–Matched Analysis



(Article No. 108037)

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Purpose: This study aimed to compare survival outcomes of thermal ablation versus partial nephrectomy for localized malignant renal cell carcinoma (RCC) in older adults using population-based data from the Surveillance, Epidemiology, and End Results (SEER) database.

Materials and Methods: Data were obtained from the SEER database (2004–2022) using SEER*Stat version 9.0.41.4. Patients aged ≥ 66 years with localized malignant RCC treated with either thermal ablation or partial nephrectomy were included. Demographic and clinical variables retrieved included age, sex, race, year of diagnosis, survival time, and cause of death. Propensity score matching (PSM) was performed to balance baseline characteristics between treatment groups. Kaplan–Meier analyses were conducted for overall survival (OS) and cancer-specific survival (CSS), with log-rank testing for group comparisons. Multivariable Cox regression was used to identify predictors of OS and CSS.

Results: A total of 23,511 patients met inclusion criteria (thermal ablation, 2,301; partial nephrectomy, 21,209). After PSM, 2,288 patients remained in each treatment group (median age, 75 years; 56.6% male). Median OS was 99 months (95% CI, 92.6–105.4) for thermal ablation and 119 months (95% CI, 113.9–124.1) for partial nephrectomy (log-rank $P < 0.001$). Median CSS was 188.9 months (95% CI, 183.3–194.5) with thermal ablation versus 202.2 months (95% CI, 197.8–206.7) with partial nephrectomy (log-rank $P = 0.007$). On multivariable analysis, significant predictors of improved OS were younger age (HR, 1.07 per year; $P < 0.001$), female sex (HR, 0.83; $P = 0.001$), and partial nephrectomy (HR, 0.77; $P < 0.001$). Predictors of improved CSS included younger age (HR, 1.06; $P < 0.001$), female sex (HR, 0.72; $P = 0.006$), and partial nephrectomy (HR, 0.75; $P = 0.008$).

Conclusion: In this large propensity score–matched analysis of older adults with localized malignant RCC, partial nephrectomy was associated with superior OS and CSS compared with thermal ablation. Patient age and sex were independent predictors of both outcomes. While thermal ablation may be an appropriate option for select patients unable to undergo surgery, partial nephrectomy remains the preferred treatment when feasible to maximize survival outcomes in this population.

Abstract No. 32

Microwave Ablation Versus Laparoscopic Partial Nephrectomy for Localized Renal Cell Carcinoma: A Systematic Review and Meta-Analysis



(Article No. 108038)

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Purpose: The purpose of this systematic review and meta-analysis was to compare perioperative, functional, and oncologic outcomes of microwave ablation (MWA) versus laparoscopic partial nephrectomy (LPN) in patients with localized renal cell carcinoma (RCC).

Materials and Methods: A systematic literature search was performed in PubMed, Embase, Web of Science, Google Scholar, and Cochrane (CENTRAL) from inception to September 2025 to identify studies directly comparing MWA and LPN for localized RCC. Case reports, reviews, nonhuman studies, duplicates, and studies without extractable comparative data were excluded. Four studies met inclusion criteria after full-text review. Pooled mean differences (MDs) for continuous outcomes and risk ratios (RRs) for categorical outcomes were calculated with 95% confidence intervals (CIs) using a random-effects model in R (version 4.4.2). Outcomes of interest were grouped into perioperative (procedure time, length of hospital stay [LOS], major [grade ≥ 3] complications), functional (postoperative change in eGFR), and oncologic (local tumor progression [LTP], cancer-specific survival [CSS]) endpoints. Leave-one-out (L1O) sensitivity analyses were performed to assess the robustness of results. Analyses were conducted in accordance with PRISMA guidelines.

Results: A total of four studies comprising 696 patients (MWA: 328; LPN: 368) were included. Compared with LPN, MWA was associated with significantly shorter procedure time (MD: -76.63 minutes; 95% CI: -93.12 to -60.13 ; $p < 0.001$; $I^2 = 0\%$). LOS was also shorter with MWA, though not statistically significant (MD: -2.91 days; 95% CI: -6.15 to 0.32 ; $p = 0.08$; $I^2 = 84.5\%$). L1O analysis reduced heterogeneity to 0% when one study was excluded. The incidence of grade ≥ 3 complications did not differ between groups (RR: 0.52; 95% CI: 0.09–3.07; $p = 0.52$; $I^2 = 41\%$), with heterogeneity decreasing to 0% on L1O analysis. Functional outcomes showed no significant difference in postoperative change in eGFR (MD: 5.43 mL/min/1.73m²; 95% CI: -9.23 to 20.09 ; $p = 0.46$; $I^2 = 73.6\%$); heterogeneity was reduced

to 0% when one study was omitted. Oncologic outcomes were also comparable, with no significant differences in LTP (RR: 3.07; 95% CI: 0.00–186,895.12; $p = 0.52$; $I^2 = 2.8\%$) or CSS (RR: 1.03; 95% CI: 0.98–1.08; $p = 0.83$; $I^2 = 0\%$).

Conclusion: MWA offers significant perioperative advantages over LPN, including shorter procedure time and reduced LOS, while achieving comparable renal function preservation and oncologic control. Larger, randomized controlled trials are needed to validate these findings.

Abstract No. 33

■ FEATURED ABSTRACT

Impact of Multiple Ablations Versus Single Ablation Procedures for Treatment T1a Renal Cell Carcinoma (RCC): Evaluation of Adverse Event Rates and Long-Term Oncologic Outcomes



(Article No. 108039)

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Purpose: To determine whether successful RCC ablation in a single procedure (primary technical success) or multiple procedures (secondary technical success) impacts adverse event rates or oncologic outcomes.

Materials and Methods: A retrospective study of all percutaneous ablation procedures from January 1, 2004–July 31, 2022 was performed identifying patients with solitary, de novo biopsy-confirmed T1a (≤ 4.0 cm) RCC treated with percutaneous ablation at a single institution. Exclusion criteria included presence of metastatic disease at time of ablation, multiple synchronous RCC tumors, prior RCC therapy, or failure to achieve successful ablation. Successful ablation was defined as no viable tumor on follow-up cross-sectional imaging after a single (primary technical success) or multiple ablation procedures (secondary technical success). Total of 269 patients with solitary biopsy-confirmed RCC (clear cell-65%, papillary-22%, chromophobe-6%, other-7%) met inclusion criteria. Ablations were performed by 9 interventional radiologists with a median follow-up of 5.1 years (IQR 3.8–7.9). Adverse events were tabulated as per 2023 Society of Interventional Radiology classification and evaluated oncologic outcomes included disease recurrence, local tumor progression (LTP), and metastatic disease/new RCC lesions (Mets).

Results: 247 patients (92%) were treated with single ablation (median age-67 years, M:F 172:75, tumor size 2.7 cm; RENAL-6; Charlson Comorbidity Index-5; RFA/MWA:Cryoablation-

190:57) and 22 (8%) had multiple ablation procedures (age-73 years, M:F 15:7; tumor size-2.8 cm; RENAL-6; CCI-6; RFA/MWA:Cryoablation-12:10; 2 ablations=20, 4 ablations=2). Per patient moderate or higher adverse events were not significantly different ($p=0.71$) between patients with a single ablation procedure (6.5%, 16/247 patients) vs. multiple ablation procedures (4.5%, 1/22 patients). Rates of RCC disease recurrence, LTP and Mets were similar between the two groups with 12% (29/247), 9% (21/247), & 4% (12/247), respectively, in the single ablation cohort and 18% (4/22), 14% (3/22), & 4% (1/22) in the multiple ablation group. Kaplan-Meier estimation of 5-year survival showed no significant difference between single ablation and multiple ablations for disease-free survival (87.9% vs. 89.7%, $p=0.55$), metastasis-free survival (95.1% vs. 95%, $p=0.9$), and overall survival (88.2% vs. 79.4%, $p=0.79$), respectively.

Conclusion: Successful RCC ablation in a single procedure or over multiple procedures does not appear to have a detrimental impact on long-term oncologic outcomes or adverse event rates.

Abstract No. 34

Percutaneous Thermoablation for Renal Tumors Greater Than 4 Cm: A Single-Center Experience



(Article No. 108040)

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Purpose: To investigate the technical success, safety outcomes, and tumor recurrence of renal tumors greater than 4 cm treated by percutaneous microwave ablation or cryoablation.

Materials and Methods: This study included patients with renal tumors larger than 4 cm who underwent thermoablation and were not candidates for surgery. From 2015 to 2024, retrospective database review identified 25 patients (16 males, median age 70) who underwent CT-guided microwave ablation ($n=5$), cryoablation ($n=16$), or embolization + cryoablation ($n=4$) of renal tumors. 25 procedures were performed for 25 tumors with a median size of 4.6 cm (range, 4.0 cm to 8.6 cm) and median RENAL score of 8 (range, 5 to 11). On pathologic examination, a majority of tumors (72%) were renal cell carcinoma.

Results: Hydrodissection and/or pneumodissection were performed in 10 cases, and pyeloperfusion was performed in 4 cases to protect the renal collecting system. Technical success, determined by immediate post-procedure imaging, was achieved in 24 patients (96%). All patients tolerated the procedure well, but there were 10 moderate and 4 severe adverse events. The hemoglobin drops in the 24-hour post-operative period ranged from -1 to 4.3 g/dL, with a median of 0.9 g/dL. 1 patient required blood transfusion due to severe perirenal hematoma; 1 patient required embolization to control the bleed. The rise in post-operative creatinine ranged from -0.26 to 1.79 mg/dL, with a median of 0.16 mg/dL. 1 patient required extended hospital admission (13 days) for management of AKI/hyperkalemia; 1 patient in the microwave ablation group developed an abscess requiring drainage tube placement; 2 patients required ureteral stent placement for hydronephrosis secondary to ureteral injury. During a median follow-up period of 17 months (range, 1 to 46 months), viable tumors or recurrence were

observed in 25% of cryoablation cases (4/16), 40% of microwave ablation cases (2/5), and none of the embolization + cryoablation cases (0/4). All 6 cases of recurrence were successfully treated by follow-up cryoablation. Needle-tract seeding implantation was observed in 2 cases. 1-year recurrence-free survival was 80.0% and 1-year overall survival was 100%.

Conclusion: Percutaneous thermoablation for renal tumors larger than 4 cm is an effective treatment option for preventing tumor recurrence and improving long-term survival in patients not suitable for surgery. Adverse events are likely to occur, so patients must be closely monitored post-operatively.

Abstract No. 35

Does the Degree of Renal Sinus Extension Impact Success and Adverse Events for Cryoablation of T1 Renal Cell Carcinoma?



(Article No. 108041)

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Purpose: Renal tumors are classified based on location relative to the renal cortex as exophytic or endophytic, however, this classification does not distinguish tumors with regards to the degree of renal sinus extension. We aim to assess procedural success and adverse events after cryoablation of solitary renal cell carcinoma (RCC) for those with and without extension into the renal sinus.

Materials and Methods: A retrospective study of all patients with solitary RCC treated with cryoablation from January 2004 to June 2022 with at least 1 imaging follow up. Patients with multiple renal masses were excluded. The patients were divided into two groups based on tumor location relative to the renal sinus of ≥ 1 mm or less than 1 mm distance between the tumor edge and the renal sinus. For the latter group, renal sinus extension was subcategorized into $>25\%$ or $\leq 25\%$ of the tumor diameter within the renal sinus measured based upon maximum tumor diameter perpendicular to the renal sinus. adverse events and primary/secondary technical success were assessed. Primary technical success was defined as complete ablation from first intervention and secondary technical success as complete ablation after more than one ablation. The tumors were also classified as endophytic and exophytic based on the RENAL nephrometry score and similar outcomes were assessed.

Results: 144 patients had a solitary RCC treated with cryoablation. 64 patients had tumors at or extending into the renal sinus (mean age was 65.3 ± 9.8 years, M:F 39:25, mean tumor size was 3.8 ± 0.1 cm) while 80 tumors were at least 1 mm away (mean age was 63.7 ± 10.5 years, M:F 61:19, mean tumor size was 3.4 ± 1.2 cm). Adverse events were slightly higher in the renal sinus extension group (20% vs. 13%), but not statistically significant ($p = 0.254$). Both groups had similar primary (77% vs 79.0%) and secondary (90% vs 93.0%) technical success, respectively. For patients who had $>25\%$ renal sinus extension, primary technical success was lower than those with renal sinus extension $\leq 25\%$

(67% vs 85%, $p = 0.079$) and secondary technical success (87% vs 91%) and adverse events (20%) were similar. Endophytic (18) and exophytic (126) renal tumors had similar primary (78% for both) and secondary (94% vs 91%) technical success and adverse event rates (17% vs 16%) respectively.

Conclusion: This study demonstrates that tumors with greater than 25% extension into the renal sinus may have lower primary technical success, but with similar secondary technical success and adverse events. This may be a better predictor of ablation success than the existing endophytic/exophytic classification.

Abstract No. 36

Comparative Safety of Percutaneous Cryoablation for Renal Tumors near the Renal Pelvis with Versus Without Prophylactic Ureteral Stent Placement



(Article No. 108042)

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Purpose: To compare the safety of percutaneous cryoablation for treatment of renal tumors near the renal pelvis with and without prophylactic ureteral stent placement for renal protection.

Materials and Methods: A retrospective review of CT-guided percutaneous cryoablations performed from 2014-2024 at a single institution identified 21 patients who had prophylactic placement of ureteral stents by urology before cryoablation (stented group). Propensity score matching was used to identify an equal-sized cohort of patients who did not undergo ureteral stent placement before cryoablation (unstented group). Patients were matched on age, tumor size and tumor location. Outcomes included immediate and delayed (within 30-days post procedure) complications and change in renal function as measured by estimated glomerular filtration rate (eGFR) within one-year post-procedure.

Results: No significant difference was noted in baseline patient characteristics between the stented and unstented groups. 16/21 (76%) of patients in the stented group and 19/21 (90%) of patients in the unstented group were male ($p=0.21$). Median tumor size was 3.2 cm (IQR: 2.6-3.9) in the stented group and 2.6 cm (2.3-3.3) in the unstented group ($p=0.21$). All patients had tumors within 5 mm from the renal sinus fat. Post-procedure complication rates were similar between the two groups (10/21 [48%] vs 8/21 [38%], respectively, $p=0.34$). Majority of the complications were immediate minor perilesional hemorrhages, which did not require intervention (8/21 [36%] in stented vs 5/21 [23%] in unstented, $p=0.51$). There were no cases of major hemorrhage, ureteral obstruction, or hydronephrosis in either group within 30 days post-procedure. One patient within the stented group had a delayed presentation of pyelonephritis requiring hospitalization 2 days after a difficult removal of the ureteral stent. No significant difference was seen in percent change in eGFR by 1-year post-procedure between the two groups (-5.8% in stented vs -7.7% in unstented, $p=0.76$).

Conclusion: Prophylactic ureteral stenting prior to cryoablation of renal tumors near the renal pelvis may not provide additional renal protective benefit and carries added risks associated with a secondary procedure. Larger studies may be needed to validate these findings.

Abstract No. 37**Safety and Feasibility of Balloon Dissection to Facilitate Cryoablation of Renal Masses at a Single Institution**

(Article No. 108043)

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Purpose: Thermal ablation is an effective, minimally invasive treatment for solid organ tumors, but achieving adequate ablation margins without injuring adjacent critical structures remains challenging. In renal tumor cryoablation, protective techniques such as hydrodissection or pneumodissection are often required to displace vulnerable tissues away from the ablation zone and reduce the risk of thermal injury or perforation. Balloon catheter dissection represents an alternative approach, using carbon dioxide-filled angioplasty balloons to mechanically separate structures. This technique offers a practical, reproducible method to extend the safety and feasibility of cryoablation in anatomically challenging settings.

Materials and Methods: We report our single-institution experience between 2020 and 2025 utilizing balloon dissection to facilitate cryoablation of renal masses. 5 patients (male; mean age 65 years) presented to our institution for cryoablation of renal lesions between November 2020 and August 2025. 3 patients presented for CT-guided biopsy before cryoablation, 1 patient presented with confirmed renal cell carcinoma, and 1 presented with confirmed metastatic esophageal carcinoma.

Results: All cryoablation procedures followed maximal sterile barrier technique with appropriate sedation and utilized Boston Scientific VISUAL ICE cryoablation needles. To dissect adjacent colon away from the kidney, BD balloon catheters of various sizes were employed, including: 16-mm × 60-mm Atlas (4 patients), 16 mm × 40 mm Atlas (1 patient). Scanning throughout the procedures demonstrated adequate coverage of lesions and margins away from critical structures, with successful cryoablation of renal lesions and no bowel injury. Only 1 patient demonstrated a small, stable right perirenal hematoma following completion of cryoablation.

Conclusion: For patients who require cryoablation for renal lesions, balloon dissection is a safe, feasible option to displace the kidney from neighboring structures and minimize the risk of injury. Further investigation is required in additional patients, along with a comparison of the efficacy of displacement methods including hydrodissection, pneumodissection, and balloon dissection.

Abstract No. 38**Utilization and Safety of Thermal Ablation Compared to Surgical Resection in T1bN0M0 Renal Cell Carcinoma: A Population-Based National Cancer Database Analysis**

(Article No. 108044)

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Purpose: To evaluate the utilization, patient selection, and outcomes of thermal ablation (TA) versus partial nephrectomy (PN) and radical nephrectomy (RN) in patients with T1bN0M0 renal cell carcinoma (RCC).

Materials and Methods: Patients with T1bN0M0 RCC (2004–2022) were identified from the National Cancer Database (NCDB). Baseline variables for TA, PN, and RN patients included age, sex, Charlson-Deyo comorbidity score, tumor size, treatment facility, and socioeconomic factors. Trends in TA utilization, survival, and comorbidity burden were analyzed across five time intervals: 2004–2006, 2007–2010, 2011–2014, 2015–2018, 2019–2022. Perioperative 90-day mortality and long-term (5- and 15-year) overall survival (OS) of TA were compared to nephrectomy using Kaplan-Meier analysis after one-to-one propensity score matching.

Results: Between 2004 and 2022, TA for clinical T1bN0M0 RCC increased from < 1% in 2004 to 3.03% in 2022 ($p < 0.001$). The proportion of TA-treated patients with a Charlson-Deyo comorbidity score ≥ 2 rose from 4.4% in 2004–2006 to 32.9% in 2019–2022 ($p < 0.0001$), reflecting expanded use in medically complex populations. Despite use in higher-risk patients, perioperative safety of TA remained favorable, with 90-day mortality comparable with PN and RN at < 3% (PN vs TA: $p = 0.15$; RN vs TA: $p = 0.35$). Long-term survival remained highest with surgical resection, as both PN and RN demonstrated significantly higher 15-year OS compared to TA in propensity matched cohorts (PN vs TA: $p = 0.001$; RN vs TA: $p = 0.03$), with median OS of 106 months vs. 91 months ($p = 0.001$) for PN vs TA, and 91 months vs. 81 months ($p = 0.001$) for RN vs TA, respectively. However, survival among TA patients continued to improve over time despite increased baseline risk. Five-year OS for TA in T1b RCC increased from 53.8% in 2004–2006 to 63.5% in 2019–2022 ($p = 0.013$), suggesting both technical advancements and rising confidence in TA as a viable therapeutic option.

Conclusion: Thermal ablation is increasingly adopted for higher-risk T1b RCC patients, with improved 5-year OS rates since 2004. These findings underscore its evolving role as a safe, effective, and minimally invasive nephron-sparing treatment option. Prospective randomized controlled studies are warranted to confirm these findings.

Abstract No. 39**Predictive Performance of Renal Complexity Scoring Systems for Adverse Events and Recurrence Following Cryoablation of Renal Masses**

(Article No. 108045)

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Purpose: To evaluate the predictive performance of five renal complexity scoring systems (RENAL, mRENAL, PADUA, [MC]², and P-RAC) in predicting adverse events and recurrence following cryoablation of renal masses.

Materials and Methods: A retrospective single-center study identified 137 patients with 139 renal masses treated with cryoablation between April 2007 and June 30, 2022. Patients had a mean age of 69.8 ± 9.02 years (range: 47–86) (M:F 96:41, BMI 30.9 ± 8.5 , Charlson Comorbidity Index 6.1 ± 1.9) with a median follow-up of 5.1 years (range: 0.6–17.3). The mean tumor size was 3.4 ± 1.1 cm (T1a: 106, T1b: 32, T2: 1). Pathology was known in 113 tumors (81.3%): 107 RCC (94.7%), 5 oncocytoma (4.4%), and 1 lymphoma (0.9%). Among RCC, 65.4% were clear cell, 23.4% papillary, 3.7% chromophobe, 2.8% clear cell papillary, 0.9% tubulocystic, and 3.7% not specified. Mean complexity scores were RENAL 7.1 ± 1.7 , mRENAL 7.6 ± 1.9 , PADUA 8.0 ± 1.5 , MC² 5.2 ± 2.2 , and P-RAC 8.4 ± 2.5 . Outcomes assessed included adverse events and disease recurrence. Predictive performance was analyzed using ROC curves and generalized estimating equation (GEE) logistic regression to account for multiple tumors per patient.

Results: Adverse events occurred in 15.1% of ablations. None of the complexity scores significantly predicted adverse events. MC² had the highest discrimination (AUC 0.61, 95% CI 0.47–0.76) with a trend toward association on regression (OR 1.19 per point, $p=0.086$). RENAL (AUC 0.56), mRENAL (0.57), P-RAC (0.55), and PADUA (0.51) showed poor predictive value. For recurrence, 16 of 127 (12.6%) patients with complete ablation experienced disease recurrence. MC² achieved the highest predictive performance (AUC 0.69, 95% CI 0.55–0.84) and was the only independent predictor on regression analysis (OR 1.37 per point, 95% CI 1.10–1.71, $p=0.005$). P-RAC (AUC 0.63, $p=0.096$), RENAL (0.60), and mRENAL (0.61) showed modest but non-significant associations. PADUA performed poorly (AUC 0.54, $p=0.49$).

Conclusion: All 5 renal complexity scores showed limited value for predicting adverse events after cryoablation. MC² demonstrated modest predictive value for disease recurrence and was the only independent predictor. These findings suggest MC² may provide incremental value in pre-procedural risk stratification for

renal cryoablation, while other nephrometry systems show limited utility.

Abstract No. 40

Percutaneous Thermal Ablation Versus Partial Nephrectomy for Stage I RCC: A Systematic Review, Meta-Analysis and Trial Sequential Analysis



(Article No. 108046)

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Purpose: To compare oncologic outcomes and complication rates of partial nephrectomy (PN) and percutaneous thermal ablation (pTA) for stage I renal cell carcinoma (RCC), and to assess the robustness of the current evidence base.

Materials and Methods: Following PRISMA guidelines, PubMed, Embase, and Cochrane Library were systematically searched for comparative studies of PN versus pTA reporting overall survival (OS) and complications. Random-effects meta-analyses and trial sequential analyses (TSA) were conducted.

Results: Forty-nine studies with 30,944 patients (pTA/PN: 6,571/24,373) were included. All-grade complication rates were significantly higher with PN (RR 1.78; 95% CI 1.47–2.16, $p < 0.001$). TSA confirmed no further studies are likely to change this finding. OS was similar between groups at 1 year (RR 0.68; 95% CI 0.45–1.03) and 5 years (RR 0.76; 95% CI 0.58–1.01), with TSA indicating that much larger sample sizes (4335 and 63720 respectively) would be needed to detect any potential survival difference.

Conclusion: pTA and PN yield comparable OS for stage I RCC, but pTA demonstrates a superior safety profile. Current evidence is sufficient to conclude that PN carries higher complication rates, whereas additional large-scale data would be required to refine OS estimates.

Scientific Session 5

Men's Health 1

Sunday, April 12, 2026

3–4:30 p.m.

Abstract No. 41

Comparison of Depth of N-Butyl Cyanoacrylate Embolic Penetration in Prostate Artery Embolization with Balloon Occlusion Microcatheters Versus Conventional End-Hole Microcatheters



(Article No. 108048)

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Purpose: There is evidence that deeper penetration of embolic is associated with improved clinical outcomes after prostate artery embolization (PAE). This study evaluated zone of embolization in PAE with n-butyl cyanoacrylate (n-BCA) for benign prostatic hyperplasia (BPH) using balloon occlusion (BO) microcatheters versus conventional end-hole (EH) microcatheters.

Materials and Methods: A retrospective study of patients who underwent primary PAE with n-BCA for BPH between June 2022 and September 2025 was performed. Patient charts and imaging were reviewed to identify whether a BO or EH microcatheter was used for embolization. Primary outcome was zone of embolization (established by Rastinehad; zone 1, embolization of the peripheral capsular arteries; zone 2, embolization of the transitional zone and/or central gland; zone 3, embolization to the midline of the ipsilateral gland). Secondary measures included if n-BCA crossed the midline and if n-BCA filled a secondary collateral. Each hemiprostate was analyzed independently. Chi-squared and Mann-Whitney U tests were performed to elucidate any association between catheter type and zone of embolization. Chi-squared analysis was performed to evaluate any significant difference between catheter groups and secondary measures.

Results: A total of 868 hemiprostates were embolized in 447 patients who underwent PAE with n-BCA for BPH. Embolization was performed using a BO microcatheter in 46.1% (400/868) of hemiprostate embolizations. Specifically, the Sniper Balloon Occlusion Microcatheter (Embolx, Sunnyvale, CA) was used in 99.5% (398/400) of BO microcatheter cases, and the Scepter C Occlusion Balloon Catheter (MicroVention, Aliso Viejo, CA) was used in 0.5% (2/400) of BO microcatheter cases. EH microcatheters were used in 53.9% (468/868) of hemiprostate embolizations. The type of microcatheter was significantly associated with zone of embolization ($p < 0.001$). Specifically, zone 3 embolization was achieved in 90.3% (361/400) of cases with BO microcatheters versus 57.3% (268/468) of those with EH microcatheters. There was also a significantly increased likelihood of

n-BCA crossing the midline (134/216, 62.0% vs. 82/216, 38.0%; $p < 0.001$) and filling secondary collaterals (114/175, 65.1% vs. 61/175, 34.9%; $p < 0.001$) using BO microcatheters as compared with EH microcatheters.

Conclusion: The use of BO microcatheters in PAE for BPH was associated with significantly deeper penetration of n-BCA, as well as a significantly increased likelihood of embolic crossing the midline and filling secondary collaterals.

Abstract No. 42

Robotic-Assisted MRI-Guided Transurethral Ultrasound Ablation (TULSA) for MRI-Visible Prostate Cancer at the Extreme Apex



(Article No. 108049)

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Purpose: MRI-guided transurethral ultrasound ablation (TULSA) is a novel treatment for prostate cancer designed to minimize the risks of erectile dysfunction and urinary incontinence associated with standard therapies. The TULSA pivotal trial protocol required preservation of 3 mm of apical tissue. Here, we present functional, imaging, and oncologic outcomes targeting prostate cancer lesions located at the extreme apex.

Materials and Methods: A retrospective subgroup from our TULSA prostate cancer cohort was identified, including men with apical MRI lesions abutting or involving the external sphincter, and ≥ 6 months of MRI or PSA follow-up. TULSA target volumes were prescribed based on disease characteristics and patient preference using intraoperative DWI, ADC maps, and T2w image guidance. For lesions adjacent to the sphincter, a reduced 5 mm margin was applied, encompassing $\leq 50\%$ of the sphincter in length or treatment arc, with DWI plus T2 used to visualize target and sphincter anatomy. Patients were followed daily for the first 2 weeks, with PSA every 3 months, and MRI, IPSS, and SHIM at 6–9 months. Local recurrence on mpMRI was evaluated by PI-RR criteria.

Results: Lesions at the extreme apex were targeted in 68 patients (61 primary PCa, 7 salvage). Median (IQR) age was 63 (58–68) years; median follow-up was 12 (9–17) months. Among men with primary PCa, the Gleason grade group (GG) distribution was 5% GG1, 42% GG2, 21% GG3, 12% GG4, 20% GG5. 70% of patients had PI-RADS=5 and 30% had PI-RADS=4 MRI lesions. Median (IQR) prostate volume was 43 cc (31–54; range 12–129).

PSA decreased from 7 (5–11) to a nadir of 0.5 (0.2–1) ng/mL. Of 59 men with follow-up MRI, 88% had no evidence of disease. Seven had positive MRI (PI-RR 4 in five, PI-RR 5 in two). Six underwent repeat TULSA: five have low recurrence likelihood at 6 months (PI-RR 1–2 and PSA ≤ 1.0 ng/mL), one is pending follow-up. Functional outcomes were favorable: two men experienced urine leakage that resolved by 3 months, all were pad-free. 80% maintained erections sufficient for penetration (SHIM Q2 ≥ 2); urinary symptoms (IPSS) remained stable. Ten patients had mild to moderate LUTS, mild hematuria, bladder spasms, or hydrocele that resolved within 4 weeks with oral medication. Three

men had retention/obstruction resolved endoscopically within 5 months post-TULSA; no rectal injuries occurred.

Conclusion: This retrospective analysis indicates TULSA is safe and effective for extreme apical prostate cancer lesions. Urinary continence was well preserved by applying a controlled ablation strategy limited to $\leq 50\%$ of sphincter extent.

Abstract No. 43

Robotic-Assisted MRI-Guided Transurethral Ultrasound Ablation in Recurrent Prostate Cancer: A Retrospective Analysis



(Article No. 108050)

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Purpose: Effective management of locally recurrent prostate cancer remains a clinical challenge. Transurethral ultrasound ablation (TULSA) uses MR image-guided prostate tissue ablation, which has the potential to achieve precise oncologic control of recurrent diseases while maintaining urinary and sexual function. Regulatory studies examined TULSA in treatment-naïve patients; outcomes of TULSA as a salvage therapy for recurrent disease are not well established. We report safety and early oncologic outcomes of salvage TULSA in patients with recurrent prostate cancer following prior local treatment.

Materials and Methods: A retrospective analysis was performed in PCa patients with ≥ 6 -month follow-up after salvage TULSA in an outpatient center. Ablation plan was defined according to patient preference and disease factors using intra-operative DWI, ADC, and T2w imaging. Patients were followed daily for 2 weeks, PSA at 3 months, with MRI, IPSS, and SHIM at 6-9 months. Radiologic recurrence was defined as PI-RR ≥ 4 on mpMRI, or positive PSMA-PET after PI-RR=3. Biochemical recurrence (BCR) was defined as PSA nadir + 2 ng/mL.

Results: Forty-five patients with recurrent PCa were identified: 39/45 after focal therapy (FLA: 22, TULSA: 16, HIFU: 1) and 6/45 after radiation (proton: 4, brachytherapy: 2). Median age was 67 years (IQR 64–71), with 18 months (12–27) median follow-up. Post-primary treatment biopsy (n=31) showed GG1–5 in 6%, 39%, 32%, 16%, and 6%. All patients had a visible lesion on MRI, and median gland volume was 30 cc (IQR 24–40, range 11–81). Whole-gland ablation was performed in 73% of patients, focal in 27%. Outcomes after whole-gland vs. focal ablation: median PSA nadir 0.7 (0.2–1.8) vs. 0.9 ng/mL (0.3–1.2) ng/mL, gland reduction 61% (44–67) vs. 30% (22–33). Overall, 87% were free of radiologic/biochemical recurrence. Five patients had residual disease on MR: three had persistent T3 disease, and two had disease related to inadequate planning margins. Urinary symptoms (IPSS) were stable. All patients remained pad- and leak-free at follow-up. Of 33 men potent before salvage TULSA, 82% preserved erections sufficient for penetration (SHIM Q2 ≥ 2).

Conclusion: Our findings suggest that salvage TULSA is a safe and effective option for patients with recurrent prostate cancer.

Abstract No. 44

Oncologic and Functional Outcomes Following MRI-Guided Transurethral Ultrasound Ablation for Localized Prostate Cancer: A Systematic Review and Meta-Analysis



(Article No. 108051)

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Purpose: This study aimed to conduct a systematic review and meta-analysis to evaluate oncologic and functional outcomes following MRI-guided transurethral ultrasound ablation (TULSA) for localized prostate cancer.

Materials and Methods: A systematic literature search was performed in PubMed, Embase, Web of Science, and Cochrane (CENTRAL) from inception to September 2025 to identify relevant studies. Case reports, reviews, nonhuman studies, duplicates, and studies without extractable comparative data were excluded. Oncologic outcomes included biochemical recurrence-free survival (BCRFS, defined by Phoenix criteria), clinically significant prostate cancer (csPCa) on follow-up biopsy, recurrence on magnetic resonance imaging (MRI), prostate-specific antigen (PSA) decline, and progression to salvage therapy. Functional outcomes included urinary continence (Expanded Prostate Cancer Index Composite, EPIC), lower urinary tract symptoms (International Prostate Symptom Score, IPSS), and sexual potency (International Index of Erectile Function, IIEF/SHIM). Pooled analyses were performed using random-effects models to calculate proportions or mean differences (MDs) with 95% confidence intervals (CIs). Heterogeneity was quantified with the I^2 statistic and analyses were conducted in accordance with PRISMA guidelines.

Results: Fifteen studies comprising 595 patients were included. The pooled biochemical recurrence rate was 9% (95% CI: 2–20%; $p = 0.0013$), corresponding to a BCRFS of 91%. csPCa was identified on follow-up biopsy in 29% (95% CI: 19–40%; $p = 0.036$), while MRI-based recurrence occurred in 15% (95% CI: 7–25%; $p < 0.001$). PSA declined significantly following treatment, with a pooled mean reduction of -4.53 ng/mL (95% CI: -5.48 to -3.58 ; $p < 0.001$). Progression to salvage therapy occurred in 14% of patients (95% CI: 6–26%; $p < 0.001$). Functional outcomes were favorable: urinary continence was maintained in 96% (95% CI: 86–100%; $p < 0.001$), IPSS improved with a mean reduction of -4.33 points (95% CI: -8.51 to -0.15 ; $p < 0.05$), and IIEF/SHIM scores showed no significant change (MD -0.07 ; 95% CI: -0.23 to 0.09 ; $p = 0.98$), indicating preserved potency.

Conclusion: TULSA provides promising oncologic control with high BCRFS and significant PSA reduction, while preserving continence and potency and improving urinary symptoms. Residual disease and heterogeneity across studies highlight the need for standardized follow-up and long-term trials to validate its role against established treatments.

Abstract No. 45

■ FEATURED ABSTRACT

Clinical Efficacy of Prostate Artery Embolization in Men with Small-Volume Prostates



(Article No. 108052)

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Purpose: Prostatic artery embolization (PAE) has been demonstrated to be clinically effective for men with large prostates and is now an accepted therapy per the American Urologic Association (AUA) Guidelines for this patient population. Very little has been published, however, on the efficacy of PAE in men with “small” volume prostates (i.e., volume $\leq$ 60cc). This study aims to examine the clinical outcomes of prostate artery embolization (PAE) in patients with “small” volume prostates.

Materials and Methods: This is a single-center, single operator, retrospective review of 108 men aged 46-83 years old with prostates volume $\leq$ 60 cc who underwent PAE between January 2018 and September 2025. Baseline International Prostate Symptom Score (IPSS)/ quality of life (QoL) score and were recorded at baseline, 6 and 12 weeks, 6 months and annually until 4 years post PAE. Baseline prostate volume (PV) and reduction at 6 and 12 weeks were also reported. Clinical success after PAE was defined as an IPSS reduction of at least 25% from baseline and an absolute score $\leq$ 15 points, and a reduction of QoL of at least 1 point from baseline score and absolute score $\leq$ 3 points. Technical success was defined as at least unilateral embolization to stasis. Adverse events were graded according to CTCAE criteria.

Results: Technical success was 98% (n=106) and bilateral embolization was performed in 82% (n=89) of cases. Median follow-up time was 12 weeks. Baseline IPSS/QoL were 19.1/4.0 (range 2-35/2-6) and PV was 42.2 cc (range 14.2-60 cc). Clinical success was achieved in 78% of patients (n=71). PV reduction at 6 and 12 weeks was 28% (n=60) and 30% (n=36) $p < .001$. IPSS/QoL improvement at 6 and 12 weeks, 6 months, and 1, 2, 3, and 4 years was 9.7, 10.8, 7.8, 6.9, 6.9, 8.5, 3.5, and 2.0, 2.2, 1.6, 1.6, 1.0, 0.5, and 1.3 ($p < .003$ except IPSS at 4 years and QoL at 3 years where $p > .05$). One patient experienced CTCAE grade 4 event during the procedure—cerebrovascular accident with headache. Five patients experienced a CTCAE grade 3 event—one with a right penile ulcer managed conservatively and four with acute urinary retention requiring foley catheter placement. One of these patients also had a urinary tract infection requiring IV antibiotics.

Conclusion: Very little has been reported regarding the clinical efficacy of PAE in small prostates. This study demonstrates that PAE is a safe and effective treatment option for patients with LUTS and small prostates. In addition, overall clinical success is comparable though slightly lower than compared to patients with enlarged prostates.

Abstract No. 46

Comparative Outcomes of Microparticle Versus N-Butyl Cyanoacrylate Prostate Artery Embolization: A 12-Month Retrospective Analysis



(Article No. 108053)

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Purpose: Prostate artery embolization (PAE) is a well-established minimally invasive treatment for lower urinary tract symptoms (LUTS) due to benign prostatic hyperplasia (BPH). Although microparticles (MP) are the most commonly used embolic, they may allow for recanalization and neo-vascularization. N-butyl cyanoacrylate (n-BCA) glue is a permanent embolic with the potential to provide more durable outcomes. This study compares clinical outcomes of PAE performed with microparticles versus n-BCA glue.

Materials and Methods: We performed a retrospective review of 319 patients who underwent PAE at our institution: 198 with n-BCA and 121 with MP. Patients lost to follow-up were excluded. Age and prostate volume matching were performed to ensure comparable baseline characteristics. Clinical outcomes, including International Prostate Symptom Score (IPSS), quality of life (QoL), and maximum urinary flow rate (Qmax), were assessed at 6 weeks, 6 months, and 12 months.

Results: Both groups demonstrated significant improvement in IPSS, QoL, and Qmax compared to baseline. At 6 weeks and 6 months, outcomes were comparable between n-BCA and MP (IPSS $p=0.1$ and $p=0.5$, QoL $p=0.4$ and $p=0.5$, Qmax $p=0.1$ and $p=0.6$, respectively). However, at 12 months, n-BCA demonstrated superior outcomes, with lower IPSS (11 vs. 18.1, $p < 0.05$) and a trend toward improved QoL (2.1 vs. 3.4, $p=0.08$). Qmax analysis at 12 months was limited by insufficient data.

Conclusion: Both MP and n-BCA PAE provide significant short-term symptomatic relief in patients with BPH. However, n-BCA appears to offer more durable improvement in LUTS at 12 months, supporting its role as a permanent embolic agent that may reduce neovascularization and treatment failure.

Abstract No. 47

Preprocedural Predictors of N-Butyl Cyanoacrylate Prostate Artery Embolization Clinical Nonresponders



(Article No. 108054)

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Purpose: Prostate artery embolization (PAE) is a safe and effective minimally invasive treatment for patients with lower urinary tract symptoms (LUTS) secondary to benign prostatic hyperplasia (BPH). However, limited data exists to guide patient selection by identifying predictors of treatment failure when n-butyl cyanoacrylate (n-BCA) is used as the primary embolic. This study aims to identify pre-procedural factors associated with clinical nonresponse after PAE with n-BCA.

Materials and Methods: A retrospective analysis was conducted on 198 patients who underwent n-BCA PAE between August 2022 and March 2024. Clinical nonresponse was defined as < 5-point reduction in International Prostate Symptom Score (IPSS) or need for repeat interventional/urologic treatment within 1 year. Patients lost to follow-up were excluded. Non-responders were matched with responders by age and baseline IPSS using propensity score matching. Pre-procedural imaging parameters, including prostate urethral angle (PUA), prostate volume (PV), intravesical prostatic protrusion (IPP) of the median lobe, and bladder wall thickness (BWT) were compared using univariate analysis.

Results: A total of 104 patients met inclusion criteria; 27 (26%) were nonresponders. Mean age was 77 years with baseline IPSS 16 among nonresponders, and 75 years with baseline IPSS 17 among matched responders. On univariate analysis, larger PV ($p < 0.01$), greater IPP of the median lobe ($p = 0.03$), and higher PUA ($p < 0.01$) were significantly associated with treatment response. Non-responders demonstrated greater BWT, although this did not reach statistical significance ($p = 0.1$).

Conclusion: Pre-procedural imaging features, including larger prostate volume, IPP of the median lobe, and higher prostate urethral angle, were significantly associated with clinical response after n-BCA PAE. These imaging characteristics may serve as valuable tools for refining patient selection and counseling patients regarding expected outcomes after embolization.

improvement); $\Delta\text{SHIM} = \text{FU} - \text{baseline}$ (+ indicates improvement). Pearson and Spearman correlations ($\alpha = 0.05$) assessed the relationship between ΔIPSS and ΔSHIM and partial correlations adjusted for phosphodiesterase-5 inhibitor (PDE5i) use. Simple linear regression estimated ΔSHIM per 5-point IPSS reduction.

Results: Mean IPSS decreased from 21.2 ± 6.9 to 9.1 ± 6.6 ($\Delta = -12.1$; $p < 0.01$), while mean SHIM increased from 16.8 ± 6.5 to 17.6 ± 6.9 ($\Delta = 0.81$; $p < 0.01$). ΔIPSS and ΔSHIM were significantly correlated (Pearson $r = -0.19$, $p < 0.01$; Spearman $\rho = -0.17$, $p = 0.02$). The association remained after adjusting for PDE5-i use (partial $r = -0.19$; $p < 0.01$). Overall, each 5-point drop in IPSS corresponded to a 0.5-point rise in SHIM, increasing to 1.0 in men with mild baseline ED. Correlation was stronger in men ≤ 70 years ($r = -0.22$; $p = 0.02$) and weaker in men > 70 years ($r = -0.15$; $p = 0.17$).

Conclusion: Improvements in urinary symptoms and sexual function reveal a statistically significant correlation after PAE. The relationship is most pronounced in men ≤ 70 years and those with mild baseline ED.

48.1.

Group	n (%)	Pearson r (95% CI)	ΔSHIM per 5-point IPSS reduction
Overall	186	-0.19 (-0.33 to -0.05)	+0.51
Age ≤ 70 y	106	-0.22 (-0.40 to -0.03)	+0.51
Age > 70 y	80	-0.15 (-0.36 to 0.07)	+0.46
Severe ED (SHIM ≤ 11)	44 (24%)	-0.21 (-0.49 to 0.12)	+0.65
Moderate ED (12–16)	33 (18%)	-0.27 (-0.56 to 0.08)	+0.67
Mild ED (17–21)	51 (27%)	-0.29 (-0.53 to -0.02)	+1.07
Normal (22–25)	58 (31%)	-0.11 (-0.16 to 0.36)	+0.09

Abstract No. 48



Linking Lower Urinary Tract Symptoms to Sexual Function After PAE: Quantifying the IPSS-SHIM Relationship



(Article No. 108055)

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Purpose: Prostatic artery embolization (PAE) is a treatment option for patients with lower urinary tract symptoms (LUTS), due to benign prostatic hyperplasia (BPH), who wish to preserve sexual function. However, the relationship between the change in urinary symptoms, measured by the International Prostate Symptom Score (IPSS), and the change in erectile function, measured by the Sexual Health Inventory for Men (SHIM), after PAE has not been systematically quantified in the literature. In this study, we quantify how change in one relates to change in the other to better equip clinicians for individualized patient counseling.

Materials and Methods: A single-center, retrospective study of 573 patients who underwent PAE between 2016–2023. Exclusion criteria were prior lower urinary tract surgery, missing baseline or first follow-up (FU, 3–6 months) IPSS/SHIM scores, repeat PAE, or technical failure. Baseline and FU IPSS and SHIM scores were compared with paired t-tests. $\Delta\text{IPSS} = \text{FU} - \text{baseline}$ (- indicates

Abstract No. 49

■ FEATURED ABSTRACT

Automated Prostate Segmentation for MRI-Guided Transurethral Ultrasound Ablation: Validation and Real-World Experience



(Article No. 108056)

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Purpose: MRI-guided transurethral ultrasound ablation of the prostate (TULSA) uses intraoperative imaging to guide ultrasound-induced thermal coagulation of a physician-defined target volume. Segmentation of the ablation zone across

multiple prostate sections is repetitive, time-consuming, and subject to reader variability. We describe validation of a deep learning whole-gland segmentation model integrated into TULSA treatment planning software, performance improvements with an updated model, and the real-world experience with AI-assisted contouring on planning time.

Materials and Methods: Two AI prostate segmentation models (first using SEResNet34, later SAM2-UNet) were trained on T2w MRI from public datasets and past TULSA cases. The first model was validated in a multi-reader multi-case study; the second was benchmarked against those results. In the validation study, 3 urologists and 5 radiologists segmented images from 51 past TULSA cases, once manually and once with AI-assistance, separated by a 4-week washout. Dice similarity scores were calculated against a reference segmentation defined using the STAPLE method by 3 other expert radiologists. Segmentation times were also compared. After regulatory clearance, treatment planning times were measured in 153 real-world cases with AI versus 962 past cases without AI at the same institutions. Physicians were surveyed on segmentation quality.

Results: Segmentation accuracy of the original model was 0.914 ± 0.027 . Among urologists, accuracy and speed of prostate segmentation improved with AI assistance vs. manual contouring (Dice 0.919 ± 0.020 vs. 0.909 ± 0.021 , and time 3.6 ± 2.5 vs. 5.3 ± 3.3 min, both $p < 0.0005$). Radiologists had equivalent accuracy but were 30% faster with AI vs. without (0.927 ± 0.021 vs. 0.928 ± 0.020 , and 2.5 ± 1.4 vs. 3.6 ± 1.4 min). The latter SAM2-UNet model had a standalone accuracy of 0.921 ± 0.023 , superior to urologists ($p < 0.0005$) and non-inferior to radiologists. In real-world use, AI reduced planning time by 11% ($p = 0.005$). Physicians reported that for treatment-naïve prostates, AI accuracy was sufficient to reduce the time and effort required to define a treatment plan.

Conclusion: AI prostate segmentation in TULSA planning resulted in non-inferior segmentation accuracy and significantly reduced planning time. The updated model had non-inferior accuracy to radiologists and was superior to urologists. Real-world results support the time savings with AI-assisted planning.

Abstract No. 50

Randomized Controlled Trial of MRI-Guided Transurethral Ultrasound Ablation (TULSA) Versus Robotic Prostatectomy for Intermediate-Risk Prostate Cancer: Ablation Parameters and Initial Perioperative Outcomes



(Article No. 108057)

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M. Cohen⁶, K. Macura⁷, T. Tirkes⁸, J. Busch⁹, A. Purysko¹⁰, P. Makela¹¹, X. Meng¹², P. Sprenkle¹³, N. Kella¹⁴, G. Sonn¹⁵, G. Clarke¹⁶, R. Staruch¹⁶, D. Costa¹²; ¹Mayo Clinic; ²UCLA Department of Radiology; ³Mayo Clinic Florida; ⁴Stanford University Medical Center; ⁵Yale University School of Medicine; ⁶Radnet Rolling Oaks; ⁷The Russell H. Morgan Department of Radiology and; ⁸Indiana University; ⁹Busch Center; ¹⁰Cleveland Clinic; ¹¹University of Turku; ¹²UT Southwestern Medical Center; ¹³Yale; ¹⁴The Urology Place; ¹⁵Stanford; ¹⁶Profound Medical

Purpose: Randomized trials comparing ablation to standard prostate cancer (PCa) treatment have historically failed to recruit. The CAPTAIN randomized controlled trial (NCT05027477) compares TULSA to robotic prostatectomy (RP) for localized, intermediate-risk prostate cancer. Primary endpoints are urinary continence, erectile function, and freedom from salvage treatment. Here we present baseline patient/treatment characteristics, and initial perioperative outcomes/return to baseline activity.

Materials and Methods: Patients were randomized between TULSA and RP in 2:1 ratio. Key eligibility criteria included intraprostatic calcifications ≤ 3 mm on CT or MRI, and Gleason 7 biopsy-positive PCa. RP was performed per local standard of care; TULSA included hemi-to whole-gland ablation. Data collection included ablation fraction (TULSA); lymph node dissection (RP); hospitalization, blood loss, 30-day diaries tracking pain and return to normal activity (both arms).

Results: From January 2022 to August 2025, 212 patients (148 TULSA; 64 RP) were treated across 23 sites, surpassing the 201 target. For TULSA vs RP: median (IQR) age was 63 (58-68) vs 65 (60-69) y ($p = 0.12$); PSA 6.5 (4.9-9.6) vs 7.2 (5.6-9.7) ng/mL ($p = 0.63$); prostate volume 41 (31-50) vs 35 (29-47) cc ($p = 0.10$). Prostate calcifications were absent/ ≤ 3 mm/ > 3 mm in 64%/19%/17% vs 67%/22%/11% (all $p > 0.05$). TULSA vs RP patients with Grade Group 2/3 histology: 76%/24% vs 77%/23% ($p = 0.88$). Most TULSA plans were designed for subtotal ablation with strategic sparing; median (IQR) fraction of the prostate heated to ablative temperatures measured by intraprocedural MRI thermometry was 78% (71%-85%). For RP, 77% had pelvic lymph node dissection. There was significantly less intraprocedural blood loss after TULSA vs RP [0 (0-0) vs 100 (100-200) mL] and shorter stay [0.29 (0.27-0.32) vs 1.24 (1.12-1.36) days], both $p < 0.001$. Catheterization was longer after TULSA, 13 (11-15) vs 8 (8-10) d. Patients reported significantly less decline in overall health on the EQ-5D 0-100 visual analog scale after TULSA vs RP for all 30 d.

Conclusion: Initial perioperative outcomes demonstrate that TULSA had no blood loss, no overnight stay, reduced post-procedure pain, and faster recovery to baseline activities and overall health compared to RP.

Scientific Session 6

Pain Management/MSK 1

Sunday, April 12, 2026

3–4:30 p.m.

Abstract No. 51

Cone-Beam CT (CBCT)-Guided Versus Non-CBCT Transarterial Micro-embolization for Refractory Plantar Fasciitis: A Prospective Comparative Study



(Article No. 108059)

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Purpose: To compare clinical outcomes and safety between cone-beam CT (CBCT)-guided and non-CBCT transarterial micro-embolization (TAME) for refractory plantar fasciitis.

Materials and Methods: In a single-center prospective cohort, adults with chronic plantar fasciitis refractory to conservative care underwent TAME with superselective embolization using fast soluble Gelfoam (KIPZA). Hypervascular targets were identified with DSA with or without CBCT guidance. All patients underwent pre-procedural foot/ankle MRI. Patients were grouped into CBCT-guided and non-CBCT. The primary endpoints were technical success and safety (procedure-related complications). The secondary endpoint was clinical response at 1 month, defined as $\geq 50\%$ reduction in VAS from baseline. Group comparisons used Fisher's exact test.

Results: A total of 14 procedures were analyzed (CBCT: 6 patients/7 procedures; non-CBCT: 7 patients/7 procedures). Technical success was 100% in both groups (7/7 vs 7/7; $p=1.000$), and no procedure-related complications occurred in either group (0/7 vs 0/7; $p=1.000$). At 1 month, the secondary endpoint ($\geq 50\%$ VAS reduction) was achieved by 85.7% (6/7) with CBCT, compared with 28.6% (2/7) without CBCT ($p = 0.103$, two-sided Fisher's exact test). Mean VAS improved from 7.43 to 2.14 ($\Delta -5.29$) with CBCT and from 7.86 to 4.86 ($\Delta -3.00$) without CBCT.

Conclusion: CBCT-guided TAME showed a higher early pain response than non-CBCT TAME with comparable safety. Technical success was 100% in both groups. These findings support the adoption of CBCT guidance for TAME in refractory plantar fasciitis; larger, adequately powered studies are needed to confirm durability.

Abstract No. 52

Morphine Equivalent and Pain Scores Following Kyphoplasty with Radiofrequency Ablation in Patients with Spinal Metastatic Disease



(Article No. 108060)

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Purpose: To determine the efficacy in pain improvement and of morphine equivalent usage after kyphoplasty with radiofrequency ablation (RFA) in patients with painful metastatic neoplastic disease to spinal vertebrae.

Materials and Methods: All patients with symptomatic metastatic spinal disease who underwent kyphoplasty and RFA between March 2019 and July 2024 were reviewed in a retrospective manner. 86 patients with a median age of 63.5 years (range, 31–88) and a M ratio of 1.05 were included. Multiple myeloma ($n=22$, 26.2%), breast cancer ($n=20$, 23.8%), lung cancer ($n=11$, 13.1%), prostate cancer ($n=10$, 11.9%), lymphoma ($n=5$, 6%), colorectal cancer ($n=3$, 4.1%), and renal cell carcinoma ($n=2$, 2.4%) were the most common primary neoplasms. Morphine equivalent daily dosage (MEDD) and visual analog scale (VAS) pain scores were recorded before the procedure and within 3 months post-procedure. The highest documented VAS scores and MEDD pre- and post-procedure were analyzed.

Results: Technical success was achieved in all patients. Kyphoplasty and RFA were performed on thoracic vertebrae in 35 patients (40.7%), lumbar vertebrae in 41 patients (47.7%), and thoracolumbar vertebrae in 10 patients (11.6%). Forty-nine patients (57%) had kyphoplasty at one vertebral level, 28 patients (32.6%) had two-level kyphoplasty, 6 patients (7%) had three-level kyphoplasty, and 3 patients (3.5%) had a four-level spinal kyphoplasty. The median amount of cement per kyphoplasty level was 3.5 cc (IQR, 2.9–4.5). The median morphine equivalent usage decreased significantly from 40 mg (IQR, 0–62 mg) pre-procedure to 0 mg (IQR, 0.0–45 mg) post-procedure ($Z = -3.351$, $p < 0.001$, $r = 0.398$). The median VAS pain score decreased from 10.0 (IQR, 8.0–10.0) pre-procedure to 2.5 (IQR, 0–4.25) within 3 months post-procedure ($p < 0.001$). There were no major complications reported.

Conclusion: Kyphoplasty with RFA is safe and provides meaningful clinical improvement in reducing both morphine equivalent usage and pain scores in patients with painful metastatic disease to the spine when measured at post-procedure follow-up within 3 months.

Abstract No. 53

■ FEATURED ABSTRACT Percutaneous Vertebral Augmentation After Osteoporotic Vertebral Compression Fracture: A Retrospective Cohort Analysis of 27,912 Patients



(Article No. 108061)

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Purpose: To evaluate outcomes associated with percutaneous vertebral augmentation (PVA) in older adults with osteoporotic

vertebral compression fractures (VCF), following the introduction of the 2025 WISER model by CMS.

Materials and Methods: We used a multicenter EHR network to identify adults ≥ 65 y with osteoporotic VCF. Exposure was PVA; comparator was no PVA. Propensity score matching was conducted for baseline covariates including age at index, sex, body mass index, bisphosphonate use, diabetes, hypertension, prior pain diagnoses, nicotine dependence/cigarette smoking status, and alcohol use. Outcomes included post-operative opioid use, pulmonary embolism, pneumonia, cardiopulmonary composite (PE + pneumonia), procedure-related events, vertebral osteomyelitis, repeat augmentation, and new skilled nursing facility (SNF) admission. We report relative risk (RR) and absolute risk difference (ARD) with 95% confidence intervals (CI) for 1-year and all-time windows.

Results: Median follow-up at 1 year was 365 days in both groups; all-time median follow-up was 814 vs 849 days (PVA vs no PVA). At 1-year ($n=27,912$): risks of post-operative opioid use was lower with PVA (21.7% vs 25.8%; RR 0.84 [0.71–1.00], ARD -4.14%); PE was similar (1.38% vs 1.21%; RR 1.14 [0.92–1.40], ARD +0.16%); pneumonia was similar (5.69% vs 5.75%; RR 0.99 [0.89–1.10], ARD -0.06%); cardiopulmonary composite was similar (6.58% vs 6.48%; RR 1.02 [0.92–1.12], ARD +0.10%); procedure-related events were rare (0.13% vs 0.09%; RR 1.50 [0.72–3.12], ARD +0.04%); vertebral osteomyelitis was rare (0.36% vs 0.42%; RR 0.86 [0.59–1.26], ARD -0.06%); new SNF was similar (1.28% vs 1.16%; RR 1.10 [0.89–1.37], ARD +0.12%). When evaluating all-time intervals, similar outcomes were observed.

Conclusion: In matched older adults with osteoporotic VCF, PVA is associated with lower opioid exposure at 1 year and all-time, no clinically meaningful differences in cardiopulmonary events, and very low absolute rates of procedural/infectious complications. These findings are timely as CMS's 2025 WISER policy advances prior authorization for PVA in select states.

Abstract No. 55

Comparative Effectiveness of Cryoablation with Steroid and Lidocaine Versus Steroid and Lidocaine Alone for Treatment of Morton Neuroma: Interim Analysis



(Article No. 108062)

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Purpose: The objective of the study is to determine if image-guided cryoablation is superior to corticosteroid injection alone in short- and long-term outcomes for treatment of Morton neuromas that have failed conservative therapy. We are presenting our interim analysis results.

Materials and Methods: This is a nonblinded randomized controlled trial with patients randomized after meeting screening criteria and signing a consent in a 1:1 ratio based on the order of the presentation to steroid/lidocaine + cryoablation (treatment) or steroid/lidocaine alone (control) group. The primary outcome of the study is pain score measured by the visual analog scale (VAS).

Secondary outcomes include quality of life and patients' satisfaction with the treatment results. These were assessed by the neuroma scale, a modified American Orthopedic Foot and Ankle Society Hallux Metatarsophalangeal Interphalangeal scale score, quality of life survey, and clinic visit. Outcome assessment is performed at baseline visit, within 45 days before the procedure, and within 10 days, 1 month, 3 months, 6 months and 1 year. If a patient failed to improve after 3 months they are released from the trial and considered a treatment failure.

Results: This interim analysis includes 14 patients of the anticipated 32; 7 treatment and 7 control. There were 10 female and 4 male patients with a median age of 58, ranging from 32 to 75. The mean change in baseline VAS at week 1 was -1.6 (SD 3.9) for the control and -1.8 (SD 2.2) in the cryoablation group. In the control group there was a decrease in pain score up until 1 month followed by a sharp increase in VAS at 3 months; at 3 months the VAS in the control group had increased by a mean change of 1.4 (SD 2.4). The cryoablation group continued to improve at 3 months with a mean VAS change of -2.0 (SD 1.4). Four patients in the treatment arm have been followed to 12 months and demonstrate a persistent improvement in VAS mean change of -2.25 with a range from unchanged to -6. Of note the patient with unchanged VAS was subsequently diagnosed with plantar fasciitis. Two additional treatment arm patients have completed the 6-month follow-up with mean decrease in VAS of -4. Five of the control arm patients were released from the trial after 3 months due to treatment failure. None of the treatment arm patients were released early due to treatment failure.

Conclusion: Our interim analysis shows promising results that cryoablation with steroid/lidocaine injection provides more symptomatic and durable relief for patients with Morton's neuroma when compared to steroid/lidocaine injection alone.

Abstract No. 56

Efficacy and Safety of Allogeneic Mesenchymal Precursor Cells with and Without Hyaluronic Acid for Treatment of Chronic Low Back Pain: A Prospective, Randomized, Double-Blind, Concurrent-Controlled 36-Month Study



(Article No. 108063)

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Purpose: Evaluate the efficacy and safety of a single injection of mesenchymal precursor cells (MPCs) with or without hyaluronic acid (HA) compared to an intradiscal saline injection through 36 months follow-up in subjects with chronic low back pain (CLBP) associated with moderate DDD (mDDD).

Materials and Methods: A prospective, multicenter, randomized, double-blind, controlled study conducted at 49 clinical sites. A total of 404 subjects with CLBP associated with mDDD at one level from L1 to S1 received MPCs without HA (MPC), MPCs with HA (MPC+HA), or saline control (control) treatment. Subjects were clinically (VAS, ODI and EQ-5D-5L index) evaluated at 1, 3, 6, 12, 18, 24 & 36 months post-injection. The primary efficacy endpoint was a composite responder analysis for overall treatment

success at both 12 and 24 months that was composed of (1) at least a 50% reduction from baseline in low back pain VAS score (average pain over 24 hours); (2) at least a 15-point decrease from baseline in ODI score; and (3) no adjudicated post-treatment interventions at the treated level.

Results: All treatment groups showed substantial improvement from baseline in LS Mean LBP and ODI. Although the trial did not meet the primary composite endpoint, MPC+HA significantly reduced lower back pain at 12 and 24 months compared to control. The results observed in all subjects were enhanced for MPC+HA and MPC in the pre-specified CLBPLTM subgroup with MPC+HA having significantly greater reduction in LBP at all time points compared to control and MPC having significantly greater reduction in LBP at 6, 12 and 36 months. In the CLBPLTM subgroup, MPC+HA led to significantly greater pain response, functional improvement, and quality of life enhancements compared to control at multiple time points. MPC+HA baseline opioid users also exhibited greater reductions in opioid use and more patients opioid-free at 36 months compared to the control group. The injection and MPC treatment were well tolerated, with no treatment-related serious adverse events and similar rates of post-treatment interventions across groups.

Conclusion: MPC+HA treatment showed a significant reduction in pain compared to control that was enhanced in subjects with CLBP duration less than 68 months. Intra-discal injection of MPC+HA is a minimally invasive non-opioid therapy that appears to be safe and demonstrates reduction in pain through 24 months compared to control with enhanced results in subjects with mDDD that have had CLBP less than 68 months.

Abstract No. 57

Percutaneous Pelvic Cementoplasty with or Without Screw Fixation in Patients Aged 70 Years and Over: Safety and Clinical Outcomes



(Article No. 108064)

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Purpose: To evaluate the safety and effectiveness of image-guided cementoplasty, with or without screw fixation, for treating pelvic bony lesions in patients aged 70 years and older.

Materials and Methods: This single-center retrospective study included all image-guided cementoplasties, with or without screw fixation, performed between June 2018 and November 2022 for the management of pelvic osteoporotic fractures or neoplastic lesions in patients aged 70 years and older.

Results: A total of 46 interventions were successfully performed, including 8 for osteoporotic fractures and 38 for neoplastic lesions. No major procedure-related adverse events were observed. Among the 36 cases assessed, 25 (69.4%) patients either switched to a lower analgesic level or reduced their analgesic consumption within 1 month postprocedurally. Specifically, 14 of 25 (56.0%) patients required less potent analgesic drugs, while 11 of 25 (44.0%) reduced their daily dose of the same analgesic drug. The proportion of patients able to stand increased from 21 of 44 (47.7%) to 41 of 44 (93.2%), while the proportion able to walk rose from 21 of 44 (47.7%) to 40 of 44 (90.9%).

Conclusion: Percutaneous cementoplasty, with or without screw fixation, is a safe and effective technique for managing pelvic lesions in patients aged 70 years and older. It results in significant pain reduction and facilitates early mobilization, with most patients able to stand the day after the procedure.

Abstract No. 58

■ FEATURED ABSTRACT Pain Mitigation in Pancreatic Adenocarcinoma: A Long-Term Analysis of Denervation via Transvascular RF Energy-Based Ablation



(Article No. 108065)

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Purpose: The purpose of this study was to develop and implement a procedure to reduce severe pain from pancreatic cancer due to overactive sympathetic nerve activity using transvascular radiofrequency (RF) nerve ablation.

Materials and Methods: 20 patients with severe abdominal pain from unresectable pancreatic cancer were enrolled and 19 treated with transvascular energy. Angio-CT was used to assess the tumor and plan the procedure. After accessing the vessel through a standard transfemoral or transbrachial approach, transvascular RF energy was delivered via catheter sequentially to multiple sites, including the celiac trunk, common hepatic artery, and/or splenic artery. All treated patients were evaluated within 24 hours, after 24 hours, 7 days, 4-6 weeks, and 3-months post-procedure for the following outcomes: adverse events, pain severity (VAS, 1-10), quality of life assessment (EORTC-30, 0-7), and opioid use.

Results: Responding femoral access procedure patients (N=16) represented 84% of treated patients with a mean pain reduction of 4.16 on the VAS pain scale (baseline of 7.81 to 3.65; 53.3% improvement) at 7-days post-procedure. At 4-6 weeks post-procedure, responding patients (N=9) reported a mean 4.67 reduction on the VAS pain scale (baseline of 7.89 to 3.22), or 59.2% improvement. 100% of responding patients were at zero opioid use at 7-days post-procedure (N=16), while 73% were at zero opioid use at 4-6 weeks post-procedure (N=11). In a post hoc analysis of responding patients, pain reduction remained consistent at 3 months post-procedure, with a mean pain reduction of 5.08 (baseline 7.75 to 2.67; 65.6% improvement; N=6). In addition to lasting pain relief, patients

(N=7) saw a mean 76.5% improvement in global health, mean 51.5% improvement in functional ability, and mean 50.4% improvement in symptom management. Additionally, 100% of responding patients (N=7) were opioid free at their 3-month post-procedure follow-up. There were no device or procedure-related serious adverse events. The number of patients decreased over time due to natural disease progression, including deaths unrelated to the procedure or device.

Conclusion: RF ablation of the somatosensory nerve via a transfemoral approach to the celiac plexus showed significant, durable pain relief, improved quality of life, and reduced or eliminated opioid use. These promising feasibility results prove that transvascular RF nerve ablation is both safe and effective in reducing severe pain from pancreatic adenocarcinoma.

Abstract No. 59

Predictors of Clinical Response Following Genicular Artery Embolization for Knee Osteoarthritis



(Article No. 108066)

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Purpose: Patient-level predictors of treatment response after genicular artery embolization (GAE) for knee osteoarthritis (OA) are poorly understood. We evaluated candidate clinical, serum, and imaging biomarkers for their ability to predict achievement of the minimal clinically important difference (MCID) in WOMAC pain and stiffness scores following GAE.

Materials and Methods: Data from a prospective single-arm clinical trial of 25 patients who underwent GAE for symptomatic knee OA was retrospectively analyzed. Candidate predictors, selected *a priori*, included sex, age, BMI, contralateral Kellgren-Lawrence score, and baseline values for WOMAC pain, serum IL-1Ra, serum VEGF, and total bone marrow edema score on MRI using MOAKS methodology. The primary outcomes were frequency of achieving the MCID in WOMAC pain and WOMAC stiffness at 1, 3, and 12 months, modeled as an ordinal outcome (0–3). Ordinal logistic regression models were constructed. Variance inflation factors (VIFs) were assessed to detect multicollinearity, and leave-one-out cross-validation was performed to evaluate model robustness.

Results: All candidate predictors were successfully incorporated into regression models, with no evidence of multicollinearity by VIF analysis ($1.157 \leq \text{VIF} \leq 2.035$). Lower contralateral KL scores (OR: 0.087 [0.012–0.618], $p=0.015$) and higher BMI (OR: 1.383 [1.001–1.910], $p=0.049$) were significantly associated with achievement of the MCID for WOMAC pain. Lower baseline serum IL-1Ra levels (OR: 0.122 [0.018–0.816], $p=0.030$) was significantly associated with achievement of the MCID for WOMAC stiffness. The remaining demographic, clinical, serum, and imaging biomarkers were not significantly associated with MCID achievement. In the cross-validation, contralateral KL score, serum IL-1Ra level, and BMI were significant in 96%, 88%, and 48% of the 25 replications, respectively, and the average and median p-values of these predictors in the nonsignificant replications were 0.062 and 0.058.

Conclusion: In this clinical trial cohort, specific baseline clinical and serum factors were associated with achievement of clinically meaningful improvements in pain and stiffness. Analysis of larger cohorts will help clarify ideal demographic-, biomarker- and imaging-based patient selection strategies which can improve prediction of treatment response and guide clinical decision-making in GAE for knee OA.

Abstract No. 60

Outcomes of SpineJack Implant-Assisted Vertebral Augmentation in the Management of Spinal Compression Fractures



(Article No. 108067)

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Purpose: To evaluate outcomes of vertebral body fracture (VCF) management with SpineJack kyphoplasty, including pain control, performance status, opioid use, and overall survival (OS) with or without radiofrequency ablation (RFA).

Materials and Methods: 64 adult kyphoplasty patients from 2019–2025 undergoing a total of 77 SpineJack implantations inserted at 9 thoracolumbar levels for treatment of VCFs were retrospectively analyzed at a single-center. 42 patients (66%) had pathologic fractures from malignancy, and 36 (57%) also received concurrent RFA. Outcomes included numerical rating system pain score (NRS), morphine milligram equivalents (MME), eastern cooperative oncology group performance status score (ECOG), and overall survival post-kyphoplasty (OS). There was an average follow-up period of 2 weeks post-kyphoplasty.

Results: Sixty-four patients were included (RFA 37; no RFA 27). Pain improved substantially at early follow-up: mean NRS decreased from 7.43 to 3.86 ($\Delta -3.57$); paired Wilcoxon $p < 0.0001$ ($n = 63$). In an ANCOVA adjusting for baseline NRS, RFA was not associated with additional early pain reduction ($\beta = 0.14$; 95% CI -1.47 to 1.76 ; $p = 0.863$). ECOG performance status showed no significant overall change (median $2 \rightarrow 2$; Wilcoxon $p = 0.446$; $n = 43$) and did not differ by RFA on post-procedure comparison (Mann–Whitney $p = 0.809$). Opioid utilization (MME) showed heterogeneous temporal effects. Relative to baseline, MME was unchanged immediately (median $60.0 \rightarrow 66.8$; $\Delta +10.2$; $p = 0.252$; $n = 64$) but decreased at 1 month ($60.0 \rightarrow 30.0$; $\Delta -30.0$; $p = 0.0003$; $n = 58$) and 3 months ($52.5 \rightarrow 0.0$; $\Delta -30.0$; $p = 0.0053$; $n = 46$). A Friedman test across immediate/1-/3-month timepoints was significant ($\chi^2 = 24.47$; $p < 0.0001$; $n = 44$). In log-linear models adjusting for baseline MME, RFA was not associated with immediate post-procedure MME ($\beta = 0.306$; 95% CI -0.249 to 0.860 ; $p = 0.280$), but was associated with higher MME at 1 month ($\beta = 2.120$; 95% CI 1.135 to 3.106 ; $p < 0.0001$; $\approx +733.5\%$) and at 3 months ($\beta = 2.896$; 95% CI 1.961 to 3.832 ; $p < 0.0001$; $\approx +1710.8\%$). Median overall survival by reverse Kaplan–Meier was 21.2 months. No significant intraoperative complications were reported.

Conclusion: Vertebral kyphoplasty with SpineJack was associated with significant improvements in patient pain and reductions in opioid pain management requirements. Concurrent RFA was not associated with independent improvements in pain outcomes and was associated with a higher post-procedure opioid use. The findings suggest that vertebral kyphoplasty with SpineJack remains an effective treatment option for patients with VCFs.

Scientific Session 7

Practice Development & Management

Sunday, April 12, 2026
3–4:30 p.m.

Abstract No. 61

Renal Cryoablation in the Office-Based Lab Setting Versus Hospital Setting



(Article No. 108069)

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²Vascular Interventional Physicians

Purpose: To assess differences in CT-guided percutaneous renal cryoablation procedures performed in an office-based lab (OBL) compared to a hospital setting.

Materials and Methods: Single-institution institutional review board–approved retrospective study of 65 CT-guided percutaneous renal cryoablation procedures performed at an office-based lab and in a hospital setting from July 2024 through May 2025. Data collected included patient demographics, consultation to procedure interval, procedure start delay, procedure duration, anesthesia/sedation duration, length of stay, radiation (dose length product), and adverse events.

Results: 36 renal cryoablation procedures performed at the OBL and 29 renal cryoablation procedures performed in the hospital setting were evaluated. There was no significant difference in patient age between the two groups. No significant difference was observed between the OBL and hospital groups with regards to consultation to procedure interval (50.7 days vs 64.1 days, $P = 0.38$) or procedure length (84.8 minutes vs 74.9 minutes, $P = 0.052$). Procedures performed in the OBL demonstrated significantly shorter procedure start delays (20.4 minutes vs 155.6 minutes, $P < 0.0001$), significantly shorter anesthesia/sedation duration (89.9 minutes vs 112.2 minutes, $P = 0.011$), and significantly shorter length of stay (291.1 minutes vs 503.3 minutes, $P < 0.0001$) compared to procedures performed in the hospital. There was a significant decrease in radiation (dose length product) for procedures performed in the OBL compared to the hospital (2462.1 mGycm vs 5300.2 mGycm, $P < 0.0001$). 2 mild adverse events occurred in the OBL group (5.6%), and 2 mild adverse events occurred in the hospital group (6.9%), all of which were small hematomas, with no significant difference between the groups ($P = 0.82$). No moderate or severe adverse events occurred in either group.

Conclusion: CT-guided percutaneous renal cryoablation can be safely performed in an office-based lab setting, with shorter procedure start delays, shorter anesthesia/sedation duration, shorter length of stay, and less radiation compared to the hospital setting.

Abstract No. 62

Outpatient-Based Lab Yttrium-90 Radioembolization: Enhancing Efficiency and Patient Value



(Article No. 108070)

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Purpose: While common interventional radiology (IR) procedures performed in outpatient-based lab (OBL) settings are known to reduce patient wait times, expedite discharge, and provide greater economic advantages compared to in-hospital settings, Y90 radioembolization is inherently more complex due to requirements for 99mTc-MAA imaging and radiation safety. We hypothesized that performing Y90 radioembolization in an OBL setting would nevertheless improve operational efficiency and patient-centered outcomes compared to traditional in-hospital approaches, despite these additional complexities.

Materials and Methods: We performed a retrospective analysis of patients who underwent Y90 radioembolization for hepatic malignancies at our institution between January 20, 2015, and August 5, 2025. In March 2019, our institution transitioned Y90 mapping and administration from an in-hospital setting to an OBL, creating two cohorts with otherwise equivalent institutional resources. Key metrics included pre-procedure wait time, post-procedure discharge time, and total facility time. Statistical comparisons utilized the Mann-Whitney U test; significance was defined as $p < 0.05$.

Results: A total of 870 patients were included 479 in the OBL group and 391 in the in-hospital group. Median wait time was significantly shorter in the OBL group (103.95 minutes) versus the in-hospital group (151.28 minutes, $p < 0.05$). Median post-procedure discharge time was also reduced in the OBL group (100.0 minutes) compared to the in-hospital group (181.8 minutes, $p < 0.05$). Overall facility time was reduced by 36.05% in the OBL cohort ($p < 0.05$).

Conclusion: OBL-based Y90 radioembolization is associated with significantly shorter wait times and expedited discharge relative to the in-hospital setting, despite procedural complexity. These findings support broader adoption of OBL protocols for eligible patients to enhance efficiency and patient value. Prospective, multicenter studies are warranted to corroborate these benefits and evaluate long-term clinical outcomes.

Abstract No. 63

Post-Market Adverse Event Patterns in Venous and Pulmonary Mechanical Thrombectomy Systems: FDA MAUDE Analysis, 2015 to 2025



(Article No. 108071)

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Purpose: To characterize adverse events, temporal trends, and failure-mode patterns in venous/pulmonary mechanical thrombectomy

using the FDA Manufacturer and User Facility Device Experience (MAUDE) database.

Materials and Methods: MAUDE was queried January 2015 to September 2025 using FDA product codes QEW and QEZ, augmented with brand keywords (FlowTriever/Triever and Clot-Triever, Inari Medical, Irvine, CA; Indigo/Lightning, Penumbra, Alameda, CA; AlphaVac, AngioDynamics, Latham, NY). Reports were de-duplicated by report number and a narrative-similarity rule. Event type (malfunction, injury, death) was extracted. Narratives were coded into failure modes: device separation/fracture (SEP), embolization/migration (EMB), vessel injury/perforation (VSI), access/bleeding (ACS), console/suction/power (CON), other (OTH). Two raters performed coding with inter-rater agreement assessed by κ on a random 100-report subset. Yearly injury-proportion trend was tested with the Cochran–Armitage test (across years with non-zero injury counts, 2019–2025). Disproportionality of injury by failure mode was estimated with proportional reporting ratios (PRR) and 95% CIs. A sensitivity analysis repeated key results excluding reports tagged as purely operational/user-error. Public, de-identified dataset.

Results: N=507 unique reports after de-duplication: malfunction 85.2%, injury 8.9%, death 4.3%. Injury-labeled reports increased 2019–2025 ($1 \rightarrow 10$; $z=7.25$, $p < 0.0001$). Most frequent failure modes were OTH 264 (52.1%), SEP 160 (31.6%), CON 46 (9.1%). ACS showed the highest disproportionate association with injury (PRR 7.17, 95% CI 3.31–15.52). Sensitivity excluding operational/user-error labels yielded similar directionality.

Conclusion: In this venous/pulmonary MAUDE review (QEW/QEZ), injury-labeled reports increased; access bleeding (ACS) showed the strongest injury link. Training/checklists for access, hemostasis, and anticoagulation may mitigate risk. Because MAUDE is voluntary/narrative—often incomplete or duplicated and lacking denominators—true rates or brand comparisons aren't inferable. Compared with prior reviews, we add trend testing, PRR-based signal flagging, de-duplication, and rater agreement.

AI Disclosure Statement: During the preparation of this work, the author used OpenAI ChatGPT in order to improve grammar, clarity, and organization. The author reviewed and edited the content and takes full responsibility for it.

Abstract No. 64

Handheld 3D Ultrasound for Bladder Volume Assessment: Accuracy, Reproducibility, and Clinical Feasibility Compared to Conventional 2D Imaging



(Article No. 108072)

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Purpose: To compare the accuracy, reproducibility, and feasibility of a handheld three-dimensional (3D) ultrasound device with conventional two-dimensional (2D) ultrasound for urinary bladder volume measurement, using voided urine volume as the reference standard.

Materials and Methods: Fifty-three healthy male volunteers (mean age 19.6 ± 2.0 years) underwent bladder volume

assessment by two novice operators using both methods: 2D ultrasound (manual caliper-based) and handheld 3D ultrasound (Butterfly iQ, automated sweep). Each operator performed two repeated measurements per method. True voided volume was recorded immediately after scanning. Accuracy was assessed by mean differences, percentage error, and Bland–Altman analysis. Intra- and inter-operator reproducibility were evaluated with intraclass correlation coefficients (ICC).

Results: Both methods underestimated bladder volume compared to voided volumes ($p < 0.001$). The 3D method demonstrated higher accuracy, with median percentage error -11.2% to -12.0% , versus -27.6% to -36.7% for 2D. Mean bias ranged from -64.9 mL to -72.3 mL for 3D, compared to -137.4 mL to -191.6 mL for 2D. Intra-operator reproducibility was excellent across all methods ($ICC > 0.96$). Inter-operator agreement was higher for 3D ($ICC = 0.977$; bias 7.3 mL) than for 2D ($ICC = 0.927$; bias -54.2 mL). All scans were successfully completed; however, the 3D device occasionally faced technical errors in very large bladders (>700 mL).

Conclusion: Handheld 3D ultrasound yielded greater accuracy and inter-operator consistency than conventional 2D ultrasound, with faster acquisition and minimal operator input. Despite systematic underestimation, its performance supports broader clinical adoption in point-of-care settings, particularly where operator variability is a concern.

Abstract No. 65

PAD Amputation Risk & Intervention Service Evaluation Tool



(Article No. 108073)

W. Leo¹, X. Zhao¹, A. Liu-Ferrara¹, K. Heath¹; ¹BD

Purpose: This project is to identify population segments with high PAD-related amputation risk and inadequate intervention services, enabling more targeted outreach and resource planning.

Materials and Methods: We developed a machine learning model to estimate PAD-related amputation risk using publicly available variables, including Area Deprivation Index (ADI), racial demographics, diabetes and obesity prevalence, smoking rates, food environment index, and uninsured rates. PAD intervention rates were calculated for every U.S. County using proprietary data sources. Each county was then categorized by amputation risk (“well below average” to “well above average”) and intervention rate (“no PAD intervention market” to “well above average”).

Results: An interactive heatmap was created to visualize all 3,146 U.S. counties, allowing users to explore 30 population segments based on their amputation risk and intervention rate. Segment-based filtering dynamically updates the map, providing a detailed view of counties within each category and offering insights into potential contributing factors.

Conclusion: This tool offers a scalable and intuitive solution for identifying geographic and demographic areas where PAD interventions may be most urgently needed. Knowing where these regions are allows us to make more informed decisions around outreach with state and local organizations, and resource allocation regarding free PAD screening services and awareness education, which in turn, can contribute to improving patient

outcomes and reducing preventable amputations. Future enhancements may include integrating patient-level data from specific organizations to help intervention providers assess and optimize their service performance.

Abstract No. 66

The METAL Score for Early Risk Stratification in Hepatocellular Carcinoma Treated with TACE and Immunotherapy Combinations



(Article No. 108074)

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Purpose: Although transarterial chemoembolization (TACE) combined with immune-based systemic therapy represents a promising regimen for patients with unresectable hepatocellular carcinoma (uHCC), it remains unclear which subgroups are most likely to benefit. We aimed to develop and validate a prognostic tool for identification of ideal candidates.

Materials and Methods: This multicenter retrospective study included 526 uHCC patients who received first-line TACE plus targeted and immunotherapy at 13 tertiary hospitals between December 2018 and August 2023. A prognostic score was developed in a derivation cohort (n=378) using multivariate Cox regression and validated in an external cohort (n=148). Radiological response and overall survival (OS) were assessed across different risk strata. Score performance was benchmarked against existing prognostic models and further evaluated in a separate cohort receiving systemic therapy without TACE (n=232).

Results: A three-variable score (METAL) integrating metastatic burden (HR 1.47 for oligometastases, $p = 0.032$; HR 4.31 for polymetastases, $p < 0.001$), log₁₀alpha-fetoprotein (HR 1.18, $p = 0.006$), and albumin-bilirubin grade (HR 1.50, $p = 0.018$) was developed, showing a linear association with mortality risk (overall $p < 0.001$; nonlinear $p = 0.556$). Median OS for low-, intermediate-, and high-risk groups was 30.8, 25.2, and 11.6 months in the derivation cohort, and 34.6, 23.0, and 14.8 months in the external validation cohort, respectively (all $p < 0.001$). In both cohorts, confirmed objective response rates (ORR) also declined progressively across risk strata (all $p < 0.001$). The METAL score outperformed existing TACE- or immunotherapy-related models, showing higher discrimination and lower prediction error (C-index, 0.70 and 0.70; integrated Brier score, 0.140 and 0.122 in the derivation and validation cohorts, respectively). Additionally, the METAL-low score successfully identified a subgroup achieving significantly longer OS (32.6 vs. 23.8 months; $p = 0.034$) and higher ORR (77.2% vs. 48.1% by mRECIST, $p < 0.001$; 49.7% vs. 30.8% by RECIST v1.1, $p = 0.029$) with combination therapy compared to systemic therapy alone.

Conclusion: The proposed METAL score enables pretreatment risk stratification in uHCC patients undergoing TACE-immunotherapy combinations and has the potential to facilitate individualized treatment decision-making in real-world settings.

Abstract No. 67

Utilization and Site of Service of IR Procedures Performed on Medicare Beneficiaries Between 2013-2023



(Article No. 108075)

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Purpose: Medicare is our nation's largest insurer and assessment of utilization and site of service for common interventional radiology (IR) procedures is important for policymakers.

Materials and Methods: We analyzed data from the Medicare Public Use Files (2013–2023), including both self-designated interventional radiologists (IRs) and all radiologists. Physicians were stratified into two categories based on the proportion of total work RVUs derived from IR services: 50–< 90% IR, and ≥90% IR. Clinical Specialty Categories (CSCs) from the Society of Interventional Radiology (SIR) were used to classify IR practice areas into eight domains: Interventional Oncology (IO), Neurointerventional Radiology (NIR), Pain Management/Musculoskeletal (PM/MSK), Peripheral Arterial Disease (PAD), Renal/Genitourinary (GU), Venous, and Women's Health (WH). IR services not fitting these CSCs were grouped into additional categories, including generic procedures, injections/drainage, biopsy, feeding tubes, venous access, and endovascular interventions. Generic procedures in this analysis included codes such as 43460 (endoscopic dilation of the esophagus) and 47530 (injection procedure for biliary duct or cyst). Annual service rates were calculated per physician and per 1,000,000 Medicare fee-for-service beneficiaries, adjusting for changes in the beneficiary population over time. CAGR (compound annual growth rate) was calculated, which is the average yearly growth rate of a value over time, assuming it grows at a steady, compounded rate.

Results: A total of 1,065 unique IR procedure codes were billed during the 11-year study period. In the ≥50% group (n = 2,272), the strongest growth was seen in Generic procedures (CAGR = 14%), IO (CAGR = 11%), and PM/MSK (CAGR = 5%). For IO, nearly all of the growth occurred in the facility setting (CAGR = 11%), while the non-facility setting showed a complete decline (CAGR = -100%). In contrast, PM/MSK procedures expanded primarily in the non-facility setting (CAGR = 19%), with a decline in facilities (CAGR = -12%). Generic procedures followed a similar pattern, showing their highest growth in the non-facility setting (CAGR = 18%) compared with facilities (CAGR = 13%).

Conclusion: Utilization of IO and PM/MSK is increasing in the Medicare Fee for service beneficiaries. Most of the growth take place in the non-facility setting except interventional oncology where growth primarily occurred in the facility setting.

Abstract No. 68

Structured Week-Long Call Reduces Burnout and Enhances Resident Experience in Interventional Radiology Without Compromising Case Volume



(Article No. 108076)

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Purpose: To evaluate the effect of changing from a random single-day call system to a dedicated week-long call block on interventional radiology (IR) resident wellbeing and burnout.

Materials and Methods: The IR call schedule was restructured from random call shifts to a continuous, Friday-to-Friday, call week. Previously, residents worked until 8 pm, took home call overnight, and returned the following day regardless of overnight activity unless continuously occupied or at duty hour limits. With the new system, one resident is on call from Friday evening through the following Friday until 7 am, with in-house duty from 2-8 pm on weekdays, and overnight home call, followed by an off-duty Friday and weekend. Mornings and early afternoon are free of clinical obligations. Residents that took call with the new system completed the validated 15 question Mini-ReZ survey before and after implementation. The survey assesses satisfaction, stress, burnout, work control, chaos, teamwork, values alignment, and EMR challenges across 3 domains with 5 questions each, using a 5-point Likert scale. Monthly case numbers per residents for the current academic year were compared to the prior. Scores were compared using the Wilcoxon and paired t-tests and presented as means.

Results: Survey response rate was 100% (n=5), all males. Total Mini-ReZ score increased from 34.9 to 46.3 (p=0.13). Among the 3 main domains, there was a statistically significant increase in scores for the supportive work environment domain (2.7 to 3.8, p=0.014) and the overall resident experience domain (1.9 to 3.1, p=0.024), respectively. No significant change was seen in work pace and EMR related stress domain (2.3 to 2.5, p=0.63). Residency satisfaction rating improved from 3 to 4.3 (p=0.02). Monthly case volume per resident did not decrease compared with the prior year (113.3 and 106.3, respectively; p=0.6). Additionally, 100% (n=6) of respondents reported feeling more technically confident and better prepared sooner due to close repetition of call level cases (e.g., angiogram, drainage of obstructed biliary and urinary systems, etc.).

Conclusion: Despite a small sample size, implementation of a structured week-long call system reduced burnout and improved residents' overall experience without affecting case load. Such changes could be an effective strategy to improve resident wellbeing. Further data will be collected as more residents rotate on service with an estimated total of 10 by March 2026.

Abstract No. 69

Is Complexity of Work Being Performed by IR Physicians Increasing?



(Article No. 108077)

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Purpose: To assess whether the complexity of work performed by interventional radiology (IR) physicians has increased over time, as measured by work Relative Value Units (wRVUs) billed to Medicare Fee For Service.

Materials and Methods: We analyzed data from the Medicare Physician and Other Supplier Public Use Files from 2013 to 2023. Physicians were classified as interventional radiologists if they self-designated their specialty as interventional radiology or diagnostic radiology and derived more than 50% of their total

work RVUs from IR work. IR work was defined as three categories: invasive HCPCS codes (10000–69999), evaluation and management (E/M) codes (99201–99499), and any NITOS code classified as I999. Each billed IR code was assigned to one of three complexity categories based on wRVU: low complexity (< 1.6 wRVU), intermediate complexity (1.6–3.9 wRVU), and high complexity (≥4.0 wRVU). We then examined the distribution of billed IR codes across these complexity categories over the last 11 years. All of the statistical analysis was done in R Studio.

Results: Over the 11-year period, 727 unique interventional radiology (IR) codes were billed, with 38% classified as low, 32% as intermediate, and 30% as high complexity. The number of radiologists performing predominantly IR work (>50% of IR RVUs) rose from 2,272 in 2013 to 2,488 in 2023. The majority of IR work (52%) performed by these physicians was high complexity, while only about 15% was low complexity. Overall, the mix of IR work shifted notably: the share of low complexity procedures declined from 17% to 15%, while intermediate complexity grew from 30% to 35%. High complexity work decreased from 52% to 50% over the last 11 years. Across 2013–2023, the most frequently billed high-complexity codes were primarily vascular-access and dialysis/arterial work: 36558 (tunneled CVC), 35476 (venous angioplasty), 36561 (tunneled port placement), 36902 (dialysis AV angioplasty), and 36247 (selective visceral/renal catheterization). The leading intermediate codes were 49083 (therapeutic paracentesis), 99214 (E/M visit), 32555 (image-guided thoracentesis), 36147 (AV shunt evaluation/fistulogram), and 36569 (PICC insertion). Low-complexity codes were dominated by imaging guidance—77012 (CT needle guidance), 76937 (US vascular access), 77001 (fluoro-venous access), 99213 (E/M visit), and 76942 (US needle guidance).

Conclusion: Over the past decade, IR practice serving Medicare FFS beneficiaries has shifted away from lower-complexity procedures towards more intermediate complexity work.

Abstract No. 70

The US IR Workforce: An Analysis of Temporal Trends of IR Physicians Serving the Medicare Fee for Service Population, 2013 to 2023



(Article No. 108078)

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Purpose: To evaluate trends in the interventional radiology (IR) workforce serving the Medicare fee-for-service (FFS) population from 2013–2023 using a work relative value unit (wRVU)-based classification of radiologists, and to compare findings with self-identified IR physicians

Materials and Methods: This retrospective study analyzed data from the Centers for Medicare & Medicaid Services (CMS) Physician and Other Supplier Public Use Files (POPSUF) from 2013 to 2023. Radiologists were categorized by the proportion of total billed work relative value units (wRVUs) attributable to interventional radiology (IR): ≥50% IR. These groups were compared with physicians who self-identified as interventional radiologists. Radiologists who did not perform any IR procedures

were excluded. For the remaining, total, diagnostic, and IR workloads were evaluated. To ensure accurate year-to-year comparisons, wRVUs were adjusted for the number of radiologists in each work category and the annual Medicare fee-for-service beneficiary population. Descriptive and longitudinal statistical analyses were conducted using Stata 18.5.

Results: The number of radiologists billing any IR procedure fell from 14,490 in 2013 to 13,035 in 2023, while self-identified interventional radiologists rose from 925 to 1,978 (+114%). Total IR work RVUs declined among radiologists and self-identified IR physicians performing $\geq 50\%$ IR, but increased among those billing $< 50\%$ IR. Among the $\geq 50\%$ IR group, annual IR work RVUs per radiologist per 100,000 beneficiaries decreased from

48 to 35 (–27%). For radiologists performing $\geq 50\%$ IR, diagnostic work RVUs dropped from 9 to 4 per radiologist per 100,000 beneficiaries (–56%), while E/M contributions rose from 2 to 5 (+150%). IR-based facility work declined from 35 to 20 (–43%), whereas IR-based non-facility work increased from 13 to 15 (+15%).

Conclusion: The proportion of radiologists dedicating the majority of their practice to IR has declined in the Medicare FFS population over the past decade, with a growing concentration of radiologists performing $< 10\%$ IR work. Self-identified specialty designations underestimate the true number of practicing IRs, as only 52% of radiologists billing $> 90\%$ IR work RVUs self-identified as interventional radiologists.

Scientific Session 8

Radioembolization 1

Sunday, April 12, 2026

3–4:30 p.m.

Abstract No. 71

Changing Utilization of Locoregional Therapies for HCC Across the United States



(Article No. 108080)

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Purpose: There is limited understanding of how treatment patterns for hepatocellular carcinoma (HCC) have evolved since 2020. Prior studies published on patients treated from 2012–2020 have largely relied on SEER-Medicare databases or single-population registries, which provide only partial insights and often fail to capture the broader national landscape leaving a gap in knowledge regarding more recent approvals of systemic therapy across the United States.

Materials and Methods: We conducted a study using the Epic Cosmos aggregated electronic health record (EHR) dataset. We identified patients diagnosed with HCC between January 2016 and December 2024 using ICD-10 and SNOMED diagnosis codes. To ensure adequate clinical data, we included only patients with at least two encounters within a two-year period. We further isolated patients who had received treatment for HCC. Treatment exposure was determined by the presence of CPT codes corresponding to brachytherapy, immunotherapy, radioembolization, surgery, transplantation, ablation, or trans arterial chemoembolization (TACE).

Results: Among 59,868 patients with hepatocellular carcinoma treated at hospitals using the EPIC EHR between 2016 and 2024, TACE was the most common first-line therapy (n = 22,302), followed by systemic therapy (n = 10,227), surgical resection or liver transplantation (n = 9,051), ablation (n = 7,983), TARE (n = 7,444), and stereotactic body radiotherapy (SBRT; n = 6,323). Between 2016 to 2024, TACE use declined, with a 5% lower odds of being used per year (OR 0.95, 95% CI 0.94–0.95, p < 0.001), representing a fall from 48% of first-line therapies in 2016 to 34% in 2024 ($\chi^2=190$, p < 0.001). In contrast, TARE adoption increased by 6% per year (OR 1.06, 95% CI 1.05–1.07, p < 0.001), rising from 9% to 14% ($\chi^2=146$, p < 0.001). Ablation had increased utilization with ~2% higher odds of use per year (OR 1.02, 95% CI 1.01–1.03, p < 0.001; $\chi^2=23.3$, p < 0.001). Surgical management (resection/transplant) increased significantly (OR 1.08 per year, 95% CI 1.06–1.09, p < 0.001) from 3% in 2016 to 10% in 2024. Radiation therapy utilization also increased (OR 1.04 per year, 95% CI 1.03–1.05, p < 0.001) from 10% in 2016 to 13% in 2024. Systemic therapy overall remained stable at 17%

(OR 1.00, 95% CI 0.99–1.01, p=0.24), though utilization changed from tyrosine-kinase inhibitors (99% in 2016) to immunotherapy-based regimens (67% in 2024).

Conclusion: More than 50% of HCC patients at 1,809 hospitals using Epic underwent IR therapies. TACE utilization declined between 2016–2024 with increases in TARE, ablation, surgery, and radiation therapies.



Abstract No. 72

Target Trial Emulation: A Comparison of Resection, Ablation, and TARE for Early-Stage HCC: A Real-World Analysis



(Article No. 108081)

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Purpose: Hepatocellular carcinoma (HCC) is increasingly detected at an early stage, but the optimal first-line therapy remains uncertain. We aimed to emulate a target trial to compare outcomes of surgical resection, local ablation, and transarterial radioembolization (TARE) in real-world practice.

Materials and Methods: We conducted a retrospective target trial emulation using data from the Epic EHR system, encompassing over 300 million patient encounters across multiple hospitals. Patients diagnosed with AJCC Stage I HCC between 2016 and 2024 with preserved liver function (no ascites or hepatic encephalopathy, creatinine < 2.0, INR < 1.7, bilirubin < 2.0) were eligible. Only patients whose first-line treatment was resection, ablation, or TARE were included. Inverse probability of treatment weighting (IPTW) was applied to balance baseline covariates, with resection as the comparison group.

Results: A total of 512 patients met eligibility criteria, including 157 who underwent resection, 180 who underwent ablation, and 175 treated with TARE. The median age at diagnosis was 70 years (IQR 64–76; 74% male). Cirrhosis was present in 380 patients, with hepatitis C virus infection (50%) and MASLD (16%) being the most common underlying etiologies. Median overall survival for the entire cohort was 77 months (IQR 62–86 months). When analyzed by treatment type, median survival was 63 months for ablation and 55 months for TARE, while resection did not reach a median survival. On univariate analyses, both ablation and TARE were associated with worse survival compared to resection. However, this difference was explained by differences in baseline characteristics, as patients treated with ablation or TARE were generally older (median 72 vs. 70 years) and had higher Charlson–Deyo comorbidity scores (median 4 vs. 2). In multivariate models adjusting for these factors, the median survival was 67 months for ablation and 57 months for TARE (p = 0.648). Compared with resection, ablation was associated with a hazard ratio (HR) of 1.86 (95% CI 0.89–3.87, p = 0.097), and TARE with an HR of 2.23 (95% CI 0.96–5.21, p = 0.063). Notably, overall survival did not differ significantly between ablation and resection, resection and

TARE, or ablation and TARE (HR for TARE vs. ablation: 1.12, 95% CI 0.54–2.62, $p = 0.648$).

Conclusion: In this real-world target trial emulation for early-stage HCC (AJCC Stage 1), ablation and TARE achieved similar overall survival to surgical resection. These findings suggest that non-surgical modalities may be appropriate first-line options for selected patients with preserved liver function.

Abstract No. 73

Evaluating Long-Term Outcomes of Liver Transplantation After Y-90 Radioembolization for Hepatocellular Carcinoma



(Article No. 108082)

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Purpose: To evaluate long-term overall survival (OS) and pathologic response in patients with hepatocellular carcinoma (HCC) who underwent liver transplantation (LT) following Yttrium-90 transarterial radioembolization (TARE), and to compare outcomes with LT recipients without prior Y-90.

Materials and Methods: Single-institution retrospective study of 214 patients with HCC who underwent LT between January 2015 and January 2025. Among these, 97 patients received Y-90 TARE prior to LT with glass or resin microspheres. Demographic, clinical, treatment, and histopathologic data were collected from institutional records. OS was estimated with Kaplan–Meier methods, and survival differences between Y-90 and non-Y-90 patients were assessed using log-rank and Wilcoxon (Breslow) tests.

Results: Among 97 patients who underwent Y-90 prior to LT, median age was 63 years; 80% were male and 20% female. The median baseline MELD score at LT was 11. Liver disease etiologies included HCV (38%), alcoholic cirrhosis (24%), NASH (16%), HBV (11%), other causes (8%), and autoimmune disease (2%). Of 94 patients with available treatment data, glass microspheres were used in 97% and resin microspheres in 3%. The median interval from the first Y-90 to LT was 265 days. Pre-LT imaging categorized treated lesions as LR-5 in 73%, LR-4 in 11%, and other in 15%. On explant pathology, complete necrosis was observed in 26% of treated lesions and extensive necrosis (75–99%) in 22%. Microvascular invasion was present in 5%, and viable tumor in 62%. For the Y-90 cohort, OS at 3, 5, and 10 years was 88.6%, 88.6%, and 30.5%, respectively. HCC recurrence occurred in 7% of patients after LT. Compared with LT recipients without prior Y-90 ($n=117$), OS was significantly different (log-rank $p=0.021$; Wilcoxon $p=0.045$), with non-Y-90 patients achieving 95.7%, 92.8%, and 85.0% survival at 3, 5, and 10 years. In the overall LT cohort ($n=214$), OS at 3, 5, and 10 years was 92.6%, 90.7%, and 80.5%.

Conclusion: LT after Y-90 achieved significant pathologic response ($\approx 48\%$ of explants showing $\geq 75\%$ necrosis) and favorable 3- and 5-year overall survival in patients who often presented with advanced LR-5/LR-4 lesions. Although 10-year survival was statistically higher in LT recipients without prior

Y-90, this likely reflects less aggressive tumor biology at the time of transplantation in that group. These findings support Y-90 as an effective bridging or downstaging strategy for disease control in selected HCC candidates.

Abstract No. 74

Patient and Tumor Predictors of Progression-Free Survival in Y90-Treated Neuroendocrine Cancer with Liver Metastases



(Article No. 108083)

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Purpose: This study aimed to investigate the progression-free survival effect of Yttrium-90 (Y90) treatment in patients with neuroendocrine cancer (NECs) with hepatic metastases. Locoregional treatment is often the best option for these patients who are often ineligible for surgery due to multifocal disease. Identifying key markers of progression-free survival can improve disease surveillance and treatment planning.

Materials and Methods: A single-center retrospective analysis was conducted on patients with NECs with hepatic metastases ($n=16$) who underwent Y90 radioembolization between July 2014 and April 2023. The outcome of interest is progression-free survival (PFS), calculated from treatment date to date of progression, death, or last follow-up. Prior to Y90 mapping studies, baseline values of creatinine, bilirubin, INR, sodium, albumin, dialysis status, MELD, MELD-Na, MELD 3.0 scores, previous liver intervention, number of lesions, largest lesion size, portal vein invasion, lung shunt percentage, and areas of treatment were collected. PFS was estimated using Kaplan–Meier curves, and its association with preliminary factors were evaluated using Cox proportional hazards models in univariate and multivariate analyses; proportional-hazards assumption was assessed with Schoenfeld residual tests.

Results: The median PFS is 257.5 days. In univariate Cox models, higher bilirubin was associated with shorter PFS (HR 2.07, 95% CI 1.20–3.57, $p=0.009$), while higher sodium was associated with longer PFS (HR 0.87, 95% CI 0.78–0.97, $p=0.012$). INR (HR 1.54, $p=0.071$) and Child-Pugh score (HR 1.38, $p=0.076$) showed near-significant trends; other variables were not significant. In the multivariate Cox model, bilirubin remained independently associated with shorter PFS (HR 1.91, 95% CI 1.01–3.60, $p=0.046$), whereas sex, Child-Pugh score, and prior liver interventions were not statistically significant. Kaplan–Meier curves stratified by largest lesion size also showed no significant difference (>5 cm [$n=19$], median 599 days; 3–5 cm [$n=11$], median 111 days; < 3 cm [$n=4$], median 184.5 days; $p=0.81$).

Conclusion: Preliminary markers of liver function, especially bilirubin, may be an important factor in predicting survival in patients with NECs with hepatic metastases being treated with Y90. Sodium showed a possible protective pattern in simple models, but this did not persist with adjustment. Further studies including larger patient populations are needed to fully understand which factors may influence or may be independent from PFS in this population.

Abstract No. 75

A Clinical Comparison Between Nuclear Medicine and CT-Based Post-treatment Dosimetry Following 90Y-Radioembolization with Multimodality Imageable Eye90 Microspheres



(Article No. 108084)

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Purpose: This report presents interim dosimetry analysis from a prospective, multicenter study (Route90, NCT05953337) comparing the mean absorbed dose (D_{mean}) derived from nuclear medicine (NM) imaging and CT imaging of patients undergoing ⁹⁰Y-radioembolization (⁹⁰Y-RE) with imageable Eye90 microspheres.

Materials and Methods: A total of 27 patients were treated for unresectable HCC using ⁹⁰Y-RE with Eye90 microspheres. Immediately post-treatment, patients were imaged with CT and NM (SPECT [n=9], PET [n=18]) to measure the absorbed dose to the perfused volume (PV) and tumor (T). In NM-based dosimetry, D_{mean} was calculated using voxel S-values for PET and the local deposition method for SPECT. For CT, D_{mean} was calculated through calibration phantom analysis and convolution with a ⁹⁰Y dose voxel kernel. D_{mean} to PV and T was compared between NM- and CT-based dosimetry using linear regression and Bland-Altman analysis. Correlation coefficients (R^2), the percent difference $\pm$ standard error (bias), and 95% limits of agreement (precision) between D_{mean} are reported. NM- and CT-based D_{mean} were also independently compared to a single compartment MIRD-based D_{mean} , considered a ground truth.

Results: When comparing D_{mean} from CT- and NM-based dosimetry to a MIRD-based D_{mean} , CT demonstrates significantly improved agreement. There is a very strong correlation between CT- and MIRD-based D_{mean} to PV ($R^2=0.96$, $p<0.001$), while in NM, the correlation was far weaker ($R^2=0.56$, $p<0.001$). The MIRD-based D_{mean} was generally greater than both CT- or NM-based D_{mean} , particularly NM. For CT, the bias and precision were $44 \pm 13\%$ and 64% , respectively. For NM, the bias and precision were $70 \pm 16\%$ and 78% . When comparing D_{mean} directly between CT and NM, there was a moderate correlation between for PV ($R^2=0.57$, $p<0.001$) and a weak correlation for T ($R^2=0.36$, $p<0.001$). D_{mean} was generally greater in CT-based dosimetry relative to NM. For PV, the bias and precision were $31 \pm 19\%$ and 94% , respectively. For T, the bias and precision were $10 \pm 21\%$ and 104% .

Conclusion: For PV, CT-based dosimetry revealed that D_{mean} maintained a significantly stronger correlation with the MIRD-based D_{mean} , relative to NM. CT-based dosimetry also had a reduced bias and improved precision relative to NM-based dosimetry. Future research will leverage the high spatial resolution of CT to more accurately characterize tumor dose heterogeneity.

Abstract No. 76

Outcomes of Transarterial Radioembolization as Salvage Liver-Directed Therapy in Patients with Poor Response to First-Line Bland or Chemoembolization for Neuroendocrine Liver Metastases



(Article No. 108085)

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Purpose: To assess the safety and efficacy of salvage transarterial radioembolization (TARE) in patients with neuroendocrine liver metastases (NELM) who fail first-line liver-directed therapy (LDT) with bland transarterial embolization (TAE) or chemoembolization (TACE).

Materials and Methods: Retrospective review identified 18 patients (10 male, 8 female, median age 61y; range, 36-82) who failed treatment with TAE/TACE, defined as hepatic progression within < 12 months of treatment, and subsequently underwent TARE between 2011 and 2023. Demographic, clinical, treatment, and adverse event data were recorded and analyzed. Hepatic progression-free survival (hPFS) and overall survival (OS) were calculated by Kaplan-Meier analysis and compared using log-rank test.

Results: NET primary site was pancreas in 61% (n=11), small bowel in 11% (n=2), and other/unknown in 29% (n=5). Tumor grade was grade 1 in 6% (n=1), grade 2 in 78% (n=14), grade 3 in 6% (n=1), and unknown in 2 patients (10%). Ten patients (56%) had liver-dominant disease and eight (44%) had liver-only metastases. Three patients (16%) underwent TAE and 15 (84%) underwent TACE as first line LDT. The median number of TAE/TACE sessions was 2 (range: 1-4). Median hPFS after TAE/TACE was 4.2 months (95% CI 2.5-7.2 months). Mean interval time between radiologic progression after TAE/TACE and the first TARE session was 82 days (range, 27-281). A total of 31 TARE sessions were conducted, 27 (87%) of which were lobar, 3 (10%) sub-lobar, and 1 (3%) segmental. The median total radiation dose delivered was 52.7 mCi (range: 26.1-87.4). Median hPFS after TARE was 13.8 months (95% CI 5.6-58.2 months) which was significantly longer compared to TACE (log-rank $p<0.001$; HR 0.20, 95% CI 0.08-0.50, $p<0.001$). The median OS after TARE was 17 months (95% CI 5.8-31.7 months). The most common adverse events were fatigue (14; 78%), nausea/vomiting (11; 61%), abdominal pain (9; 50%), and opioid-induced constipation (7; 39%), all of which were CTCAE Grade 2. Hepatic encephalopathy and radioembolization induced liver disease (REILD) occurred in one (6%) and two (11%) patients, respectively. There was one instance of radioembolization induced chronic hepatotoxicity (RECHT).

Conclusion: TARE is a safe and effective salvage treatment for treatment of NELMs in those with short-term progression after TAE/TACE, suggesting that patients who fail TAE/TACE should immediately be considered for TARE if LDT remains indicated.

Abstract No. 77**FEATURED ABSTRACT****Transarterial Radioembolization (TARE) with Yttrium-90 (Y90) Glass Microspheres in Patients with Hepatocellular Carcinoma and Portal Vein Thrombosis (PVT): Real-World Data from the PROACTIF Study**

(Article No. 108086)

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Purpose: Presence of PVT and the degree or extent of thrombosis are prognostic factors for HCC patients. Whether locoregional treatments are still appropriate in patients with PVT is an open debate and most treatment guidelines recommend systemic therapies as the first treatment option in patients with PVT. Herein, we evaluated the effectiveness of Y90 in patients with and without PVT.

Materials and Methods: All patients treated with Y90 glass microspheres (TheraSphere) across 34 French institutions who not opposed to data collection, were included in the PROACTIF study. Duration of follow-up and overall survival (OS) were assessed by reverse Kaplan-Meier (KM) and KM analysis, respectively.

Results: Among the 989HCC patients, 349 (35.3%) had PVT determined by central read. Key baseline and treatment characteristics and median OS by portal vein invasion (Vp) categories are reported in 297.1. The baseline characteristics were similar for patients with Vp0 to 3, whereas Vp4 patients had larger tumors and impaired liver function. Median OS [95% confidence interval (CI)] in patients without and with PVT were 23.1 [95% CI, 21.6,27.0] and 18.3 months (M) [15.4–22.2] respectively. By multivariate analysis, the HR for survival was 1.02 [0.64, 1.64] for Vp1-2, 2.01 [1.21–3.34] for Vp3 and 4.8 [2.10–10.93] for Vp4. Similar to patients with no

PVT, 13.6% of patients with Vp1-3 were downstaged to surgery and subsequent treatment (excluding surgery) was given to 38.9% of patients.

Conclusion: While a number of factors limit cross-study comparisons, median OS in PROACTIF patients with PVT compares favorably with results reported in pivotal immunotherapy combination studies, corroborating that TARE is an appropriate treatment in patients with PVT and allows subsequent resection. Y90 administration for patients with PVT should be considered in multidisciplinary tumor board discussions.

77.1. Baseline and treatment characteristics and OS

	Vp0 n=623	Vp1/Vp2 n=179	Vp3 n=138	Vp4 n=32
Tumor size, >5 cm	404 (64.8)	106 (59.2)	97 (70.3)	24 (75.0)
Solitary, n (%)	307 (49.3)	87 (48.6)	75 (54.3)	16 (50.0)
ALBI 1, n (%)	252 (40.4)	62 (34.6)	51 (37.0)	7 (21.9)
Absorbed Dose to Index Lesion (Gy), mean (SD)	479.01 (355.367)	437.57 (353.264)	340.02 (263.438)	285.69 (157.138)
Median OS, months [95% CI]	23.1 [21.6,27.0]	24.8 [19.3,30.3]	14.3 [10.7,17.7]	10.1 [7.0,21.7]
Surgery, n (%)	69 (11.1)	26 (14.5)	17 (12.3)	0
Subsequent Treatment Excluding Surgery, n(%)	280 (44.9)	71 (39.7)	59 (42.8)	6 (18.8)

Abstract No. 78**Lung Dose Verification Following Y90-Radioembolization Therapy: An Inter-modality Comparison**

(Article No. 108087)

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Purpose: Post-radioembolization 3D liver dosimetry is increasingly used to verify treatment delivery and predict treatment outcomes. However, lung shunt fraction (LSF) and dose estimates are primarily based on pre-therapy 2D imaging of surrogate Tc99m-MAA particles. The objective of this work is to compare the quantitative performance of lung dosimetry in post-therapy Y90 gamma camera, SPECT, and PET imaging.

Materials and Methods: A modular phantom with a water-filled liver and 3 cm diameter tumor and two Styrofoam bead-filled lung inserts was imaged multiple times over the course of 2 weeks on a Siemens Intevo Bold SPECT/CT (7-minute planar and 25-minute SPECT), GE Discovery MI PET/CT (25-minute), and Siemens Quadra PET/CT (25-minute). The phantom contained initial activities resulting in 64 Gy to normal liver, 634 Gy to tumor, 12 Gy to right lung (6.7% LSF), and 26 Gy to left lung (13.2% LSF). Acquisition parameters followed clinical protocols (planar, SPECT, and DMI) or default vendor parameters (Quadra). For each image, an image scaling factor was derived from the known activity in the liver and the measured liver contour total signal. Individual lung activity was calculated from the product of lung contour total signals and the scaling factor. LSFs were calculated using the ratio of contour counts, and lung doses were

calculated using the known lung masses of 440 g. For brevity, only results of a single acquisition per modality are reported herein.

Results: Calculated image scaling factors (Bq/count in planar and SPECT or Bq/Bq in PET) and errors in estimated LSFs and lung doses are tabulated. Overall, the DMI PET images had the lowest errors within $\pm 6\%$, followed by underestimations of up to -12% by planar, -33% with SPECT, and -76% with Quadra PET. Given the measured liver activities agreed within 6% across both PET systems, the large errors in Quadra lung doses suggest optimization is still needed for lung activity quantification.

Conclusion: Initial results with high lung uptake phantoms suggest that doses can be estimated within 10% using SPECT or PET imaging but cross-modality harmonization is still needed. Protocol optimization with phantom data is underway to establish the minimum detectable lung microsphere deposition with each modality prior to performing inter-modality comparisons in patient data.

78.1.				
Image	Planar	SPECT	PET (DMI)	PET (Quadra)
Phantom Activity (GBq)	1.52	1.53	1.86	0.57
Image Scaling Factor	6716	359	1.10	1.17
	Bq/count	Bq/count	Bq/Bq	Bq/Bq
Right Lung LSF Error	-4%	-21%	5%	-72%
Right Lung Dose Error	-5%	-22%	6%	-74%
Left Lung LSF Error	-11%	-30%	-4%	-37%
Left Lung Dose Error	-12%	-33%	-5%	-40%

Abstract No. 79

The Prognostic Value of Baseline Hemoglobin in Hepatocellular Carcinoma Treated with Yttrium-90 Radioembolization: An Institutional Experience from 705 Patients



(Article No. 108088)

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Purpose: To evaluate the prognostic value of baseline hemoglobin (Hgb) levels in patients with hepatocellular carcinoma (HCC) undergoing Yttrium-90 (Y90) transarterial radioembolization (TARE). The hypothesis was that lower Hgb predicts worse overall survival (OS).

Materials and Methods: This retrospective institutional review board-approved study included 705 HCC patients treated with Y90 TARE using glass microspheres [Boston Scientific, MA, USA] from 2004 to 2019. Baseline Hgb was recorded on the day of treatment, and patients were stratified into three groups: ≥ 13.0 , 10.0–12.9, and < 10.0 g/dL. Demographics, liver function, tumor burden, and etiology were recorded. OS was estimated using Kaplan-Meier analysis and compared by log-rank test.

Multivariate Cox proportional hazards regression was used to identify independent predictors of OS with hazard ratios (HR).

Results: The mean baseline Hgb was 11.67 ± 1.93 g/dL. Lower Hgb was significantly associated with older age, female sex, larger tumor size, and worse liver function. Median OS was 58.9 months for ≥ 13.0 g/dL, 22.4 months for 10.0–12.9 g/dL, and 13.8 months for < 10.0 g/dL (log-rank $p < 0.0001$). On multivariate analysis, baseline Hgb remained an independent predictor of OS. Compared to patients with Hgb ≥ 13.0 g/dL, those with levels of 10.0–12.9 g/dL and < 10.0 g/dL had a HR 1.28 (95% CI, 1.01–1.62; $p = 0.038$) and 2.04 (95% CI, 1.55–2.70; $p < 0.001$), respectively. Other independent predictors of worse OS included older age (HR 1.02; $p = 0.001$), PVT (HR 2.54; $p < 0.001$), multifocal disease (HR 1.65; $p < 0.001$), extrahepatic metastasis (HR 2.01; $p < 0.001$), and tumor size large than > 5 cm (HR 2.37, $p < 0.001$). Gender was not independently associated with survival.

Conclusion: Baseline Hgb independently predicts OS in patients with HCC treated with Y90 TARE after treatment with glass microspheres. Lower Hgb levels correlated with significantly reduced OS. Future research should assess whether correcting anemia improves clinical outcomes.

Abstract No. 80

Efficacy of Yttrium-90 Radiation Segmentectomy for Ablative Treatment of Hepatocellular Carcinoma: A Systematic Review and Meta-Analysis



(Article No. 108089)

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Purpose: The aim of this study was to evaluate the ablative efficacy of Yttrium-90 (Y-90) radiation segmentectomy (RS) for hepatocellular carcinoma (HCC) through a systematic review and meta-analysis. RS is a technique that delivers ablative doses of Y-90 microspheres into a segmental hepatic artery branch, offering a potential alternative to surgical resection or thermal ablation for patients with unresectable or unamenable lesions.

Materials and Methods: A systematic search was performed in PubMed, Scopus, Google Scholar, [ClinicalTrials.gov](https://www.clinicaltrials.gov), and reference lists from inception to August 29, 2025, using predefined keywords to identify relevant studies. Case reports, reviews, duplicates, nonhuman studies, and articles without relevant RS outcomes were excluded and the remaining studies' full texts were reviewed thoroughly to determine eligibility. Data on objective response rate (ORR), complete response rate (CRR), disease control rate (DCR), and median tumor dose (MTD), based on mRECIST, were extracted. A random-effects model using inverse variance weighting with logit transformation and REML τ^2 estimation was applied. Meta-regression analyses were conducted to evaluate MTD as a covariate. A leave-one-out sensitivity analysis was conducted to assess the effects of individual studies on pooled estimates and heterogeneity. The R Project for Statistical Computing version 4.4.2 was used for all analyses. This review was done in accordance with PRISMA guidelines.

Results: Of the eleven studies included, a total of 853 patients were analyzed with a median age of 65.8 years and a median tumor size of 2.8 cm. The pooled ORR was 0.93 (95% CI, 0.87–0.96; $I^2 = 81\%$) and CRR was 0.74 (95% CI, 0.63–0.83; $I^2 = 90.5\%$). The pooled DCR estimate was 0.97 (95% CI, 0.93–0.99; $I^2 = 80.2\%$). Meta-regression with MTD data showed no statistically significant association between MTD and ORR, CRR, or DCR. Sensitivity analysis confirmed the stability of results, with a reduction in heterogeneity ($I^2 = 67\% \rightarrow 0\%$) for DCR when a single study was excluded.

Conclusion: RS demonstrates high ablative efficacy in HCC, with pooled estimates of ORR, CRR, and DCR at 93%, 74%, and 97%, respectively. The absence of a significant association between MTD and treatment outcomes suggests that beyond achieving ablative thresholds, additional dose escalation may yield diminishing returns. These findings support RS as a promising ablative therapy in HCC patients who are not candidates for resection or thermal ablation. Larger prospective studies are warranted to validate these results and refine patient selection.

Scientific Session 9

Women's Health 1

Sunday, April 12, 2026
3–4:30 p.m.

Abstract No. 81

Clinical Symptoms Improvement After Iliac Vein Stenting in POTS and Pelvic Venous Disease: A Single-Center Experience



(Article No. 108091)

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Purpose: Postural orthostatic tachycardia syndrome (POTS) with concurrent pelvic venous disease (PVD) is poorly understood, and data on symptom trajectories following left common iliac vein (LCIV) stenting is limited. This study evaluates post-stenting symptom course in this unique patient population.

Materials and Methods: A retrospective study was conducted at a large single-center academic institution between June 2023 and June 2025. Twenty-nine patients with POTS and PVD who underwent LCIV stenting were included. All patients had pelvic venography, intravascular ultrasound (IVUS), and LCIV stenting. Indications for stenting included IVUS narrowing >50% and presence of lumbar or pelvic collaterals. Demographics, pre-/post stenting symptoms, and follow-up interventions up to one year were collected. Symptoms assessed include pelvic pain (pressure/heaviness), cardiac (palpitations/tachycardia), neurologic (headache/brain fog), fatigue (exertional/orthostatic), genitourinary (frequency/urgency), reproductive (dyspareunia/dysfunction), gastrointestinal (nausea/abdominal discomfort), lower extremity swelling (edema), and lightheadedness.

Results: Of the 29 patients, 28 had 8-week follow-up data and 15 patients had 1 year follow-up. At 8 weeks, patients reporting improvement or complete resolution included pelvic pain (n=23/26), neurological (n=12/14), fatigue (n=9/9), gastrointestinal (7/10), lower extremity swelling (13/19), and lightheadedness (n=13/14). At 1 year, improvements were seen in pelvic pain (n=10/14), neurological (n=5/6), lower extremity swelling (n=6/9), and lightheadedness (n=4/7). Worsening symptoms at 8 weeks included pelvic pain (n=1/26), genitourinary (n=1/4), and lower extremity swelling (n=1/19). At 1 year, worsening symptoms included pelvic pain (n=2/14), lower extremity swelling (n=1/9), and lightheadedness (n=1/7). Only two patients underwent subsequent procedures within one year including saphenous vein ablation to help treat persistent venous pooling.

Conclusion: LCIV stenting in patients with POTS and PVD was associated with improvement in multiple symptoms. At 8 weeks, 61% (n=17/28) of patients had a complete recovery or improvement of all symptoms. However, there are cases where patients

reported persistent or worsening symptoms, highlighting the need for careful follow-up and adjunctive therapies in select cases.

Abstract No. 82

Disparities in Access to Uterine Artery Embolization Versus Hysterectomy: A 7-Year National Cross-Sectional Study



(Article No. 108092)

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Purpose: Evaluate differences in utilization of uterine artery embolization (UAE) vs hysterectomy for the management of Postpartum Hemorrhage across socioeconomic, demographic, and institutional factors.

Materials and Methods: This cross-sectional study used deidentified patient data from the National Inpatient Sample between the years of 2016 to 2022. Adult patients with a diagnosis of postpartum hemorrhage were identified based on the International Classification of Diseases, Tenth Revision (ICD-10) diagnostic codes and further filtered to patients treated with either UAE or hysterectomy based on the ICD-10 Procedure Coding System. A multivariable logistic regression model was created to identify the differences in utilization of each procedure by demographics, socioeconomic, and geography.

Results: A total of 17,275 hospital admissions were identified, among which 9,165 had hysterectomies and 8,110 had UAEs. The median age was 33 years in both the UAE and hysterectomy groups. The patient sample was 44.6% White, 16.8% Black, 22.6% Hispanic, 10.5% Asian, 0.8% Native American and 4.7% other. Compared to Whites, there was no significant difference in UAE utilization over hysterectomy by race. However, compared to private insurance, patients with Medicaid had 29% lower odds of receiving a UAE than a hysterectomy (OR=0.71, 95% CI: 0.60-0.85, p< 0.001). Compared to patients in the 76-100th income quartile, those in the 0-25th and 26-50th income quartiles were less likely to receive UAE than hysterectomy (OR=0.63, 95% CI: 0.50-0.80, p< 0.001 and OR=0.72, 95% CI: 0.57-0.90, p=0.004, respectively). Compared to patients living in the most central counties, those living in the most rural counties were less likely to receive UAE vs hysterectomy (OR=0.50, 95% CI: 0.30 to 0.83, p=0.007). Compared to patients in rural hospitals, those in an urban teaching hospital were more likely to receive UAE than hysterectomy (OR=5.70, 95% CI: 2.95-11.0, p< 0.001). UAE utilization increased from a total of 760 procedures in 2016 (27.2% of procedures vs hysterectomy to treat postpartum hemorrhage) to 1,555 (54.9%) in 2022.

Conclusion: Following postpartum hemorrhage, patients in rural regions, lower-income quartiles, or with Medicaid insurance were less likely to receive UAE than hysterectomy. These disparities highlight the urgent need for policy reforms to ensure equitable patient care.

Abstract No. 83

Fertility Outcomes Following Uterine Fibroid Embolization Versus Myomectomy: A Multicenter Observation Study



(Article No. 108093)

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Purpose: To compare fertility-related outcomes between women treated with uterine fibroid embolization (UFE) and myomectomy for symptomatic uterine fibroids.

Materials and Methods: This retrospective cohort study utilized the TriNetX US-Collaborative Network, encompassing 71 health-systems. Two cohorts of reproductive-age women (18-40 years) with uterine fibroids: 524 patients who underwent UFE and 15,879 patients who underwent myomectomy. Patients were matched on 37 characteristics including demographics, BMI categories, fibroid subtypes, comorbidities, and medications, yielding 522 matched pairs. Outcomes included pregnancy rates, ectopic pregnancy, and postpartum hemorrhage (PPH) over a 10-year period.

Results: After propensity score matching, baseline characteristics were well-balanced between groups. Mean follow-up was 755 days for UFE and 672 days for myomectomy-patients. UFE-patients did not have a statistically significant difference in overall pregnancy rates compared to myomectomy patients (18.6% vs 21.5%; RR:0.866, 95% CI:0.679-1.105; $p=0.246$). However, time-to-event showed a trend toward delayed pregnancy in UFE patients that approached statistical significance (HR:0.763, 95% CI:0.581-1.002; $p=0.050$). Ectopic pregnancy rates were similar between groups (1.9% vs 1.9%, $p=0.548$). UFE patients demonstrated a numerically higher but non-significant rate of postpartum hemorrhage (3.8% vs 2.3%; risk ratio 1.667, 95% CI 0.823-3.374; $p=0.151$).

Conclusion: This multicenter analysis found that pregnancy rates are similar between UFE and myomectomy in reproductive-age women with uterine fibroids, though there was a trend toward delayed time to pregnancy following UFE that approached statistical significance. Ectopic pregnancy and PPH rates were not different between treatments. These findings suggest that both treatments may have comparable fertility outcomes, with potential counseling considerations regarding timing of conception and hemorrhage risk for reproductive-age women considering these fibroid treatment options.

Abstract No. 84

Percutaneous Drainage Versus Operative Washout for Suspected Pocket Infection After Implant-Based Breast Reconstruction: Lower Infection Complications with IR in a Propensity-Matched Multicenter Cohort



(Article No. 108094)

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Purpose: To compare interventional radiology (IR) percutaneous drainage/aspiration versus operative washout/debridement (OR) as first-line management for suspected pocket infection after implant-based breast reconstruction. As well as the necessity for subsequent reintervention or reconstruction procedures.

Materials and Methods: We used the TriNetX federated network to identify adults with prior implant-based breast reconstruction who underwent a first qualifying intervention for post-operative fluid collection. Exposure at index was IR percutaneous drainage/aspiration (e.g., CPT 10030/10160; ICD-10-PCS percutaneous breast drainage) versus OR washout/debridement (e.g., CPT 10180; ICD-10-PCS open breast drainage). All cases with same-day explant (CPT 19328/11971 or facility removal codes) were excluded. We then performed propensity score matching which yielded two balanced cohorts of 1,324 patients each. Outcomes were assessed between 8-30 and 8-90 days for reconstructive failure (implant/expander removal), as well as infection-related events, reintervention, and readmission. Outcomes were compared using risk ratios (RRs) and hazard ratios (HRs) from Cox models.

Results: After 1:1 propensity matching, both analyses included 2,648 patients (1,324 IR vs 1,324 OR) with near-identical demographics. Mean age at index was 52.5 ± 12.2 (IR) vs 52.6 ± 12.6 years (OR), with comparable comorbidities, including hypertension 34.4% vs 33.6% and diabetes 10.0% vs 9.6%. Pocket infection was significantly lower with IR vs OR at both time windows: 7.6% vs 12.1% at 8-30 days (RR 0.63; HR 0.62; both $p < 0.001$; absolute risk reduction 4.5%) and 12.8% vs 17.7% at 8-90 days (RR 0.72; HR 0.70; both $p < 0.001$; ARR 4.9%). Effect sizes were concordant across binary and time-to-event analyses, supporting a sustained reduction in infection risk with IR through 90 days. However, reintervention was observed more frequently after IR (8-30d: 9.8% vs 3.2%; 8-90d: 12.9% vs 6.5%), while reconstruction/device removal rates remained similar at 90 days (11.3% vs 11.4%).

Conclusion: Across a large, propensity-matched cohort, first-line IR drainage/aspiration was associated with fewer pocket infections at 30 and 90 days compared with operative washout, without increasing device removal. Our data support IR as a preferred initial strategy for suspected pocket infection, acknowledging a higher likelihood of subsequent, but typically less invasive, reintervention.

Abstract No. 85

Hypertrophy of Pelvic Floor Muscles in Patients Receiving Therapeutic Botulinum Toxin Injections for High Tone Pelvic Floor Dysfunction



(Article No. 108095)

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Purpose: Pelvic floor muscle hypertonicity is a common cause of chronic pelvic pain (CPP) that can be treated with targeted muscle

injections and blocks. This study aims to determine if high tone pelvic floor dysfunction (HTPFD) exhibits muscle alterations CT imaging.

Materials and Methods: This is a retrospective, institutional review board–approved and HIPPA-compliant study. The non-contrast, axial CT images of 57 individuals ages 18-40 referred to interventional radiology for pelvic muscle chemodenervation and/or pelvic blocks between January 2017 and August 2025 were compared to 11 age-matched control patients with no history of pelvic pain or dysfunction. The puborectalis angle and obturator internis (OI) muscle area were measured at the level of the pubic symphysis. The piriformis muscles were measured at their largest point on axial CT. Univariate data analyses were performed with $p < 0.05$ considered to be statistically significant.

Results: Patient demographics and results are summarized in 364.1. Patients diagnosed with HTPFD were noted to have increased OI and piriformis muscle area when compared to the control group. The OI was also noted to have higher Hounsfield units in the HTPFD group. There was no significant difference in levator muscle angle between the two groups.

Conclusion: This study showed that OI and piriformis hypertrophy is a sign on CT imaging that can be used to aid in the diagnosis of HTPFD. Further research is needed to investigate if these and other CT findings may aid in the diagnosis and treatment of HTPFD.

85.1.			
	HTPFD (n=57)	Non-HTPFD (n=11)	p value
Demographics			
Age, mean (SD)	31.58 (6.31)	28.91 (5.44)	0.47
Female, n (%)	53 (92.98)	11 (100)	0.82
Male, n (%)	4 (0.07)	0	0.82
Muscle Area (mm²)			
Puborectalis Angle, mean (SD)	33.64 (9.10)	37.38 (6.80)	0.13
Right Obturator Internus, mean (SD)	971.23 (270.54)	651.51 (241.05)	<u>0.0013</u>
Left Obturator Internus, mean (SD)	942.66 (275.90)	609.31 (227.09)	<u>0.0006</u>
Bilateral Obturator Internus, mean (SD)	1913.88 (518.49)	1260.82 (419.27)	<u>0.0005</u>
Right Piriformis, mean (SD)	1040.68 (289.86)	891.12 (151.75)	<u>0.0129</u>
Left Piriformis, mean (SD)	992.56 (289.86)	867.28 (208.12)	0.11
Bilateral Piriformis, mean (SD)	2043.24 (552.08)	1758.39 (338.74)	<u>0.04</u>
Hounsfield Units (HU)			
Right Obturator Internus, mean (SD)	42.76 (5.57)	33.3 (6.53)	<u>0.0007</u>
Left Obturator Internus, mean (SD)	39.73 (7.00)	29.92 (8.55)	<u>0.0038</u>
Bilateral Obturator Internus, mean (SD)	82.50 (10.47)	63.22 (14.63)	<u>0.0013</u>
Right Piriformis, mean (SD)	39.68 (6.92)	39.56 (4.48)	0.95
Left Piriformis, mean (SD)	37.14 (7.90)	41.15 (5.93)	0.07
Bilateral Piriformis, mean (SD)	76.82 (13.27)	80.72 (9.42)	0.26

Abstract No. 86

Prophylactic Uterine Artery Embolization Versus Balloon Occlusion of the Aorta to Prevent Hemorrhage from Placenta Accreta Spectrum Disorder



(Article No. 108096)

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Purpose: Endovascular procedures may reduce blood loss during cesarean hysterectomy in patients with placenta accreta spectrum disorder (PAS).⁽¹⁻³⁾ However, there is limited data on the comparative efficacy of different endovascular approaches. The goal of this study is to evaluate outcomes from prophylactic uterine artery embolization (UAE) vs balloon occlusion of the aorta (BOA) for patients with PAS undergoing cesarean hysterectomy.

Materials and Methods: This cohort analysis included all patients with histologically confirmed placenta increta or percreta who underwent endovascular treatment prior to cesarean hysterectomy at two academic medical centers between January 2020-June 2025. 52 patients underwent BOA; 39 patients underwent UAE. Maternal age, BMI, and gestational age at time of delivery were similar between the two groups. Clinical outcomes and maternal radiation exposure were collected from the electronic medical record. Clinical normality was assessed using the Shapiro-Wilks test and t-test or Mann Whitney test.

Results: Compared with UAE, BOA was associated with significantly shorter operative time (323 [253, 372] vs 454 [419, 509] min, $p < 0.01$), less fluoroscopy time (6 [4, 11] vs 1404 [1050, 2162] seconds, $p < 0.01$) and less maternal radiation exposure (1.9 [0.7, 4.4] vs 3470 [2477, 4929] mGy, $p < 0.01$). Blood loss was similar between groups (1456 [1007, 1999] vs 1423 [950, 2411] mL, $p = 0.70$) as was post-operative length of stay (4 [3, 4] vs 4 [3, 5] days, $p = 0.67$).

Conclusion: While BOA and UAE are equally effective at reducing blood loss and length of stay, BOA is associated with less operative time, less fluoroscopy time, and less maternal radiation exposure.

Abstract No. 87

Assessing Long-Term Obstetric Risks in Patients Undergoing Uterine Artery Embolization



(Article No. 108097)

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Purpose: Uterine artery embolization (UAE) has been advertised as a uterine sparing treatment option for women with symptomatic uterine fibroids. Standard procedures used in the treatment of uterine fibroids include hysterectomy, myomectomy, and UAE, with the latter 2 procedures being labeled as uterine-sparing. Although UAE has been utilized for symptomatic fibroids since their inception, there has been a contrast in opinion on pregnancy-related obstetric risks with the procedure for those who wish to become pregnant in the future compared to other techniques.

Materials and Methods: TriNetX was used to evaluate patient electronic medical records between January 1, 2016, and January 1, 2020. Patients were identified who had undergone first-time myomectomy or UAE and were diagnosed with uterine fibroids. Patients were divided into either the UAE or myomectomy group. Patients were 1-to-1 propensity matched by BMI, race, parity, history of diabetes, hypertension, PCOS, myocardial infarction, cerebral infarction, prior uterine surgeries and C-sections, D&C, vaginal deliveries, and surgically managed abortions. Final cohort amounts were 6824 each. Outcomes measured were rates of postpartum hemorrhage (PPH), placenta previa, uterine rupture, C-sections, vaginal deliveries, repeat myomectomies and UAEs, abortions, and hysterectomy over 5 years.

Results: The UAE group was associated with significantly less risk of PPH (RR = 0.308, 95% CI [0.216,0.438]), placenta previa (RR = 0.208, 95% CI [0.12,0.363]), and abortions (RR = 0.133, 95% CI [0.094,0.188]). Both groups were associated with similar albeit very low rates of uterine rupture. Both groups had very low rates of vaginal deliveries. The UAE group was associated with significantly less C-sections than the myomectomy group (19vs 476; RR = 0.04, 95% CI [0.025,0.063]). The UAE group was associated with significantly greater UAE reinterventions (n = 308vs 0) but significantly less repeat myomectomies than the myomectomy group (RR = 0.354, 95% CI [0.293,0.427]). UAE group was associated with significantly more hysterectomies than the myomectomy group (RR = 1.626, 95% CI [1.434,1.844]); however, patients in the UAE group were older than those in the myomectomy group (p < .0001) and more menopausal (p < .0001).

Conclusion: UAE is associated with less pregnancy-related obstetric risks than myomectomy. With similar reintervention rates, it provides a minimally invasive alternative to surgical resection. Future studies should focus on randomized trials to further assess efficacy.

Abstract No. 88

Current Management of Tubo-Ovarian Abscess: Should We Drain Earlier and Smaller?



(Article No. 108098)

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Purpose: To determine the effectiveness of current management patterns for tubo-ovarian abscess (TOA) and assess potential for improvement.

Materials and Methods: This retrospective review included all patients at a single tertiary care center who underwent initial treatment of TOA, defined by CPT code, from November 1, 2020,

to November 1, 2024. 108 patients were identified; 32 were excluded for recurrent TOA or alternative diagnoses. The electronic medical record was reviewed for treatment (surgical, medical or catheter drainage,) clinical and laboratory data, clinical success, hospital length of stay, and adverse events (AE).

Results: Of 76 patients, 51 (67%) had primary conservative treatment with antibiotics; 35 were clinically successful and 16 (31%) ultimately required "salvage" catheter drainage; of these 13 (81%) were successfully treated. Salvage drainage patients had significantly larger abscesses on presentation than successful primary conservative patients (6.8 vs. 5.2 cm, p=0.009). 19 patients (25%) had primary image-guided drainage; 18 (95%) clinically successful. Primary drainage patients had significantly larger abscesses (8.6 cm) than primary antibiotics patients (5.2 cm, p< 0.001). Length of stay (LOS) was similar between primary drainage and primary conservative management (6.9 days vs. 4.8 days, p=0.072). LOS was significantly longer in patients needing salvage drainage compared to primary conservative patients (8.4 vs. 4.8 days, p=0.009). LOS after drain placement was similar regardless of salvage or primary approach (5.5 days vs 6.9 days, p = 0.63). 10 patients underwent surgery. Of these, 6 were primary, and 4 followed primary (1) or salvage (3) drainage. Grade 3 AEs (Clavien-Dindo Severity Scale) were observed in 3 (30%) patients. No other severe AEs were observed. All patients had similar symptoms and clinical signs on presentation and similar white blood cell counts.

Conclusion: Catheter drainage is effective for TOA primarily and after failure of conservative medical therapy; intervention should be considered as primary treatment for TOA larger than 5 cm to reduce LOS. Surgical management is associated with serious AEs in up to one-third of cases.

Abstract No. 89

Safety and Efficacy of Cryoablation for Breast Tumors: A Systematic Review and Meta-Analysis



(Article No. 108099)

J. Chen¹, F. Zhou², J. Sun¹, T. Paul¹, C. Yu³; ¹Rosalind Franklin University, Chicago Medical School; ²Columbia University; ³University of Chicago

Purpose: Cryoablation is an emerging minimally invasive technique in interventional radiology that destroys abnormal tissues by freezing¹. It is widely used to treat both malignant and benign breast tumors, but its long-term safety and efficacy relative to surgery remain uncertain.

Materials and Methods: We evaluated the safety and efficacy of cryoablation through systematic review and meta-analysis. Following PRISMA guidelines, we conducted a comprehensive search of PubMed, Scopus, Embase, CINAHL, and Cochrane databases in September 2024 and identified 24 studies comprising 2,481 patients, including 1,573 with breast cancers and 908 with benign breast tumors. Study characteristics, adverse events, local recurrence, distant recurrence, and adjuvant therapy use were extracted. Data was analyzed using a random-effects model to estimate pooled proportions in R (v4.4.1).

Results: The patient age ranged from 13 to 96 years (mean 62 years). Adverse effects were reported in 11 studies (266/791 patients, 33.6%) and included erythema, bruising, frostbite,

ecchymoses, induration, focal pain, infection and nipple retraction. Among these, 88.7% were mild and self-resolving, 9.8% were moderate and required treatment, and 1.5% were classified as serious, necessitating extensive interventions such as lumpectomy. Across 16 studies involving 1,117 patients with breast cancer, the pooled local tumor recurrence rate was 8% (95% CI, 4–15%; $I^2 = 87\%$). Pooled distant recurrence based on six studies with 360 patients was 4% (95% CI, 1–11%; $I^2 = 62\%$). Use of adjuvant therapies was common, particularly endocrine therapy (45%) and radiation (33%). Other adjuvant therapies include chemotherapy and immunotherapy.

Conclusion: These findings suggest cryoablation is a safe and effective modality for selected patients with breast tumors, demonstrating low rates of serious adverse events and acceptable oncologic outcomes, especially with adjuvant therapy. Heterogeneity across studies highlights the importance of tumor selection, adjuvant regimens, and study design in determining outcomes. Further investigations are warranted to optimize patient selection and outcome.

Abstract No. 90

Comparison of Image-Guided Endometrioma Sclerotherapy Versus Laparoscopic Cystectomy: A Systematic Review



(Article No. 108100)

N. Kheshtchin-Kamel¹, J. Guido¹, H. Johnson-Stenger¹, C. Anderson¹, A. Rajendran¹, R. Pyne²; ¹University of Arizona, College of Medicine, Phoenix; ²Rochester General Hospital, The Vein Institute

Purpose: Endometriomas are a common cause of infertility and pelvic pain in reproductive-age women. Laparoscopic cystectomy may reduce ovarian reserve, while image-guided sclerotherapy offers a minimally invasive, fertility-preserving alternative. This review compares outcomes of sclerotherapy versus cystectomy, focusing on ovarian reserve, recurrence, fertility, and complications.

Materials and Methods: We systematically searched PubMed, Scopus, and Embase from inception. References were imported into Rayyan, duplicates removed, and abstracts/full texts screened independently by blinded reviewers with conflicts resolved by consensus, with rigorous adherence to PRISMA. Eligible studies

compared percutaneous/image-guided sclerotherapy with laparoscopic cystectomy for ovarian endometriomas; animal, in vitro, and review articles were excluded. Extracted outcomes included recurrence, ovarian reserve (AMH, FSH, AFC), fertility, and postoperative complications.

Results: Across 42 studies, with 4,783 total patients: 2,145 sclerotherapy, 2,312 cystectomy, most used 95–100% ethanol (34 studies) or tetracycline (2), with ultrasound guidance in 24. Mean cyst size was ~30–40mm, follow-up 1–12 months. Sclerotherapy showed fewer complications (< 5%, mostly mild; rare hemorrhage, minimal infection/adhesions) but higher recurrence (15–25% vs 8–12%). Cystectomy caused more complications (8–12%, including adhesions/bleeding) and greater declines in ovarian reserve (AMH -0.7 to -3.2 ng/mL, AFC -2.5) compared with sclerotherapy (AMH -0.1 to -1.4 ng/mL, AFC -1.96). FSH changes were minimal in both. Fertility outcomes favored sclerotherapy for spontaneous pregnancy, while MAR/IVF outcomes and overall live birth rates were comparable.

Conclusion: Image-guided sclerotherapy is a promising alternative to cystectomy, better preserving ovarian reserve and spontaneous pregnancy while showing comparable IVF and live birth rates. Recurrence was higher after sclerotherapy, underscoring the need for larger RCTs with standardized protocols, long-term follow-up, and cost-effectiveness analyses to better guide future clinical practice and patient decision-making.

90.1.

Recurrence outcomes after sclerotherapy vs cystectomy Category	Patients (n)	Recurrences (n)	Recurrence rate (%)	P-value
Sclerotherapy	298	65	21.80%	0.0033*
Cystectomy	153	53	34.60%	

Note: * $p < 0.05$.

369.2. Fertility and pregnancy outcomes

Category	Patients (n)	Pregnancies (n)	Pregnancy rate (%)	P-value
Sclerotherapy	206	47	22.80%	0.0135*
Cystectomy	153	53	34.60%	

Note: * $p < 0.05$.

Scientific Session 10

Chemoembolization 2

Monday, April 13, 2026
3–4:30 p.m.

Abstract No. 91

Impact of Metabolic Syndrome on Outcomes in Patients with Neuroendocrine Tumor Liver Metastases Treated with Liver-Directed Therapy



(Article No. 108102)

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Purpose: To investigate the impact of metabolic syndrome (MetS) on hepatic progression free survival (HPFS) and overall survival (OS) in patients undergoing transarterial chemoembolization (TACE) or transarterial radioembolization (TARE) for neuroendocrine tumor liver metastases (NETLM).

Materials and Methods: A single-center retrospective chart review investigating patients with NETLM receiving first time liver-directed therapy (LDT) from January 2019 to June 2025 was performed. MetS diagnosis at time of LDT was defined using NCEP ATP3 criteria and tumor grade was based on most recent histopathological analysis/KI-67 index. Tumor response was assessed using the RECIST criteria. Patient follow-up ended upon the first occurrence of any of the following: hepatic progression, death, or the last scheduled visit. Seventy patients receiving first time LDT for NETLM were included, with 60% receiving TACE and 40% receiving TARE. Of the 70 patients, 55.7% had MetS and 92.8% reached the median overall follow-up of 292.5 days. HPFS and OS were calculated using Kaplan-Meier curves and COX regression analysis was performed.

Results: Patients with MetS had an HPFS of 210.5 ± 59.8 versus 320.6 ± 59.9 days without MetS ($p = 0.044$). Patients with MetS had an OS of 689.4 ± 189.6 versus 1632.6 ± 492.4 days without MetS ($p = 0.020$). Multivariate analysis for HPFS identified hypertension, female gender, and higher tumor grade (grades 2 and 3) as significant predictors of progression (34.1). For OS, female gender and higher tumor grade were significant predictors of mortality (34.1). When stratified by tumor grade, the negative impact of MetS on OS remained significant in patients with grade 1 and 2 tumors ($p = 0.039$ and 0.018 respectively). However, this was not observed in patients with grade 3 tumors ($N = 12$). There were no significant differences in adverse events between MetS and non-MetS groups.

Conclusion: Patients with MetS receiving LDT had significantly shorter HPFS and OS. These findings highlight the impact of metabolic dysfunction on treatment outcomes and suggest a need for preventative strategies in treating NETLM.

91.1.

	HR	p
HPFS		< 0.001
HTN	5.4	
Female Gender	6.2	
Tumor Grade		
2	15.9	
3	31.5	
OS		< 0.05
Female Gender	7.0	
Tumor Grade		
2	7.2	
3	28.3	

Abstract No. 92

Ten-Year Survival Outcomes After Conventional Transarterial Chemoembolization for Hepatocellular Carcinoma in the Era of Cone-Beam CT and Advanced Microcatheter Technology



(Article No. 108103)

L. Kwon¹, J. Chung²; ¹Hallym University Sacred Heart Hospital; ²Seoul National University Hospital

Purpose: The purpose of this study is to evaluate the long-term survival outcomes of conventional TACE in hepatocellular carcinoma, incorporating recent advances in imaging and catheter technology. We present 10-year survival data from a large patient cohort, analyze outcomes according to disease stage, and compare results with emerging therapies. These findings aim to clarify the current clinical value of TACE and support evidence-based strategies for HCC management.

Materials and Methods: This retrospective study included patients who underwent conventional TACE as the initial treatment for HCC between 2010 and 2012, and patients were followed for up to 15.7 years. Multiple staging systems—including the BCLC, modified UICC, AJCC/UICC, Okuda, Cancer of the Liver Italian Program (CLIP), Hong Kong Liver Cancer (HKLC), Chinese Liver Cancer Staging (CLCS), Japan Integrated Staging (JIS), and Italian Liver Cancer (ITA.LI.CA)—were applied. TACE was performed using superselective microcatheterization with cone-beam computed tomography guidance. Survival was analyzed using the Kaplan-Meier method and log-rank tests. Prognostic performance of staging systems was compared using AIC, BIC, and C-index.

Results: Among 974 patients assessed, 734 were included in the analysis. The mean age was 60.6 ± 10.7 years (range, 27–89), with 606 men (82.4%) and 129 women (17.6%). Liver transplantation was performed in 42 patients during follow-up. The median follow-up duration was 36.2 months (range, 0.2–187.3). The HKLC staging system demonstrated the best prognostic performance, showing the lowest AIC (6546.240) and BIC (6581.061) values and the highest C-index (0.751). The next best-performing

systems were the ITA.LI.CA and the AJCC 8th edition staging systems. In the BCLC staging system, the 10-year survival rates were 56.5% in stage 0, 38.3% in stage A, 22.7% in stage B, 6.5% in stage C, and 0% in stage D. The restricted mean survival in stage 0 reached 136.1 months, while the median survival was 90.2, 47.7, 12.7, and 7.7 months for stages A–D, respectively.

Conclusion: With innovations in cone-beam CT–guided imaging and refined microcatheter techniques, conventional TACE has shown more favorable survival outcomes than previously reported in the literature. This study provides updated survival information for patients undergoing TACE and demonstrates the prognostic value of various staging systems.

Abstract No. 93

Embolization of Neuroendocrine Tumor Metastases to the Liver: A Single-Center Experience Before and After Introduction of Pressure-Enabled Drug Delivery



(Article No. 108104)

R. Marshall¹, S. Matriano Lim¹, A. Robinson¹, A. Irving¹, C. Hall¹; ¹Tulane University

Purpose: This study will evaluate differences in treatment type, imaging response, laboratory, and weight data in patients with neuroendocrine tumor (NET) metastases to the liver treated with pressure-enabled drug delivery (PEDD) versus end-hole (EH) microcatheters.

Materials and Methods: A single-institution, retrospective review of patients with NET metastases to the liver treated consecutively before and after switching from EH to PEDD (TriNav, TriSalus Life Sciences, Denver, Colorado, USA) using bland particle embolization was performed. Data from charts and PACS were reviewed. Images were independently reviewed to determine target lesion(s) response using mRECIST. Student t-tests and chi-squared analyses were used for statistical evaluation.

Results: A total of 44 patients were evaluated for inclusion in data analysis (22 in PEDD, 22 in EH group), and 6 were excluded due to inpatient treatment or incomplete data. There was no statistically significant difference in baseline parameters between the two groups before treatment. All patients were treated in a lobar fashion, and all but one were treated to an endpoint of stasis (no flow beyond the right or left hepatic artery). There was no difference in complication rate or length of inpatient stay between groups. Treatment response data were available for all patients but one (in the PEDD group) in the first 180 days after treatment. Treatment response in the PEDD versus EH groups was complete response 22% vs 0%, partial response 61% vs 64%, stable disease 6% vs 7%, progressive disease 0% vs 29% and overall response 83% vs 64%. P-value for all response data was 0.034, and for ORR was 0.044 (Chi Squared analysis). Overall, there was no difference in laboratory values for all patients after treatment, except for a lower albumin 6 months post procedure in the PEDD group (3.8 vs 4.2 g/dL, p 0.022). This was more pronounced in patients undergoing right lobe treatment at 1-3 months follow-up (3.6 vs 4.3 g/dL, p 0.005) but was no different at 6 months after treatment. For patients with bilirubin > 0.6 g/dL prior to treatment, alkaline phosphatase was elevated at 6 months post-procedure in the PEDD group (394 vs 125 U/L, p 0.034). To evaluate weight, a 95% confidence interval was used to remove outliers

from both groups. Patients in the PEDD group had gained weight at 6 months post-treatment, whereas patients in the EH group lost weight (PEDD: +0.35 lbs, n=12, EH: -3.61 lbs, n=10, p=0.005).

Conclusion: This retrospective review of patients with NET metastases to the liver showed better treatment response and maintained weight in the PEDD group.

93.1.		
	TriNav	EH
CR	4	0
PR	11	9
SD	1	1
PD	0	4

Abstract No. 94

Precision Liver Therapy: DEBIRI Chemoembolization in Metastatic Colorectal Cancer



(Article No. 108105)

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Purpose: To evaluate the efficacy, safety and survival outcomes of transarterial chemoembolization using irinotecan-loaded drug-eluting beads (DEBIRI TACE) in patients with unresectable colorectal liver metastases refractory to systemic chemotherapy.

Materials and Methods: This retrospective study included 26 patients (mean age: 61.8 years; range: 42–76 years) with histologically confirmed and resected colorectal adenocarcinoma and unresectable liver metastases who had progressed on at least one line of systemic chemotherapy. A total of 44 DEBIRI TACE procedures were performed between January 2021 and January 2025. Patients with extrahepatic disease or ECOG performance status >2 were excluded. The DEBIRI procedures were conducted via a transfemoral approach using 100–300 µm irinotecan-loaded embolic microspheres. Follow-up imaging was conducted at 1 and 3 months post-procedure, and then at 3-month intervals, with response assessed according to mRECIST criteria.

Results: The study cohort comprised 26 patients, including 17 males (65.4%) and 9 females (34.6%), with a mean age of 61.8 years (range: 42–76 years). Of the 26 patients, 4 (15.4%) demonstrated complete response, 11 (42.3%) partial response, 7 (26.9%) stable disease, and 4 (15.4%) progressive disease at 3-month imaging follow-up. The overall disease control rate (CR + PR + SD) was 84.6%. The median overall survival (OS) was 39.2 months (range: 16.8–65.5 months). The 3-year and 5-year OS rates were 54.1% and 19.3%, respectively. The median progression-free survival (PFS) was 6.8 months (range: 2.5–11.1 months), with 1-year and 2-year PFS rates of 22.4% and 9.7%, respectively. Notably, patients achieving complete or partial response on first follow-up imaging had significantly longer OS (median 47.6 months) than those with stable or progressive disease (median 28.4 months).

Conclusion: DEBIRI TACE is a safe and effective image-guided locoregional therapy for patients with unresectable and chemo-refractory colorectal liver metastases. The high disease control rate and favorable median overall survival underscore its potential role in the palliative setting. This procedure exemplifies the evolving field of interventional oncology and supports the expansion in cancer care.

94.1. Patient Demographic Characteristics

CHARACTERISTIC	VALUE
Total patients	26
Male	17 (65.4%)
Female	9 (34.6%)
Mean age (years)	61.8
Age range (years)	42–76

94.2. Treatment Response

RESPONSE	NUMBER OF PATIENTS	PERCENTAGE (%)
Complete Response	4	15.4
Partial Response	11	42.3
Stable Disease	7	26.9
Progressive Disease	4	15.4

Abstract No. 95

Longitudinal Monitoring of GRIm and HCC-GRIm Scores Reveals Immunologically Relevant Prognostic Indicators in Hepatocellular Carcinoma Undergoing TACE Plus ICIs and Anti-VEGF Antibodies/TKIs



(Article No. 108106)

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Purpose: To investigate the clinical significance and peripheral immunological basis underlying the dynamic changes of the Gustave Roussy Immune (GRIm) score and the hepatocellular carcinoma-specific GRIm (HCC-GRIm) score in unresectable hepatocellular carcinoma (uHCC) patients treated with trans-arterial chemoembolization (TACE) plus immune checkpoint inhibitors (ICIs) and anti-VEGF antibodies or tyrosine kinase inhibitors (TKIs).

Materials and Methods: This single-center retrospective study included uHCC patients treated with TACE plus ICIs and anti-VEGF antibodies/TKIs from July 2019 to August 2024. Primary outcomes were ORR and DCR after four cycles per mRECIST; secondary outcomes were OS and PFS. GRIm and HCC-GRIm scores were analyzed at baseline, Cycle 2, Cycle 4, and progression in relation to OS. Peripheral immune markers were measured longitudinally and compared between GRIm score groups and response subgroups. PCA was used to integrate GRIm components into an immune-metabolic index (PC1), correlated with immune markers.

Results: Sixty-eight uHCC patients received TACE plus ICIs and anti-VEGF/TKIs. At first evaluation, ORR was 52.9% and DCR

86.8%. After a median follow-up of 18.4 months, median OS was 30.1 months and median PFS 10.6 months. GRIm and HCC-GRIm scores were prognostic only at baseline (GRIm $P = 0.011$; HCC-GRIm $P = 0.001$), and patients with persistently low scores had longer OS than those with increasing trajectories. Immunoglobulins (Igλ, Igκ, IgG, IgA) increased overall after treatment, with significant rises in responders but not in nonresponders. At baseline, high GRIm scores were associated with elevated Igλ, Igκ, and IgG. In low-score patients, Igλ, Igκ, and IgG increased significantly during treatment. PCA-derived PC1 correlated positively with Igλ, Igκ, IgG, and complement factor B, supporting links between GRIm status, immunoglobulin dynamics, and clinical outcomes.

Conclusion: GRIm and HCC-GRIm scores are effective prognostic indicators only at baseline in uHCC treated with TACE plus ICIs and anti-VEGF/TKIs. Low-score patients demonstrated treatment-related increases in Igλ, Igκ, and IgG, linking GRIm-defined risk, immune activation, and clinical outcomes. Incorporating GRIm dynamics and immunoglobulin monitoring into clinical workflows may improve risk stratification and guide personalized therapy in uHCC.

Abstract No. 96

Efficacy and Cost-Effectiveness of Atezolizumab-Bevacizumab Versus Sintilimab-Bevacizumab with TACE in uHCC



(Article No. 108107)

C. Liu¹, X. Zhu¹; ¹The First Affiliated Hospital of Soochow University

Purpose: Atezolizumab plus bevacizumab (Ate/Bev) or sintilimab plus bevacizumab biosimilar (Sin/Bio) combined with transarterial chemoembolization (TACE) shows promising efficacy in unresectable hepatocellular carcinoma (uHCC). This study aimed to evaluate the efficacy, safety, and real-world cost-effectiveness of Ate/Bev-TACE versus Sin/Bio-TACE as first-line therapy for uHCC.

Materials and Methods: This multicenter, real-world study included patients with uHCC treated at five centers in China from November 2020 to June 2024 who received Ate/Bev-TACE or Sin/Bio-TACE as first-line therapy. Stabilized inverse probability of treatment weighting (sIPTW) was applied to reduce confounding. The primary outcomes were overall survival (OS) and cost-effectiveness. Secondary outcomes included progression-free survival (PFS), objective response rate (ORR), disease control rate (DCR), and safety.

Results: A total of 123 patients were analyzed (Ate/Bev-TACE, $n=42$; Sin/Bio-TACE, $n=81$). After sIPTW, baseline characteristics were well balanced. Median OS was not reached in either cohort (Ate/Bev: 95% CI, 29.7 months–NE; Sin/Bio: 20.8 months–NE; HR=0.59, 95% CI 0.24–1.42; $P=0.2242$). The 1- and 2-year OS rates were 91.8% and 82.8% in the Ate/Bev group versus 83.9% and 62.3% in the Sin/Bio group. Median PFS was similar (Ate/Bev vs Sin/Bio: 14.6m [95% CI, 7.93–33.0] vs 14.8m [13.6–19.4]; HR=1.32, 95% CI 0.79–2.22; $P=0.2458$). ORR was comparable (risk difference [RD], Ate/Bev–Sin/Bio = -1.0% ; 95% CI, -23.6% to 21.6% ; $P=0.9317$), whereas DCR was numerically higher with Sin/Bio (RD, Ate/Bev–Sin/Bio = -14.5% ; 95% CI, -33.7% to 4.7% ; $P=0.1362$). Grade ≥ 3 adverse events occurred in

18.5% and 18.9% of patients in the Ate/Bev and Sin/Bio groups, respectively. Cost-effectiveness analysis showed that Ate/Bev was dominated by Sin/Bio (incremental quality-adjusted life-years = -0.1640; incremental cost = US \$11,492.37).

Conclusion: Ate/Bev-TACE and Sin/Bio-TACE demonstrated comparable efficacy and safety as first-line therapy for uHCC. However, Ate/Bev was not cost-effective and was dominated by Sin/Bio from a Chinese health-system perspective.

Abstract No. 97

Multidimensional Vision Transformer Modeling of Lipiodol Staining for Outcome Prediction Following TACE in Hepatocellular Carcinoma



(Article No. 108108)

T. Mehta¹, T. Kim², A. Jost², C. Lugo-Fagundo³, K. Reichel³, R. Liddell⁴; ¹The Johns Hopkins Hospital; ²Johns Hopkins Hospital; ³Johns Hopkins University; ⁴Johns Hopkins School of Medicine

Purpose: To develop a multidimensional 3D vision transformer (ViT) model that analyzes Lipiodol staining patterns on post-TACE CT imaging to predict key clinical outcomes in hepatocellular carcinoma (HCC), including Milan criteria status, mRECIST response, progression-free survival (PFS), and overall survival (OS).

Materials and Methods: This retrospective study included 200 patients with biopsy-confirmed HCC treated with transarterial chemoembolization (TACE). Non-contrast CTs within 30 days post-TACE were used to evaluate Lipiodol staining. Lesions were segmented using Segment Anything 2 (SAM2), generating 3D masks. A Multi-Dimensional ViT model was constructed with 3D patch embeddings (4×4×4 voxels), hierarchical transformer blocks, and shifted window attention across four stages (C=96→768). Spatial context was captured using relative positional encoding. Clinical variables (age, sex, MELD, Child-Pugh, systemic therapy) were embedded and fused with imaging features. Output heads included SoftMax classifiers (for 6-month Milan and mRECIST) and Cox proportional hazards layers (for PFS/OS). Training was performed on 160 patients; 40 patients were used for testing. Optimization included AdamW with Cox, cross-entropy, and MSE losses, plus dropout and data augmentation. Model performance was evaluated using AUC, sensitivity (SE), specificity (SP), PPV, NPV, accuracy, F1 score, and R².

Results: The Multi-D ViT model achieved strong predictive performance with results as below:

- AUC (Milan) = 0.95; SE = 92.0%, SP = 87.5%, PPV = 88.5%, NPV = 93.0%, Accuracy = 90.0%, F1 = 90.1%
- AUC (mRECIST) = 0.85
- R² (PFS) = 0.89, R² (OS) = 0.84

Conclusion: Lipiodol staining patterns captured on post-TACE CT contain spatial features predictive of future transplant eligibility, radiologic response, and survival in patients with HCC. Our 3D vision transformer model effectively integrates volumetric imaging and clinical data, enabling automated, accurate prognostication following TACE. These results highlight the promise of transformer-based AI tools in guiding personalized management for liver cancer patients.

Abstract No. 98

Radiomics-Based Machine Learning to Predict Post-TACE Outcomes Using Lipiodol Staining Patterns in Hepatocellular Carcinoma



(Article No. 108109)

T. Mehta¹, C. Heiberger², R. Chowdhury³, K. Bafna⁴, R. Liddell⁵; ¹The Johns Hopkins Hospital; ²Johns Hopkins; ³Medical College of Wisconsin Affiliated Hospitals; ⁴Co-fellow; ⁵Johns Hopkins School of Medicine

Purpose: To evaluate whether radiomics features derived from Lipiodol staining patterns on post-TACE CT imaging can be used in conjunction with patient-level data to accurately predict clinically significant outcomes in hepatocellular carcinoma (HCC), including 6-month Milan criteria status, target lesion mRECIST response, progression-free survival (PFS), and overall survival (OS).

Materials and Methods: Two hundred patients with biopsy-confirmed HCC treated with selective transarterial chemoembolization (TACE) at a tertiary care center were retrospectively included. Non-contrast CT imaging within 30 days post-TACE was used to assess Lipiodol staining. Lesions were segmented using the Segment Anything 2 (SAM2) model, enabling semi-automated extraction of Lipiodol deposition regions. Radiomic features were derived from each segmented lesion using the PyRadiomics library, including shape, intensity, and texture-based metrics. These imaging features were integrated with clinical variables such as age, sex, Child-Pugh class, MELD score, BCLC stage, and systemic therapy status at the time of TACE. A machine learning model was trained using AutoGluon's ensemble framework. The cohort was split into 160 patients for training and 40 for independent testing. Primary outcomes included binary Milan criteria status and mRECIST response at 6 months, as well as continuous outcomes for PFS and OS. Model performance was evaluated using AUC, sensitivity (SE), specificity (SP), positive predictive value (PPV), negative predictive value (NPV), accuracy, F1 score, and R² for survival.

Results: The final AutoML model was an ensemble model with a NeuralNetFastAI model in the first layer:

- AUC (Milan) = 0.93
- SE = 89.5%, SP = 85.7%, PPV = 85.0%, NPV = 90.0%, Accuracy = 87.5%, F1 = 87.2%
- AUC (mRECIST) = 0.81
- R² (PFS) = 0.83, R² (OS) = 0.79

Conclusion: Post-TACE Lipiodol staining patterns contain rich phenotypic signatures that can be captured through radiomics and leveraged by machine learning models to predict relevant patient outcomes. This AutoML-based approach demonstrates high predictive performance in forecasting 6-month transplant eligibility, radiologic response, and survival metrics. These findings support the clinical integration of radiomics and AI to inform earlier, personalized decision-making following TACE and to optimize downstream management strategies in patients with HCC.

Scientific Session 11

Gastrointestinal Interventions

Monday, April 13, 2026
3–4:30 p.m.

Abstract No. 99

Gallstone Organ-Sparing Cholangioscopy and Percutaneous Extraction (GO-SCOPE) as a Safe and Effective Same-Day Approach for Outpatient Gallstone Removal



(Article No. 108111)

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Purpose: Evaluate 3-month outcomes of Gallstone Organ-Sparing Cholangioscopy and Percutaneous Extraction (GO-SCOPE) with de novo access in patients with calculous biliary colic seeking gallbladder preservation.

Materials and Methods: This study is an institutional review board-approved, prospectively collected, and retrospectively analyzed cohort of patients presenting to a large academic center with calculous biliary colic. All patients met standard criteria for cholecystectomy following surgical evaluation, but elected to undergo GO-SCOPE. Data collected included procedural and clinical parameters, hospital length of stay, incidence of repeat cholangioscopy, time to cholecystostomy tube removal, and post-procedural symptom improvement. Technical success was defined as complete removal of all visualized stones during the procedure. Clinical success was defined as stone-free status on 3-month follow-up imaging without recurrence of biliary colic symptoms.

Results: Fifty-one patients (mean age 46.7yr, range 25.9–76.1yr; 14 male and 37 female) with biliary colic secondary to cholelithiasis, 44 patients had transhepatic, 6 patients had transperitoneal, and 1 patient had both transhepatic and transperitoneal de novo cholecystostomy accesses at the time of GO-SCOPE. A minimally invasive rigid (MIP-L) nephroscope was utilized in 47 patients, while a disposable cholangioscope was used in 3 patients and a flexible cystoscope in 1 patient to visualize the stones. Dual-energy lithotripsy was performed on 34 patients, electrohydraulic lithotripsy on 2 patients, and laser lithotripsy on 4 patients. Basket retrieval and irrigation were utilized solely in 11 patients. Mean procedure time was 54.0 min (SD 27.6 min), and mean fluoroscopy time was 10.1 min (SD 8.9 min). There was a 100% technical success rate in stone removal with no major adverse events. A cholecystostomy tube was left in place to allow decompression of the gallbladder and tract formation. 100% were symptom-free and

pain-free during follow-up at the time of tube removal. Mean hospital stay post-procedure was 23 hours. Mean gallstone extraction to biliary tube removal time was 21.8 days (SD 9.5 days). One of the 51 patients (2.0%) demonstrated residual 4-mm cholelithiasis on 3-month follow-up US or cross-sectional imaging. No patients had cholecystitis or cholangitis.

Conclusion: Gallstone Organ-Sparing Cholangioscopy and Percutaneous Extraction (GO-SCOPE) is a safe and effective outpatient procedure for gallstone removal in healthy patients who seek to preserve their gallbladder.

Abstract No. 100

What Happens to Patients Who Get Percutaneous Cholecystostomies? 233-Patient Single-Center 5-Year Analysis



(Article No. 108112)

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Purpose: Percutaneous cholecystostomy (PC) is commonly performed for patients with acute acalculous cholecystitis (AAC) and acute calculous cholecystitis (ACC) who are not surgical candidates at initial presentation. Various surgical and non-surgical treatment options [with interventional radiology (IR) and gastroenterology (GI)] are now available to remove PCs in patients with ACC who remain non-surgical candidates at their follow-up (Reference 1). This analysis reviews the flow of patients after PC.

Materials and Methods: A total of 233 consecutive patients who underwent PC for acute cholecystitis at our institution in the last 5 years were included. 122 (52%) of these were for AAC while 111 (48%) had ACC. The median age was 69 (range 18-98). 115 were male (49%). Cancer (23%), sepsis (18%), and heart disease (17%) were the most common reasons to place a PC rather than undergo surgery. All PC patients were re-evaluated by Surgery to determine surgical candidacy at initial presentation and at their 4-week follow-up PC drain check, prior to definitive IR/GI intervention.

Results: A total of 133 patients (57%) did not have their drains removed; 92/133 (69%) of these patients died with their PC in place. PC drains were successfully removed in 74/111 (66%) of patients with ACC and 26/122 (21%) patients with AAC. 27/122 (22%) patients with AAC and 22/111 (20%) patients with ACC underwent cholecystectomy after PC. 51 patients with ACC (46%) had successful percutaneous lithotripsy and cholecystoduodenal stenting. 4/51 (4%) patients developed acute pancreatitis which resolved with conservative management. 1/51 (2%) patients had a gallbladder perforation. One patient with ACC (1%) had successful endoscopic ultrasound-guided gallbladder drainage (EUS-GBD) by GI.

Conclusion: The PC removal rates in patients with ACC were high (66%), with room for improvement. The establishment of a streamlined protocol (including re-evaluation of surgical candidacy prior to IR or GI options) is needed to increase the number of patients who undergo surgery, percutaneous lithotripsy/cholecystoduodenal stenting, and EUS-GBD.

Abstract No. 101

Efficacy of Biliary Drainage in Achieving Target Bilirubin Levels for Subsequent Chemotherapy Administration in Patients with Pre-drainage Bilirubin Levels >10 mg/dL



(Article No. 108113)

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Purpose: To assess percutaneous biliary drain (PBD) indication in malignant biliary obstruction in patients with total bilirubin (TB) >10 mg/dL and evaluate rate of chemotherapy receipt relative to intent following drainage. To determine the efficacy of PBD in achieving TB levels at acceptable levels for chemotherapy administration (< 5 and < 2 mg/dL).

Materials and Methods: Retrospective cohort of 99 patients with a pre-drain TB >10 mg/dL (55.6% male, mean age 67 years) undergoing PBD for malignant obstruction (2020-2025). Primary malignancies: pancreatic (32), cholangiocarcinoma (25), upper gastrointestinal (13), colorectal metastases (12), gallbladder (5), breast (4), hematologic (4), hepatocellular carcinoma (2), others (2). Data collected: number of drain/s placed, TB values prior to/after drain placement, treatment intent and receipt.

Results: Twenty-two patients (22%) had 2 PBDs placed and 5 (5%) had 3+ PBDs placed. Average TB prior to first PBD was 17.2 mg/dL. Average TB prior to second was 10.7 (7.1 for 3+ drains). Average lowest TB after single PBD was 6.8 mg/dL and 7.9 after two. Of patients with a single PBD, a TB < 2 and < 5 mg/dL was achieved in 25 (25.5%) and 47 (47.9%), respectively. For patients with 2 drains, a TB < 2 and < 5 mg/dL was achieved in 7 (30.4%) and 23 (47.8%), respectively. Average number of days to achieve a TB < 2 and < 5 mg/dL after 1 PBD was 20 days and 19 days. Mean and median survival were 118 and 50 days from PBD placement. Biliary drainage was performed in 84 (87.7%) patients with the primary indication of lowering TB to allow for subsequent chemotherapy. Of those patients, 36 (42.9%) received chemotherapy. The rate of chemotherapy administration varied based on cancer type (46.2% upper GI, 37.5% pancreatic, 33.3% colorectal, 36.0% cholangiocarcinoma, 25% breast, 100% hematologic, 0% for gallbladder, hepatocellular carcinoma, and other).

Conclusion: This analysis demonstrates the low rates of chemotherapy receipt relative to intent following PBD. Less than half of patients achieve a TB < 5 mg/dL after PBD placement. Placement of PBD with the goal of lowering TB to allow for chemotherapy administration, should be carefully weighed against the morbidity associated with PBD, particularly in patients with malignancies known to have poor survival. Additional studies with expanded cohorts should be performed to substantiate these findings.

Abstract No. 102

Internal Gallbladder Drainage in Non-operative Patients: Outcomes and SIR-Graded Adverse Events



(Article No. 108114)

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Purpose: To synthesize outcomes of internal gallbladder drainage in non-operative patients across transpapillary endoscopic stenting (ETGS/EGBS), endoscopic ultrasound-guided gallbladder drainage (EUS-GBD), and percutaneous tract-matured internalization, with adverse events (AEs) regraded using numerical Society of Interventional Radiology (SIR) criteria.

Materials and Methods: A structured scoping review (PRISMA-ScR) identified 523 studies across 6 databases. Nine studies meeting the inclusion criteria underwent full-text review, encompassing 435 patients across internal drainage strategies. Two reviewers independently extracted patient selection, access route, device specifications, clinical intent, technical/clinical success, patency metrics, and complications. All reported AEs were systematically mapped to numerical SIR grades (1–6) based on management requirements and clinical severity indicators. Given heterogeneity and small sample sizes, the data synthesis was descriptive.

Results: Technical success was high across modalities (ETGS/EGBS 79-98%; percutaneous 91%). AE profiles differed mechanistically: transpapillary approaches showed durable patency (median 760 days) with papillary-related AEs (pancreatitis/cholestasis 8.7% each, SIR-3). EUS-GBD achieved immediate internalization but generated tract-specific complications, including pneumoperitoneum (3.2%), perforation (1.6%), and bile leak (16.7%) in conversions. Percutaneous internalization yielded the lowest major AE rates (SIR-3/4: 10%, 30-day mortality 3.0%). Multicenter data favored permanent EGBS over drain removal (n=180; late AEs 5.0% vs 22.1%, p=0.002).

Conclusion: Internal drainage demonstrates consistent feasibility with route-specific risk profiles, enabling evidence-based selection. Transpapillary EGBS provides superior durability with manageable pancreaticobiliary risks. EUS-GBD offers immediate internalization at the cost of transmural complications. Percutaneous internalization may be optimal for frail patients when cystic-duct access is feasible.

AI disclosure: During the preparation of this work, the author used Claude Sonnet 4 in order to improve grammar, spelling, and readability of the submission.

Abstract No. 104

Safety and Efficacy of Balloon Lithotripsy for Percutaneous Biliary Stone Management



(Article No. 108115)

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Purpose: Conventional laser or electrohydraulic lithotripsy (EHL) wires are used to target individual biliary stones under direct visualization, through a large sheath. In contrast, intravascular lithotripsy (IVL) balloons, intended to treat arterial calcifications, can deliver shockwaves to multiple biliary stones simultaneously under fluoroscopic guidance through a smaller access. The purpose of this study was to report the efficacy and safety of IVL balloons for treatment of biliary stones.

Materials and Methods: In this single-institution retrospective study, 12 patients (8 males; mean age=68.5 years [43-81]) underwent attempted balloon lithotripsy for biliary stones. Technical success was defined as any stone fragmentation based on cholangiography. Clinical success was defined as not needing any additional stone removal procedures prior to drain removal.

Results: Stones were in the common bile duct in 10 patients and in intrahepatic ducts in 2 patients. Stones were 5-30 mm (mean=15.6) in size and 1-innumerable (median=2) in number. All IVL procedures were performed under moderate sedation through 7- to 12-Fr (median=8) sheaths a median of 20 days (range=0-56) after initial biliary access. IVL balloons used were 6-12 mm (median=8) in diameter. Among 12 patients, 8 procedures were technically successful (67%) and 6 were clinically successful (50%) with PBD removal a median of 19.5 days after IVL (range=12-55 days). The 6 patients with clinical failure required subsequent percutaneous cholangioscopic EHL (n=5) or surgical (n=1) stone removal. Cases with smaller stones were more likely to be clinically successful (10.8 versus 20.3 mm, $p=0.02$); however, stone number trended higher in successful (2.8 versus 1.8, $p=0.28$) cases. There were 2 major complications (biliary sepsis, $n=1$; readmission for pericatheter leakage and a fluid collection along the PBD tract, $n=1$), both occurring when IVL was performed at the time of initial biliary access. There was 1 minor complication (minor bleeding in the CBD limiting cholangiographic and cholangioscopic visualization).

Conclusion: IVL yielded approximately 67% technical and 50% clinical success for management of biliary stones. Applying this technique to smaller stones and avoiding balloon lithotripsy at the index biliary access procedure may enhance efficacy and safety. Overall IVL is a safe and effective option for fracturing multiple stones at once, particularly when EHL or laser equipment is not available.

Abstract No. 105

Percutaneous Cholecystostomy for Severe Acute Cholecystitis Associated with Organ Dysfunction: Is It as Effective and Safe as That Without Organ Dysfunction?



(Article No. 108116)

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Purpose: The management of acute cholecystitis (AC) associated with organ dysfunction (Grade 3 AC according to Tokyo Guidelines 2018) remains controversial. Percutaneous cholecystostomy

(PC) is usually the first-line treatment; however, recent studies reported higher mortality and complications in patients with Grade 3 AC undergoing PC compared to cholecystectomy. This study's purpose was to evaluate the efficacy and safety of PC for Grade 3 AC in comparison with that for Grade 1 or 2 AC (without organ dysfunction).

Materials and Methods: This single-institution retrospective study included 248 PCs performed from 2014 to 2023 (152/96: male/female, median age: 69), including 150 patients with Grade 3 AC, and 98 with Grade 1 or 2 AC. Efficacy was evaluated by: 1) 30-day mortality, 2) rate of a bail-out cholecystectomy (due to lack of clinical improvement post-PC), 3) resolution of sepsis or abdominal pain within 48 hours, and 4) length of hospitalization post-PC. Major complications were recorded per Society of Interventional Radiology Quality Standards. Chi-square analysis was used for comparison.

Results: The 30-day mortality rate was significantly higher in patients with Grade 3 AC. There were no significant differences between groups in other clinical outcomes, or major complication rates. Hypotension requiring pressor support was significantly more frequent in Grade 3 AC.

Conclusion: Despite similar safety profiles, patients with Grade 3 AC demonstrated a significantly higher 30-day mortality rate following PC. Further research is needed to determine the role of PC for Grade 3 AC, especially when laparoscopic cholecystectomy for high-risk patients is available.

Abstract No. 106

Intraluminal Gallbladder Opening Pressures: An Emerging Adjunct Tool for Clinical Decision-Making in Acute Cholecystitis



(Article No. 108117)

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Purpose: To standardize a technique for measuring intraluminal gallbladder pressures as an adjunct objective metric to assist in the evaluation of acute cholecystitis and guide clinical decision-making for percutaneous cholecystostomy.

Materials and Methods: In an institutional review board-approved retrospective study, intraluminal gallbladder pressure measurements were recorded in patients undergoing percutaneous cholecystostomy at a tertiary care academic medical center between December 2023 and September 2025. Pressures were recorded at three time points: (1) upon initial needle entry into the gallbladder lumen, (2) immediately after placement of pigtail catheter, and (3) after maximal active or manual decompression. The higher value between the needle entry and pigtail catheter entry measurements was designated as the "opening pressure." Descriptive statistics and comparative analyses were performed.

Results: Among 74 patients who underwent percutaneous cholecystostomy placement, measurement of intraluminal gallbladder opening pressure (GBOP) was successful in 73 cases (98.6%) and limited in one case due to the presence of a large gallstone. GBOP ranged from 3 to 50 mm Hg with a mean of 16.1 mm Hg (25th-

75th percentile: 9-22 mm Hg). The mean decompressed pressure was 3.6 mm Hg (1-5 mm Hg). The mean pressure differential from opening to decompressed state was 12.8 mm Hg (7-15 mm Hg). Cases of perforated cholecystitis trended towards smaller pressure differentials from opening to decompressed state compared to non-perforated cases (11.2 vs 13.5 mm Hg, $p = 0.34$). Patients with negative gallbladder microbial cultures had significantly higher opening pressures than those with positive cultures (19.9 vs 14.4 mm Hg, $p = 0.02$) with trends toward higher decompressed pressures (5.1 vs 3.2 mm Hg, $p = 0.06$) and greater pressure differentials (16.0 vs 11.6 mm Hg, $p = 0.07$).

Conclusion: This study establishes the typical range of gallbladder pressures in patients undergoing cholecystostomy tube placement and demonstrates a negative correlation between opening pressures and microbial culture positivity. Given that the pathophysiology of acute cholecystitis involves obstruction, GBOP measurement and changes in luminal pressure may serve as an adjunct tool in the diagnosis and evaluation of this condition. Further research should aim to clarify the relationship between GBOP and the severity of imaging findings, perforation status, laboratory values, and patient outcomes.

Abstract No. 107

Percutaneous Versus Transjugular Random Renal Biopsy in High-Risk Patients: Comparison of Outcomes with Updated Results



(Article No. 108118)

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Purpose: The purpose of this retrospective study was to compare outcomes between percutaneous random renal biopsy (PRRB) versus transjugular random renal biopsy (TJRRB) in patients with high major bleeding risk scores (MBRS).

Materials and Methods: This is a retrospective, institutional review board-approved and HIPPA-compliant study. At our institution, TJRRB is considered for patients with morbid obesity or a calculated MBRS >15. The records of all patients who underwent PRRB between April 2020 and June 2024 were reviewed, and a selected cohort of patients with MBRS >15 was compared to patients who underwent TJRRB. Patient risk factors, technical success, diagnostic yield and complication rates were compared. Univariate data analyses were performed with $p < 0.05$ considered to be statistically significant.

Results: A total of 21 patients underwent TJRRB and 87 PRRB high risk patients were identified. Patient demographics and results are summarized in 80.1. Patients undergoing TJRRB had a higher mean BMI and while patients undergoing PRRB had a higher mean MBRS. Major bleeding complications, biopsy diagnostic rate, and number of glomeruli per biopsy were similar. There were no deaths related to either technique.

Conclusion: This study showed that PRRB and TJRRB are comparable in safety and diagnostic yield in patients with high bleeding risk. BMI >35 may be the main indication for TJRRB.

107.1.

	PRRB (N=87)	TJRRB (N=21)	P value
Demographics:			
Age, mean (SD)	52.14 (12.67)	48.5 (16.1)	0.27
Age > 71, n (%)	5 (5.74)	2 (9.5)	0.62
BMI, mean (SD)	29.69 (11.66)	32.6 (10.5)	0.036
BMI >35, n (%)	11 (12.64)	8 (38.1)	0.011
Charleston Comorbidity Index > 6, n (%)	21 (24.14)	3 (14.3)	0.39
Thrombocytopenia, n(%)	15 (17.24)	3 (14.3)	1
AKI, n (%)	63 (72.41)	13 (61.9)	0.43
Vasculitis, n (%)	8 (9.2)	2 (9.5)	1
Major Bleeding Score, mean (SD)	19.93 (2.8)	16.6 (6.2)	0.0003
CCI Score, mean (SD)	4.1 (2.64)	3.25 (2.7)	0.19
Procedural Outcomes:			
Glomeruli, mean (SD)	30.67 (15.83)	24 (13.5)	0.078
Diagnostic Rate, n (%)	85 (97.7)	19 (90.47)	0.17
Bleeding Complication, n (%)	6 (6.9)	1 (4.76)	1
Technical Failure, n (%)	0	1 (4.76)	0.19
Anticoagulation/ Antiplatelets:			
Total Patients on AC/AP, n (%)	52 (59.77)	4 (19)	0.0012
AC/AP Held, n (%)	50 (57.47)	1 (4.8)	0.0001
ASA Monotherapy- Held, n (%)	9 (10.34)	1 (4.8)	0.68
DAPT- Held, n (%)	2 (2.29)	0	1
AC—Held, n (%)	7 (8.05)	0	0.34
Eliquis + ASA—Held, n (%)	4 (4.59)	0	1
Heparin—Held, n (%)	28 (32.18)	0	0.0015

Abstract No. 108

Safety, Technical and Clinical Success, and Patency of Nonmalignant Splanchnic Vein Recanalization with or Without Stent Placement



(Article No. 108119)

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Purpose: To access the safety, technical & clinical success (TS, CS) and short/long-term patency of splanchnic vein (SV) recanalization for nonmalignant chronic narrowing or occlusion.

Materials and Methods: This is an institutional review board-approved single-center retrospective study of 25 patients who had SV recanalization between (August 2019–;August 2025) for chronic narrowing/occlusion secondary to various nonmalignant clinical conditions. Primary end-points include: safety, TS & CS, pre- and post-intervention pressure gradient, and patency at follow-up (3–48 months). Access to SV system was obtained through transhepatic or transsplenic route. Venoplasty was performed with size 6-14F balloons. Stents were placed in 8 patients including Viabahn VBX (Gore Medical, Flagstaff, AZ), Protégé (Medtronic, Minneapolis, MN), and Express (Boston Scientific, Marlborough, MA).

Results: Overall technical success was 100% with no recurrent SV thrombosis during the follow-up period (81.1). Two incidences of minor complications were identified: stent migration—successfully repositioned and contained rupture of the portal vein—managed with stent placement.

Conclusion: These results suggest SV recanalization is a safe & effective technique with high rate of TS to restore physiological flow in chronic narrowing/occlusion with long-term CS. This study is limited by the small sample size and lack of thrombosis during the follow up period. Further research is warranted to evaluate the role of post-procedural anti-coagulation and/or anti-platelet therapies to understand benefits of prolonged stent patency vs bleeding risk in patients with pre-existing variceal bleeding.

108.1.		
		Mean (SD)
Age		43 (25)
Risk Factors		
	Pro-thrombotic condition	10
	Transplant	10
	Post-surgical (non-transplant)	2
	Pancreatitis	3
	Cirrhosis	6
Vein		
	PV	16
	SMV	4
	SV	3
	HV	2
<i>continued</i>		

108.1. (continued)		
		Mean (SD)
Indication		
	Variceal bleeding	5
	PV occlusion	8
	PV stenosis w/ varices	7
	SV/SMV thrombosis	2
	Altered flow dynamics	2
Access		
	Liver	16
	Spleen	7
	Femoral Vein	2
Procedure performed		
	Recanalization	21
	Thrombectomy	8
	Venoplasty	24
	Stent placement	16
Post-procedure		
	Anticoagulation	16
	Anti-platelet	11
Pressure Gradient (mm Hg)		
	Pre-procedure	6
	Post-procedure	2.5
TS		25
CS		24
Complications		3
Follow-up		
	Patency	100%
	Duration - months	24 (8)

Scientific Session 12

General IO 1

Monday, April 13, 2026
3–4:30 p.m.

Abstract No. 109

Novel Tract Cautery Device Increases Safety and Efficiency of Image-Guided Percutaneous Needle Biopsies: A Retrospective Study of 120 Patients



(Article No. 108121)

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Purpose: We evaluated the safety, efficacy, and procedural outcomes of a novel percutaneous biopsy tract cautery device.

Materials and Methods: In this institutional review board–approved, HIPAA-compliant study, we retrospectively reviewed 120 consecutive patients undergoing percutaneous solid organ and/or mass biopsy with tract cautery closure using SinglePass Kronos. The PACS system was searched for biopsies during the study period (2024–2025). Key procedural and clinical factors were recorded, including biopsy site, procedure time, bedrest/discharge time, complications, required treatments, and deaths. Hematologic parameters were compared in a 65 matched-pairs subset via Wilcoxon signed-rank test.

Results: Patients were 49.2% male and 50.8% female with a mean age of 62.0 ± 17.9 years. Biopsy sites included liver (74; 61.7%), kidney (28; 23.3%), abdominal/mesenteric (10; 8.3%), and lung (5; 4.2%). Indications were most often liver mass (38; 31.7%), medical liver (33; 27.5%), and medical renal (25; 20.8%). Patients on blood thinners (21; 17.5%) stopped such medications per Society of Interventional Radiology guidelines. Procedures were ultrasound- (52.5%) or CT-guided (47.5%). Mean procedural time was 17 ± 7 minutes. Average bedrest and discharge times were 2.9 ± 1.2 and 2.9 ± 1.2 hours, respectively. Four self-limited, intraprocedural hematomas—all medical renal biopsies—stabilized on the procedural table after cautery. There were no device-related complications or adverse events. There were no readmissions for bleeding, transfusion, intervention, or surgery within the 30-day follow-up. Five deaths during follow-up were all hospice patients; there were no procedure-related deaths. There was a paradoxical increase in post- versus pre-procedural hemoglobin (11.9 ± 2.1 vs. 11.6 ± 2.1 g/dL respectively, $p=0.0019$), carrying no clinical significance.

Conclusion: This novel cautery device provided effective tract closure during percutaneous biopsy with rapid recovery and no major bleeding events, significant complications, or related deaths. These findings support device deployment in common high-risk biopsy settings, particularly hepatic and renal. There may be advantages over conventional closure methods. Prospective studies with larger cohorts and longer-term outcomes should be performed to confirm safety, rare complication rates, and cost-effectiveness.

Abstract No. 110

Safety and Clinical Implications of Concurrent Biopsy of Neuroendocrine Liver Metastases at the Time of Liver-Directed Therapy



(Article No. 108122)

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Purpose: Liver-directed therapy (LDT) utilizing embolization is commonly performed for treatment of neuroendocrine tumor liver metastases (NETLMs). Tumor grade informs treatment and may evolve over time, suggesting a role for serial biopsy. This study evaluates the safety of concurrent biopsy at the time of LDT and assesses whether such biopsy results altered patient management.

Materials and Methods: Patients with NETLMs were enrolled in an institutional review board–approved prospective cohort study for genetic, proteomic and metabolic tumor characterization at a single academic center from 2016–2024. 18G core biopsies were obtained using coaxial technique at the time of LDT. Primary outcomes were adverse event (AE) rates per Society of Interventional Radiology guidelines, classified as major (additional intervention and/or hospitalization) or minor (no therapy/nominal therapy). Secondary outcomes included tumor grade change between biopsy samples and prior tissue samples and alterations in clinical management based on these results. Potential associations between clinical characteristics (biopsy location, number of cores and AEs) were assessed by univariate analyses; $p < 0.05$ was significant.

Results: Eighty-seven biopsies performed in 77 patients were included in the primary analysis. Diagnostic yield was 92% (80/87). A mean of 8 core biopsies (SD 1.76) were taken from the same lesion per procedure. Median interval from baseline biopsy was 1.7 (IQR 0.7–3.6) years. Biopsy-related AEs occurred in 8% of cases (7/87); major in 2% (2/87) including: 1) an arteriportal/arteriobiliary fistula resulting in hemobilia and a main portal vein thrombosis (PVT), and 2) perihepatic bleeding requiring an additional embolization. Both patients fully recovered. Minor AEs included asymptomatic arteriportal ($n=1$) and arteriovenous ($n=1$) fistulas, subcapsular/perihepatic hematoma ($n=2$), and segmental PVT ($n=1$). No significant associations of AEs with clinical characteristics were found. Among 63 patients eligible for grade change analysis, 27 (43%) had a change in tumor grade: 8 (13%) decreased and 18 (30%) increased. Seven of 18 patients (39%) with increased grade consequently underwent changes in clinical management, indicating a number needed to treat of 9 for biopsy-related management change.

Conclusion: Concurrent biopsy of NETLMs at the time of LDT has an acceptable AE rate and yielded clinically actionable information regarding grade change in a substantial proportion of patients. These findings suggest concurrent biopsy at the time of LDT should be considered in those lacking recent tissue sampling.

Abstract No. 111

Renal Biopsy Before Versus During Ablation: A Retrospective Comparison of Biopsy Yield, Ablation Success, Complications, and the Frequency of Treating Benign Disease



(Article No. 108123)

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Purpose: To determine whether performing a renal biopsy during renal ablation procedures affects the biopsy diagnostic yield or the ablation procedural outcomes when treating known or suspected renal cell carcinoma (RCC).

Materials and Methods: A retrospective study reviewed all renal biopsy and ablation procedures from May 2007 to May 2021 at a single institution. All small, solitary T1a renal masses (≤ 4 cm) that were sent for biopsy and/or ablation were included. Patients with metastatic disease were excluded. A total of 378 patients (mean age 67.6 years, male:female 240:138, mean tumor size 2.6 ± 0.8 cm) were included. 110 patients had biopsy during ablation (Ax+Bx, RFA:Cryo:MWA 90:14:6, mean tumor size 2.6 ± 0.7 cm, mean RENAL Nephrometry score 6.2 ± 1.6), 148 had biopsy before ablation (Ax-, RFA:Cryo:MWA 81:55:12, mean tumor size 2.7 ± 0.7 cm, mean RENAL Nephrometry score 6.1 ± 1.5), and 120 had biopsy without following ablation treatment (Bx-, mean tumor size 2.5 ± 0.9 cm, mean RENAL Nephrometry score 6.1 ± 1.7). Statistics were calculated using Fisher's exact test.

Results: The diagnostic yield for biopsy during ablation (Ax+Bx) was 85% ($n=93/110$), which was significantly lower ($p=0.04$) than the 92% ($n=246/268$) diagnostic rate for biopsy before (Ax-) and without (Bx-) ablation. The timing of biopsy did not significantly affect ($p=0.85$) the success rate of ablation, as achieving complete RCC ablation in a single procedure (primary technical success) was 88% ($n=97/110$) for Ax+Bx and 87% ($n=129/148$) for Ax-. The adverse event rate was also not significantly affected ($p=0.85$) by biopsy timing and was 12% ($n=13/110$) for Ax+Bx in comparison to 13% ($n=19/148$) for Ax-. The Bx-adverse event rate was 2.5% ($n=3/120$). The frequency of treating benign disease was 13% ($n=12/93$) for Ax+Bx, which was significantly higher ($p=0.0003$) than 1.4% ($n=2/148$) for Ax-.

Conclusion: Combining renal biopsy and ablation did not significantly affect the rate of ablation technical success or the post-ablation adverse events, however, it did lower the biopsy diagnostic yield and increased the frequency of treating benign disease. This data provides valuable information when deciding whether to combine procedures or perform them sequentially.

Abstract No. 112

Predictive Value of TI-RADS Scores for Thyroidectomy and Assessment of Inter-rater Variability



(Article No. 108124)

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Purpose: To elucidate the relationship between the total score and individual components of the TI-RADS thyroid nodule scoring system, the Bethesda grade following FNA biopsy, the need for thyroidectomy, and likelihood of malignancy on final surgical pathology. Interobserver variability among radiologists and pathologists will also be analyzed.

Materials and Methods: Retrospective chart review was conducted of patients at a single institution over a 5-year period who received thyroid nodule FNA biopsies and had a preceding ultrasound report with a TI-RADS score of the corresponding nodule. Spearman's correlation was calculated to determine if there was a correlation between TI-RADS scoring and Bethesda grading. Logistic regression evaluated whether TI-RADS score predicted thyroidectomy and whether individual features, including size, predicted benign or malignant pathology. The Kruskal-Wallis test was conducted to compare TI-RADS scores assigned by different radiologists and Bethesda scores assigned by different pathologists. Statistical analysis was conducted using IBM SPSS Statistics.

Results: Data from 220 nodules were collected, with 177 of the nodules occurring in female patients (80.5%). Spearman's correlation demonstrated a weak but positive association between TI-RADS and Bethesda scores ($p = 0.206$, $p = 0.002$). Logistic regression showed that the TI-RADS score was an independent predictor of thyroidectomy, with a 1.9-fold increase in odds of undergoing thyroidectomy ($OR = 1.92$ [1.13-3.26], $p = 0.016$) and finding subsequent malignancy ($OR = 1.91$ [1.02-3.57], $p = 0.042$) for each point increase in the TI-RADS score. Among the TI-RADS features, microcalcifications were associated with greater odds of malignancy ($OR = 8.13$ [1.52-43.6], $p = 0.014$). The Kruskal-Wallis test identified a significant difference between radiologists ($H(19) = 33.94$, $p = 0.010$), suggesting that there is inter-rater variability in TI-RADS scoring. However, no statistically significant inter-rater variability in Bethesda scores was noted between pathologists ($H(11) = 8.82$, $p = 0.639$).

Conclusion: Higher TI-RADS scores are indeed associated with a greater likelihood of thyroidectomy following FNA biopsy, with microcalcifications being a predictive feature of malignancy. However, significant inter-rater variability among radiologists highlights the need for standardization of grading TI-RADS components on ultrasound reports.

Abstract No. 113

Novel Acousto-Optic Sensor Stylet for Needle Tip Tracking, Needle Tip Imaging, and Tissue Characterization Compared to Capabilities of Electromagnetic Tracking



(Article No. 108125)

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Purpose: To assess the accuracy of a novel acousto-optic sensor for needle tip 3D localization within ultrasound (US) imaging

compared to electromagnetic (EM) tracking in phantoms. The ability to localize tumor and reconstruct US view from the needle tip was also evaluated.

Materials and Methods: An acousto-optic 50 μ m sensor was prototyped and integrated into a 20G stylet inside an 18G needle. The sensor was interfaced with US and a visualization software (DeepSight Technology). It provided 3D location of the needle tip relative to US plane and an internal US view from the needle tip. A phantom with target tumors (Sun Nuclear) was punctured using the acousto-optic sensor and using a commercial EM tracking system (PercuNav, Philips). Because of inherent high echogenicity, the needle tip was not visible under conventional ultrasound within the target tumors. The EM tracking system was composed of a US transducer sensor, a needle holder sensor (the offset to the tip was corrected by the system according to needle length), a patient tracker sensor placed on the phantom and an EM field generator placed above the phantom. Needle insertions were completed when the tracking system indicated the needle tip was located at the center of the target tumor. Accuracy of needle placement was defined as the distance from the needle tip to the target center on CT imaging (iQon, Philips). Paired t-test was used to compare accuracy (tip-to-target center distance) (Rstudio v2024).

Results: Target tumors of various diameters (5-10 mm) and various depths (5-13 cm) were targeted using the acousto-optic tracking system (N=10) and then the EM tracking system (N=10). The mean tip-to-center accuracy was 2.85 mm (SD 1.32 mm) for the acousto-optic tracking system and 3.57 mm (SD 1.18 mm; P=0.19) for the EM tracking system. Using the acousto-optic system, US imaging from needle tip was feasible for each insertion, with sufficient resolution to allow characterization of target-specific echogenicity around the needle tip. The EM tracking system did not allow internal imaging or tissue characterization capabilities but enables fusion with an additional imaging modality like CT or MRI.

Conclusion: This novel acousto-optic sensor could successfully localize the needle tip in 3 dimensions with accuracy similar to EM tracking in phantom, while enabling internal US imaging from the needle tip. This dual tracking and imaging technology could augment current US-guided interventions and facilitate new applications.

Abstract No. 114

Treatment Outcomes of Interventions for Fibroadipose Vascular Anomaly: A Systematic Review



(Article No. 108126)

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Purpose: To produce the most comprehensive and up-to-date synthesis of medical and surgical outcomes of FAVA at the patient level.

Materials and Methods: A systematic review was done in the PubMed/MEDLINE databases following PRISMA guidelines. All studies in the English language published between 2014 and 2025 were identified. Only studies where FAVA lesions were treated were included, composed of 27 studies (14 retrospective; 4 case series; 7 case reports; 1 visual vignette; 1 imaging vignette). One

retrospective was excluded due to probable duplication of published cases. Another retrospective seemed to have cohort overlap with another paper, so de-duplication was performed. Only unique patients who were treated were included, yielding 292 patients. Information on re-intervention (defined as further interventions to treat recurrence or lack of resolution) and follow-up outcomes, particularly pain reduction and improvement of range of motion (ROM), were extracted. Categorical outcomes (pain relief, ROM improvement, re-intervention) were compared across three modalities (cryoablation, surgery, sirolimus) using the Fisher-Freeman-Halton exact test for $r \times c$ tables (two-sided $\alpha=0.05$) due to small/zero cells. When the omnibus test was significant, pairwise 2×2 Fisher's exact tests with Holm adjustment were performed.

Results: Removing potentially duplicated subjects yielded 27 studies comprising 292 patients. 12/292 patients received combination therapy, defined as > 1 procedures delivered as part of the index course, excluding prior procedures, were excluded in analyses. 183 patients received surgical excision, with 126/130 reporting ROM improvement, 23/148 reporting re-intervention, 135/139 reporting pain reduction. 41 patients received cryoablation, with 19/21 lesions reporting ROM improvement, 8/46 lesions reporting re-intervention, 28/31 lesions reporting pain reduction. 21 patients received sirolimus with 3/5 lesions reporting ROM improvement, 0/2 re-intervention, 18/19 reporting pain reduction. ROM improved in 19/21 (90.5%) after cryoablation, 126/130 (96.9%) after surgery, and 3/5 (60.0%) after sirolimus ($p=0.0075$); surgery $>$ sirolimus (Holm-adjusted $p \approx 0.047$), cryo $\approx$ surgery ($p=0.20$). Pain improved in 28/31 (90.3%) cryoablation, 135/139 (97.1%) surgical excision, and 18/19 (94.7%) sirolimus, respectively ($p=0.14$). Re-intervention occurred in 8/46 (17.4%) cryoablation, 23/148 (15.5%) surgical excision, and 0/2 (0.0%) ($p=0.87$) sirolimus.

Conclusion: Cryoablation has similar efficacy to surgical resection with similar re-intervention rates.

Abstract No. 115

Socioeconomic Factors Influencing Treatment Receipt of HCC: A Nationwide Analysis



(Article No. 108127)

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Purpose: Hepatocellular carcinoma (HCC) remains significantly undertreated across the cancer literature. Approximately 40% of patients do not receive any treatment following diagnosis. In this study, we aimed to evaluate socioeconomic factors affecting survival in HCC patients using national-level data.

Materials and Methods: We conducted a study using the Epic Cosmos aggregated electronic health record (EHR) dataset. We identified patients diagnosed with HCC between January 2016 and December 2024 using ICD-10 /SNOMED diagnosis codes. Treatment exposure was determined by the presence of CPT codes corresponding to brachytherapy, immunotherapy, radio-embolization, surgery, transplantation, ablation, or trans arterial chemoembolization (TACE). Specialty engagement was defined as

the patient's first evaluation for HCC occurring with a cancer-relevant specialty (hepatology, gastroenterology, surgery, interventional radiology, radiation oncology, oncology or other) at the time of diagnosis. Analysis was carried out in RStudio.

Results: Among 160,624 patients diagnosed with HCC in Epic hospitals, 37% received treatment, 12% received curative-intent therapy, and 64% received no treatment. Median age at diagnosis was 67 years. After multivariable adjustment, independent correlates of receiving treatment included age ≥ 65 (aOR 1.03, 95% CI 1.00–1.05, $p=0.04$) and initial evaluation by a cancer-relevant specialty, the strongest determinant: hepatology (aOR 1.33), gastroenterology (aOR 1.15), surgery (aOR 1.26), interventional radiology (aOR 1.84), and radiation oncology (aOR 3.30) compared with oncology (all $p < 0.001$). Higher odds for being treated were also observed for patients from high-SVI areas (aOR 1.07, 95% CI 1.03–1.11), American Indian/Alaska Native (aOR 1.27), Native Hawaiian/Other Pacific Islander (aOR 1.18), and other race (aOR 1.16). Lower odds for being treated were seen among women (aOR 0.72, 95% CI 0.71–0.74), those who were single (aOR 0.91), and patients residing in urban areas (aOR 0.95). Compared with private insurance, patients with Medicare (aOR 0.97), missing coverage (aOR 0.75), or self-pay (aOR 0.77) had lower odds of receiving treatment.

Conclusion: In this national cohort, two modifiable system factors early specialty engagement with radiologists and radiation oncologists and financial coverage were powerful predictors of treatment initiation. EHR interventions that automate specialty referral to interventional radiology/radiation oncology and provide early financial navigation may increase treatment uptake and narrow inequities in HCC care.

Abstract No. 116

Shift in Transarterial Modality of Choice for Hepatocellular Carcinoma and Its Association with Achieving Complete Pathologic Necrosis



(Article No. 108128)

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Purpose: Liver transplantation is the gold standard treatment for hepatocellular carcinoma (HCC). Bridging locoregional therapy (LRT) before transplantation improves survival after transplant, which is best seen in those achieving complete pathologic necrosis (CPN). Historically, transarterial chemoembolization (TACE) was the dominant bridging modality. However, over the past decade transarterial radioembolization (TARE) has become the most utilized therapy, likely due to refinements in dosimetric approaches. This study hypothesizes that TARE's likelihood to achieve CPN has improved over time, and this improvement parallels increased adoption of TARE versus TACE as the main transarterial bridging therapy. A secondary aim was evaluate progression-free survival (PFS) by CPN in this cohort.

Materials and Methods: A retrospective analysis of consecutive lesions from patients who underwent transplant from 2010–2024 at a single institution. CPN was defined as 100% tumor necrosis on the explant specimen. Temporal trends in CPN proportions and amount of lesions that were treated with TARE versus TACE were assessed using the Cochran-Armitage test. PFS by CPN was evaluated with Kaplan-Meier curves.

Results: A total of 266 lesions from 149 patients (68% male) were included with a mean age at transplant of 61.6 years. The etiology of chronic liver disease included HCV (40%), multifactorial (28%), alcohol (13%), MASLD (12%), HBV (5%), and other (2%). Among lesions treated with TARE, the proportion achieving CPN increased significantly over time from 35% before 2019 to 84% after 2019 ($p < 0.001$). Among lesions treated with TACE, there was no significant difference in the proportion achieving CPN over time from 33% before 2019 to 29% after 2019 ($p = 0.79$). The relative utilization of TARE compared with TACE significantly increased over time from 9% of lesions treated in 2011 to 86% in 2024 ($p < 0.0001$). Although median PFS was not reached in either the CPN or incomplete necrosis group, the Kaplan-Meier curves did significantly diverge with patients with CPN having a decreased risk of progression ($p = 0.03$).

Conclusion: Complete pathologic necrosis has been shown to improve posttransplant outcomes; this study validated that patients with CPN had improved PFS. This study found that, over the past 14 years, TARE's rate of achieving CPN has improved significantly—likely due to improved dosimetry techniques—and its increased utilization outpaced TACE.

Abstract No. 117

Development of Epirubicin-Loaded Lipiodol Beads by Two-Step Membrane Emulsification



(Article No. 108129)

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Purpose: To characterize the physicochemical properties of novel Lipiodol Beads and to evaluate their in vitro epirubicin release kinetics.

Materials and Methods: Lipiodol Beads were developed using a two-step membrane emulsification method (i.e., W/O/W type multiple emulsion): first through a hydrophobic membrane to form a W/O emulsion, followed by passage through a hydrophilic membrane to produce Lipiodol droplets with a bead-like morphology. The droplet shape was stabilized using a gelatin solution as the external aqueous phase. Droplet morphology and size distribution (D10/D50/D90) were assessed by laser diffraction particle analysis and optical microscopy. In vitro epirubicin release was quantified by UV-Vis spectrophotometry and the release kinetics were compared with conventional W/O emulsion by using a two-way mixed repeated-measures ANOVA. For in vivo evaluation in a rat HCC model, micro-CT and H&E histology were performed immediately after intra-arterial delivery of both formulations.

Results: Epirubicin-loaded Lipiodol Beads exhibited a narrow size distribution (D10 $66.70 \pm 4.91 \mu\text{m}$; D50 $107.38 \pm 10.9 \mu\text{m}$;

D90 $166.02 \pm 18.35 \mu\text{m}$). On microscopy, epirubicin was consistently localized within Lipiodol Beads. Release from Lipiodol Beads was significantly slower compared with W/O emulsions ($P=0.001$), with a significant time $\times$ group interaction ($P<0.001$). In vivo imaging showed greater Lipiodol deposition in tumors treated with Lipiodol Beads. Histopathology demonstrated clearer ischemic changes and accumulation of Lipiodol droplets within intratumoral microvasculature and peritumoral portal venous branches.

Conclusion: Epirubicin-loaded Lipiodol Beads were successfully prepared with uniform size distribution and stable drug encapsulation. They exhibited slower in vitro epirubicin release, and preliminary in vivo data suggest enhanced intratumoral retention of Lipiodol with potential for improved therapeutic efficacy.

AI Disclosure Statement: During the preparation of this work, the author(s) used ChatGPT (OpenAI, GPT-5, 2025 version) to check grammar, spelling, and readability. After using this tool, the author(s) reviewed and edited the work and take full responsibility for the content of the abstract.

Abstract No. 118

Endovascular Management of Tumor Thrombus: Comprehensive Analysis of Mechanical Thrombectomy and Interventional Strategies Across Cancer Types



(Article No. 108130)

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Purpose: To evaluate endovascular treatment strategies for tumor thrombus across different cancer types, focusing on mechanical thrombectomy, catheter-directed interventions, and combined approaches for hepatocellular carcinoma, renal cell carcinoma, and other solid tumors with venous extension.

Materials and Methods: Systematic review of 89 patients from 12 institutions (2015-2024) with tumor thrombus treated endovascularly. Cancer types included renal cell carcinoma ($n = 42$), hepatocellular carcinoma ($n = 31$), and other malignancies ($n = 16$). Interventions included mechanical thrombectomy, aspiration techniques, balloon occlusion, and combination therapies. Primary endpoints were technical success, symptom relief, and progression-free survival.

Results: Technical success was achieved in 91.0% of procedures. For renal cell carcinoma with IVC thrombus, mechanical thrombectomy demonstrated 95.2% success with a median procedure time of 68 minutes and minimal blood loss (mean 85 mL). Complete thrombus removal was achieved in 83.3% of cases. Hepatocellular carcinoma with portal vein thrombus demonstrated 87.1% technical success, accompanied by significant symptom relief in 74.2% of patients. Major complications occurred in 6.7% of cases, including pulmonary embolism (3.4%) and vessel perforation (2.2%). Six-month progression-free survival was 67.4% for RCC and 42.9% for HCC. Combined endovascular-surgical approaches yielded superior outcomes compared to endovascular treatment alone ($p < 0.01$).

Conclusion: Endovascular management of tumor thrombus provides effective palliation with acceptable morbidity across multiple cancer types. Mechanical thrombectomy offers rapid symptom relief with minimal invasiveness compared to surgical alternatives. Combined endovascular and surgical approaches optimize outcomes, particularly for high-level renal tumor thrombi. Patient selection and multidisciplinary planning remain crucial for optimal results.

Scientific Session 13

General IR 1

Monday, April 13, 2026
3–4:30 p.m.

Abstract No. 119

Molecular Profiling of Hepatocellular Carcinoma with Contrast Ultrasound Using a Novel Antibody-Conjugated Microbubble via Light-Activated Site-Specific Chemistry



(Article No. 108132)

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Purpose: To develop and evaluate a microbubble-based contrast agent using light-activated site-specific conjugation (LASIC) for targeted molecular ultrasound imaging of glypican-3 (GPC3) positive hepatocellular carcinoma (HCC).

Materials and Methods: Microbubbles were conjugated with anti-GPC3 antibody using oYo-Link DBCO chemistry, which enables site-specific labeling of the antibody heavy chain with up to two DBCO groups per antibody by employing a LASIC-based approach that ensures site-specific conjugation without compromising antigen affinity. GPC3 expression levels in HCC cell lines (SNU423, SNU449, and HepG2) were confirmed by Western blotting. Binding specificity was validated by pre-blocking with free anti-GPC3 antibodies in the HCC cell lines. Fluorescence microscopy and quantitative image analysis were used to assess cell-binding efficiency. For in vivo analysis, conjugated microbubbles were intravenously injected into mice bearing orthotopic HepG2 xenografts, and contrast-enhanced ultrasound (CEUS) imaging was performed at multiple time points post-injection (0 sec, 30 sec, 10 min) to evaluate tumor signal enhancement and persistence.

Results: LASIC-based chemistry enabled stable and homogeneous antibody attachment to microbubbles. In vitro assays showed significantly increased binding of targeted microbubbles to GPC3-positive cells compared to antigen blocked control groups (85% vs 2%; $p=0.001$). In vivo CEUS imaging revealed enhanced tumor-specific signal within 30 seconds post-injection, which persisted up to 10 minutes, confirming specific and sustained tumor targeting. Compared to the targeted group, the control group showed a noticeable decrease in signal intensity beginning at 30 seconds post-injection.

Conclusion: Conjugation of anti-GPC3 microbubbles enable efficient, specific, and durable binding to GPC3-expressing HCC in vitro and in vivo. This approach allows for real-time, image-guided molecular profiling using CEUS, paving the way for precision imaging and potential theranostic integration in liver cancer management.

Abstract No. 120

Clinical Utility of Consensus Multimodel LLMs for Interventional Radiology: A Proof-of-Concept Evaluation



(Article No. 108133)

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Purpose: To develop and evaluate an LLM-driven procedure planning and recommendation system for interventional radiology (IR) that integrates multiple large language models with patient data and clinical guidelines, and to compare true image interpretation against a template-based approach for clinical utility and accuracy.

Materials and Methods: A multimodel architecture integrated three LLMs (OpenAI GPT-4o, Anthropic Claude 4, and xAI Grok-3) via APIs into an aggregation engine that synthesized consensus outputs into guideline-concordant recommendations. In a retrospective study (institutional review board–approved), 10 de-identified IR cases spanning venous thromboembolism, arterial interventions, trauma, and interventional oncology were processed by two pipelines: (1) direct image analysis (LLMs interpreted CT/MRI/angiography with consensus and confidence scoring) and (2) template-based analysis (generic recommendations from case descriptions without image review). Clinical data included imaging, laboratory values, demographics, and history. Quality metrics included agreement with procedures performed (Cohen's kappa), intervention specificity, risk stratification accuracy, guideline compliance, and decision support utility.

Results: Direct image analysis produced case-specific findings and recommendations (e.g., active upper GI hemorrhage with targeted embolization; traumatic aortic pseudoaneurysm with TEVAR; lesion-specific HCC therapy), whereas template-based outputs were generic, imaging-agnostic, and often misaligned with clinical context. Agreement with procedures performed was strong for image analysis ($\text{kappa} > 0.8$) and poor for template-based analysis ($\text{kappa} < 0.3$). Intervention specificity was 90% for image analysis versus 20% for template-based; correct urgency/risk stratification was 85% versus 40%, respectively. Quality ratings favored image-based over template-based outputs for clinical relevance (9/10 vs 4/10), evidence base (9/10 vs 2/10), intervention specificity (9/10 vs 3/10), and risk assessment accuracy (8/10 vs 4/10).

Conclusion: In this proof-of-concept evaluation, LLM-driven decision support for IR was clinically useful only when real image interpretation was incorporated. Template-based, non-image pipelines underperformed on accuracy, specificity, and risk assessment, underscoring the necessity of image based LLM analysis for safe, evidence-based IR recommendations.

Abstract No. 121**Pneumothorax and Chest Tube Placement Incidence After Lung Biopsy with a Valved Versus Nonvalved Coaxial Biopsy Device**

(Article No. 108134)

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Purpose: To compare post-biopsy pneumothorax rates and chest tube placement between valved and nonvalved devices used during percutaneous lung biopsy.

Materials and Methods: This retrospective study included 156 patients who underwent percutaneous lung biopsy at a single institution between June 20, 2024, and February 12, 2025. Eighty-two (52.6%) were female and 74 (47.4%) were male with an average age of 66.7 years. Demographic and medical history for each patient was obtained including presence of chronic obstructive pulmonary disease and severity, presence of bullae, and smoking status. Biopsy success for each procedure was recorded and defined by obtaining at least one core biopsy. Post procedure complications, including incidence of pneumothorax and chest tube placement within 30 days of procedure, were recorded. Chi-square test was used to determine differences in pneumothorax and chest tube placement rates between the two groups.

Results: Fifty-six patients (35.9%) underwent biopsy with a valved device, and 100 (64.1%) patients with a nonvalved device. Thirteen (23.2%) patients who underwent biopsy with a valved device developed pneumothorax compared with 27 (27.0%) who underwent biopsy with a nonvalved device ($p=0.6034$). Four (7.1%) patients had a chest tube placed in the valved group and 11 (11.0%) in the nonvalved group ($p=0.4331$).

Conclusion: This analysis found no statistically significant difference between pneumothorax and chest tube placement rates between valved and nonvalved devices used in percutaneous lung biopsies. Limitations of the study include a relatively small sample size at a single institution.

Abstract No. 122**Beyond Proof of Concept, Interventional Gene Therapy: Successful Transduction of Pancreatic Islet Cells in Nonhuman Primates by Wedged Retrograde Pancreatic Duct Injection Using Adeno-Associated Virus Vectors**

(Article No. 108135)

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Purpose: To establish a translational interventional gene therapy platform using Adeno-Associated Virus Vectors in nonhuman primates for type 1 diabetes (T1D).

Materials and Methods: 14 rhesus macaques (1.1–5.4 yrs, mean 3.1; wt 2.3–10.8 kg, mean 4.6) underwent mini-laparotomy with duodenotomy under general anesthesia. The major duodenal papilla was surgically exposed and cannulated using a 24-gauge angiocath. Pancreatic duct injection was performed with iodinated contrast, followed by insertion of a 0.010-inch guidewire to facilitate placement of either a 4–5 Fr micropuncture outer sheath or a 7 Fr sheath introducer. After confirming wedged positioning, various AAV vectors were infused into the pancreatic ductal with a 20-minute dwell. Serum amylase, lipase, and vector levels were measured before and after infusion. Animals were maintained for a 3–6 wk incubation period prior to tissue harvest for histopathologic analysis.

Results: Technical procedural success was achieved in all 14 cases (100%). Wedged retrograde injection enabled reliable delivery of AAV vectors into the pancreatic parenchyma (mean injected dose 8.9×10^{12} vg) at the pancreatic body. All animals demonstrated transient, asymptomatic elevations in serum amylase and lipase between 4–24 hours post-injection, returning to baseline thereafter. Histological evaluation confirmed successful transduction of pancreatic acinar and islet cells in all animals, with clear variability in transduction efficiency and islet cell selectivity among vector subtypes. Of particular note, the AAV-KP1 vector exhibited high tropism for islet cells and minimal off-target organ transduction, suggesting vector-dependent optimization for targeted therapy.

Conclusion: This study demonstrates that interventional gene therapy has moved beyond theoretical application. Wedged retrograde pancreatic duct injection of AAV vectors enables safe and efficient transduction of pancreatic islet cells in NHPs. The vector-specific findings, particularly with AAV-KP1, highlight the feasibility of achieving islet-selective gene delivery, establishing a promising translational platform for future clinical applications in T1D.

Abstract No. 123**Feasibility Studies in the Nascent Field of in Vivo Proteomics: Implications for a New Domain for Interventional Radiology?**

(Article No. 108136)

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Purpose: Protein expression is dynamic and context-dependent, yet it is mainly studied in vitro. We sought to determine feasibility to detect putative differences in protein expression in vitro and in vivo and evaluate if interventional radiology techniques can be leveraged to determine and potentially manipulate protein expression profiles in vivo.

Materials and Methods: A three-phase experiment was conducted. Phase I consisted of a 4-arm binary go/no go design with a negative control, tail vein injection (100 μ L of iodoacetamide alkyne, IAA, Vector Labs, Plain City, OH), perfusion, and post-lysis positive control in 4Dbh^{cre} KI male mice (Jackson Laboratory, Bar Harbor, ME). For perfusion IAA was delivered in vivo at 1millimolar concentration in saline at 2.5mL/min for 10min via direct left ventricular puncture followed by perfusion with ice-cold

PBS at pH 7.4. Tissues were harvested, homogenized, and lysed, and lysates treated with Cy5-azide (BroadPharm, San Diego CA) and CuSO₄ under click conditions to visualize labeling. SDS PAGE was performed on the reaction products and imaged using in-gel fluorescence. Phase 2 consisted of three arms with in vitro cells (Bnl Cl.2 liver cells), untreated liver (3 male Dbh^{cre} KI mice), and in vivo perfusion with 3 Dbh^{cre} KI mice (2M/1F). Lysates from cell culture and untreated liver were alkylated with IAA, then digested for proteomic analysis. LC-MS/MS was performed using a timsTOF Pro2 mass spectrometer (Bruker Daltonics, Billerica MA). Phase 3 consisted of data analysis. MS raw files were searched using FragPipe GUI version 20 with the MSFragger (version 3.8) search algorithm. Protein identification used the UniProtKB/Swiss-Prot protein database for *Mus musculus* (release 2025_05; 17,052 entries). Only proteins found in at least two of the three subjects were included, and data were purged of duplicate entries.

Results: Phase 1 fluorescence imaging showed a qualitatively strong positive signal for the perfusion and post-lysis positive control, and negligible signal for the negative control and the tail-vein injection. Phase 2 provided three distinct lysates and data sets for analysis. Phase 3 revealed 1,829 distinct proteins. Of 192 proteins in the perfusion arm, 34 or 18% were unique.

Conclusion: Detection of differences in protein expression in vitro and in vivo is clearly feasible and clear differences exist based on conditions. This implies that percutaneous delivery methods will be readily adapted and will likely prove to be powerful tools when brought to bear in discovery of new proteins and for manipulation in vivo across a wide range of conditions in the future.

Abstract No. 124

Multiplex Immunofluorescence, Immunohistochemical, and Mass Spectrometry Evidence for Localized Chemical Modifications in Tissue Using a Swine Model



(Article No. 108137)

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Purpose: To investigate the effects in tissue of an exploratory new method called thermoembolization using a multimodality, multiparametric approach.

Materials and Methods: Thermoembolization was performed in 3 outbred swine (2M/1F) under an approved protocol. Via common femoral artery access, the liver was catheterized using a 5F reverse curve catheter and a 2.8F microcatheter, and a single lobar branch of the hepatic artery was treated using 500-600 µL of a 1 mol/L solution of 2-propylpentanoyl chloride in ethiodized oil. Animals were imaged and necropsied after 7 days and specimens were excised for analysis. Samples of treated tissue were formalin fixed and paraffin embedded (FFPE) for analysis. Sections were processed for H&E staining as well as chromogenic immunohistochemistry (IHC) for cleaved caspase 3 (CC3) as a marker for apoptosis. Samples were further analyzed using multiplex immunofluorescence (MIF) and for mass spectrometry imaging (MSI). MIF staining was performed using a Leica Bond RX (Leica

Biosystems, Deer Park, IL, USA) with an Opal 7-color kit (Akoya Biosciences, Marlborough, MA, USA) for FOXP3, CD8, CD4, CD45, Granzyme B, and CD3 with DAPI as a nuclear stain. For MSI, FFPE sections were dewaxed and treated sequentially with matrix (9-aminoacridine) followed by trypsin and peptidyl-N-glycase using an HTX M5 robotic sprayer (HTX TECHNOLOGIES, CHAPEL HILL, NC). Imaging was performed after each enzymatic treatment using a timsTOF Pro2 mass spectrometer (Bruker Daltonics, Billerica MA) in negative ion mode.

Results: H&E sections revealed large, confluent areas of coagulative necrosis with complete loss of cytoskeletal detail. With IHC, increased staining for CC3 was observed at the margins. With all markers for IHC and MIF poor staining was noted in the regions corresponding to the coagulative necrosis on H&E. MSI molecular ion images for tryptic peptides and glycans likewise showed multiple mass markers that were present in normal tissue yet absent in the areas of coagulative necrosis. In a complementary fashion, new mass markers were identified in the treated areas but not present in unaffected tissues.

Conclusion: The combination of necrosis, apoptosis, focal absence of affinity for multiple antibodies in IHC and MIF, and the altered profiles for molecular ion images in MSI compared to normal tissue suggest that fundamental chemical modifications occurred in the affected areas. These results support further study of in vivo chemistry for clinical application.

Abstract No. 125

A Novel Nano-functionalized Silicone-Covered Stent-Mediated Local Thermal Ablation for the Prevention of Tracheal In-Stent Restenosis: Feasibility Evaluation in a Rat Model



(Article No. 108138)

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Purpose: Incidence of central airway obstruction has significantly increased in the post-COVID-19 era. Airway stenting is one of the major strategies for the management of airway obstruction, but its effectiveness is limited by in-stent restenosis. This study aimed to develop a novel photothermal stent and evaluate its potential for preventing tracheal in-stent restenosis preclinically.

Materials and Methods: The AuNPs-integrated silicon-covered stents (AuNPs stent) were fabricated via dip coating method, and the surficial properties were characterized using optical microscope. The gold content of each stent was measured by ICP-MS. The photothermal characteristics were assessed using an 808 nm NIR laser system and an infrared thermal camera. To evaluate the feasibility of the stents in preventing tracheal in-stent restenosis, a total of eighteen 10-week-old healthy SD rats were randomized to receive control silicone-covered stents only (Group A), AuNPs stent only (Group B), or AuNPs stent plus NIR (Group C). Sham operation or tracheal NIR was performed on POD 14 days after stent insertion. Follow-up fluoroscopy, histological changes and hepatorenal function were examined on POD 28. Additionally, the concentration of inflammatory cytokines in bronchoalveolar lavage fluid were evaluated.

Results: AuNPs stents were successfully developed, containing a mean amount of 4179.09 μg per stent. Compared to control stent, AuNPs-stents demonstrated significant photothermal effect. Under NIR irradiation (0.5 W), the mean surface temperatures were as follows: NIR fiber, 32.8°C; control stent, 37.8°C; AuNP-functionalized stent, 55.4°C. In the rat experiment of tracheal stent insertion, Group C showed significant reduction in the submucosal thickness, the inflammation score, and the percentage of collagen staining compared to Group A and Group B ($p < 0.05$), and there was no significant difference between Group A and Group B ($p > 0.05$). Compared with Groups A and B, animals in Group C did not increase the risk of pulmonary inflammation or hepatorenal impairment ($p > 0.05$).

Conclusion: The AuNPs-integrated silicon-covered stent with significant photothermal effect was safe and effective in preventing tracheal in-stent restenosis.

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Abstract No. 126

Radiofrequency Identification (RFID) Marker Localization in Nonbreast Tumors: A Safety and Outcomes Analysis



(Article No. 108139)

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Purpose: Accurate localization of non-palpable tumors is critical for oncologic resection. While radiofrequency identification (RFID) marker localization is increasingly adopted in breast surgery, its role in extra-mammary lesions remains underexplored. This study evaluated the safety, feasibility, and clinical outcomes of RFID (LOCALizer, Hologic, Marlborough, MA) localization for nonbreast tumors.

Materials and Methods: A retrospective review was performed of all RFID placements for surgical localization of nonbreast tumors between 2020 and 2024. Eligible patients had histologically confirmed malignancy with metastatic/recurrent lesions requiring surgical excision. RFID tags were deployed by interventional radiologists or advanced practice providers under ultrasound or CT guidance using a 12-gauge introducer. Technical success was defined as tag deployment within/adjacent to the lesion on post-

placement imaging. Migration was defined as > 5 mm displacement, and retrieval success as intraoperative identification and removal of the tag with the specimen. Data collected included demographics, tumor type, lesion size and depth, interval between placement and surgery, complications, and surgical margin status.

Results: Forty patients (mean age 65.9 ± 17.2 years; 52.5% male) underwent 48 RFID localization procedures. Lesion sites included lymph nodes (47.9%) and soft tissue/subcutaneous metastases (52.1%). Primary malignancies were predominantly melanoma (62.5%), followed by carcinoma (17.5%; ovarian $n=3$, breast $n=2$, cholangiocarcinoma $n=2$), sarcoma (15%; spindle cell $n=2$, Ewing's $n=2$, others $n=2$), and lymphoma (5%). Technical success was achieved in all procedures (100%). Tags were placed a median of 28 days prior to surgery (range: 1-134) with no increase in migration or retrieval failure over longer intervals. Procedure-related adverse events were limited to two minor hematomas (4.2%). One migration (2.1%) was observed without impact on surgical success. Intraoperative retrieval was confirmed in 95.8% of cases. Negative margins were achieved in 91.7% of resections, and only 4.2% required re-excision. Outcomes did not differ between ultrasound and CT guidance ($p = 1.00$).

Conclusion: RFID localization is a safe and effective technique for preoperative marking of nonbreast tumors. It provides high intraoperative reliability, margin clearance, and minimal complication risk, with scheduling flexibility that facilitates complex oncologic workflows. These results support broader adoption of RFID technology beyond breast applications.

Abstract No. 127

Ketamine Procedural Sedation in Interventional Radiology Without Anesthesiology: Experience from 900 Consecutive Cases



(Article No. 108140)

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Purpose: Procedural sedation in interventional radiology (IR) often relies on opioids and benzodiazepines, which may provide inadequate depth and carry cardiopulmonary risks. Ketamine offers deeper sedation without respiratory depression, but has not been widely adopted in IR. This study evaluates the safety of ketamine/midazolam sedation administered by IR physicians without anesthesiology presence in a large patient cohort.

Materials and Methods: All consecutive procedures performed on adult patients using intravenous ketamine/midazolam administered by IRs with no anesthesiology staff present were collected at a single institution from 7/24 to 1/25. Data is presented descriptively, with mean $\pm$ standard deviation and (ranges) unless otherwise specified.

Results: Of 900 procedures (475 outpatient, 425 inpatient) performed in 785 patients (398 women, 387 men; 65 ± 14 [18–96] years old), there were 8 cryoablations, 41 arteriograms/embolizations, 360 biopsies, 113 venous access cases, 346 drainage interventions, 19 pain interventions, and 13 venography/other cases. Of 900 cases, 79 (9%) entailed multiple procedures (e.g., port and biopsy). Among the 785 patients, 110 (14%) had sleep apnea and 102 (13%) had opiate

dependence. Median dose of midazolam was 2 (range: 0.5–6) mg and ketamine was 40 (20–260) mg. Intravenous diphenhydramine was given in 17 (2%) to augment sedation; antiemetics were given in 104 (12%) due to nausea. Mean lowest oxygen saturation was 96 (83–100)%, with 380 (42%) cases managed on room air, 503 (56%) with nasal cannula, and 17 (2%) with simple or other types of masks. No patient required an oral or nasal airway or intubation. Lowest and highest mean systolic blood pressure was 122 (63–194) and 144 (93–243) mm Hg. There were 4 (0.4%) sedation-related adverse events: flumazenil was administered in 1 (0.1%) due to hypotension; midazolam caused combativeness regardless of ketamine in 1; 1 patient fell from the table; 1 had desaturation prone that resolved when turned supine.

Conclusion: Ketamine/midazolam sedation was safely administered by IRs without anesthesiology presence, with a very low rate of adverse events far lower than those reported for opiate-based regimens. Compared with traditional fentanyl/midazolam sedation, ketamine/midazolam may improve patient safety and expand access to advanced IR procedures by reducing reliance on anesthesiology providers.

Abstract No. 128

Ketamine/Midazolam Sedation by Interventional Radiologists Enables Pediatric Procedures Without Anesthesiology Support



(Article No. 108141)

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Purpose: Performing procedures on children usually requires anesthesiology. Ketamine sedation is an emerging practice in interventional radiology (IR) with favorable outcomes in adults. This study reports outcomes in children undergoing image-guided procedures using ketamine sedation without anesthesiology.

Materials and Methods: All IR procedures in patients < 18 years using intravenous ketamine/midazolam without anesthesiology were identified in the Picture Archiving and Communication System. Demographics, procedural details, medications, and intra-procedural vital signs were gleaned from medical charts. Data are presented descriptively as median (range).

Results: Ten procedures were performed in 9 children (5 girls, 4 boys), 13 (10–17) years old; weighing 54 (40–92) kg. No child had sleep apnea or opiate dependence history. Procedures included 7 abdominopelvic drainages, 1 intrapulmonary drainage, and 1 liver and 1 renal biopsy, performed with US (3) or CT (7). Sedation included 2 (0–2) mg midazolam and 50 (40–50) mg ketamine, corresponding to 0.9 (0.5–1.2) mg/kg ketamine. Nine cases were completed using room air and 1 with nasal cannula; lowest oxygen saturation was 98% (93%–100%). No sedation-related or respiratory adverse events occurred. Minimum and maximum systolic blood pressure was 109 (99–140) and 131 (118–148) mm Hg. Antiemetics were given in 4 (40%) procedures. Median post-procedure day 1 opioid use was 2 (0–26.5) mg (morphine milligram equivalent). All procedures were completed successfully and tolerated by the children. No post-procedure adverse events occurred; 1 patient presented the next day with back pain after biopsy and was discharged after analgesia.

Conclusion: Ketamine/midazolam sedation administered by IRs allowed invasive procedures such as abscess drainage and solid organ biopsy to be completed successfully without the need for anesthesiology support. Incorporating ketamine sedation into an IR department may facilitate efficient care for children who need image-guided procedures.

Scientific Session 14

IO–Liver Ablation

Monday, April 13, 2026

3–4:30 p.m.

Abstract No. 129

Comparative Outcomes of Surgery and Contemporary Interventional Radiology Therapies for Early-Stage Hepatocellular Carcinoma: A National Cancer Database Propensity-Weighted Analysis



(Article No. 108143)

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Purpose: Although surgical resection is considered a curative option for small hepatocellular carcinoma (HCC), only about 20–30% of patients are eligible, with most ineligible due to comorbidities or inadequate liver reserve. This study evaluated outcomes of minimally invasive locoregional therapies (LRTs) compared with surgery in early-stage HCC using a national cancer registry.

Materials and Methods: The 2022NCDB Participant User File was queried for adult patients with AJCC stage I HCC, tumor size ≤ 40 mm, and no metastases. Eligible patients (n=9,084) were stratified by initial treatment: surgical resection (transplants excluded), thermal ablation, Stereotactic Body Radiation Therapy (SBRT), Trans-arterial radioembolization (TARE), or Trans-arterial chemoembolization (TACE). Inverse probability of treatment weighting (IPTW) was applied using demographic, clinical, and tumor covariates to match cohorts. Standardized mean differences confirmed covariate balance. Kaplan–Meier analysis estimated overall survival (OS), and Cox proportional hazards models evaluated relative risk of death.

Results: After IPTW adjustment, surgery demonstrated the most favorable outcomes (1-, 3-, and 5-year OS: 95.3%, 88.7%, 79.4%). Among LRTs, ablation and TARE yielded superior survival compared with SBRT and TACE. Median OS was 62.6 months for ablation, 59.3 months for TARE, 45.3 months for SBRT, and 40.3 months for TACE, not reached for surgery. On Cox regression, ablation (HR 2.91, 95% CI 1.89–4.50), TARE (HR 3.32, 95% CI 2.13–5.18), SBRT (HR 3.840, 95% CI 2.39–6.19), and TACE (HR 4.45, 95% CI 2.87–6.90) were all associated with significantly lower survival than surgery ($p < 0.0001$). Among LRTs, TACE (HR 1.53, 95% CI 1.36–1.72) and SBRT (HR 1.32, 95% CI 1.06–

1.65) had increased mortality relative to ablation, while survival was not different between ablation and TARE (HR 0.88, 95% CI 0.77–1.00).

Conclusion: While surgery remains the benchmark for small HCC, most patients are not surgical candidates. Among minimally invasive LRTs, ablation and TARE provided the most favorable long-term survival and represent effective alternatives when surgery is not feasible.

Abstract No. 130

Overcoming Resistance to Thermal Ablation in Hepatocellular Carcinoma via Galectin-1 Targeting: A Murine Preclinical Investigation



(Article No. 108144)

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Purpose: Thermal ablation is the standard-of-care treatment modality with curative intent for early-stage nonresectable HCC, but a durable response is limited, with up to 40% of patients with HCC eventually experiencing local recurrence on posttreatment surveillance. While ablation causes immediate cell death, its metabolic impact on surrounding tissue is unclear. We aimed to identify protein profiles in patients with HCC that are responsive or resistant to thermal ablation and demonstrate the therapeutic potential of combining Galectin-1 (Gal-1) inhibition with thermal ablation using a murine model.

Materials and Methods: We performed proteomic analysis on pre-ablation biopsies from 32 responsive and 23 nonresponsive HCC patients. Separately, we evaluated the Gal-1 inhibitor OTX008 in an orthotopic mouse model of HCC. SNU449 cell-derived tumors were treated with OTX008 (5 mg/kg IP, twice weekly) for two weeks before and one week after microwave ablation. One week post-ablation, tumors were harvested for weight and metabolic analysis.

Results: In our proteomic analysis of patient biopsy samples, we found a statistically significant 1.5-fold increase in Galectin-1 in nonresponsive (n=23) vs. responsive (n=32) hepatocellular carcinoma patients based on proteomic analysis of pre-ablation biopsies ($p < 0.01$). In the mouse model, combining the Galectin-1 inhibitor with thermal ablation led to a significant 2-fold reduction in tumor size (n=5). This was compared to both the control group (n=7) and the group that received only thermal ablation (n=7), with the results being statistically significant ($p < 0.05$). Further metabolic analysis of these tumors revealed a substantial 40% decrease in galactose and a subsequent 60% decrease in galactose-1 phosphate within the combination therapy group compared to thermal ablation alone group ($p < 0.001$). This disruption in a key metabolic pathway resulted in an 80% decrease in overall energy production, as indicated by corresponding decreases in the TCA cycle metabolites, citrate ($p < 0.01$) and malate ($p < 0.001$).

Conclusion: Galectin-1 plays a crucial role in thermal ablation resistance in HCC. Therefore, targeting this protein in conjunction

with thermal ablation significantly increased the therapy's effectiveness, suggesting a novel synergistic strategy to improve patient outcomes.

Abstract No. 131

Pulmonary Function Following Thermal Ablation of Lung Tumors: A Prospective Study



(Article No. 108145)

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Purpose: To evaluate changes in pulmonary function in patients who undergo thermal ablation of lung tumors.

Materials and Methods: We enrolled 59 patients (mean age = 66.7 ± 12.8 ; 50.8% male; 15.3% with interstitial lung disease [ILD]) who underwent standard-of-care thermal ablation (94.9% cryoablation, 5.1% microwave ablation) of one or more lung tumors at an academic center following multidisciplinary evaluation between December 2023 and September 2025. Shortness of breath was assessed using transformed T-scores from the validated PROMIS SF v1.0 Dyspnea Severity questionnaire at baseline (pre-procedure) and at 1 day, 1 week, 1 month, and 3 months post-procedure. Thirty-one of 59 patients (53%) also completed formal pulmonary function testing within 4 months prior to the ablation (baseline) and at 1 month and 3 months post-procedure, with FEV1, FVC, and DLCO measured. Longitudinal trends were quantified using linear mixed-effects regression models, while data dependencies were acknowledged using random intercepts. Interactions between ILD and time were included to evaluate temporal trajectories. Models were summarized by estimated coefficients and 95% confidence intervals.

Results: Self-reported dyspnea T-scores increased in the short term post-procedure, with statistically significant increases observed at 1 day (*1 day vs baseline* = 1.92, 95% CI [0.27, 3.58]) and 1 week (*1 week vs baseline* = 2.19, 95% CI [0.55, 3.82]), before returning to baseline at 3 months. Pulmonary function test results for FEV1, FVC, and DLCO (% predicted) slightly increased with time; however, no significant differences were observed relative to baseline. When stratified by ILD diagnosis, the subset of patients with ILD reported higher dyspnea scores at 3 months relative to baseline (*3 months vs baseline* = 5.17, 95% CI [-0.19, 10.53]), but an increase in FEV1 (*3 months vs baseline* = 7.64, 95% CI [-7.16, 22.44]), FVC (*3 months vs baseline* = 12.82, 95% CI [-2.75, 28.39]), and DLCO (*3 months vs baseline* = 15.45, 95% CI [-5.56, 36.46]).

Conclusion: Pulmonary function remained stable in patients following thermal ablation of lung neoplasms and FEV1, FVC, and DLCO were preserved at 3 months compared to baseline. While shortness of breath during routine activities increased within the first month, patients returned to baseline levels at 3 months post-procedure. This study provides a granular characterization of post-ablation lung function and informs patient counseling.

Abstract No. 132

Hepatic Histotripsy After Contrast-Enhanced Ultrasound: Evaluation in an in Vivo Swine Model



(Article No. 108146)

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Purpose: During hepatic histotripsy, diagnostic ultrasound is used to identify and target tumors. Techniques to facilitate targeting poorly echogenic tumors are needed. Contrast enhanced ultrasound (CEUS) is commonly used to increase the conspicuity of liver tumors, however, the safety and efficacy of performing histotripsy after the administration of ultrasound contrast, which effectively lowers the cavitation threshold of the tumor and surrounding liver, is unknown. The purpose of this study was to assess the safety and efficacy of hepatic histotripsy after CEUS in an in vivo porcine liver model.

Materials and Methods: Six healthy, acute, female swine (mean weight, 52.3kg) each underwent two histotripsy treatments (2.0 cm diameter) of the liver. Following a control histotripsy treatment in either the right or left liver, ultrasound contrast was administered intravenously. After a 10-minute washout period (the reported terminal half-life), a second histotripsy treatment (post-CEUS) was performed on the contralateral lobe. Imaging (intra- and post-procedural) and gross necropsy were used to assess off target damage to determine safety. Efficacy was assessed by comparing planned and actual treatment zone dimensions on post-treatment MRI and by confirming cell death on histology. Confidence intervals ($p=0.05$) were used to compare differences in treatment zone sizes between control and post-CEUS.

Results: 12/12 treatments were well demarcated and visible on post-treatment CEUS and MRI. No off-target cavitation was noted during treatment and there was no off-target damage on necropsy. One post-CEUS treatment was associated with mild T2 hyperintensity in the abdominal wall adjacent to the treatment zone without an identifiable pathologic correlate. Small portal or hepatic thromboses were observed in 5/6 post-CEUS and 6/6 control treatments. The average difference (95% CI) between planned and actual dimensions of the treatment zone was 8.1mm (5.3,10.8), 6.4mm (1.6,11.2), and 7.7mm (0.9,14.4) for the post-CEUS treatments and 10.1mm (6.0,14.2), 6.0mm (-0.3,12.2), and 8.1mm (6.4,9.9) for control treatments. Complete cellular destruction was achieved within all histotripsy treatment zones.

Conclusion: In this in vivo swine model, hepatic histotripsy after CEUS was safe and effective, provided a 10-minute washout period is included before energy delivery.

Abstract No. 133

Insights from the FDA MAUDE Database on the Adverse Events Related to the Use of Histotripsy Device for Liver Cancer



(Article No. 108147)

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Purpose: Histotripsy is an emerging treatment modality for cancers. Its non-thermal nature has been posited as an advantage for reducing treatment related adverse events, though very few studies document its adverse events. The aim of this study was to further the understanding of these adverse events by utilizing the FDA's Manufacturer and User Facility Device Experience (MAUDE) database.

Materials and Methods: The MAUDE database was searched for device reports by selecting "focused ultrasound system for non-thermal, mechanical tissue ablation" in the product class dropdown. Reports from January 1, 2023, until August 28, 2025, were retrieved. Data on patient age, sex, adverse events and the cancer type were retrieved. Reports were read to extract adverse events.

Results: 22 reports were retrieved and 21 were included in the study after excluding an incomplete report. Patients included 12 females and 9 males with a median age of 69. Cancer types included metastatic colorectal carcinoma (28.6%), metastatic cholangiocarcinoma (23.8%), metastatic neuroendocrine tumor (NET) (14.3%), hepatocellular carcinoma (9.5%), metastatic ovarian cancer of unspecified type (4.8%), metastatic squamous cell carcinoma of the tongue (4.8%), metastatic leiomyosarcoma (4.8%), GIST liver metastasis (4.3%) and a liver cancer of unspecified type (4.8%). A total of 47 adverse events and 3 deaths were reported in 21 patients. Adverse events included acute kidney injury (AKI) (21.3%), gastrointestinal hemorrhage (8.5%), pseudoaneurysm in liver segment (6.4%), ascites (4.3%), hemoptysis (4.3%) and hypotension (4.3%). All three patients with metastatic NET experienced AKI. Abdominal pain due to duodenitis, abdominal wall hematoma, aspiration pneumonia, liver necrosis, acidosis, ARDS, blood in urethral catheter, cardiac arrest, confusion, difficulty ambulating, ecchymoses on the back, esophageal stricture, hypertensive urgency, intraperitoneal bleeding, liver enzyme abnormality, nausea, NSTEMI, second degree burn on the back, decrease in platelet count and vomiting each occurred once. No device malfunction was reported in any report. In two separate reports, the treating physicians attributed the adverse events, hemoptysis and duodenitis, to the hepatic treatment zone boundaries adjacent to lung tissue and duodenum, respectively.

Conclusion: Adverse events associated with histotripsy included both organ-specific and systemic events with AKI being the most prevalent complication. Our study highlights previously under-reported adverse events related to this procedure.

Abstract No. 134

Electromagnetic Navigation with Marker Guidance for Microwave Ablation of CT-Inconspicuous Liver Lesions: Prospective Feasibility and Outcomes Study



(Article No. 108148)

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Purpose: To evaluate the feasibility, safety, and efficacy of percutaneous microwave ablation (MWA) of malignant liver lesions that are invisible or poorly defined on non-contrast CT, using an electromagnetic navigation system with a marker function.

Materials and Methods: In this prospective study (March 2024–March 2025), all patients with hepatic tumors being inconspicuous on non-enhanced CT underwent percutaneous MWA guided by electromagnetic navigation with a marker function in combination with computed tomography. Technical success was confirmed with immediate post-ablation contrast-enhanced CT. Follow-up MRI was performed at 1, 3, and 6 months to assess local tumor control. Outcomes included probe placement accuracy, procedure duration, number of CT scans, and complications per modified CIRSE classification.

Results: Fifteen patients (12 men, mean age 66 years) with 16 lesions (mean diameter 15 mm) were treated. Lesion types included HCC (n=7), colorectal metastases (n=4), ocular melanoma (n=1), neuroendocrine tumor (n=1), intrahepatic cholangiocarcinoma (n=1), and breast cancer metastasis (n=1). Median procedure time was 53 minutes, with a median 1 mm needle placement deviation. No complications occurred. Local control was 94% after a single session and 100% after re-ablation, with no local progression during a median follow-up of 23 months. Three patients (20%) experienced systemic progression; two died (13%), one cancer-related.

Conclusion: Electromagnetic navigation with marker guidance enables highly accurate and safe MWA of CT-inconspicuous hepatic tumors, offering excellent local control and favorable long-term oncologic outcomes.

Abstract No. 135

Hepatic Histotripsy of Central Tumors: Retrospective Analysis of the First 10 Cases for Safety



(Article No. 108149)

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Purpose: Treatment of central hepatic malignancies with thermal ablation modalities can be challenging or contraindicated due to the risk of injuring central bile ducts or hilar vessels. Histotripsy is a nonthermal ablation modality that destroys tumors but spares the biliary and vascular architecture at the treatment site. Animal studies have shown it is safe to target central locations in the liver prompting many providers to offer Histotripsy to patients with central tumors who traditionally would not have been candidates for percutaneous thermal ablation. The purpose of this study is to retrospectively evaluate the treatment safety of Histotripsy used for ablation of centrally located tumors.

Materials and Methods: Patient charts and images were retrospectively reviewed to identify patients who underwent histotripsy treatment of a hepatic tumor within 1 cm of a central bile duct between January 2024 to July 2025. All patients provided preprocedural written informed consent for the procedure and the retrospective review was performed under a waiver of informed consent provided by the institutional review board and was HIPPA compliant. The treatment plan, post procedural imaging, follow up imaging, clinic notes and periprocedural labs were evaluated.

Results: 10 patients with central hepatic lesions treated with Histotripsy (8 male, 2 female; average age 60.7 years). A variety of tumor types were treated; 4 HCC, 4 mCRC, 1 metastatic ocular melanoma, 1 mNET. Average tumor size was 3.8 cm (range 1.8-5.6 cm). 4 of the lesions were treated with one planned treatment volume (PTV), 4 of the lesions were treated with two overlapping PTV's, 1 lesion was treated with 3 overlapping PTV's and 1 lesion was treated with 4 overlapping PTV's. None of the patients had biliary injuries on the post procedural or follow up imaging. Two patients had non occlusive portal venous thrombus on post procedure imaging requiring anticoagulation treatment. One of the patients had a liver transplant prior to acquiring follow up imaging and the second patient had resolution of the thrombus on the follow up scan.

Conclusion: Treatment of central hepatic lesions with histotripsy was generally safe with minimal complications.

Abstract No. 136

Safety and Survival Outcomes of Ablation for the Treatment of Intrahepatic Cholangiocarcinoma: A Large Academic Center's 20-Year Experience



(Article No. 108150)

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Purpose: Intrahepatic cholangiocarcinoma (ICC) is the second most common primary liver cancer, second only to hepatocellular carcinoma. If left untreated, the median survival of ICC from time of diagnosis is grim—reported at just 6.5 months—making effective treatment imperative. The current gold standard for treating early-stage ICC is surgical resection, with consideration for coupled adjuvant chemotherapy. Current practice often limits Interventional Radiology (IR)-facilitated local treatment options, such as ablation, to surgically irresectable cases despite a few prior reports of similar overall survival in comparison to surgery.

Materials and Methods: In this study, we conducted a single-center retrospective analysis from patient cases at a large United States based academic center. To our knowledge, this is the largest reported US-based single-center study analyzing multiple ablation modalities for the treatment of ICC. We included patients who underwent treatment for radiology or pathology confirmed pure ICC with either microwave ablation, cryoablation, radiofrequency ablation, or pulsed field ablation.

Results: We analyzed a total of 64 patients with 103 pure ICC ablations between 2005 and 2025. In aggregate, the 1-year, 3-year, and 5-year overall survival (OS) was 78.4% (95% CIs, 70.5%-87.3%), 51.2% (95% CIs, 41.3%-63.4%), and 43.9% (95% CIs, 33.7%-57.2%), respectively.

Conclusion: Multiple prior studies on curative-intent surgical hepatectomies for ICC treatment report 5-year OS at around 30%. Thus, the 20-year experience of our hospital center suggests that ablation produces similar, if not improved 5-year OS outcomes compared to current surgical outcome reports. Furthermore, preliminary analysis of our data supports prior studies that suggest that ablations have a more favorable complication profile compared to surgery. On an individual level, several patients were longitudinally managed by IR with repeat ablations who well-surpassed the 5-year survival mark. Characterizing these cases may support the expansion of IR's role into a clear clinical guideline pathway for pursuing IR-administered treatment as the longitudinal treatment option or first-line treatment option for a category of ICC cases.

Abstract No. 137

Robotic Assisted Microwave Ablations of Liver Tumors: A Paradigm Shift



(Article No. 108151)

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Purpose: To evaluate safety and accuracy of robotic-assisted microwave ablation (MWA) for primary and secondary liver tumors using the Epione (Quantum Surgical) robotic system.

Materials and Methods: This single-center retrospective study included CT-guided robotic MWA procedures in 78 patients between May 2023 and March 2025. Primary endpoints were safety and accuracy. Safety was assessed by reporting adverse events related to robotic guidance and the ablation procedures. Accuracy was assessed by minor (depth or lateral) and major (antenna reinsertion) adjustments. Secondary endpoints included feasibility, technical success, local tumor progression (LTP), LTP-free survival (LTPFS), and local control (LC).

Results: Robotic placement was feasible in 77 of 78 patients (98.7%). Technical success per-trajectory was 99.4% (156/157). Antenna placement was successful after the first insertion in 96.8% (152/157) of trajectories; 18.5% needed no adjustments. Minor corrections were made in 80.3% (62.4% depth, 17.8% lateral); 3.2% (5/157) required reinsertion. One antenna was started with robotic guidance and ultimately placed manually. Mean pre-adjustment lateral deviation was 5.6 mm (SD 3.9). Adverse events occurred in 14.1% of procedures (11 grade 1, 2 grade 2, 1 grade 3), none related to robotic deviations. At a median of 6.9 month follow-up, LTP occurred in 9.2% (14/152 tumors). One- and two-year per-tumor LTPFS was 87.3% and 84.7%; LC was 100%. LTP decreased from 13.2% in year one to 3.3% in year two of robotic guidance.

Conclusion: Robotic guidance for liver MWA demonstrated a high safety profile and feasibility, excellent technical success, and low placement error with no robot-related complications supporting its safety and accuracy in clinical practice.

Abstract No. 138

Impact of Metabolic Syndrome and HDL on Survival in Hepatocellular Carcinoma Following Thermal Ablation



(Article No. 108152)

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Purpose: To evaluate the impact of metabolic syndrome (MetS) on local progression free survival (PFS), intrahepatic distant PFS, overall PFS, and overall survival (OS) in early-stage hepatocellular carcinoma (HCC) following thermal ablation (TA).

Materials and Methods: This single-center retrospective case control study included HCC patients within Milan criteria, treated

at UCLA Medical Center's transplant center from 2005 to 2022 who underwent TA for curative-intent or bridge to transplantation. Kaplan-Meier analysis was used to estimate survival outcomes and log rank test was used to compare outcomes between those with and without differences between those with and without MetS. Stepwise Cox regression was performed to identify independent predictors of survival, incorporating a range of metabolic, clinical, and tumor-related variables.

Results: Of 126 patients in the final study cohort, 65(52.6%) in the MetS subcohort had significantly reduced intrahepatic distant PFS (hazard ratio [HR] 1.93; 95% CI: 1.18- 3.18; $p = 0.009$) and overall PFS (HR 1.78; 95% CI: 1.15- 2.77; $p = 0.01$). Following adjustment, the association between MetS and intrahepatic distant PFS (HR 1.9; 95% CI: 1.09-3.56; $p=0.03$) remained significant. Stepwise Cox regression consistently identified elevated HDL as a significant predictor in adjusted models associated with improved overall PFS (HR 0.98; 95% CI: 0.96-0.99; $p=0.01$), local PFS (HR:0.97; 95% CI: 0.94-0.99, $p=0.005$), distant intrahepatic PFS (HR 0.96; 95% CI: 0.94-0.99, $p=0.001$), and OS (HR 0.95; 95% CI: 0.91-0.98; $p=0.002$).

Conclusion: MetS was independently associated with higher recurrence of intrahepatic distant HCC lesions, while higher HDL levels consistently predicted improved OS, overall PFS, local PFS, and distant PFS. These findings suggest that pharmacologic modulation of lipids may enhance post-TA outcomes in HCC. Future studies should explore the role of lipid-targeted interventions as adjunctive therapy in the periablation setting.

Scientific Session 15

Men's Health 2

Monday, April 13, 2026

3–4:30 p.m.

Abstract No. 139

Clinical Efficacy of PAE in Men with Radiation Induced Chronic Prostatitis After Definitive Therapy for Localized Prostate Cancer



(Article No. 108154)

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Purpose: Radiation therapy (RT) is a mainstay of definitive therapy for localized prostate cancer (PCa). Chronic genitourinary (GU) toxicity after RT, which manifests as chronic prostatitis/chronic pelvic pain syndrome (CP/CPPS) occurs in up to 33% of men with large-volume glands and high baseline lower urinary tract symptoms (LUTS) representing risk factors. CP/CPPS is a challenging condition, with over 50% of cases medically refractory. Prostate artery embolization (PAE) has shown promising early results in men with CP/CPPS from radiation. In this study, we report on clinical efficacy of PAE in a large cohort of this patient population.

Materials and Methods: Single center, single-operator retrospective review of 68 men with localized PCa who underwent PAE for RT-induced CP/CPPS between 2017-2025. Baseline International Prostate Symptom Score (IPSS)/ quality of life (QoL) score were recorded at baseline, 6 and 12 weeks, 6 months and annually until 5 years post PAE. Baseline prostate volume (PV) and reduction at 6 and 12 weeks was also reported. Clinical success after PAE was defined as IPSS reduction at least 25% from baseline and absolute score ≤ 15 points, and reduction of QoL at least 1 point from baseline and absolute score ≤ 3 . Technical success was defined as at least unilateral embolization to stasis. Adverse events were graded according to standard CTCAE criteria.

Results: Technical success was 93% (n=63) and bilateral embolization was performed in 57% (n=39). Median follow up was 12 weeks. Baseline IPSS/QoL were 22.3/4.8 (range 4-35/2-6) and PV was 58.4 cc (range 12.1-164 cc). Clinical success was 67% (n=35). IPSS/QoL improvement at 6 and 12 weeks, 6 months, and 1, 2, 3, 4 and 5 years was 9.3, 9.2, 11.8, 13.6, 15.5, 17.2, 16.8, 20.7 and 1.9, 2.2, 2.1, 2.9, 3.7, 3.8, 2.8, and 2.7 (p=< .01 for all except QoL at 5 years where p=.09), respectively. PV reduction at 6 and 12 weeks was 36% (n=21) and 32% (n=17) p< 0.002, respectively. One patient had grade 3 adverse event and presented to the emergency room with left lower quadrant pain immediately after PAE of uncertain etiology. Patient was discharged the next day without intervention.

Conclusion: CP/CPPS from RT for localized PCa is a highly morbid condition and over half of cases are refractory to medical therapy. PAE is a novel, efficacious therapy for this condition resulting in improved QoL based on urinary symptoms. Technical aspects of the procedure are more challenging leading to reduced technical success while clinical success is slightly reduced as compared to men with naïve prostates who undergo PAE.

Abstract No. 140

Aspiration and Sclerotherapy as an Alternative to Hydrocelectomy in the Management of Hydroceles: A Retrospective Cohort Study



(Article No. 108155)

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Purpose: Hydrocele is the accumulation of serous fluid within the tunica vaginalis, resulting in a fluid-filled scrotal sac. While hydrocelectomy is the management gold standard, it presents various risks. Sclerotherapy is a less invasive alternative, however, present literature lacks thorough exploration of sclerotherapy as an alternative to hydrocelectomy. The purpose of this study is to evaluate the efficacy and safety of sclerotherapy for hydroceles at a high-volume institution and to identify factors predicting treatment success/complications.

Materials and Methods: This retrospective single-arm cohort study assessed 118 male patients (mean age 63.2 ± 13.9 years) who underwent sclerotherapy for hydrocele at our institution between January 2020 and January 2025. Inclusion criteria were a hydrocele diagnosis and completion of sclerotherapy at our center; exclusion criteria were a prior hydrocelectomy. We analyzed patient demographics, comorbidities, procedural details, and outcomes (recurrence, complications, satisfaction).

Results: The overall recurrence rate after initial sclerotherapy was 38.9% (46/118). Factors associated with recurrence included bilateral hydroceles (OR 3.14, p=0.027), inguinal hernias (OR 2.70, p=0.048), volume of fluid aspirated (OR 1.002 /cc, p=0.026), and post-procedural complications (OR 2.53, p=0.032). Conscious sedation was associated with a lower risk of recurrence than local anesthesia alone (OR 0.41, p=0.045). Notably, sclerosant type (1%, 2%, or 3% STS) and form (foam vs. liquid) were not significantly associated with recurrence. The overall complication rate was 25.4% (30/118)—solely Clavien-Dindo Grade I events. Current smoking was a strong predictor of complications (OR 15.3, p=0.015). The rate of subsequent conversion to hydrocelectomy was 4.2% (5/118).

Conclusion: Sclerotherapy is an effective non-surgical approach to hydrocele management, with its efficacy and safety strongly influenced by patient factors (bilaterality, comorbidities, smoking) and procedural factors (sedation), rather than sclerosant

formulation. These findings may guide patient selection, procedural technique, and counselling to optimize sclerotherapy outcomes and provide valuable nuance to its success as an alternative to hydrocelectomy. Limitations of this study include its retrospective design and single-center origin.

Abstract No. 141

MRI-Guided Cryoablation for Primary and Salvage Prostate Cancer Treatment: Initial Patient Experience



(Article No. 108156)

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Purpose: To evaluate the efficacy of cryoablation for primary and recurrent prostate cancer (PCa), tracking prostate-specific antigen (PSA) levels and morbidities.

Materials and Methods: At the University of Wisconsin–Madison, 42 patients underwent MRI-guided prostate cryoablation between 2022 and 2025 using previously reported techniques. Cryoablation was used as a minimally invasive treatment for both primary and recurrent prostate cancer due to its low risk of morbidity, especially valuable for salvage therapy. Patients with biopsy-proven, focal or nondiffuse multifocal PCa were cryoablation candidates. Demographic, clinical, and procedural data were analyzed. Mean patient age was 72.2±6.4 years; mean BMI was 30.6±6.0, and average smoking pack-years was 3.3±7.5. By race, 38 (90.7%) patients were white, 3 (7.0%) were Black, and 1 (2.3%) was Asian. There were 19 (44.2%) patients with primary PCa and 23 (55.8%) with recurrent PCa. By Gleason score (GS), 1 case was GS6, 34 GS7, 3 GS8, and 3 GS9. Recurrence was monitored via serial PSA measurements and MRI or PET/CT imaging. Post-cryoablation biochemical recurrence (BCR) was determined via Phoenix Criteria: PSA levels rising 2 ng/mL from the post-treatment nadir, as done in other work.

Results: BCR was observed in 7 (16.6%) cases. In the 35 (83.3%) non-BCR cases, post-treatment PSA dropped by a significant ($p < 0.05$) 82% on average, with follow up monitoring showing no significant PSA increases. In the 7 BCR cases, 5 showed recurrence outside of the treatment zone, suggesting microscopic, diffuse disease spread pre-treatment. Of the remaining 2, imaging showed local tumor progression, while 1 showed no evidence of disease on follow up imaging. Long-term complications were assessed. Many patients had baseline erectile dysfunction (ED) and urinary symptoms pre-procedure. Notably, 2 patients experienced improved urinary symptoms post-cryoablation. Five (11.6%) patients reported a decrease in erectile function and five (11.6%) separate patients reported stress incontinence post-procedure.

Conclusion: MRI-guided prostate cryoablation offers safe, targeted, minimally invasive cancer control while sparing healthy structures, making it attractive for recurrent cancers, where treatment options are limited. It is also a great option for patients prioritizing urinary and sexual function or are poor surgical candidates as the outcomes have shown low morbidity with minimal reports of worsened ED and urinary symptoms.

Abstract No. 142

Effectiveness of PAE in Patients with High Baseline Postvoid Residual Volume



(Article No. 108157)

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Purpose: Prostatic artery embolization (PAE) for benign prostatic hyperplasia (BPH) improves lower urinary tract symptoms (LUTS) and obviates the need for surgery in most patients in the short and medium term. However, symptomatic relief and the risk of post-PAE surgery among patients with high baseline postvoid residual (PVR) volumes remain uncertain. We tested whether baseline PVR ≥ 300 mL is associated with higher likelihood of surgery after PAE and compared subjective and objective outcomes.

Materials and Methods: This was a retrospective single-center review of 573 PAE cases (2015–2023), stratified by baseline PVR ≥ 300 vs < 300 mL. Exclusion criteria included prior prostate surgery, repeat PAE, and missing baseline or follow-up data. The primary outcome was need for prostate surgery. Secondary outcomes were subjective (IPSS) and objective (PVR) measures at 3–6 months (FU1) and 12 months (FU2) post-PAE. Fixed-horizon surgery risks and risk ratios (RR) were estimated using propensity weighting for age, prostate volume, and baseline IPSS.

Results: Among patients with PVR ≥ 300 mL ($n=35$) vs < 300 mL ($n=160$), surgery risk overall was 26% vs 10% ($p=0.020$; RR 2.7; 95% CI 1.2–6.1), 15% vs 2% at 24 months ($p < 0.01$; RR 6.2; 95% CI 1.5–26), and 15% vs 6% at 36 months ($p=0.06$; RR 2.5; 95% CI 0.7–7.3). IPSS change was -10.7 vs -10.4 points at FU1 ($p=0.62$); -11.1 vs -10.4 at FU2 ($p=0.19$). Surgery occurrence increased across baseline PVR strata: < 100 mL: 7%, 100–199 mL: 8%, 200–299 mL: 18%, 300–399 mL: 19%, 400–499 mL: 37%, ≥ 500 mL: 31%.

Conclusion: Baseline PVR ≥ 300 mL is associated with a significantly higher surgery risk following PAE, despite good symptom relief.

142.1.

Baseline PVR (mL)	Surgery risk %
< 100	7
100–199	8
200–299	18
300–399	19
400–499	37
≥ 500	31

Abstract No. 143

Embolc Type Comparative Analysis in Prostate Artery Embolization: Efficacy and Safety Outcomes



(Article No. 108158)

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K. Naser-Tavakolian¹; ¹Columbia University, Vascular and Interventional Radiology; ²Columbia University Irving Medical Center

Purpose: To compare efficacy and safety of 100-300 μ m, 300-500 μ m, and nBCA in prostate artery embolization (PAE) for benign prostatic hyperplasia (BPH) and hematuria, assessing clinical success, prostate volume reduction, bilateral embolization, adverse events (AEs), and IPSS reduction.

Materials and Methods: Retrospective analysis of 154 PAE procedures (2018–2025) included 100-300 μ m (n=44), 300-500 μ m (n=90), and nBCA (n=20). Clinical success was defined as IPSS $\leq$ 15 post-procedure, $>50\%$ IPSS reduction, Foley removal, or hematuria cessation. Outcomes were clinical success rate, mean prostate volume reduction, bilateral embolization rate, AE rate, and mean IPSS reduction. Chi-square/Fisher's exact tests compared categorical outcomes; ANOVA with pairwise t-tests assessed continuous outcomes ($p < 0.05$ significant).

Results: Clinical success rates were 81.82% (100-300 μ m), 92.23% (300-500 μ m), and 90.00% (nBCA) ($p=0.16$). Pairwise: 100-300 vs. 300-500 μ m ($p=0.07$), 300-500 μ m vs. nBCA ($p=0.67$), 100-300 μ m vs. nBCA ($p=0.43$). Mean prostate volume reduction was 16.73% (100-300 μ m, n=12), 28.27% (300-500 μ m, n=37), and 25.45% (nBCA, n=8) ($p=0.03$). Pairwise: 100-300 vs. 300-500 μ m ($p=0.02$), 300-500 μ m vs. nBCA ($p=0.61$), 100-300 μ m vs. nBCA ($p=0.25$). Bilateral embolization rates were 81.82% (100-300 μ m), 67.96% (300-500 μ m), and 94.74% (nBCA) ($p=0.02$). Pairwise: 100-300 vs. 300-500 μ m ($p=0.09$), 300-500 μ m vs. nBCA ($p=0.01$), 100-300 μ m vs. nBCA ($p=0.15$). Minor AE rates were 18.18% (100-300 μ m), 11.65% (300-500 μ m, n=86), and 15.00% (nBCA) ($p=0.60$). Pairwise: 100-300 vs. 300-500 μ m ($p=0.31$), 300-500 μ m vs. nBCA ($p=0.71$), 100-300 μ m vs. nBCA ($p=0.73$). Mean IPSS reduction was 14.33 (100-300 μ m, n=18), 15.52 (300-500 μ m, n=44), and 12.50 (nBCA, n=10) points ($p=0.58$). Pairwise: 100-300 vs. 300-500 μ m ($p=0.62$), 300-500 μ m vs. nBCA ($p=0.34$), 100-300 μ m vs. nBCA ($p=0.58$). No major AEs occurred.

Conclusion: The 300-500 μ m embolic type showed superior clinical success (92.23%), prostate volume reduction (28.27%), and IPSS reduction (15.5 points), with the lowest minor AE rate (11.65%). Significant differences in volume reduction (100-300 vs. 300-500 μ m, $p=0.02$) and bilateral embolization (300-500 μ m vs. nBCA, $p=0.01$) suggest 300-500 μ m optimizes efficacy, though nBCA's high bilateral embolization rate merits further study.

Abstract No. 144

Sociodemographic and Clinical Predictors of Utilization of Prostatic Artery Embolization Versus Transurethral Resection of the Prostate

(Article No. 108159)

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Purpose: To evaluate sociodemographic and clinical predictors of receiving prostatic artery embolization (PAE) versus

transurethral resection of the prostate (TURP) among elective hospitalizations in the 2017 National Inpatient Sample (NIS).

Materials and Methods: Using the 2017 NIS we filtered for male elective admissions with benign prostatic hyperplasia or lower urinary tract symptoms. PAE and TURP procedures were identified. A 1:3 age-matched sample was generated, 87 patients underwent PAE and 258 underwent TURP. Covariates included race, household income quartile, insurance status, hospital type, and APDRG surgical risk status. Multivariate logistic regression was used to evaluate predictors of undergoing PAE versus TURP.

Results: High surgical risk status (APDRG >2) was strongly associated with undergoing PAE (OR 4.44, 95% CI 2.35–8.38, $p < .001$). Odds of PAE were lower for Black (OR 0.42, 95% CI 0.13–1.31, $p = .142$) and Hispanic patients (OR 0.46, 95% CI 0.17–1.25, $p = .118$) compared with White patients, though not statistically significant. AAPI patients showed no difference (OR 1.07, 95% CI 0.26–4.39, $p = .924$). Income quartiles 2 (OR 1.15, 95% CI 0.49–2.70, $p = .754$), 3 (OR 1.48, 95% CI 0.62–3.50, $p = .377$), and 4 (OR 1.60, 95% CI 0.69–3.72, $p = .266$) were not significant compared with quartile 1. Insurance type, including Medicare (OR 1.32, 95% CI 0.11–15.66, $p = .827$) and Private (OR 2.20, 95% CI 0.16–29.5, $p = .551$), was also not significant. Compared with urban teaching hospitals, rural hospitals trended toward lower PAE utilization (OR 0.14, 95% CI 0.02–1.03, $p = .066$), while urban non-teaching hospitals had significantly lower odds (OR 0.41, 95% CI 0.19–0.88, $p = .021$).

Conclusion: High surgical risk status was the strongest predictor of undergoing PAE, indicating that poor surgical candidates may be more likely to be referred. Despite the historically higher disease burden among Black patients, the wide confidence interval and low lower bound suggest that Black patients may be under-represented among those receiving PAE and that despite higher comorbidity burden, they are not being referred for PAE as often as their clinical risk might warrant. Further studies with larger datasets are needed to reveal potential significance. Furthermore, patients at urban non-teaching centers were less likely to receive a PAE, which may be attributed to limited availability of interventional radiology services, lower familiarity with the procedure among referrers, or differences in adoption of newer interventions at non-academic centers.

Abstract No. 145

Efficacy of Prostate Artery Embolization in Small-Volume Prostates Compared with Large-Volume Prostates



(Article No. 108160)

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Purpose: To evaluate the safety and efficacy of prostate artery embolization (PAE) in patients with small-volume prostates (< 50 mL) compared to large-volume prostates (≥ 50 mL) for treatment of lower urinary tract symptoms due to benign prostatic hyperplasia.

Materials and Methods: This retrospective study analyzed 179 PAE patients treated between 2016–2025. Patients were stratified by baseline prostate volume: small (< 50 mL, n=30, mean 38.0 mL) and large (≥ 50 mL, n=149, mean 114.1 mL). The International Prostate Symptom Score (IPSS) was assessed at baseline

and 1-3 months post-procedure. Statistical analysis included paired t-tests for within-group comparisons and unpaired t-tests for between-group differences.

Results: Baseline characteristics were similar between groups (mean age 71.9 vs 72.9 years, $p > 0.05$). Both groups demonstrated significant IPSS improvement: small prostates from 20.9 to 15.0 (5.9-point reduction, $p < 0.001$) and large prostates from 21.1 to 10.0 (11.1-point reduction, $p < 0.001$). Large prostates showed significantly greater absolute improvement than small prostates ($p < 0.001$). Technical success was achieved in all small prostate cases. Mean prostate volume reduction was 8.7% in small prostates compared to 26.8% in large prostates at 3 months.

Conclusion: PAE demonstrates significant symptomatic improvement in small-volume prostates with excellent technical success rates. Although absolute IPSS reduction is less pronounced than in larger glands, the clinical benefit remains substantial and statistically significant. These findings support offering PAE to symptomatic patients with small prostates while acknowledging that larger glands may achieve greater symptomatic improvement.

AI Disclosure Statement: During the preparation of this work the authors used Anthropic Claude Opus 4.1 and GPT-OSS-20b to assist in chart review and for manuscript drafting. After using this tool, the author(s) reviewed and edited the work and take(s) full responsibility for the content of the publication.

Abstract No. 146

Prostate Artery Embolization Utilization to Allow for Stereotactic Body Radiation Therapy in Men with Prostate Cancer



(Article No. 108161)

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Purpose: Stereotactic body radiation therapy (SBRT) is a treatment offered to some men with low-grade prostate cancer, but has increased toxicities in patients with larger prostates and/or lower urinary tract symptoms (LUTS). In a subset of SBRT patients, prostate gland volume reduction is traditionally achieved using androgen deprivation therapy (ADT) with the specific purpose of decreasing size of the gland to maximize safety of SBRT. Prostate artery embolization (PAE) is a safe, effective, and well-proven treatment for benign prostatic hyperplasia (BPH) causing moderate to severe lower urinary tract symptoms, particularly in those with large prostates. A retrospective single-institution study was performed to evaluate the utility of PAE to treat symptomatic BPH prior to SBRT for low-grade prostate cancer, to allow for SBRT in patients with large prostate glands who otherwise would have needed ADT for gland volume reduction.

Materials and Methods: PAE was performed approximately 3 months prior to SBRT for low-grade prostate cancer. Patients were seen in IR clinic for initial consultation and post procedure to monitor treatment response. All patients had prostate volume (PV) calculated before PAE and 3 months post PAE (ellipsoid model). Other data collected included pre- and post-PAE international prostate symptom score (IPSS) and quality of life score (QoL). Electronic health record review for timing and tolerability of

SBRT was performed. Paired t-test was used to compare IPSS, QoL, and PV.

Results: From March 2018 through April 2025, 10 patients underwent PAE prior to SBRT and had imaging follow up available. No patients required ADT. Median IPSS, QoL, and PV before PAE was 14.5 (range 13-20), 2 (range 0-4), and 79cc (range 65-165), respectively. Mean improvements in IPSS and QoL at 1 month were 9.9 and 1.9, respectively ($p < 0.001$ for both). Mean prostate volume reduction 3 months post PAE was 30.6cc (33.4%), $p < 0.001$. All patients had successful SBRT (725cGy $\times$ 5 sessions) without complication.

Conclusion: In patients with BPH and low-grade prostate cancer being treated with SBRT, PAE prior to SBRT can obviate the need for ADT and allow for safe cancer treatment. Utilization of PAE in this scenario needs additional study in larger patient populations, but may be another indication for PAE in the future.

Abstract No. 147

Qualitative Grading of Prostatic Artery Visualization on CTA and Association with Clinical Outcomes After Prostatic Artery Embolization



(Article No. 108162)

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Purpose: Accurate assessment of prostatic arteries (PA) is essential prior to prostate artery embolization (PAE). However, measurement of PA caliber on CTA is limited by vessel size and resolution. This study investigated whether a qualitative PA visualization grading system on CTA correlates with clinical outcomes after PAE.

Materials and Methods: A retrospective chart review was conducted on patients who underwent PAE between March 2012 and October 2023 with available pre-procedure CTA and follow-up clinical outcomes. Each PA was scored on a 0-4 scale according to distal extent of visualization: 0 = not seen, 1 = proximal only, 2 = to gland edge, 3 = branching at gland level, 4 = branching within gland. Scores from both sides were summed (0-8) and categorized as poor (0-3), moderate (4-5), or well-visualized (6-8). Prostate volume was calculated by the ellipsoid method. Clinical outcomes included International Prostate Symptom Score (IPSS) at baseline, 3-6 months, and 12 months. Associations between PA score, prostate volume, and symptom improvement were assessed with linear regression, Kruskal-Wallis, and pairwise Wilcoxon tests.

Results: A total of 134 patients were included. Mean prostate volume was 121.0 ± 58.7 cc. Baseline IPSS was 21.3 ± 7.0 . Median PA visualization score was 5 (Q1-3: 4-7); 24 patients (17.9%) had poor, 51 (38.1%) moderate, and 59 (44.0%) well-visualized CTAs. At 3-6 months, higher PA scores were associated with greater IPSS reduction ($p = 0.027$). Pairwise analysis showed significant difference between poor and well groups ($p = 0.018$), but not between poor vs moderate ($p = 0.093$) or moderate vs well ($p = 0.427$). At 12 months, there was a trend toward greater IPSS improvement in the well-visualized group, although the overall difference did not reach significance ($p = 0.077$) and no statistically significant difference was found in pairwise comparisons. Linear regression demonstrated a significant positive

correlation between prostate volume and PA visualization score ($p < 0.001$).

Conclusion: A qualitative grading system for PA visualization on CTA may stratify patients undergoing PAE and correlate with early IPSS improvement. If validated in larger cohorts, this approach could serve as a practical tool for pre-procedure planning and patient selection.

Abstract No. 148

Prostate Artery Embolization in Catheter-Dependent Patients: Efficacy, Safety, and Lessons Learned from a Large-Cohort Single-Center Experience



(Article No. 108163)

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Purpose: Assess the efficacy of prostate artery embolization (PAE) in patients with short and long-term urinary retention with indwelling catheter.

Materials and Methods: The first stage of this institutional review board-approved retrospective cohort study included 59 catheter-dependent patients who underwent PAE between 2015 and 2025 for urinary retention with indwelling catheter. All patients referred to IR with indwelling catheter were included, irrespective of catheter duration or prior non IR therapy.

Preprocedural data included demographics, prostate volume, catheter type/duration, bladder outlet obstruction index (BOOI), and pharmacologic treatment. Procedural parameters (embolization technique, fluoroscopy time, radiation dose) were recorded with technical success (TS) defined as bilateral embolization and clinical success (CS) as a successful voiding trial without catheter (TWOC). Post-procedural data collection included time to successful TWOC, number of TWOC required, medication adjustments, and complications. Regression analysis was used to evaluate predictors (baseline prostate size, catheter duration/type, embolization technique/success) against outcomes: successful TWOC, time interval between PAE and catheter removal, as well as trends in adjunct medication needs.

Results: Fifty-nine catheter-dependent patients (mean age 76.3 ± 8.4 years) were included in the preliminary analysis. Technical success was achieved in 88% (52/59). unsuccessful procedures include only unilateral embolization of 2 patients (3%) and incomplete bilateral embolization in 4 patients (6%). CS achieved in 36 patients (69%), with the majority (54%) succeeding on first TWOC. Time to successful TWOC was 8 (22.2%) < 4 wks, 14 (38.8%) within 4–6 wks, 4 (11.1%) between 6–11 wks, and 10 (27.8%) ≥ 12 wks. TWOC attempts were 28 patients (77.7%) had 1, 5 patients (13.8%) had 2, 1 patient (2.7%) 3, and 2 patients (5.5%) had 4 attempts. Pharmacological therapy was discontinued in 15 patients (25%) following PAE. Mean follow up was 12 months with no relapse. Prostate size, catheter duration, and urodynamic (UDS) findings did not significantly predict outcomes. Ongoing analysis of an expanded cohort (N=90) will evaluate IPSS score trajectories and medication requirements.

Conclusion: PAE demonstrates high clinical success in patients with short and long-term urinary retention with indwelling catheters, irrespective of duration of indwelling catheter.

Scientific Session 16

Pain Management/MSK 2

Monday, April 13, 2026

3–4:30 p.m.

Abstract No. 149

Expanding the Evidence: Genicular Artery Embolization for Mild-to-Moderate Knee Osteoarthritis in a 30-Patient Prospective Cohort: Safety, Efficacy, and Functional Outcomes



(Article No. 108165)

A. Gupta¹, M. Shaw¹; ¹NIMS Medical and Research institute, Jaipur

Purpose: Genicular artery embolization (GAE) has emerged as a novel endovascular therapy that targets synovial hypervascularity and inflammation, thereby disrupting the pain–angiogenesis feedback loop. Early pilot studies demonstrated promising efficacy and safety, yet sample sizes have been small. This study expands the evidence by evaluating GAE in a larger 30-patient cohort with mild-to-moderate knee OA. The primary purpose of this study was to investigate the efficacy and safety of GAE using calibrated microspheres in patients with mild-to-moderate knee OA who were refractory to conservative management. Specifically, we aimed to:

1. Quantify changes in pain intensity (Visual Analog Scale [VAS]).
2. Assess functional improvement using validated PROMs (KOOS, WOMAC) and objective performance tests.
3. Explore the impact of GAE on physical activity levels (IPAQ) and bone mineral parameters (DEXA).
4. Document analgesic/NSAID usage post-treatment.
5. Evaluate the safety profile and spectrum of adverse events.

Materials and Methods: In this prospective single-center study, 30 patients (Kellgren–Lawrence grades 1–3) with VAS >50 mm underwent GAE using 100–300 µm microspheres. Primary endpoint was VAS pain at 6 months. Secondary outcomes included KOOS, WOMAC, IPAQ, physical performance tests, DEXA scans, medication use, and adverse events

Results: Technical success was 93% (28/30). Median VAS decreased from 65 mm to 38 mm at 6 months ($p < 0.001$), with 76% achieving $\geq 50\%$ reduction. KOOS and WOMAC scores improved significantly (both $p < 0.001$). Objective tests showed 35% more chair-stand repetitions and 28% faster stair climb. IPAQ activity improved nonsignificantly; NSAID use decreased by 40%. No significant DEXA changes were observed. Adverse events were minor and transient (10% groin hematoma, 17% skin discoloration, transient post-procedural pain). No severe complications occurred. Importantly, our study highlights the need for systematic patient selection. Patients with severe OA (Kellgren–

Lawrence grade 4), advanced meniscal degeneration, or mechanical malalignment are less likely to benefit, as vascular-driven pain plays a smaller role in advanced disease. Future trials should stratify outcomes by radiographic severity.

Conclusion: GAE provided substantial pain relief, functional improvement, and favorable safety in mild-to-moderate knee OA. It may serve as a minimally invasive option bridging conservative care and arthroplasty. Larger randomized trials are needed to confirm long-term efficacy and optimize patient selection.

Abstract No. 150

To Block or Not to Block: The Value of Pretreatment Block Prior to Cryoneurolysis



(Article No. 108166)

S. Young¹, G. Woodhead¹, J. Hannallah¹, I. Vittoria De Martini¹, A. Abramyan¹, L. Strycken¹, M. Lee¹, S. Singh¹, S. Placek¹, D. Goldberg¹; ¹University of Arizona

Purpose: Cryoneurolysis is an emerging treatment option for patients with poorly controlled pain. As this treatment is emerging, one question that remains in debate is whether or not patients should undergo a diagnostic and therapeutic block prior to cryoneurolysis. While blocks are likely very predictive of the response which could be expected from cryoneurolysis they can also delay time to definitive therapy (cryoneurolysis) of particular concern in this patient population, who often have a limited life expectancy. The goal of this retrospective review is to evaluate if treatment outcomes vary in patients who undergo cryoneurolysis primarily or after a block.

Materials and Methods: Consecutive patients who underwent cryoneurolysis of the impar ganglion, pudendal, splanchnic or celiac nerves were retrospectively reviewed. Visual analog scale (VAS) pain scores were recorded prior to and after the procedure. Numeric improvement (NI) in VAS was calculated by the following formula: (VAS pretreatment) – (VAS post treatment). While percent improvement (PI) was calculated with this formula: (NI VAS)/(VAS post treatment). Demographic variables and adverse events were also recorded.

Results: In total 97 patients were reviewed and 92 of those underwent block and cryoneurolysis, of which 50 (50/92, 54.3%) had a pre-cryoneurolysis block and 42 (42/92, 45.7%) did not. 5 patients underwent a block without cryoneurolysis (5/97, 5.2%), however, only 1 patient (1/97, 1%) did not undergo cryoneurolysis because sufficient pain relief was not achieved. 2 (2/97, 2.1%) were lost to follow up and 2 (2/97, 2.1%) died prior to cryoneurolysis. In the entire cohort the VAS significantly improved when pretreatment (8.5 ± 1.6) scores were compared to 1 week (4.2 ± 2.5), 1 month (4.1 ± 2.8), 3 months (4.9 ± 3.1) and 6 months (6.4 ± 2.6) post treatment scores ($p < 0.05$, for all). Comparison of NI and PI between those who did and did not have a block can be found in table 1, however, there was no significant difference in any of the variables at any of the time points.

Conclusion: If patients are carefully evaluated prior to cryoneurolysis, a block procedure may not be required.

150.1.

Variable	Block	No Block	p value
NI 1 week Post	4.8 ± 2.7	4.1 ± 2.6	0.107
NI 1 month Post	5 ± 2.9	4.2 ± 2.5	0.109
NI 3 months Post	4.9 ± 3.8	3.1 ± 2.5	0.036
NI 6 months Post	3.6 ± 4	1.9 ± 2.8	0.093
PI 1 week Post	56.1% ± 31.6%	46.6% ± 34.2%	0.096
PI 1 month Post	57.2% ± 32.5%	49.9% ± 27.9%	0.168
PI 3 months post	54.1% ± 39.2%	35.3% ± 29.4%	0.042
PI 6 months post	38.4% ± 39.6%	20% ± 37.2%	0.108

NI=numeric improvement in VAS, PI=percentage improvement in VAS

Abstract No. 151**Pudendal Cryoneurolysis: Efficacy and Complications**

(Article No. 108167)

S. Young¹, A. Abramyan¹, I. Vittoria De Martini¹, J. Hannallah¹, G. Woodhead¹, L. Strycken¹, S. Placek¹, S. Singh¹, M. Lee¹, D. Goldberg¹; ¹University of Arizona

Purpose: Pelvic pain is a common complaint in the United States and new treatment methods are needed. One treatment method that has come to the forefront is cryoneurolysis and in the setting of pelvic pain the pudendal nerve is a common target. While reports of pudendal chemical blocks and ablation have been published very little data is available on pudendal cryoneurolysis. This single-center retrospective study evaluates the outcomes of pudendal cryoneurolysis.

Materials and Methods: Consecutive patients who underwent pudendal cryoneurolysis were retrospectively evaluated. Patients pain was evaluated using the visual analog pain scale (VAS), morphine equivalents were evaluated, and eastern cooperative oncology group performance status (ECOG) was recorded. Patients demographic, procedural and complication data was also reviewed.

Results: Of the 27 included patients 18 (18/27, 66.7%) were women and 22 (22/27, 81.5%) had pain secondary to malignancy (table 1). When comparing the pretreatment VAS scores to 1 week post (8.7 ± 1.3 vs 2.9 ± 1.9, $p < 0.001$), 1 month post (8.7 ± 1.3 vs 4.5 ± 2.4, $p < 0.001$), 3 months post (8.7 ± 1.3 vs 2.6 ± 0.9, $p < 0.001$) and 6 months post (8.7 ± 1.3 vs 7.1 ± 3, $p < 0.025$) there was significant improvement at all time points. When comparing opioid analgesic use by morphine equivalents there was significantly less usage when comparing pretreatment to 1 week (40 [range:15-252] vs 30 [range:0-216], $p = 0.0466$) and 1 month (40 [range:15-252] vs 17.5 [range:0-216], $p = 0.008$) post treatment time points. However, there was no significant difference in morphine equivalents between pretreatment and 3 months (40 [range:15-252] vs 40 [range:0-216], $p = 0.459$) and 6 months (40 [range:15-252] vs 85 [range:0-216], $p = 0.61$) post treatment timepoints. Similarly, there was no significant difference in pre-treatment ECOG scores and those at 1 week (2 [range:1-3] vs 2 [range:0-3], $p = 0.617$), 1 month (2 [range:1-3] vs 2 [range:1-3], $p = 0.66$), 3 months (2 [range:1-3] vs 1 [range:1-3], $p = 0.352$) and 6 months (2 [range:1-3] vs 2 [range:1-4], $p = 0.582$) post treatment time points. No significant adverse events occurred.

Conclusion: Pudendal cryoneurolysis appears to be effective at pain alleviation with low morbidity in patients with pelvic pain.

151.1.

Variable	
Age	65.1 ± 21.6
Admission status	
Inpatient	10 (10/27, 37%)
Outpatient	17 (17/27, 63%)
Sex	
Male	9 (9/27, 33.3%)
Female	18 (18/27, 66.7%)
INR	1.2 ± 0.2
Hemoglobin	10.8 ± 3.4
Creatinine	0.9 ± 0.6
Platelets	293.2 ± 138.9
Bilirubin	0.3 ± 0.2
Cause of pain	
Malignant	22 (22/27, 81.5%)
Non-Malignant	5 (5/27, 18.5%)
Pretreatment block	
Yes	18 (18/27, 66.7%)
No	9 (9/27, 33.3%)

Abstract No. 152**Negative Taps: Potential Role for Preoperative Ultrasound-Guided Synovial Biopsy**

(Article No. 108168)

J. Goodwin¹, R. French², J. Martin¹, E. Vinson¹, J. Seidelman¹; ¹Duke University; ²Mayo Clinic Arizona

Purpose: In the preoperative workup for total joint arthroplasty or revision, the presence or absence of joint infection often determines surgical candidacy and approach, typically utilizing a single-stage operation in noninfected cases and a two-stage operation in infected cases. Unfortunately, conventional arthrocentesis is often negative or yields insufficient fluid, precluding accurate determination of infection status preoperatively. The purpose of this study is to assess the utility of preoperative ultrasound-guided synovial/periprosthetic tissue core biopsy (USGSB) as a new adjuvant diagnostic tool for ruling out joint infection in patients with dry/negative arthrocentesis.

Materials and Methods: A total of 31 patients underwent USGSB of the knee, hip, or shoulder by musculoskeletal radiologists. Biopsies were performed in patients with a history of native septic arthritis undergoing workup for primary arthroplasty (n=12), or patients with existing total arthroplasty being evaluated for prosthetic joint infection (n=19), who had a dry/negative tap. Three 18-gauge biopsy cores were obtained using a Bard Marquee coaxial biopsy system and sent for culture, pathology, and sequencing. For those patients who subsequently underwent surgical intervention, biopsy results were compared to intraoperative cultures. Those who did not undergo surgery were followed to assess for any future clinical or laboratory evidence of infection in that joint.

Results: Subsequent surgical intervention was performed in 41.7% of native joints and 47.4% of prosthetic joints. US-guided synovial tissue biopsy demonstrated high specificity (92.9%) and negative predictive value (92.9%) for detection of joint infection. Of those with a negative USGSB, 40.0% of native joints and 55.6% of prosthetic joints were successfully managed non-operatively, with no further evidence of infection. No procedural complications were associated with the intervention.

Conclusion: Ultrasound-guided synovial tissue biopsy has a high specificity and negative predictive value for the diagnosis of native and prosthetic joint infection in patients without sufficient fluid for conventional arthrocentesis. USGSB may therefore serve as a powerful tool to help rule out infection in such patients, potentially simplifying clinical decision making. For those requiring surgical intervention, this additional diagnostic information facilitates surgical planning and has the potential to decrease the need for multistage operations.

Abstract No. 153

Durable Pain Relief with Plantar Fasciitis Embolization: Outcomes from a Multi-institutional Real-World Cohort



(Article No. 108169)

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Purpose: To evaluate the real-world role of plantar fasciitis embolization (PFE) in patients with plantar fasciitis by comparing recurrence rates against matched controls using a large, multi-institutional cohort.

Materials and Methods: We performed a retrospective cohort study utilizing the TriNetX Analytics Network. We examined patients with plantar fasciitis treated with plantar fasciitis embolization (PFE) versus those without PFE via ICD-10 diagnostic coding. Patients with vascular disease, diabetes complications, vascular injury, hemorrhage, pregnancy, coagulation defects, foot fractures, tarsal tunnel syndrome, tendonitis, or Charcot's joint were excluded. Propensity score matching (1:1) adjusting for age, sex, diagnoses, and medications was used to reduce selection bias related to differences in baseline features. Clinical success was determined by recurrence of plantar fasciitis (ICD-10: M72.2) coding following the cohort's index event (plantar fasciitis and PFE).

Results: After matching, 1,133 patients were included in each group. PFE patients experienced significantly lower recurrence risk with 12.0% at 3 months to 17.0% at 18 months compared to

controls ranging from 29.9% at 3 months to 38.6% at 18 months. Hazard ratios favored PFE at every interval (HR range, 0.367-0.395; all 95% CI [0.301-0.468]). Recurrence rates remained after 12 months in the PFE group, whereas controls continued to show progressive recurrence.

Conclusion: In this large, real-world cohort, PFE was associated with a lower rate of recurrent plantar fasciitis compared with matched controls among the various time frames measured. These findings support the need for prospective randomized trials to establish the role of PFE in clinical practice.

AI Disclosure Statement: During the preparation of this work, the author(s) used ChatGPT (GPT-5, OpenAI, 2025) in order to check grammar and spelling. After using this tool, the author(s) reviewed and edited the work and take(s) full responsibility for the content of the abstract.

Abstract No. 154

Radiofrequency Nerve Ablation for Management of Pain in Plantar Fasciitis: A Systematic Review and Meta-Analysis



(Article No. 108170)

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Purpose: Radiofrequency ablation uses heat from a medium-frequency alternating current to destroy tissue, such as a tumor or sensory nerves. The capacity to ablate sensory nerves has unlocked a powerful new paradigm for achieving immediate and sustained pain relief. A notable application of this technique is the management of plantar fasciitis (PF), a degenerative disease and the leading cause of heel pain. This systematic review aims to assess the outcomes of radiofrequency nerve ablation (RFNA) for the management of pain associated with PF. To our knowledge a systematic review of the literature has not been previously completed on this topic.

Materials and Methods: This systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. A systematic search was performed across Medline (via PubMed), Web of Science, and Embase. Following the search, all identified studies were imported into Rayyan for blinded, dual-independent screening and full-text review. Studies were included if they reported pre- and post-procedure pain scores and involved a minimum of 10 adult patients (age > 18). Secondary outcomes of

153.1.

Time Frame	3month			6month			12 month			18 month		
Cohort	Cohort Outcome/ Size	Risk	HR (95% CI)	Cohort Outcome/ Size	Risk	HR (95% CI)	Cohort Outcome/ Size	Risk	HR (95% CI)	Cohort Outcome/ Size	Risk	HR (95% CI)
PFE	136/1,133	0.12	0.367 (0.301, 0.448)	162/1,133	0.143	0.374 (0.312, 0.450)	186/1,133	0.164	0.392 (0.330, 0.465)	193/1,133	0.17	0.395 (0.333, 0.468)
Control	339/1,133	0.299		390/1,133	0.344		425/1,133	0.375		437/1,133	0.386	

interest included the American Orthopaedic Foot and Ankle Society's Ankle-Hindfoot (AOFAS) Score, targeted nerves, and complications. A fixed-effects inverse variance model was used to calculate the pooled mean difference in pre- and 1-month post-procedure pain scores using RStudio. A forest plot was generated for visual representation of the results.

Results: Eight studies (486 patients, 642 feet) met the inclusion criteria. All studies reported pain using Visual Analogue Scale (VAS) scores and showed a statistically significant reduction in pain scores at the initial one-month follow-up (range 1 to 24 months). The pooled meta-analysis demonstrated a mean difference in VAS scores of 6.89 (95% CI: 5.79 to 7.99). Furthermore, all studies reported no statistically significant change in VAS scores between the first post-procedure follow-up and the final follow-up. The medial calcaneal nerve and the first branch of the lateral plantar nerve were the most commonly reported targets of the therapy.

Conclusion: Radiofrequency nerve ablation (RFA) is a safe and effective treatment for chronic plantar fasciitis pain. The lack of a statistical difference in pain scores between the 1-month and final follow-up demonstrates the procedure's enduring effectiveness in managing pain.

Abstract No. 155

Early Outcomes of the Discure System for the Treatment of Lumbar Degenerative Disc Disease: A Prospective Multicenter Feasibility Study



(Article No. 108171)

D. Beall¹, O. Clerk², A. Elghzali³, A. Kaufmann⁴; ¹Clinical Radiology of Oklahoma; ²Beam Radiology; ³Oklahoma State University Center for Health Sciences; ⁴Westlake Dermatology & Cosmetic Surgery

Purpose: Prospective, single-center, open-label, multicenter feasibility trial.

Materials and Methods: Ten patients were enrolled at Beam Radiology Clinic in Calgary, Canada. All underwent implantation of the Discure System under local anesthesia, with treatment initiation prior to discharge. Pain intensity, and disability levels were measured at baseline and during follow-up using the Visual Analog Scale (VAS) for back pain, and the Oswestry Disability Index (ODI). The minimum clinically important difference (MCID) for VAS and for ODI was defined as a $\geq 30\%$ reduction from baseline. All serious adverse events, whether related or unrelated to the device or procedure, were recorded.

Results: Low back pain and disability scores, measured using VAS and ODI respectively, improved across all follow-up periods. Mean single-point VAS decreased from 6.1 cm to 2.6 cm at 1 month ($n=10$; 56.6% reduction, 70% achieving MCID; $p < 0.001$), from 6.2 cm to 2.4 cm at 3 months ($n=5$; 61.3% reduction, 60% achieving MCID), and from 6.0 cm to 2.5 cm at 6 months ($n=2$; 58.3% reduction, 50% achieving MCID). Seven-day diary VAS scores demonstrated similar improvements. Functional outcomes also improved, with mean Oswestry Disability Index (ODI) scores decreasing from 46.5 to 25.9 at 1 month ($n=10$, 44.4% improvement, 70% achieving MCID; $p < 0.001$), from 42.6 to 20.5 at 3 months ($n=5$, 52% improvement, 80% achieving MCID), and from

34.5 to 28.1 at 6 months ($n=2$, 18.6% improvement). No device- or procedure-related serious adverse events were observed.

Conclusion: Over a one- to six-month period, implantation of the Discure System and induction of negative charge to the nucleus pulposus resulted in clinically meaningful and durable improvements in pain and function, with a favorable safety profile, in patients with low back pain associated with early to moderate degenerative disc disease.

Abstract No. 156

Nucleus Pulposus Supplementation for Intervertebral Disc Degeneration: Evaluation of Pain and Functional Outcomes from Two Clinical Studies



(Article No. 108172)

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Purpose: Intervertebral disc (IVDs) consists of the annulus fibrosus (AF), nucleus pulposus (NP), and a cartilaginous endplates. Degeneration of the IVD is characterized by a loss of hydration of the NP, a depletion of proteoglycans, and a decrease in disc height that can often lead to pain. Disc degeneration is often associated with chronic lower back pain (cLBP) and patients experiencing chronic lumbar discogenic pain currently have limited non-surgical treatment options. Herein, we present safety data as well as pain and functional outcomes from two multicenter, prospective clinical studies following intradiscal supplementation of nucleus pulposus allograft for patients with symptomatic discogenic low back pain.

Materials and Methods: Two prospective, multicenter, single-arm pilot studies were conducted across 11 participating institutions in the United States. Both studies had the same inclusion criteria with the following exceptions One study included subjects ≥ 65 years (up to three treated levels), the other ≥ 18 years (up to two levels). Subjects were given a single treatment of a human nucleus pulposus tissue allograft (VIA Disc NP, Vivex Biologics, Miami FL, USA) at up to three levels in the lumbar spine. For both studies, subject reported outcomes including pain via the numeric rating scale (NRS) and function via the Oswestry Disability Index (ODI) were collected at specified timepoints through 6 months. Safety was assessed by collection of all adverse events.

Results: A total of 49 subjects were enrolled across both studies ($n = 28$ male, $n = 21$ female). 16 subjects (33%) received NP allograft at one-level, 27 subjects (55%) received NP two-levels, and 6 subjects (12%) were treated at 3 levels. Mean pain at baseline was 6.89 ± 1.46 and mean ODI was 49.74 ± 15.12 . At 1-month, significant improvement in subject reported pain ($NRS = 3.61 \pm 2.62$, $p < 0.001$) and function ($ODI = 28.56 \pm 18.28$, $p < 0.001$) was observed. These improvements continued throughout follow-up. Of 24 reported adverse events, 4 (16.7%) were reported to be possibly related to NP allograft, and all were classified as mild.

Conclusion: Data from these clinical studies provide additional evidence that nucleus pulposus supplementation with NP allograft is safe and is associated with clinically significant functional improvement and pain palliation. Minimally invasive delivery of

NP allograft may be able to bridge the current treatment gap for patients experiencing chronic lumbar discogenic pain. Larger, randomized, controlled trials are ongoing to further establish the safety and clinical efficacy of NP allograft.

Abstract No. 157

Adverse Events and Device Failure Modes in Basivertebral Nerve Ablation Devices: A MAUDE Database Study



(Article No. 108173)

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Purpose: Basivertebral nerve ablation (BVNA) has emerged as a minimally invasive treatment for vertebrogenic low back pain, with commercially available systems including OptaBlate (Stryker) and Intracept (Boston Scientific). To better characterize the safety profile of these devices, this study aimed to analyze adverse event reports from the FDA Manufacturer and User Facility Device Experience (MAUDE) database.

Materials and Methods: The MAUDE database was queried for reports from August 2015 through August 2025 using the brand names “OptaBlate” and “Intracept.” Reports were screened to exclude duplicates and incomplete entries. Patient-related complications and device-related malfunctions were extracted, categorized, and summarized as frequencies.

Results: A total of 110 reports were identified, of which 104 involved Intracept and 6 involved OptaBlate. Across these, 160 patient adverse events and 54 device malfunctions were reported. The most common patient complications included retained foreign body (15.0%), vertebral fracture (13.1%), other bone fracture (13.1%), and spinal column injury (12.5%). Three patient deaths (2.7%) were also reported. Less frequent events included pain (5.6%), hemorrhage (3.1%), hematoma (3.1%), hypoxia (2.5%), hypotension (4.4%), aspiration (1.3%), bradycardia (1.3%), paralysis (1.9%), and muscle weakness (1.9%). The most common device failures were material fragmentation (29.6%), material integrity problems (11.1%), difficulty removing the device (7.4%), and device fracture (5.6%). Other reported malfunctions included dislodgment, entrapment, physical resistance, deformation, unexpected shutdown (3.7%), and failure to deliver energy.

Conclusion: Analysis of MAUDE reports indicates that BVNA devices are associated with a range of patient complications and device failures. The most common adverse events including vertebral or bony injury and retained foreign body were localized to the treatment site, highlighting the potential risks of ablating within spinal structures. Device fragmentation, integrity failures, and removal difficulties represented the leading technical problems. These findings highlight the need for continued postmarket surveillance, operator vigilance, and potential device refinements to further enhance procedural safety.

Abstract No. 158

Long-Term Outcomes of CT-Guided Percutaneous Cryoablation of Osteoid Osteomas



(Article No. 108174)

E. Garza-Frias¹, D. Abdollahian², J. Labis¹, R. Galuppo Monticelli³; ¹Houston Methodist Hospital; ²Houston Radiology Associated; ³Houston Methodist, Houston Radiology Associated

Purpose: The purpose of this study is to evaluate the safety, technical success, and clinical efficacy of percutaneous cryoablation for the treatment of osteoid osteoma. In addition, we aim to retrospectively assess the diagnostic yield of pre-ablation nidus core biopsy and to characterize patterns of pain recurrence during long-term follow-up.

Materials and Methods: This retrospective study was performed by using a radiology report search engine (mPower Nuance, Microsoft, USA) to query all radiology reports about cryoablation of suspected osteoid osteomas in our institution. A physician then manually reviewed all reports to include those patients in an institutional database. Then, electronic medical records and radiology reports were used to collect patient demographics, lesion characteristics, biopsy results, procedural information, and follow-up data. Technical success was defined as complete probe coverage of the nidus by ice ball margin, confirmed by a CT imaging after the last thaw. Recurrence was recorded as a routine use of NSAIDs for local pain after ablation at any follow-up visit.

Results: A total of 30 consecutive patients (mean age: 25.8 years; range: 12-68; F:M ratio 5:25) underwent CT-guided cryoablation for imaging suspected osteoid osteoma between 2015 and 2024. The most common bone treated was the femur (n=14), followed by the tibia (n=5), and the ulna (n=3) and fibula (n=3). The mean nidus size was 7.4 mm (range 3 mm-12 mm). Most of the procedures had two freeze-thaw cycles (87%), three patients underwent 3 cycles, and only one patient underwent 1 cycle. Technical success was achieved in 100% of procedures. Only 4 (13%) patients required post-ablation pain management with NSAIDs before being discharged home on the same day. A total of 29 patients underwent core-biopsy of the nidus before the ablation, 63% (n=19) had a confirmed osteoid osteoma diagnosis, 30% (n=9) had reactive or cortical sclerosis without definite diagnosis, and one case was diagnosed as cortical chondroma. At a mean follow-up time of 40.6 months (range 5-91), the permanent symptomatic resolution of the symptoms after one ablation session was 93% (n=28). Recurrence was reported in 7% (n=2) of the cases; one required a second cryoablation session, and the other surgery. Pain was completely resolved in both patients after the second procedure. No complications were observed at immediate or long-term follow-up.

Conclusion: Percutaneous cryoablation is a safe and effective minimally invasive treatment for osteoid osteoma, demonstrating high rates of technical success, durable pain relief, and low recurrence rates.

Scientific Session 17

Peripheral Arterial Disease 1

Monday, April 13, 2026
3–4:30 p.m.

Abstract No. 159

Adverse Event Patterns by Stent Type and Anatomic Location in Superficial Femoral and Popliteal Artery Stenting: Insights from the FDA MAUDE Database



(Article No. 108176)

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Purpose: Stent outcomes in the superficial femoral and popliteal arteries are shaped by both device characteristics and biomechanical forces associated with vessel anatomic differences. Drug-eluting stents (DES) may reduce neointimal hyperplasia, but adverse event patterns may differ when considering non-drug-eluting stents (BMS) and anatomic location. This study compared event profiles for DES vs. BMS in the SFA and across supra-popliteal, popliteal, and infrapopliteal sites using the FDA MAUDE database.

Materials and Methods: Adverse event reports were extracted and categorized by stent type and location. Frequencies of variables associated with patient demographics, treatment factors, complications, and device issues were compared between groups.

Results: In the stent-type analysis (n=3,903), 2,805 (71.9%) were BMS and 1,098 (28.1%) DES. Demographics were similar. DES were more frequently reported with combination product use (98.5% vs. 24.2%, $p < 0.0001$). DES had higher reported rates of restenosis (40.3% vs. 30.9%, $p < 0.0001$), vascular occlusion (47.4% vs. 33.7%, $p < 0.0001$), dissection (4.7% vs. 2.4%, $p = 0.0043$), and immune reactions (2.0% vs. 0.3%, $p < 0.0001$). Bleeding was less common (1.8% vs. 4.3%, $p = 0.0043$). BMS more often showed structural/mechanical (28.1% vs. 18.7%, $p < 0.0001$), positioning/placement (15.2% vs. 6.8%, $p < 0.0001$), and flow obstruction issues (12.8% vs. 0.2%, $p < 0.0001$). In the anatomic analysis (n=4,315), restenosis and occlusion were highest infrapopliteally (56.5% and 53.5%) compared with suprapopliteal (36.0%, 35.3%) and popliteal (47.4%, 47.7%; $p < 0.0001$). Mechanical problems were most common suprapopliteally (27.4% vs. 15.5% popliteal, 9.0% infrapopliteal; $p < 0.0001$). Asymptomatic reports were more frequent suprapopliteally (25.8% vs. 12.4% popliteal, 6.0% infrapopliteal; $p < 0.0001$).

Conclusion: MAUDE data show DES adverse events associated with more biologic complications but fewer structural issues compared with BMS adverse events. By location, infrapopliteal stents carried the highest restenosis/occlusion risk, while suprapopliteal stents were more prone to mechanical problems, as predicted by findings from existing literature. Understanding the likely nature of adverse event when one occurs with a given stent

type and anatomical location may better help characterize risk profile for use of different stent types in specific anatomy.

Abstract No. 160

Resource Utilization Differences Between Aspiration Thrombectomy and Open Embolectomy in Lower Extremity Acute Limb Ischemia (LE-ALI): A U.S. Nationwide Cohort Study



(Article No. 108177)

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Purpose: To compare resource use among patients with LE-ALI managed with aspiration thrombectomy, using computer-assisted vacuum thrombectomy (CAVT), or open embolectomy (OE) in the United States

Materials and Methods: This nationwide study used the Premier Healthcare Database to identify adult (≥ 40 years) inpatients with a principal or secondary diagnosis of LE-ALI discharged between January 1, 2021, and June 30, 2024. ICD-10 procedure codes identified therapy groups. Patients undergoing both CAVT and OE were excluded. Outcomes included length of stay (LOS), post-procedure LOS (PLOS), intensive care unit stay (ICU), post-procedure ICU (PPICU), post-procedure step-down unit use, in-hospital mortality, discharge status, and 30-day all cause and ALI related readmissions. Multivariable regression models adjusted for patient/hospital factors and reported odds ratios (OR) and LOS ratios (LOSR) with 95% confidence intervals (CIs).

Results: A total of 9,243 patients were identified. Of these, 1,332 were managed with CAVT and 7,911 with OE. After adjustment, CAVT was associated with a 35% reduction in mean LOS (2.33 days shorter) (LOSR 0.65, 95% CI 0.62-0.68; $p < 0.001$) and a 41% reduction in mean PPLOS (2.27 days shorter) (LOSR 0.59, 95% CI 0.56-0.62; $p < 0.001$). While there was no difference in overall ICU admissions between groups, when admitted, CAVT patients had shorter mean ICU stays by 0.66 days (LOSR 0.77, 95% CI 0.71-0.84; $p < 0.001$). Conversely, CAVT had 27% lower odds of PPICU admissions (OR 0.73, 95% CI 0.63-0.85; $p < 0.001$) and shortened mean PPICU duration by 0.79 days (LOSR 0.71, 95% CI 0.64-0.80; $p < 0.001$). Overall, accounting for ICU admission probability, CAVT saved 0.35 ICU days per patient ($p < 0.0001$). Also, CAVT patients had 50% lower odds of step-down unit use (OR 0.50, 95% CI 0.43-0.58; $p < 0.001$). In-hospital mortality did not differ during index admission, however, within the 30-day follow-up period, CAVT patients were 39% less likely to experience death (OR 0.61, 95% CI 0.38-0.99, $p = 0.047$). CAVT patients had 28% lower odds of 30-day all cause readmissions (OR 0.72, 95% CI 0.60-0.87, $p < 0.001$), and 41% lower 30-day ALI related readmissions (OR 0.59, 95% CI 0.47-0.74, $p < 0.001$).

0.001) compared to OE. After discharge, CAVT patients had over three times the odds of being discharged to home (OR 3.09, 95% CI 2.67-3.58, $p < 0.001$).

Conclusion: Compared to OE, CAVT is associated with a significant reduction of hospital resources including shorter hospital/ICU stays, lower need for post-procedure-ICU and step-down care, fewer readmissions, and more discharges to home, while potentially improving 30-day survival.

Abstract No. 161

Aspiration Thrombectomy Versus Pharmacologic Thrombolysis for Acute Limb Ischemia: A Single-Center Retrospective Review



(Article No. 108178)

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Purpose: This single-center, retrospective study aimed to evaluate and compare outcomes of aspiration thrombectomy and pharmacologic thrombolysis in patients with acute limb ischemia (ALI).

Materials and Methods: A total of 303 patient records who presented with ALI from 2016 to 2024 were reviewed. Those who were treated with aspiration thrombectomy ($n = 58$) or pharmacologic thrombolysis ($n = 65$) were included. Those treated with multiple primary interventions or other forms of mechanical thrombectomy were excluded. Primary endpoints include technical success, procedural success, primary patency and amputation free survival. Secondary endpoints include in-hospital complications, major amputation and mortality.

Results: Notable differences in demographic variables between aspiration thrombectomy and pharmacologic thrombolysis include age (71.83 ± 15.5 vs 66.4 ± 13.4 , $p = 0.04$), male sex (47% vs 69%, $p = 0.01$), diabetes (60% vs 40%, $p = 0.02$), pre-existing peripheral arterial disease (47% vs 77%, $p = < 0.001$), prior cerebrovascular accident (24% vs 8%, $p = < 0.001$), and smoking history (49% vs 74%, $p = 0.01$). A greater proportion of those treated with aspiration thrombectomy presented with ALI of embolic or native vessel etiology (92% vs 38%, $p = < 0.001$) while a greater proportion of those treated with pharmacologic thrombolysis presented with stent or graft occlusion (8% vs 62%, $p = < 0.001$). The rates of technical success (97% vs 91%, $p = 0.19$) and procedural success (78% vs 78%, $p = 0.92$) did not significantly vary between cohorts. Furthermore, 12-month primary patency (77% vs 70%, $p = 0.46$) and amputation free survival (94% vs 93%, $p = 0.71$) did not vary significantly between cohorts. Complication rates were low overall with notable differences between cohorts being the occurrence of distal embolization

(0% vs 5%, $p = 0.06$), recurrent thrombus (5% vs 0%, $p = 0.02$), and reperfusion injury (0% vs 5%, $p = 0.06$). In-hospital amputation rates were similar (5% vs 6%, $p = 1$) as was in-hospital mortality of any cause (7% vs 2%, $p = 0.19$).

Conclusion: Within this cohort, aspiration thrombectomy and pharmacologic thrombolysis obtained similar technical and procedural success and maintained similar 12-month primary patency and amputation free survival rates. Given the greater medical utilization associated with pharmacologic thrombolysis, these findings favor use of aspiration thrombectomy. However, further research is needed to determine if confounding variables such as the suspected etiology of ALI may bias findings given the significant baseline variation between cohorts.

Abstract No. 162

Does DCB Work After IVL on Calcified Lesions? A Retrospective Study



(Article No. 108179)

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Purpose: Intravascular lithotripsy (IVL) has shown promise in treating heavily calcified peripheral arterial lesions that are often resistant to conventional therapies. IVL is commonly used to prepare vessels for downstream treatments such as drug-coated balloon (DCB) angioplasty or stenting. However, the additive benefit of DCB following IVL remains unclear, especially given uncertainty over whether antiproliferative drugs can effectively diffuse through calcified plaque. In this study, we aimed to evaluate whether DCB therapy offers any advantage when used after IVL.

Materials and Methods: We conducted a retrospective cohort study of patients with peripheral arterial disease (PAD) undergoing femoropopliteal interventions using IVL followed by either DCB angioplasty (DCB group) or IVL with or without plain balloon angioplasty (control group). All patients had moderate-to-severe calcified lesions and at least one year of follow-up. Primary outcomes were freedom from restenosis at 1 year, need for reintervention, and change in ankle-brachial index (ABI). Secondary outcomes included overall survival, functional status, ambulation status, and freedom from major amputation. Demographics, comorbidities, and procedural details were collected and used for regression analysis.

Results: A total of 31 patients met inclusion criteria: 19 in the IVL+DCB group and 12 in the control group. At one year, there was no statistically significant difference in restenosis rates between the groups (36% for control and 26% for DCB) ($p = 0.690$). Similarly, no significant difference was observed in ABI improvement ($p = 0.805$). The relative risk of amputation at 18 months was 0.58 (DCB vs. control; $p = 0.387$), indicating a nonsignificant trend toward lower risk in the DCB group.

Conclusion: In this retrospective analysis, no significant differences in treatment outcomes were observed at one year between patients treated with IVL+DCB versus IVL with or without POBA. These findings suggest limited short-term benefit of DCB in heavily calcified femoropopliteal lesions following IVL. It remains possible that severe arterial calcification impairs drug uptake and reduces the efficacy of DCBs in this setting. Larger studies with longer-term follow-up are needed.

162.1.				
Factor	Overall	POBA (ctrl)	DCB (exp)	p-value
N	31	12	19	
CURRENT LIVING STATUS				0.390
Home	17	8	9	
Nursing home	2	0	2	
Dead	12	4	8	
Mortality status				0.720
Alive	19	8	11	
Dead	12	4	8	
FREEDOM FROM AMPUTATION AT 18 MONTHS				0.430
No	10	5	5	
Yes	20	6	14	
CURRENT PATENCY				0.690
Patent	21	7	14	
Occluded	9	4	5	

Abstract No. 163

Comparison of Superwoven and Helical Nitinol Stents for the Femoropopliteal Artery



(Article No. 108180)

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Purpose: Certain regions of the femoropopliteal artery, such as the proximal popliteal artery, subject stents to greater torsion, bending and axial/radial compression. These mechanical forces can lead to higher rates of restenosis and strut fractures. To address this, novel stent designs have been developed to withstand these forces. The purpose of this study is to compare the outcomes of superwoven nitinol stents and 3D helical stents in the femoropopliteal artery.

Materials and Methods: A retrospective review was performed of all patients at a single university hospital undergoing femoropopliteal stenting by interventional radiology in whom either (1) Supera (Abbott Vascular, Santa Clara, CA) superwoven nitinol stent(s) or (2) Biomimics (Veryan Medical, Galway, Ireland) 3D helical stent(s) were placed. Primary, assisted primary, and secondary patency was compared between the two groups, as well as amputation-free survival at 1 and 2 years.

Results: Patient demographics did not differ significantly between the two groups (Superwoven: n=72 stents): 72 years of age, 51% male; 3D Helical (n=45 stents): 73 years of age, 54% male). The proportion of patients with chronic limb-threatening ischemia (CLTI) was also not significantly different (superwoven: 93%; 3D Helical 81%). However, lesions stented with the 3D helical stent were significantly longer than those with the superwoven stent (121 ± 18 mm vs 56 ± 10 mm, $p < 0.001$). Median primary unassisted patency for superwoven stents (62% in popliteal artery) at 6-months, 1- and 2-years was not significantly different from 3D helical stents (69% in popliteal artery): $65 \pm 13\%$, $58 \pm 14\%$, and $50 \pm 15\%$ vs. $83 \pm 14\%$, $63 \pm 19\%$, and $54 \pm 20\%$, respectively ($p = 0.1$, log-rank test). Similarly, median primary assisted patency was not significantly different between Supera stents ($60 \pm 14\%$ at

1-year) and 3D helical stents ($77 \pm 18\%$ at 1-year, $p = 0.1$). In contrast, secondary patency of 3D helical stents ($100 \pm 0\%$ at one year) was significantly higher than that of superwoven stents ($69 \pm 14\%$ at 1-year, $p = 0.005$). Among CLTI patients (89% of the total cohort), amputation-free survival was $81 \pm 12\%$ and $77 \pm 13\%$ at 1- and 2-years for superwoven stents, compared to $95 \pm 9\%$ and $95 \pm 9\%$ at 1 and 2 years for 3D helical stents ($p = 0.3$). Strut fractures were observed in 2% of patients with superwoven stents compared to 4% of patients with 3D helical stents.

Conclusion: Patency and limb salvage rates were similar between superwoven and 3D helical stents, with no significant difference in the incidence of strut fractures or limb salvage.

Abstract No. 164

■ FEATURED ABSTRACT

Treatment of Calcified PAD with Shockwave Peripheral Intravascular Lithotripsy System: One Year Outcomes from the DISRUPT BTK II and FORWARD PAD IDE/Mini-S Study



(Article No. 108181)

C. Pena¹; ¹Miami Cardiac & Vascular Institute

Purpose: Both balloon-based and non-balloon-based intravascular lithotripsy (IVL) have demonstrated favorable acute results when moderate to severe calcium is present in peripheral lesions, with high rates of procedural success and low angiographic complications. The one-year outcomes from the Disrupt BTK II study (balloon-based IVL) and the FORWARD IDE/Mini-S Feasibility trials (non-balloon-based IVL catheter) are reported here.

Materials and Methods: The Disrupt BTK II study enrolled 250 subjects; 200 patients had chronic limb-threatening ischemia (CLTI, Rutherford Category (RC) 4 or 5). The FORWARD PAD IDE/Feasibility trial enrolled 110 patients (RC 3-5). Twelve-month endpoints for Disrupt BTK II included Kaplan-Meier (KM) estimates of freedom from (FF) clinically driven target lesion revascularization (CD-TLR), FF major target limb amputation, primary patency, and change in Rutherford Category. Twelve-month endpoints for the FORWARD PAD IDE/Feasibility studies included major adverse events (MAE), target limb major amputation, and patency, in both above-the-knee (ATK) and below-the-knee (BTK) vessels.

Results: Through 12 months of Disrupt BTK II, there were 30 deaths, 18 withdrawals from the study, and 2 subjects were lost to follow up. At 12 months, there was a 67.1% rate of primary patency with a KM FF CD-TLR of 84.5% and KM FF major amputation of 94.8%. There were no amputations in the RC 3 patients. At baseline, 20%, 23%, and 57% of limbs were classified as RC 3, 4, and 5, respectively. At 12 months, RC was substantially improved as 48% were asymptomatic (RC 0) and 15% reported only mild claudication (RC 1). In the FORWARD PAD IDE/Feasibility at 12-months, there were 10 deaths, 4 withdrawals from the study, and 3 patients were lost to follow up. The 12-month overall rate of MAE was 18.6%

(19/102) with 3.9% (4/102) of subjects experiencing cardiovascular death, 1.0% (1/102) with major amputation, and 14.7% (15/102) having CD-TLR. Primary, primary-assisted, and secondary patency in ATK lesions were 72.7%, 74.5%, and 76.4%, respectively. Primary, primary-assisted, and secondary patency in the BTK lesions were 61.5%, 78.4%, and 88.6%, respectively.

Conclusion: IVL demonstrated continued efficacy in both balloon-based and non-balloon-based IVL with low rates of cardiovascular death and major amputation. IVL continues to offer promising mid-term results in challenging patients with moderate to severe calcium, including CLTI. Continued assessment of when to utilize a balloon-based IVL versus a non-balloon-based IVL catheter is ongoing.

Abstract No. 166

■ FEATURED ABSTRACT Quality of Life in Patients After Percutaneous Transmural Arterial Bypass: Complex Femoropopliteal Disease: Clinical Impact of Femoropopliteal Revascularization in the DETOUR-2 Study



(Article No. 108182)

S. Dhand², A. Sood¹; ¹Endologix; ²Harbor UCLA Medical Center

Purpose: Percutaneous transmural arterial bypass (PTAB) with the DETOUR System is a novel endovascular procedure to treat complex femoropopliteal disease including long lesions, heavy calcification, and CTOs. The DETOUR System uses standard endovascular techniques with a unique crossing device and stent graft to create a percutaneous femoropopliteal bypass. Prespecified secondary objectives included health-related quality of life (HRQoL) outcomes.

Materials and Methods: The DETOUR-2 IDE study is a prospective, single-arm, multicenter center trial across 36 sites for lesions >20 cm long in the femoropopliteal segment with Rutherford Stage 3-5 disease. Follow-up visits were conducted at 30 days, 6 months, and annually through 3 years. HRQoL was assessed at 1 month and 12 months using Vascular Quality-of-Life (VascuQoL), European Quality-of-Life-5D (EQ-5D), the Short Form-12 (SF-12) and a 6 Minute Walk Test. The 6 Minute Walk Test is summarized by a sub cohort as only select clinical sites perform this routinely.

Results: 202 patients were enrolled and treated with the DETOUR System; 96% had CTO. Mean lesion length was 327 ± 61 mm. Primary clinical success rate at 3 years was 96.7%. The rate of FF CD-TLR through 3 years for DETOUR patients was 66.8%. HRQoL results will be outlined in the future.

Conclusion: The 36-month outcomes from the DETOUR 2 demonstrate clinical utility and safety of this novel therapeutic

strategy in complex femoropopliteal lesions. These long-term results suggest that PTAB with the DETOUR System achieves similar results to open surgical prosthetic femoropopliteal bypass. In addition, HRQoL outcomes demonstrated clinically meaningful improvements.

Abstract No. 167

Non-Posterior Tibial Artery Deep Vein Arterialization: The Lesser Known Path



(Article No. 108183)

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Purpose: Percutaneous deep vein arterialization (pDVA) is an innovative alternative for no-option/poor-option critical limb-threatening ischemia (CLTI) patients, offering a strategy to prevent major amputations. The majority of pDVAs are created using the posterior tibial artery (PTA) and vein due to easier anatomy. In the absence of a PTA or other obstructing factors, alternative targets may exist for pDVA, but this approach is only minimally described in the literature.

Materials and Methods: Retrospective review was performed across 5 institutions that perform a high volume of pDVA cases, yielding 34 cases of pDVA where the PTA was not used. Data points included donor artery, reason for PTA pDVA ineligibility, crossover and scaffold type, wound healing/location, and limb salvage outcomes.

Results: Of the 34 cases, the donor arteries were anterior tibial artery (16/34), peroneal artery (10/34), and the tibioperoneal trunk (8/34). Technical success was achieved in 97% (33/34) of cases, with 1 failure due to lack of attaining venous pedal outflow. Crossover devices were Outback (15/34), LimFlow System (8/34), Beback (6/34), Pioneer (3/34), and Gunsight (2/34) approaches. Outflow scaffolds were used in 30/34 cases: Viabahn (22/30) and LimFlow (8/30) graft; and at the fistula in 33/34 cases using Viabahn (16/34), Xience (9/34), and LimFlow (8/34) stents. The most frequent non-PTA pDVA creation causes were PTA providing sole arterial pedal perfusion (9/34), inability to cross into the PTA (7/34), and the anterior tibial artery providing sole arterial pedal perfusion (4/34). Wound location prior to pDVA was in the forefoot (31/34) and heel (3/34). Complete wound healing was observed in 18/34 patients, with on-going/active wound healing occurring in 3/34 additional patients. Patency of the pDVA fistula ranged from 0 months to 57 months, with a median time of 3 months and reinterventions performed in 3/34 patients. Major amputations occurred in 7/34 patients, with 5 below-the-knee and 2 above-the-knee amputations. Minor amputations were performed in 15 patients, comprising 12 TMA and 3 toe amputations. Limb salvage was observed in 79.41% (27/34) of patients with a non-PTA pDVA.

Conclusion: pDVA creation has developed as an approach to offer limb preservation for no-option/poor-option CLTI patients, with acceptable and sustained amputation-free survival. Though the posterior tibial artery is the most common target for pDVA creation, alternative arteries can provide suitable revascularization targets with similar rates of limb salvage and should be considered.

Abstract No. 168

Long-Term Outcomes in Subintimal Arterial Flossing with Antegrade-Retrograde Intervention (SAFARI)



(Article No. 108184)

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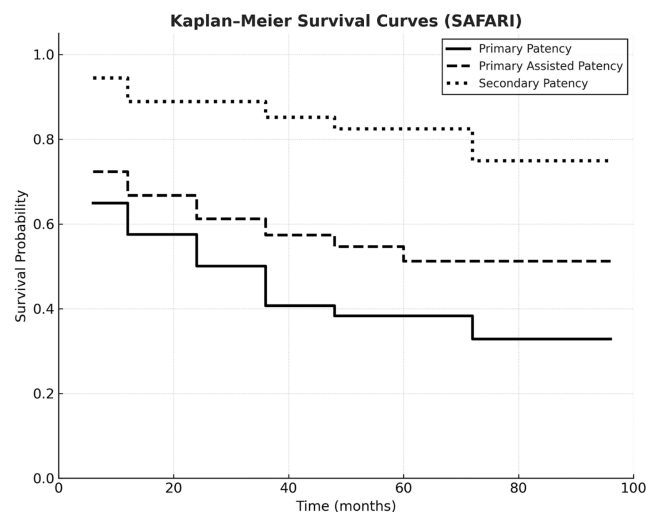
Purpose: To our knowledge, this is the first study to evaluate patency and clinical outcomes beyond 3 years for SAFARI recanalization.

Materials and Methods: A single-center retrospective chart review of all SAFARI cases from 2012-2022 were reviewed. Patency was confirmed utilizing a combination of ultrasound duplex, CT, and angiographic findings. Longitudinal outcomes were quantified with Kaplan-Meier analysis. Patients who did not have follow up ≥ 3 years were excluded.

Results: A total of 55 limbs in 45 patients were included in our analysis (69% men; median age 65). Comorbidities included HTN 98%, DM 84%, HLD 60%, smoking history 71%, CAD 67%, and CKD/ESRD 58%. Rutherford Classification (RC) distribution: 7% RC-3, 24% RC-4, 49% RC-5, and 20% RC-6. The technical success rate for SAFARI was 100%. The median follow-up time was 51 months. Primary patency rate at 6 months, 65% (95% CI: 51–76%); 12 months, 57% (95% CI: 43–69%); 24 months, 50% (95% CI: 36–62%); 36 months, 41% (95% CI: 28–53%); 48 and 60 months, 38% (95% CI: 25–51%); and 72, 84, and 96 months, 33% (95% CI: 19–48%). Primary-assisted patency rate at 6 months, 72% (95% CI: 58–82%); 12 months, 67% (95% CI: 53–78%); 24 months, 61% (95% CI: 47–73%); 36 months, 57%

(95% CI: 43–69%); 48 months, 55% (95% CI: 40–67%); and 60, 72, 84, and 96 months, 51% (95% CI: 36–64%). The secondary patency rates at 6 months, 94% (95% CI: 84–98%); 12 and 24 months, 89% (95% CI: 77–95%); 36 months, 85% (95% CI: 73–92%); 48 and 60 months, 82% (95% CI: 69–91%); and 72, 84, and 96 months, 75% (95% CI: 53–88%). AFS rates at 6, 12, 24, and 36 months, 98% (95% CI: 88–100%); 48 months, 95% (95% CI: 81–99%); and 60, 72, 84, and 96 months, 88% (95% CI: 70–96%).

Conclusion: We report remarkably high durability of SAFARI, with longitudinal follow-up and appropriate reintervention. In particular, we demonstrate a 5-year secondary patency rate of 82% for SAFARI. By comparison, for femoropopliteal bypass, 5-year secondary patency rates are slightly lower at 73.2%, 80.1%, and 79.7% for above-knee PTFE, above-knee GSV, and below-knee GSV conduits, respectively. Conversely, 5-year primary patency rates for femoropopliteal bypass (57.4–77.2% depending on conduit) are superior to our reported SAFARI outcomes. Note that our sample size for SAFARI is smaller than referenced datasets for bypass. Clinical outcomes in SAFARI were also excellent, with AFS exceeding 88% at 3- to 8-year endpoints. In conclusion, SAFARI is technically feasible, safe, and highly durable. We report long-term secondary patency rates comparable to GSV bypass, without the risk of perioperative complication or prolonged recovery associated with surgery.



168.1:

Scientific Session 18

Portal Hypertension 1

Monday, April 13, 2026

3–4:30 p.m.

Abstract No. 169

Trends in the Utilization of Transjugular Intrahepatic Portosystemic Shunt Insertion and Revision in Medicare Part B Beneficiaries from 2006 to 2023



(Article No. 108186)

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Purpose: The purpose of this study was to evaluate national utilization trends of transjugular intrahepatic portosystemic shunt (TIPS) insertion and revision among Medicare Part B beneficiaries over an 18-year period using Centers for Medicare & Medicaid Services (CMS) data.

Materials and Methods: Publicly available CMS Part B national summary data files (2006–2023) were analyzed. TIPS insertion and revision procedures were identified using Current Procedural Terminology (CPT) codes 37182 and 37183, respectively. Annual counts of beneficiaries were extracted and standardized as rates per 1,000,000 total Medicare Part B beneficiaries, with denominator data obtained from the Harvey L. Neiman Health Policy Institute. This was done in order to make the counts comparable across different years. Joinpoint regression was used to identify inflection points and calculate annual percent change (APC) with 95% confidence intervals (CIs).

Results: The highest annual counts of beneficiaries were observed in 2015 for TIPS insertion ($n = 1,899$) and in 2019 for TIPS revision ($n = 928$). The lowest counts occurred in 2008 ($n = 1,326$) for insertion and in 2007 ($n = 584$) for revision. When standardized, peak utilization occurred in 2015 for insertion (57.05 per 1,000,000) and 2019 for revision (28.06 per 1,000,000), while the lowest rates were in 2008 (41.39) and 2007 (18.06), respectively. For TIPS insertion, Joinpoint regression identified a single inflection point in 2015, with APCs of +3.49% (2006–2015, $P < 0.001$) and –2.21% (2015–2023, $P < 0.001$). For TIPS revision, two inflection points were identified in 2009 and 2014, with APCs of –1.18% (2006–2009, $P = 0.434$), +6.71% (2009–2014, $P = 0.003$), and +0.60% (2014–2023, $P = 0.194$).

Conclusion: TIPS insertion among Medicare beneficiaries increased steadily until 2015, followed by a significant decline, while TIPS revision demonstrated growth between 2009 and 2014 before stabilizing. These findings highlight important temporal shifts in TIPS utilization, warranting further investigation into underlying clinical, policy, and practice-related drivers.

Abstract No. 170

Predicting Adequate Future Liver Remnant Hypertrophy Following Liver Venous Deprivation (LVD) in Colorectal Liver Metastases: A Radiomic-Based Approach



(Article No. 108187)

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Purpose: To investigate whether clinical characteristics and radiomic features extracted from the non-embolized future liver remnant (FLR) on pre-embolization CT scans are associated with kinetic growth rate (KGR) following liver venous deprivation (LVD).

Materials and Methods: A retrospective analysis was conducted on 22 patients with Colorectal Liver Metastases (mean age 51.1 ± 11.5 years; 73% male), who underwent LVD between September 2018 and August 2023. Embolization was performed using microparticles and coils for the portal vein and n-BCA with Amplatzer plugs for the hepatic vein via percutaneous approach. Pre- and post-procedure FLR volumes were quantified using CT volumetry. The standardized liver volume was estimated by the Vauthey formula, and KGR was calculated from FLR volumetric changes. The non-embolized FLR was segmented (excluding major vessels) using MIM software, and 107 original radiomic features (first order and gray level) were extracted using PyRadiomics. Associations between radiomic and clinical variables with continuous KGR were assessed using Spearman correlation. Categorical variables were evaluated with Wilcoxon rank-sum tests. An exploratory multivariable linear regression was performed to assess the independent association of clinical and radiomic variables with KGR.

Results: 18/22 patients (82%) achieved adequate hypertrophy ($KGR > 2\%/week$). After LVD, the median degree of hypertrophy was 16% and the median KGR was 3.9%/week. Embolization particles were $\leq 100 \mu m$ in 11/22 (50%) and 250–400 μm in the rest. No clinical variable, including particle size, ALT, AST, INR, or total bilirubin, correlated with KGR (all $p > 0.05$). Pre-procedure BMI showed a negative correlation with KGR ($\rho = -0.46$, $p = 0.034$). Of 107 radiomic features, the strongest univariable correlations were sphericity ($\rho = -0.51$, $p = 0.016$), SmallDependenceHighGrayLevelEmphasis ($\rho = +0.47$, $p = 0.027$), and ShortRunLowGrayLevelEmphasis ($\rho = -0.47$, $p = 0.027$). In multivariable modeling, sphericity ($\beta = -1.27$, $p = 0.002$) and SmallDependenceHighGrayLevelEmphasis ($\beta = +2.04$, $p < 0.001$) remained significant.

Conclusion: This preliminary analysis suggests that radiomic features of the non-embolized FLR may have predictive value for liver regenerative capacity in patients planned for hepatectomy as shape-based measures such as sphericity and textural gray-level features demonstrated moderate associations with KGR. These findings indicate that radiomic signatures could be incorporated to

develop machine learning models that could aid in patient selection and optimizing outcomes.

Abstract No. 171

Liver Venous Deprivation Versus Portal Vein Embolization for Future Liver Remnant Hypertrophy: A Meta-Analysis



(Article No. 108188)

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Purpose: Liver venous deprivation (LVD) has emerged as a technique to improve future liver remnant (FLR) hypertrophy, combining hepatic vein embolization (HVE) with portal vein embolization (PVE) prior to major hepatectomy. This meta-analysis aims to evaluate the safety and efficacy of LVD compared with PVE alone using available comparative studies.

Materials and Methods: A comprehensive literature search was conducted up to September 2025, identifying 16 eligible comparative studies including 416 patients in the LVD group and 783 in the PVE-only group. Pooled outcomes included FLR volume, percentage FLR hypertrophy, kinetic growth rate (KGR), post-embolization resectability, and major post-resection adverse events. Effect estimates were reported as odds ratios (ORs) and standardized mean differences (SMDs) with 95% confidence intervals (CIs). Publication bias was assessed using funnel plots and Egger's test.

Results: Compared to PVE alone, LVD resulted in significantly greater FLR volume (SMD: 628.6, 95%CI: 533.1-724.1, $p < 0.001$), percentage FLR hypertrophy (SMD: 39.7, 95%CI: 35.0-44.3, $p < 0.001$), and KGR (SMD: 2.0, 95%CI: 1.7-2.4, $p < 0.001$). The overall rate of resection failure (OR: 1.6, 95%CI: 0.8-2.8, $p = 0.163$) and that due to insufficient FLR (OR: 1.4, 95%CI: 0.7-2.9, $p = 0.385$) were comparable between groups. No significant difference was observed in the incidence of major post-resection adverse events (OR: 1.1, 95%CI: 0.7-1.6, $p = 0.759$).

Conclusion: LVD appears to be more effective than PVE alone in promoting FLR hypertrophy, without increasing the risk of major postoperative complications.

Abstract No. 172

Outcomes of Percutaneous Treatment of Posttransplant Portal Vein Stenosis



(Article No. 108189)

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Purpose: Portal vein (PV) stenosis following liver transplant (LT), a rare complication, can result in portal hypertension or threaten transplant longevity via reduced perfusion. Treatment options include surgical revision or percutaneous transluminal angioplasty (PTA) or stent placement. This study describes outcomes of percutaneous management of post-LT PV stenosis.

Materials and Methods: Retrospective review of patients referred for percutaneous treatment of post-LT PV stenosis between 2015-2025 was performed. 18 patients (9M:9F; median age 55) were referred. Data collected included LT variables, percent PV stenosis, primary patency, anticoagulation (AC) use, and resolution of ascites. Outcomes were compared between PTA and stent groups.

Results: PV stenosis was identified at a median of 160 days post-LT (11 asymptomatic stenosis with PV stenosis on post-LT surveillance imaging, 7 with ascites). Median percent stenosis was 64% (29-100%) with median minimal luminal diameter of 5 mm (0-7.7 mm). All 18 LT were performed with end-end PV-PV anastomosis. Two were repeat LTs and 2 were living related LT. 11 patients were on AC prior to intervention. Percutaneous transhepatic approach was used in 15, transjugular in 2, and transsplenic in 1 index procedures. Technical success rate was 88.9% (16/18). Both failures occurred in 2 of the 3 patients with 100% PV stenosis. No complications occurred. Primary PTA was performed in 7 patients and primary stenting in 9 (5 self-expanding bare metal, 4 balloon-expandable stent grafts). Median PTA diameter was 14 mm (10-16 mm) and median final stent diameter was 14 mm (10-14 mm, $p > 0.05$). Median residual stenosis was 0% in both groups. 9 patients continued AC following index procedure while 2 initiated AC post-procedure. Symptomatic ascites completely resolved in 4/6 (66%) of patients who underwent successful index procedure. Median primary patency was 213 days for stents and 233 days for PTA ($p > 0.05$). Rate of repeat intervention was not significantly different between groups (43% PTA vs 11% stent, $p > 0.05$). Secondary patency was similar between groups (PTA 1435 days vs Stent 897 days, $p > 0.05$). No patients required repeat transplant after successful index or repeat interventions.

Conclusion: Post-LT PV stenosis treated with PTA or stenting have similar median residual stenosis and primary patency rates. Technical failure occurred only in the setting of complete PV stenosis. Post-LT PV stenosis should be treated with either PTA or stent placement before reaching complete occlusion.

Abstract No. 173

Percutaneous Portal Venous Stent Placement for Posttransplant Portal Vein Stenosis: Technical and Clinical Outcomes from a Single-Center Experience



(Article No. 108190)

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Purpose: Portal vein (PV) stenosis and thrombosis are major vascular complications after liver transplantation. If left untreated, it leads to portal hypertension (PoHTN), graft dysfunction/failure. This study evaluated the technical success, patency, and clinical outcomes of percutaneous PV stent placement in liver transplant recipients with PV stenosis/occlusion.

Materials and Methods: This retrospective study included 15 post-liver transplant patients (mean age 51.7 ± 17.9 years; 10 males) who underwent percutaneous PV stent placement. All patients presented with at least 1 clinical manifestation of PoHTN (ascites, abnormal liver enzymes, variceal bleeding) along with imaging evidence of significant PV stenosis/occlusion ($\geq 50\%$

luminal narrowing, flow acceleration at anastomosis, or post-anastomotic jet), confirmed on direct portography. Pre- and post-stent PV pressure gradients (PVPg) and adverse events were documented. Technical success (successful stent deployment with restoration of hepatopetal flow) and clinical success (resolution of PoHTN-related signs and normalization of liver function) were noted. Patency was assessed at 1, 3, 6, and 12-months.

Results: Technical success was reported in all patients (100%). Stent sizes ranged from 8-14 mm (median = 10, IQR = 10-12). Direct portogram showed PV thrombosis requiring thrombectomy in 2/15 patients (13.3%). Clinical success was reported in all patients (100%), with improvement in MELD scores reported in 13/15 (86.7%) patients at 1-month follow-up. Mean pre- and post-stent PVPg was 7.75 ± 4.6 mm Hg and 1.1 ± 1.4 mm Hg ($p=0.0002$). The mean PVPg decrease post-stent placement was 6.7 ± 4.1 mm Hg. No intraprocedural adverse events were reported. One late complication, a hepatic artery pseudoaneurysm at 4 months, was managed with coil embolization. Stent patency was 93.3% at 1 month (14/15), with 1 restenosis requiring reintervention. At 3, 6, and 12 months, stent patency was 100% (including patient with secondary venoplasty). Changes in lab values are shown in 173.1. One-year survival was 100%.

Conclusion: Percutaneous PV stent placement is a safe, effective, and durable option for the management of portal hypertension in liver transplant recipients. PV stent placement demonstrated high technical & clinical success, and sustained patency.

173.1. Changes in lab parameters

Parameter	Baseline (Mean $\pm$ SD)	1Month (Mean $\pm$ SD)	p-value
AST (IU/L)	55.57 $\pm$ 55.68	34.14 $\pm$ 24.47	0.04
ALT (IU/L)	79.79 $\pm$ 126.49	45.36 $\pm$ 49.57	0.15
Total bilirubin (mg/dL)	0.97 $\pm$ 0.47	0.54 $\pm$ 0.24	< 0.01
INR	1.33 $\pm$ 0.31	1.46 $\pm$ 0.49	0.52

Abstract No. 174

Impact of Pre-emptive TIPS on Outcomes in Acute-on-Chronic Liver Failure with Variceal Bleeding



(Article No. 108191)

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Purpose: Pre-emptive transjugular intrahepatic portosystemic shunt (pTIPS), defined as placement within 72 hours of initial endoscopic therapy for an active variceal bleed, has been proposed as a strategy to reduce rebleeding and improve survival in high-risk patients with cirrhosis. We evaluated outcomes of patients with acute-on-chronic liver failure (ACLF) who presented with variceal bleeding and underwent therapeutic endoscopy (EGD) with or without the addition of pre-emptive TIPS.

Materials and Methods: The Nationwide Readmissions Database (2010–2022) was queried for ACLF patients, using previously validated algorithms, admitted with variceal upper GI

bleeding who received EGD. Patients were stratified into EGD+pTIPS vs. therapeutic EGD alone. Primary outcomes were 30- and 90-day unplanned and GI bleed-related readmissions; secondary outcomes included blood transfusion (BT)-related readmissions. Multivariable hierarchical regression adjusted for demographics and comorbidities was performed.

Results: 142,969 patients were identified, of whom 6,963 (4.6%) underwent pTIPS+EGD. Predictors of pTIPS utilization are shown in 266.1. pTIPS was associated with higher odds of unplanned readmission at 30days (OR: 1.29; $p < 0.001$) and similar odds at 90days (OR: 1.09; $p=0.13$). pTIPS had significantly lower odds of GIB-related readmission at 30days (OR: 0.55; $p < 0.001$) and 90days (OR: 0.46; $p < 0.001$). Secondary analyses showed reduced BT-related readmissions at 90days (OR: 0.71; $p < 0.001$) and similar odds at 30days (OR: 0.88; $p=0.29$).

Conclusion: In patients with ACLF presenting with variceal bleeding, therapeutic EGD combined with pTIPS was associated with fewer GI bleed-related readmissions and lower transfusion requirements, but at the cost of higher 30-day unplanned readmission. These findings highlight the importance of early GI-IR collaboration in selecting patients with ACLF who may derive the greatest benefit from the addition of pTIPS. Incorporating additional clinical variables such as hepatic encephalopathy will be essential to refine selection criteria and optimize outcomes.

174.1.

Variables	Odds Ratio	95% lower bound	95% upper bound	p-value
Female	0.91	0.83	0.99	0.03
Primary expected payer				
Medicare	1.00			
Medicaid	0.94	0.83	1.07	0.36
Private insurance	1.01	0.90	1.14	0.83
Self-pay	0.68	0.57	0.81	< 0.001
No charge	0.70	0.46	1.06	0.09
Other	1.11	0.91	1.35	0.29
Bed size of hospital				
Small	1.00			
Medium	1.72	1.41	2.10	< 0.001
Large	2.98	2.49	3.56	< 0.001
Teaching status of urban hospitals				
Urban Nonteaching	1.00			
Urban Teaching	2.38	2.10	2.68	< 0.001
Rural	0.28	0.17	0.45	< 0.001

Abstract No. 176

Interactions Between TPM4-Positive Hepatocellular Carcinoma Cells and IL32-Positive Monocytes Mediate the Formation and Progression of Portal Vein Tumor Thrombus in Hepatocellular Carcinoma



(Article No. 108192)

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Purpose: Hepatocellular carcinoma (HCC) with portal vein tumor thrombus (PVTT) progresses rapidly and carries a high mortality. Multiple clinical studies indicate that, compared with patients without PVTT, those with PVTT derive limited benefit from TACE combined with targeted therapy and immunotherapy. This study aimed to characterize the tumor microenvironment (TME) of HCC without PVTT and HCC with PVTT, and to elucidate mechanisms underlying PVTT formation and suboptimal therapeutic efficacy.

Materials and Methods: Primary tumors from 3 patients with BCLC stage A HCC and primary tumors plus PVTT tissues from 3 patients with BCLC stage C HCC were subjected to single-cell RNA sequencing. Findings were validated and prognostic relevance assessed using TCGA-LIHC and the GSE77509 public dataset.

Results: The TME comprised tumor cells, endothelial cells, fibroblasts, T/NK cells, myeloid cells, and B cells. Compared with HCC without PVTT (HCCNP), HCC with PVTT (HCCP) showed marked alterations in tumor cells. TCGA-LIHC patients exhibiting the tumor cells molecular signature of HCCP had significantly reduced overall survival (OS). Pathway enrichment highlighted disruption of cell junctions and polarity, cytoskeletal remodeling, vascular adhesion, and pro-proliferative signaling. Tumor cells in HCCP displayed elevated TPM4 expression. High TPM4 expression in TCGA-LIHC was associated with shorter OS, and TPM4 was further upregulated in PVTT. TPM4-positive tumor cells were enriched for “regulation of actin cytoskeleton” and “focal adhesion” indicating enhanced migration–adhesion–colonization capacity, and engaged inflammatory/immune-evasive programs via “IL-17 pathway” and “NOD-like receptor pathway.” CellChat analysis revealed strengthened interactions between TPM4-positive tumor cells and myeloid cells, with the strongest interaction observed with IL32-positive monocytes. TPM4-positive tumor cells likely secrete SPP1 to engage CD44 on IL32-positive monocytes. The presence of IL32-positive monocytes correlated with reduced OS and was enriched for “cellular senescence” and “leukocyte transendothelial migration,” promotes cell migration, vascular infiltration, and an immunosuppressive microenvironment.

Conclusion: TPM4-positive tumor cells drive PVTT formation and, through interactions with IL32-positive monocytes, establish an immunosuppressive microenvironment that fosters HCC progression and contributes to poor first-line therapeutic efficacy.

Abstract No. 177

Combined PVE/HVE Versus PVE: Increased Biliary Adverse Events and Surgical Dropout Unique to Perihilar Cholangiocarcinoma

(Article No. 108193)



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Purpose: To compare surgical resection rate of primary and metastatic liver tumors following combined portal and hepatic vein embolization (PVE/HVE) versus portal vein embolization (PVE) alone. To assess biliary adverse events (AEs) and surgical dropout after embolization in perihilar cholangiocarcinoma (pCCA).

Materials and Methods: A single-center retrospective study was performed in 174 patients undergoing PVE/HVE (N=49) or PVE alone (N=125) between 2008 to 2025 for colorectal liver metastases (CRLM, N=58), other liver metastases (OLM, N=30), hepatocellular carcinoma (HCC, N=33), pCCA (N=30), intrahepatic cholangiocarcinoma (iCCA, N=20), and benign disease (N=3). PVE was performed using nBCA; HVE was performed using plugs with or without nBCA. Completion of surgical resection was recorded. For pCCA, baseline characteristics were comparable in PVE/HVE (N=12) and PVE (N=18) subgroups: presence of endoscopic biliary drain (92% vs. 78%, p=0.62), percutaneous biliary drain (42% vs. 61%, p=0.46), prior cholangitis (58% vs. 39%, p=0.46), total bilirubin (1.8 vs. 3.8 mg/dL, p=0.30), and cancer antigen 19-9 (148 vs. 191 U/mL, p=0.55). Biliary AEs within 2 months after embolization were recorded. Univariate and multivariate logistic regressions were performed to identify factors affecting resection. Categorical and continuous variables were compared by Fisher's exact and Wilcoxon rank-sum tests.

Results: For pCCA, surgical resection was lower following PVE/HVE compared with PVE (2/12 [17%] vs. 11/18 [61%], p=0.019). For all other malignancies, resection was comparable after PVE/HVE versus PVE: CRLM (15/17 [88%] vs. 31/41 [76%], p=0.48), OLM (8/8 [100%] vs. 16/22 [73%], p=0.16), HCC (3/4 [75%] vs. 20/28 [71%], p=0.58), and iCCA (4/6 [67%] vs. 12/14 [86%], p=0.34). For pCCA, choice of PVE/HVE or PVE was the sole factor associated with resection in multivariate analysis (OR=8.0, 95% CI: 1.1-58.5, p=0.041). Incidence of biliary AEs was similar in PVE/HVE and PVE (8/12 [67%] vs. 7/18 [39%], p=0.26). However, severity of AEs after PVE/HVE included cholangitis (N=3, 25%), cholangitis with intrahepatic abscesses (N=4, 33%), and death from biliary sepsis (N=1, 13%). Only cholangitis (N=7, 38%) occurred after PVE. Zero of 8 patients (0%) with biliary AEs after PVE/HVE and 4 of 7 patients (57%) with biliary AEs after PVE completed hepatectomy (p=0.026).

Conclusion: Surgical resection of pCCA was lower after PVE/HVE than PVE alone but similar in all other malignancies. PVE/HVE should be performed with caution in pCCA as patients may be more prone to severe biliary AEs which jeopardize surgical candidacy.

Abstract No. 178

Portal Vein Embolization with Traditional Technique: A Contemporary Report on Success Rate, Predictors of Failure at a High-Volume Center



(Article No. 108194)

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Purpose: Major hepatectomy for liver malignancies can be limited by an inadequate future liver remnant (FLR), increasing the risk of post-hepatectomy liver failure. Portal vein embolization

(PVE) is used to induce hypertrophy in patients with small FLR but otherwise resectable tumors. PVE techniques continue to evolve, with recent studies suggesting that N-butyl cyanoacrylate and/or hepatic vein embolization achieve greater hypertrophy than traditional PVE with microspheres and coils. This study evaluated contemporary outcomes of traditional PVE at a high-volume tertiary cancer center.

Materials and Methods: A retrospective review was performed of patients undergoing PVE prior to major hepatectomy between 2015–2023 using microspheres and coils. Patient, tumor, and liver function characteristics were collected. Baseline and post-PVE liver volumetry were measured using 3D software. Successful hypertrophy was defined as achieving delta degree hypertrophy (DDH), the required FLR% increase to meet target FLR volume based on baseline liver function (25% for normal, 30% for pre-operative chemotherapy or steatohepatitis, and 35% for cirrhosis).

Results: Eighty-three patients (49 male, 34 female; median age 62) were included. Colorectal liver metastases were most common (51%), followed by primary liver cancers, HCC and ICC (30%). 67% of patients received systemic chemotherapy prior to PVE. At baseline, 81% had normal liver function and 19% had NASH or cirrhosis. Median hypertrophy was 11%, median kinetic growth rate 2.49%/week, and successful hypertrophy occurred in 96%. Liver resection was completed in 75 patients (90%). On univariate analysis, DDH was the only significant predictor of success ($p < 0.001$). ROC analysis showed that $DDH \leq 9\%$ predicted 100% success, whereas thresholds above 9% lost predictive reliability.

Conclusion: Traditional PVE with microspheres and coils achieved 96% success at a high-volume center, comparable or slightly better compared with outcomes reported with glue and/or hepatic venous deprivation. Adjunct hypertrophy techniques may be warranted in patients requiring $DDH > 9\%$.

Scientific Session 19

Radioembolization 2

Monday, April 13, 2026

3–4:30 p.m.

Abstract No. 179

■ FEATURED ABSTRACT COnsortium on Best Practice for RAdiation Segmentectomy (COBRAS) with Glass Microspheres: A U.S. Multicenter Study Evaluating Predictors of Complete Pathologic Necrosis in Hepatocellular Carcinoma Prior to Liver Transplantation



(Article No. 108196)

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Purpose: Complete pathologic necrosis (CPN) at liver transplantation (LT) is a positive predictor of freedom from recurrence and overall survival for patients with hepatocellular carcinoma (HCC). Yttrium-90 radiation segmentectomy (RS) CPN rates at explant have been described by small multi-institutional experiences, but consensus for comprehensive authorized user recommendations remain undefined. A national consortium was assembled to establish definitive parameters for RS to optimize CPN.

Materials and Methods: A retrospective, institutional review board–approved, multicenter study conducted in seven liver transplant centers across the United States from 2016 to 2024 was performed. All consecutive patients with targeted tumor treatment-naïve HCC who underwent radiation segmentectomy using Y90 glass microspheres (TheraSphere, Boston Scientific, Marlborough, MA) prior to liver transplantation were included. Patients treated with RS, but not subsequently transplanted, were excluded from the analysis. Treatment parameters were compared for patients who achieved CPN vs those without CPN.

Results: A total of 364 treatment-naïve tumors with a median size of 2.4 cm (IQR 2.0–3.1) demonstrated a CPN rate of 68% (n=246). Tumors with CPN had a higher median microsphere activity (1242 vs 1203 Bq; $p < 0.001$), microspheres per mL (9.0 vs 7.6×10^3 /mL; $p = 0.023$), single-compartment dose (544 vs 379 Gy; $p < 0.001$), and angiosome-to-tumor volume ratio (25.2 vs 15.6; $p = 0.017$).

CPN rates at liver transplantation were optimized when a microsphere activity ≥ 1087 Bq, microsphere per mL $\geq 8 \times 10^3$ /mL, dose ≥ 440 Gy, and an angiosome-to-tumor volume ratio (ATR) ≥ 16 were achieved based on a multivariate analysis. There was a direct correlation between the number of optimized parameters and CPN at liver transplantation, with a PPV of 74% with one threshold met and 91% with all thresholds met ($p < 0.001$). These findings were observed in the overall cohort as well as at each participating center and were reproducible in an internal validation cohort.

Conclusion: Glass microsphere RS achieved high CPN rates, which directly correlated with optimized treatment parameter thresholds. Therapy with microsphere activity ≥ 1087 Bq (up to 5days post calibration), with over 8,000microspheres per mL, a dose above 440Gy, and an ATR ≥ 16 is recommended as a comprehensive standard for authorized users.

Abstract No. 180

■ FEATURED ABSTRACT Large Single Hepatocellular Carcinoma: Radioembolization Has Longer Overall Survival Than Chemoembolization



(Article No. 108197)

H. Kim¹; ¹Seoul National University Hospital

Purpose: To evaluate the survival outcome of chemoembolization and radioembolization in patients with large single hepatocellular carcinoma (HCC) > 6 cm.

Materials and Methods: The institutional review board approved this retrospective single-center study, which comprised 215 patients with single nodular HCC (> 6 cm) who underwent chemoembolization (n = 101) between 2010 and 2016 or radioembolization (n = 114) between 2017 and 2023. Tumor response was assessed using the modified Response Evaluation Criteria In Solid Tumors (mRECIST). If other treatment modality was added without tumor progression, the best tumor response was assessed just before the addition of the second treatment modality. Local tumor progression-free survival (LTPFS) and overall survival (OS) were obtained by the Kaplan-Meier method, and were compared by the log-rank test.

Results: In terms of best tumor response, chemoembolization group had 40 CR, 58 PR, 1 SD and 2 PD, respectively. Radioembolization group had 32 CR, 67 PR, and 15 SD, respectively. Median LTPFS was 8.8 months (95% CI, 6.8–10.8) for chemoembolization and 25.1 months (95% CI, 8.6–41.6) for radioembolization, respectively. Median OS for chemoembolization was 47.2 months (95% CI, 21.7–72.7). Median OS for radioembolization did not reach, yet. 2 year and 5 year OS rate were 67.3% and 46.4% for chemoembolization, and 87.2% and 71.6% for radioembolization, respectively.

Conclusion: Radioembolization has longer overall survival than chemoembolization in patients with large single unresectable HCC (> 6 cm).

Abstract No. 181

Characterization of HCC Tumor Response Using Prospective Voxel Dosimetry in 90Y-Radioembolization Clinical Trial RAPHY90D



(Article No. 108198)

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Purpose: Characterization of hepatocellular carcinoma (HCC) tumor responses for single-arm single-center prospective 90Y-radioembolization clinical trial (n=40) that used patient-specific voxel-dosimetry-based treatment planning (NCT03896646).

Materials and Methods: Eligibility criteria included adult HCC patients with non-infiltrative tumor diameters ≥ 3 cm otherwise eligible for 90Y-glass radioembolization. All patients underwent hepatic angiography CT (AngioCT), received 99mTc-MAA injections at all sites of treatment, and underwent SPECT/CT imaging. Fused AngioCT and 99mTc-MAA SPECT/CT was used to plan tumor mean-voxel dose ≥ 200 Gy and normal liver mean-voxel dose ≤ 100 Gy. Post-treatment dose verification was performed using 90Y-SPECT/CT and 90Y-PET/CT. Localized mRECIST tumor responses were determined at 6-month follow-up. We characterize tumor response relationships, based on 37 patients 59 tumors who completed 6-month follow-up, with size and dose-coverage metrics.

Results: At 6 months, the DCR $[(CR+PR+SD)/(CR+PR+SD+PD)]$ was 100%, with 97% ORR $[(CR+PR)/(CR+PR+SD+PD)]$, and 73% CRR $[(CR)/(CR+PR+SD+PD)]$. The median (range) tumor effective diameter was 5.4 (3-15.4) cm; with 40% 3-5 cm, 17% 5-7 cm, and 25% > 7 cm. The median (range) tumor voxel-dose delivered was 361 (208-981) Gy; with 100% > 200 Gy, 83% > 300 Gy, and 65% > 400 Gy. The Welch's t-test reported non-significant differences ($p=0.68$) in tumor mean-dose for CR (420Gy) versus others (396Gy); but significant differences ($p=0.0003$) in size for CR (4.8 cm) versus others (8.4 cm). Non-significant differences were also observed when assessing other dose-coverage metrics: D50, D70, D90, D70-50_gradient, D90-50_gradient. Multi-variate logistic regression showed tumor size was prognostic of CR with odd's ratio 0.39 (95%CI:0.19-0.62) and ROC curve AUC 0.85 (95%CI:0.73-0.98, $p < 0.0001$). The threshold size for CR was estimated as < 5.7 cm with sensitivity of 82% and specificity of 93%. Dose heterogeneity was not correlated with tumor size.

Conclusion: The feasibility and efficacy of prospective, patient-specific, MAA-based voxel dosimetry treatment planning for 90Y-radioembolization has been demonstrated. Mean tumor doses alone do not account for tumor response for tumors larger than 5 cm. Other factors in larger tumors may be the reason for lack of CR.

Abstract No. 182

Predictors of Lung Shunt Fraction in Y-90 Radioembolization Across Various Tumor Types



(Article No. 108199)

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Purpose: Pre-treatment lung shunt fraction (LSF) is a critical determinant for Y-90 radioembolization safety and dosimetry. Mappings are routinely performed regardless of tumor type, characteristic, or other clinically relevant information. Prior studies have shown hepatocellular carcinoma (HCC) has higher and more variable LSF than non-HCC tumors. We aim to identify factors predicting elevated LSF and to compare LSF distributions across tumor types.

Materials and Methods: We retrospectively reviewed 822 mapping angiograms (2012-2024) at a single center. Patients were grouped by cancer: with HCC (n = 577) and colorectal (n = 82) being the most common. LSF was categorized as Low $< 10\%$, Intermediate 10–20%, or High $> 20\%$. Variables tested included portal vein invasion, MELD (original, Na, and 3.0), Child–Pugh, tumor burden, tumor size, prior liver therapy, and sex. Kruskal–Wallis, Mann–Whitney U, chi-square, or Fisher exact tests were used ($p < 0.05$).

Results: LSF differed significantly between cancers ($p < 0.0001$), with HCC showing higher and more variable shunting with a mean of 8.9. For HCC, elevated LSF was strongly associated with portal vein invasion (39.5% in high vs 9.3% in low LSF, $p < .001$), worse liver function (higher MELD and Child–Pugh, all $p < .05$), tumors > 5 cm ($p < .001$), > 3 lesions ($p < .05$), and prior endovascular liver therapy ($p < .05$). For colorectal metastases, since there were no high LSFs, intermediate LSF was associated with larger primary tumor size > 5 cm (70% vs 35%; $p < .05$) and slightly higher MELD-Na (median 8.7 vs 7.5; $p < .05$). For cholangiocarcinoma, neuroendocrine, breast, fibrolamellar HCC, gynecologic, and other metastatic cancers, no significant predictors of LSF were identified.

Conclusion: LSF varies significantly by cancer, with HCC demonstrating the highest and most variable values. Colorectal metastases generally show low LSF, but large tumors and worse MELD-Na significantly correlate to increased shunting. Non-HCC/colorectal tumors rarely exhibit elevated LSF or predictive factors, but this may be due to underpowered studies. These findings reinforce the need for HCC mapping due to variability; however, certain non-HCC cancers with consistently low and predictable lung shunt fractions warrant further investigation into whether mapping is universally required.

182.1.

Cancer	N	Mean LSF	Low $< 10\%$	Int 10-20%	High $> 20\%$
HCC Total	577	8.9	418 (72.4%)	121 (21.0%)	38 (6.6%)
HCC Group A: (Milan, No PV invasion, No prior intervention)	140	6.4	121 (86.4%)	17 (12.1%)	2 (1.4%)
HCC Group B: Remaining	437	9.7	297 (68.0%)	104 (23.8%)	36 (8.2%)
Colorectal	81	6.2	72 (88.9%)	9 (11.1%)	0 (0%)

Abstract No. 183

Comparative Voxel-Based Dosimetry of Underdosed Tumor Volume and Tumor Absorbed Dose Between Tc-MAA SPECT/CT and 90Y PET/CT in HCC Patients Treated with Radiation Segmentectomy



(Article No. 108200)

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Purpose: To evaluate the agreement between Technetium Macroaggregated Albumin (Tc-MAA) voxel-based dosimetry and post-Yttrium-90 (90Y) voxel-based dosimetry in hepatocellular carcinoma (HCC) patients treated with radiation segmentectomy.

Materials and Methods: This single-center, retrospective study included adult patients with early-stage solitary HCC treated with radiation segmentectomy using resin microspheres between July 2014 and June 2025, with available Tc-MAA SPECT/CT and post-90Y PET/CT. Voxel-based dosimetry was carried out on both images using the local deposition method with known activity. Evaluation included traditional dosimetry measures, including the mean tumor absorbed dose (TAD), the minimum dose absorbed by 95% of the tumor tissue (D95), and tumor to normal ratio (TNR). Underdosed tumor volume, defined as the percentage of tumor volume receiving less than 100 Gy (V0-100%), was determined. Linear regression and Bland Altman analysis were performed, and Pearson correlation coefficient (r) was calculated.

Results: A total of 40 patients (median age, 71 years [IQR, 66-76], 75% males) were included in the analysis. Median tumor size was 2.7 cm [IQR, 2.1-4.4]. Mean TAD measured on Tc-MAA SPECT/CT was 331 Gy (IQR, 181-572), and mean TAD measured on post-90Y PET/CT was 356 Gy (IQR, 206-521). Both Tc-MAA SPECT/CT and 90Y PET/CT based mean TAD were strongly correlated ($r = 0.77$). On average, Tc-MAA based mean TAD was higher than 90Y-based mean TAD by 8%. Similarly, Tc-MAA based D95 showed strong correlation with the D95 measured on post-90Y PET/CT (Tc-based D95 = 105 [IQR, 51-216] Gy vs 90Y-based D95 = 134 [IQR, 63-239], $r = 0.64$), with a mean difference of 19% (95%CI: -5,42). TNR calculated on post-Tc-MAA SPECT/CT was significantly lower than the actual TNR calculated from post-90Y PET/CT (1.88 vs 2.26, $p = 0.007$). On the other hand, there was a weak correlation between the underdosed tumor volume measured on post-Tc-MAA SPECT/CT and Post-90Y PET/CT (V0-100%: 3.6% vs 0.8%, $r = 0.24$). On average, V-100% predicted by Tc-MAA was 1.89 times (95%CI: 1.5, 2.28), higher than the actual underdosed tumor volume determined by post-90Y PET/CT.

Conclusion: Tc-MAA voxel-based dosimetry showed strong correlation and low bias in predicting tumor absorbed doses. However, the correlation for underdosed tumor volume was weak, with Tc-MAA tending to overestimate the underdosed fraction compared with post-Y-90 PET/CT.

Abstract No. 184

Tumor-to-Normal Ratio Derived from Direct Hepatic Arterial Injection 4DCT Perfusion Imaging and Dual-Energy CT During Mapping Angiography: Comparison with Tc-99m MAA SPECT/CT



(Article No. 108201)

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Purpose: To compare tumor-to-normal ratio (TNR) derived from direct hepatic arterial injection 4-dimensional computed tomography perfusion imaging (4DCT) and dual-energy CT (DECT) during mapping angiography with single photon emission computed tomography (SPECT)/CT after technetium-99m macroaggregated albumin (Tc-99m MAA) infusion.

Materials and Methods: Twenty consecutive mapping angiograms prior to radioembolization for hepatocellular carcinoma performed on a hybrid angiography-CT unit (Alphenix 4DCT, Canon Medical Systems, Otawara, Japan) were retrospectively reviewed. Catheters were positioned in the common hepatic artery and low dose volumetric CTs were obtained at 1.5-5 second intervals for 60 seconds after injection of 15 milliliters of contrast (Iohexol, Omnipaque 300, GE Healthcare, IL, USA) over 5 seconds. DECT was then obtained 5-7 seconds after a repeat contrast injection. Four millicuries of Tc-99m MAA were then infused into the right or left hepatic artery followed by SPECT/CTs. Tumor and background liver volumes of interest (VOI) were drawn using a semi-automated process (Vitrea Advanced Visualization, Canon Medical Systems, Otawara, Japan) on 4DCT to generate time-density curves. Areas under the curve were then measured and used to determine TNR. Regions of interest around the tumor and non-tumoral perfused liver were drawn on DECT. Iodine concentrations were recorded and used to measure TNR. VOIs were drawn around the tumor and non-tumoral perfused liver on SPECT/CT using a semi-automated process (Visage Imaging, CA, USA) and the mean standardized uptake value was recorded and used to calculate TNR. A paired t-test was used to compare TNR derived from 4DCT and DECT with SPECT/CT.

Results: Mean tumor size was 3.4 ± 1.9 cm (range 1.5-8.8 cm). Mean tumor volume was 50.4 ± 56.6 cm³ (range 13.3-227.2 cm³) and mean non-tumoral perfused liver volume was 427.4 ± 256.7 cm³ (range 100.4-1263.5 cm³). Mean tumor to normal ratio was 3.7 ± 3.6 (range 1.4-14.3) on 4DCT perfusion imaging, 4.0 ± 2.6 (range 2-12) on DECT, and 4.2 ± 1.9 (range 1.7-8.84) on SPECT/CT. There was no significant difference in TNR calculated from 4DCT and SPECT/CT ($p = 0.90$) or DECT and SPECT/CT ($p = 0.80$).

Conclusion: TNR derived from direct hepatic arterial injection 4DCT perfusion and DECT during mapping angiography is comparable to Tc-99m MAA SPECT/CT. These techniques may enable real-time TNR measurement, potentially obviating MAA SPECT/CT and guiding strategies to modulate TNR before treatment (flow diversion or vasodilator infusion).

Abstract No. 185

First-Line Therapy Using Yttrium-90 Radioembolization Plus Systemic Gemcitabine, Cisplatin, and Capecitabine for Unresectable Intrahepatic Cholangiocarcinoma



(Article No. 108202)

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Purpose: To evaluate the long-term outcomes of first-line treatment using a combination of yttrium-90 transarterial radioembolization (TARE) and systemic gemcitabine, cisplatin, and capecitabine in patients with unresectable, locally advanced intrahepatic cholangiocarcinoma (iCCA).

Materials and Methods: This single-center retrospective study included treatment-naïve patients with locally advanced iCCA who underwent an institutional downstaging protocol using gemcitabine, cisplatin, TARE, and capecitabine between March 2018 and August 2023. Outcomes assessed included overall survival (OS), radiologic response per RECIST criteria, and treatment-related adverse events.

Results: Twenty-nine patients (17 female, 12 male; mean age 64.8 ± 11.5 years) were included, with a mean dominant tumor size of 6.0 ± 2.4 cm. Radiologic response was observed in 14 of 29 patients (48.3%), while disease control was achieved in 24 of 29 patients (82.8%). From the start of treatment, median OS was 20.3 months (95% CI, 14.7–35.8 months). The 1-year, 3-year, and 5-year OS rates were 82.1% (95% CI, 62.3%–92.2%), 31.4% (95% CI, 15.4%–48.8%), and 18.9% (95% CI, 6.6%–35.9%), respectively. Eight patients (27.6%) were successfully downstaged to surgical resection and demonstrated significantly improved survival (median OS: 60.9 months [95% CI, 24.7–not reached] vs. 15.0 months [95% CI, 11.8–27.7]; $p = 0.0001$).

Conclusion: The combination of TARE with systemic gemcitabine, cisplatin, and capecitabine demonstrated promising efficacy as a first-line treatment strategy for locally advanced iCCA, with the potential to downstage patients to resection and improve overall survival.

Abstract No. 186

Impact of Segmentation Method on Y90-SIRT Dosimetry in Ultra-Selective Radiation Segmentectomy



(Article No. 108203)

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Purpose: Identifying “ground truth” perfused volume (PV) structures for treatment planning and dosimetry in ⁹⁰Y-selective internal radiation therapy remains difficult. In multicompartiment dosimetry, both anatomic imaging and MAA-SPECT/CT have been used previously to define PV and tumor structures, with comparable relationships between dosimetry and outcomes in either approach. In radiation segmentectomy (RS), MAA-SPECT/CT offers minimal value because MAA injection is not recommended at the segmental level. Instead, treatment planning relies on analysis of contrast-enhanced CBCT from the planning procedure. In this work, the impact of segmentation methods on treatment planning and dosimetry was assessed in 42 ultra-selective glass RS cases for HCC.

Materials and Methods: Tumors were segmented from pre-therapy diagnostic MRI. PV segmentation was performed using HU-threshold guidance from planning CBCT and three post-therapy ⁹⁰Y-SPECT/CT thresholds at 10, 20, and 30 pct of maximum counts. Post-therapy, ⁹⁰Y-SPECT/CT voxelized dosimetry was computed using the local deposition method and activity normalization to the PV. PV volumes, PV/tumor dose metrics, and dose-response models were compared among the different segmentation methods.

Results: Median (IQR) tumor size and CBCT PV were 2.3 (1.7–3.0) cm and 64.5 (44.9–94.1) mL, respectively. PVs from ⁹⁰Y-SPECT were 94.9 (58.2–148.1), 49.5 (31.4–85.8), and 27.7 (17.8–63.9) mL for 10, 20, and 30 pct thresholds, respectively. All PVs were significantly different ($p < 0.001$) except for CBCT vs 20 pct ($p = 0.097$). The variations in PVs produced inverse changes in PV and tumor doses with comparable statistical significance. Volume and dose differences in specific cases were at times substantial. In 4 of the 5 tumors without complete response, tumor mean dose and tumor D₉₅ were lower using 10 and 20 pct contours relative to CBCT.

Conclusion: Because PV volumes directly affect treatment planning and dosimetry, inaccurate estimation methods may impact tumor response and patient outcomes if targeted regions are underdosed from PV underestimation. The results in this study highlight that, especially in ultra-selective RS, special care is needed to ensure treatment planning aligns with ⁹⁰Y activity distributions in post-therapy imaging.

186.1.

	⁹⁰ Y-SPECT vs. CBCT Contours					
	Median Difference			Range		
	10 pct	20 pct	30 pct	10 pct	20 pct	30 pct
PV (mL)	35.2	-7.6	-23.1	-84.8 – 311	-175 – 154	-195 – 57.6
PV Dose (Gy)	-250	136	772	-1810 – 1760	-1230 – 4470	-714 – 8220
Tumor Dose (Gy)	-396	-23.6	449	-2760 – 1320	-1920 – 2700	-1190 – 5670
Tumor D ₉₅ (Gy)	-162	-14.8	204	-2030 – 1240	-1410 – 967	-1100 – 3420

Abstract No. 187

■ FEATURED ABSTRACT

Transarterial Radioembolization (TARE) with Yttrium-90 (Y90) Glass Microspheres in Patients with Large Hepatocellular Carcinoma Tumors: Real-World Data from PROACTIF



(Article No. 108204)

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Purpose: Effective treatment of large HCC tumors can be challenging with TARE. Treatment challenges often include tumor dose limitations due to lung shunt fraction and hepatic reserve. We report here patients' characteristics and outcomes of HCC population according to tumor size from PROACTIF, a multicenter, post-approval Y90 (TheraSphere) study conducted in 34 French institutions.

Materials and Methods: Index lesion (IL) size was determined by mRECIST assessed by central read in 989 HCC patients and categorized as: ≤ 5 vs > 5 cm; ≤ 7 vs > 7 cm; ≤ 10 vs > 10 cm, with tumors > 5 cm categorized as large. Overall survival (OS) was assessed by Kaplan-Meier analysis.

Results: At baseline patients with larger IL were more often older, with a solitary lesion, higher tumor burden, and no previous treatment; other characteristics were similar to the full population including PVT. Overall, median IL size was 6.8 cm [IQR, 4.6–9.0 cm]; 294 (31.8%) were ≤ 5 cm; 517 (55.9%) ≤ 7 cm and 764 (82.6%) ≤ 10 cm. Thus, 631 (68.2%) were > 5 cm; 408 (44.1%) > 7 cm; and 161 (17.4%) > 10 cm. The impact of IL size on dose and survival are reported in the table below. Of note, the mean pre/post treatment absorbed dose (AD) to IL decreased with increasing tumor size that may have impacted survival. Ongoing analysis of PROACTIF will investigate factors beyond IL dose that influence median OS. Larger IL size did not limit subsequent surgery nor subsequent treatment.

Conclusion: Real world data demonstrated the ability to deliver a high dose to large tumors, with long OS post treatment in patients with advanced disease. Tumor size did not affect downstaging to surgery or the ability to undergo subsequent treatment.

187.1.

Size (cm)	≤ 5 (n=294)	> 5 (n=631)	≤ 7 (n=517)	> 7 (n=408)	≤ 10 (n=764)	> 10 (n=161)
Solitary, n (%)	127 (43.2)	337 (53.4)	241 (46.6)	223 (54.7)	375 (49.1)	89 (55.3)
PVT, n (%)	101 (34.4)	227 (36.0)	168 (32.5)	160 (39.2)	273 (35.7)	55 (34.2)
Mean (SD) AD to IL, central (Gy)	582.3 (456.79)	380.9 (238.90)	540.0 (401.10)	329.6 (192.47)	489.9 (365.58)	277.2 (138.65)
Median OS, months [95% CI]	25.2 [21.2,28.6]	21.2 [18.5,22.8]	24.8 [22.1,28.0]	18.5 [16.2,21.7]	22.8 [21.3,25.8]	16.5 [12.0,20.1]
Surgery, n (%)	31 (10.5)	80 (12.7)	57 (11.0)	54 (13.2)	87 (11.4)	24 (14.9)
Subsequent Treatment Excluding Surgery, n(%)	122 (41.5)	270 (42.8)	222 (42.9)	170 (41.7)	331 (43.3)	61 (37.9)

Scientific Session 20

General IO 2

Tuesday, April 14, 2026

3–4:30 p.m.

Abstract No. 188

Percutaneous Endobiliary Radiofrequency Ablation Using Habib Probe for Unresectable Cholangiocarcinoma: Safety, Technical Feasibility, and Clinical Outcomes



(Article No. 108206)

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Purpose: Cholangiocarcinoma (CCA) frequently presents at an advanced stage where curative resection is not feasible, necessitating palliative interventions to relieve biliary obstruction. Endobiliary radiofrequency ablation (RFA) has been explored as an adjunct to biliary stent placement to improve biliary patency, yet data on its percutaneous application remain limited. This study evaluates the safety, technical success, and clinical outcomes of percutaneous RFA with the Habib EndoHPB probe in unresectable CCA.

Materials and Methods: We retrospectively reviewed 8 patients (mean age 59.9 ± 6.2 years; 4 males, 4 females) with unresectable intrahepatic CCA who underwent percutaneous endobiliary RFA between January 2022 and June 2025. RFA was performed with an electrocautery system (Erbe VIO 300 D) at 10 W for 90 sec. The entire RFA procedure, including catheter placement, was performed within 5–10 minutes, depending on the number of treatments. Procedural details, liver function tests, technical success, clinical success ($\geq 50\%$ bilirubin reduction or symptom resolution within 14 days), and adverse events were analyzed.

Results: Technical success was achieved in all patients (100%). Clinical success was observed in 7 of 8 patients (87.5%). No major adverse events occurred; all patients experienced only transient, mild post-ablation pain. Targeted ablation sites included the right hepatic duct (n=6), left hepatic duct (n=6), common bile duct (n=3), common hepatic duct (n=1), and porta hepatis (n=1), with several patients having multilevel involvement. Balloon dilatation was performed in all patients (sizes 6–12 mm), optimizing luminal patency. Drain exchange intervals improved substantially: pre-RFA exchanges occurred every 1–3 weeks, while post-RFA intervals extended to 4–8 weeks. Mean interventional radiology (IR) visits for tube exchanges decreased from 4.0 ± 1.6 to 2.3 ± 0.6 ($p=0.133$). Laboratory outcomes demonstrated improvements: total bilirubin declined from 5.5 ± 7.6 mg/dL to 2.7 ± 2.7 mg/dL at 1 month ($p=0.187$); AST decreased from 85.9 ± 48.1 U/L to

59.7 ± 39.5 U/L ($p=0.005$); ALT decreased from 104.7 ± 76.2 U/L to 56.1 ± 50.8 U/L ($p=0.054$). Over a mean follow-up of 398.6 $\pm$ 562.3 days, 3 patients (37.5%) achieved drain internalization, while 2 patients died from disease progression unrelated to the RFA procedure.

Conclusion: Percutaneous endobiliary RFA with the Habib probe is a safe and technically feasible intervention for unresectable CCA, yielding high procedural success, favorable laboratory and clinical outcomes, reduced IR utilization, and potential drain internalization.

Abstract No. 189

High Surface Area Intraluminal Gallbladder Cryoablation with the CholeSafe System: Preclinical Swine Studies as a Minimally Invasive Alternative to Cholecystectomy



(Article No. 108207)

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Purpose: To investigate the feasibility and safety of high surface area intraluminal gallbladder cryoablation with the CholeSafe System (Ictero Medical, TX, USA) in a swine model, and to evaluate cryogen delivery parameters and identify thresholds for effective ablation.

Materials and Methods: Ten swine underwent high surface area intraluminal gallbladder cryoablation. After laparotomy, thermocouples were sutured to the gallbladder fundus, body, and neck. An 18F introducer sheath was advanced into the lumen, and nitrous oxide freeze cycles were delivered using the CholeSafe System. End-of-cycle intraluminal temperature (EOCT), thaw time to $> 10^\circ\text{C}$ (TT), and minimum external gallbladder temperature (MET) were recorded. After ablation, the sheath was removed and the abdomen closed. Animals were monitored and underwent hepatobiliary MRI at 90 days to assess gallbladder volume, followed by necropsy and histology. Imaging success was defined as gallbladder involution with $>90\%$ luminal volume reduction and final volume < 1.5 mL. Histologic success was defined as the absence of viable mucosa.

Results: High surface area intraluminal gallbladder cryoablation was completed in all subjects with a median of 5.5 freeze cycles (IQR 1.75, range 3–7) and mean nitrous oxide delivery of 8.0 ± 3.4 L (range 2.6–12.8). All animals survived without adverse events. Mean EOCT was $-34.5 \pm 18.8^\circ\text{C}$ (range -0.1 to -82.1), TT 129.8 ± 78.6 s (27.2–350.0), and MET $-3.0 \pm 15.7^\circ\text{C}$ (-41.0 to 30.0). Eight of ten animals (80%) achieved imaging success, with necropsy showing gallbladder involution and histology confirming transmural fibrosis without viable mucosa. Two animals demonstrated incomplete ablation with a persistent lumen and residual mucosa, but these animals had no complications. Compared with incomplete ablation, complete ablation was associated with higher cryogen dose (8.5 vs 5.7 L), colder EOCT (-37.9 vs -20.4°C) and MET (-5.5 vs 7.6°C), and longer TT (142.0 vs 78.5 s).

Conclusion: High surface area intraluminal gallbladder cryoablation with the CholeSafe System is a promising minimally

invasive alternative to cholecystectomy, with gallbladder involution and complete transmural fibrosis achieved in 80% of subjects with no adverse events. Threshold parameters of cryogen delivery (≥ 8.5 L), EOCT ($< -38^\circ\text{C}$), and TT (> 140 s) were identified as potential predictors of successful ablation, warranting further investigation.

Abstract No. 190

■ FEATURED ABSTRACT Percutaneous Drainage of Malignant Biliary Obstruction Precluding Treatment: A Single-Center Experience



(Article No. 108208)

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Purpose: To evaluate the efficacy of percutaneous biliary drainage to enable oncologic therapy for patients with malignant biliary obstruction.

Materials and Methods: A single-center retrospective review was performed of patients who underwent percutaneous biliary drain (PBD) placement for malignant biliary obstruction precluding oncologic treatment between January 2018 and June 2024. The primary outcome was undergoing oncologic treatment (chemotherapy, radiation, surgery, or liver-directed therapy) following PBD. Demographics, diagnosis, site and degree of obstruction, number of drains placed, total number of procedures, and rates of conversion to internalization of drains were collected. Uni- and multivariate analyses were performed to identify factors associated with treatment initiation. Overall survival was evaluated. Two hundred and thirty-four patients were included, with 116 (50%) patients receiving oncologic treatment following PBD placement. The most common primary malignancies were pancreatic (39.2%), cholangiocarcinoma (17.7%), and colon (9.1%). Most patients (64.1%) received treatment prior to PBD placement. Biliary obstruction was extrahepatic in 43.2%, hilar in 41.9%, and intrahepatic in 14.1% of patients. Moderate or severe biliary dilation was present in 54.3%. Patients underwent a mean of 3.8 ± 4 procedures (range, 1–26) related to their biliary drain; 59% were never internalized, and 22.6% of those internalized were subsequently re-externalized.

Results: Location of biliary obstruction did not significantly impact ability to receive treatment or overall survival. Intrahepatic biliary obstruction is significantly associated with receiving more biliary drains compared to hilar or extrahepatic biliary obstruction (1.6 ± 1.3 vs 1.2 ± 0.7 ; $p < 0.005$). Patients who received oncologic treatment had a lower initial

bilirubin (8.4 ± 5.8 mg/dL vs 10.9 ± 7 mg/dL; $p < 0.005$), underwent more drain-related procedures (5.3 ± 5.1 vs 2.4 ± 1.6 ; $p < 0.001$), and had longer time to internalization (3.1 ± 4.2 vs 1.2 ± 0.7 months; $p < 0.001$). In multivariate analysis, internalization was independently associated with receiving treatment ($p < 0.001$). Mean survival was significantly longer in patients who achieved internalization (11.4 months; 95% CI, 9.3–13.7) compared to those who did not (2.8 months; 95% CI, 2.1–3.5).

Conclusion: Among patients undergoing PBD for malignant biliary obstruction precluding therapy, half ultimately received oncologic treatment. Internalization is strongly associated with treatment initiation and improved overall survival.

Abstract No. 191

CT-Guided Intervention: Reduction of Metal Artifact Using an Off-Axis Reconstruction Method



(Article No. 108209)

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Purpose: Needle artifact redistribution technique (Needle-ART) is a recently developed prototype method for reducing image artifacts in CT-guided needle procedures. The technique involves tilting the gantry out of the needle plane during scanning, then reformatting the images along the needle plane. The purpose of this study is to evaluate the feasibility, artifact reduction, and clinical applicability of Needle-ART for the placement of biopsy introducer needles into the liver, kidneys, and lungs of a deceased animal model.

Materials and Methods: A paired before-and-after preclinical study in two deceased swine (~50 kg) evaluated Needle-ART for reducing metal artifacts during CT-guided interventions. A 17G coaxial needle was placed into liver, lung, and kidney (6 sites per organ) and scanned twice at each site: standard axial (0° gantry, control) and Needle-ART (6° tilted gantry) reconstructions. A total of 48 scans (24 control, 24 Needle-ART) were obtained. Images were reformatted along the needle trajectory, and MATLAB was used to measure artifact, width, and length. Blinded radiologists rated overall artifact severity to qualitatively validate quantitative results.

Results: Needle-ART significantly reduced metal artifacts across all quantitative metrics and in blinded reader assessments. Mean artifact length decreased from 45.6 to 15.6 mm in kidney (65.9%, $p=0.003$), 47.1 to 19.1 mm in lung (59.4%, $p=0.0021$), and 46.6 to 30.0 mm in liver (35.5%, $p=0.0019$). Median artifact width decreased from 5.35 to 4.05 mm in kidney (24.3%, $p=0.028$), 6.0 to 4.3 mm in lung (8.3%, $p=0.017$), and 5.0 to 3.5 mm in liver (30%, $p=0.028$). Median artifact intensity improved from -960.6 to -620.6 HU in kidney (35.4%, $p=0.028$), -961 to -734.3 HU in

lung (23.6%, $p=0.021$), and -900.5 to -551 HU in liver (38.8%, $p=0.011$). Three blinded radiologists scored conventional CT needle images with significantly worse artifacts (median=3) compared to Needle-ART images (median=2, $p=0.00041$).

Conclusion: Needle-ART is effective for reducing metal artifacts during CT-guided interventions in this deceased animal model. Future work includes integrating and automating Needle-ART into clinical CT scanners and obtaining regulatory approval for human clinical use.

Abstract No. 192

MR-Guided Catheter-Based Radiotherapy/Brachytherapy of Liver Tumors: First Experience and Feasibility



(Article No. 108210)

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Purpose: To show feasibility and safety of MR-guided catheter-based radiotherapy/brachytherapy of primary or secondary liver tumors

Materials and Methods: Between June 2023 and April 2024, a total of 27 patients with 54 liver lesions were treated within a prospective single-center trial on MR-guided catheter-based radiotherapy (MR BRIGHT trial). Treatments were performed under conscious sedation and local anaesthesia, utilizing a 1.5T MRI system (Magnetom Solafit, Siemens Healthineers) with a 15 cm loop coil. Each procedure involved administering gadoteric acid at 0.1 mmol/kg body weight for contrast enhancement, inserting an 18G coaxial needle (Co. ITP) and navigating to the lesion through real-time gradient-echo (TE 3.4 ms, TR 7.3 ms, FA 30°) fluoroscopy sequences (with iMRI UI Extension, Research Software Package), subsequently exchanging the needle over a nitinol wire for a 6F hydrophilic angiography sheath harboring a 6F brachytherapy catheter. 3D T1-weighted sequences were sent to treatment planning system in the radiation department for Brachytherapy (BT) with IR192 high-dose-rate (HDR) after-loading unit. Target doses ranged from 15 to 25 Gray (Gy) depending on the tumor entity, including HCC (33.3%), CRC (22.2%), GIST (11%), NET (11.1%) and metastases from other primaries (22.2%). The catheters were removed after BT and the radiation tract was sealed with gelatine sponge.

Results: The average lesion diameter was 13 ± 6 mm, whereas the average clinical target volume (CTV) was 3.0 ± 2.9 cm³. The average room time was 74 ± 35 minutes, the average time for catheter placement was 19 ± 11 minutes. The mean dose administered per lesion (D100) was 18.9 ± 3.6 Gy. Complications during and after BT were generally rare with only 1 patient (3.7%) having a minor bleeding without need for blood transfusion or intervention.

Conclusion: Overall, MR-guided catheter-based radiotherapy for liver tumors is feasible and safe, particularly for small lesions. With low complication rates and precise dosimetry achieved through advanced imaging, this approach holds promise for effective tumor management.

Abstract No. 193

Noninvasive Imaging of the Tumor Microenvironment in Hepatocellular Carcinoma Treated with Sorafenib and Memory-like NK Cells



(Article No. 108211)

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Purpose: Hepatocellular carcinoma (HCC) presents a significant global health burden due to late-stage diagnosis and limited treatment options. Sorafenib provides modest survival benefits in advanced HCC but is often hindered by resistance and toxicity. Memory-like NK (pNK) cells have emerged as promising immunotherapeutic agents due to their potent cytotoxicity functions. This study investigates the therapeutic potential of combining Sorafenib with memory-like NK cells immunotherapy in HCC, with a focus on different administration routes and noninvasive monitoring strategy using MRI.

Materials and Methods: Two rat HCC models (N1S1 and MCA) were used to assess treatment outcome. Animals received control, Sorafenib, pNK cell, or combination therapy. NK cells were administered locally (in N1S1) or systemically (in MCA). Quantitative MRI was used to monitor tumor progression weekly. Histopathological analysis (H&E, CD56, CD31, TUNEL) was used to illustrate tumor microenvironment (TME) characteristics. Random Forest models were trained using MRI-derived radiomic features to predict histopathological changes.

Results: The N1S1 model exhibited significantly greater response to all therapies, particularly combination therapy with local NK cell delivery, which nearly halted tumor growth. Baseline histological assessments revealed higher NK infiltration, vascularization, and rate of spontaneous apoptosis in N1S1 tumors compared to MCA. The machine learning models trained on MRI-derived radiomic features successfully predicted key histopathological features with high accuracy ($R^2 > 0.90$). Models based on T1-weighted and T2-weighted imaging individually demonstrated robust accuracy, with their combination offering consistent improvements in prediction.

Conclusion: The enhanced therapeutic response in the N1S1 model is likely driven by its more immunogenic and vascularized TME. Local pNK cell delivery markedly improved efficacy. These findings underscored the value of integrating quantitative MRI with machine learning to non-invasively monitor TME dynamics. This approach holds a promising potential to enhance individualized HCC therapy while mitigating key constraints of conventional diagnostic approaches. Limitations of this study include small sample size, few histopathological markers, and the conventional T1 and T2 imaging. Future studies integrating more diverse datasets, multiple histopathological features, and higher-quality MRI inputs could potentially strengthen the current findings.

Abstract No. 194**Multicentric Prospective Evaluation of Cone-Beam Computed Tomography Virtual Hepatic Volumetry for Selective Internal Radiation Therapy: Preliminary Results from the PALAS-VP Registry**

(Article No. 108212)

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Purpose: To prospectively evaluate perfused liver volume calculated from virtual injection points on non-selective contrast-enhanced cone-beam computed tomography angiography (nsCBCT) using selective CBCT (sCBCT) as a reference.

Materials and Methods: 142 patients were prospectively enrolled from five centers participating in the international PALAS-VP registry (July 2024–July 2025). During work-up, the reference selective volume (RSV) was manually segmented from the sCBCT acquired at the ^{99m}Tc-MAA injection point. Virtual perfusion volume (VPV) was computed using the Liver ASSIST Virtual Parenchyma software (GE HealthCare) on nsCBCT using the same injection site. In cases with multiple ^{99m}Tc-MAA injection points, RSV and VPV were summed. Volumetric concordance was evaluated using: signed volumetric error (SVErr), the difference between VPV and RSV; absolute volumetric error (ABSErr), the absolute value of SVErr; relative volumetric error (RVErr), the ABSErr expressed in percentage; and Dice similarity coefficient, measuring spatial overlap between volumes.

Results: Thirty-two patients were excluded due to inadequate reference standard preventing manual segmentation. Software failure occurred in 1/110 (0.9%). Eighty patients had a single injection point, while 21 and 8 patients had two and three injection points, respectively. Among the 109 patients, median RSV and VPV were 379 mL (165–487) and 390 mL (207–638), respectively ($p=0.49$). Median SVErr, ABSErr, RVErr and Dice similarity coefficient were 28.5 mL (−36.0 to 89.2), 54.4 mL (32.2–122), 8.3% (−9.5% to 25.8%), and 76.5% (68.9–81.6), respectively. Dice similarity was comparable between procedures with a single vs. multiple injection points [74.8% (67.9–81.5) vs. 78.3% (72.4–81.7), $p=0.44$]. No significant differences in SVErr, ABSErr or RVErr were found in case of single vs. multiple injection points ($p=0.96$, $p=0.86$, and $p=0.33$, respectively).

Conclusion: This prospective multicenter study demonstrates that perfused liver volumes generated from virtual injection points on non-selective CBCT during selective internal radiation therapy are both numerically and spatially comparable to manually segmented volumes from selective CBCT.

Abstract No. 195**Evaluation of ComBat Batch Correction for Harmonizing Radiomic Features Across a Multicenter DCE-MRI Dataset**

(Article No. 108213)

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Purpose: To investigate the presence and impact of batch effects in radiomic features extracted from hepatocyte-avid DCE-MRI of metastatic uveal melanoma lesions, and to evaluate the effectiveness of ComBat batch correction using image acquisition covariates such as the imager manufacturer. Batch effects, introduced by site-specific imaging protocols, scanner hardware, and contrast agents, can obscure biological signals and reduce the generalizability of machine learning models. Therefore, robust batch effect correction is essential to ensure that machine learning models capture clinically meaningful relationships rather than site-specific or covariate artifacts.

Materials and Methods: We retrospectively analyzed DCE-MRI studies from 401 patients. Each scan consisted of a T1-weighted hepatocyte-avid axial sequence acquired at multiple sites before interventional radiology treatment. An expert radiologist annotated a total of 1,537 liver metastases. Of these, 723 lesions from 157 patients were segmented using a fuzzy C-means algorithm. Morphological, texture, and kinetic radiomic features were subsequently extracted from each lesion. After segmentation quality control was performed using a DICE threshold of 0.25, 451 lesions from 136 patients were retained. Dimensionality reduction techniques (PCA, t-SNE, UMAP) were employed to visualize potential batch effects. Cosine similarity was used to quantify changes in feature similarity. The dataset was split 70/30 into training and testing subsets. ComBat was fit on the training set, and the testing set was corrected using the training-derived estimates.

Results: Dimensionality reduction revealed significant batch effects driven by scanner manufacturer and contrast agent, with intensity-based features showing greater susceptibility than morphological features. Following the post-ComBat correction, within-group similarity increased across most covariates, indicating improved internal consistency. However, between-group similarity also rose in some cases, notably among responders in the manufacturer subgroup, suggesting incomplete separation.

Conclusion: Radiomic features extracted from DCE-MRI are affected by site-specific acquisition parameters, introducing confounding batch effects. ComBat correction improved within-group consistency but did not fully resolve between-group separation, especially in imbalanced subgroups. These findings underscore the importance of covariate-aware batch correction in radiomics studies, suggesting that further refinement of feature harmonization strategies may be necessary.

Abstract No. 196**Comparing Volumetrics for Predicting Adverse Events and Local Recurrence After Percutaneous Ablation of Renal Cell Carcinoma**

(Article No. 108214)

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Purpose: This study aims to assess tumor diameter and volume as predictors of major adverse events (AEs) and local recurrence following PA for RCC.

Materials and Methods: In this single-center retrospective study, patients undergoing PA for RCC from January 2008 to December 2023 were included in the analysis. Data collection included patient demographics, medical co-morbidities, and pre-procedure laboratory values. Tumor characteristics, including diameter and volume, were obtained from pre-procedural imaging. Technical success, local recurrence, and AEs were recorded. Statistical analyses included t-tests, Mann-Whitney U tests, and multivariate logistic regression. Adverse events were classified using Society of Interventional Radiology criteria, and overall and cancer-specific survival analyses were conducted using the Kaplan-Meier method.

Results: 203 patients with 207 unique tumors (mean diameter: 30.1mm; mean volume: 16,959mm³) were included in the study. Major AEs occurred in 14 patients (6.8%), and local recurrence was observed in 13 patients (6.3%). Tumors associated with major AEs had significantly larger mean diameters (43mm vs. 29.2mm, $p < 0.001$) and mean volumes (35,580mm³ vs. 15,667mm³, $p < 0.001$) than those with minor/no adverse events. However, tumor size and volume did not significantly differ between patients with or without recurrence ($p = 0.06$ and $p = 0.09$, respectively). In multivariate analysis, only diameter size (OR: 6.4, 95% CI (1.5, 32.3), $p = 0.015$) and pre-procedural INR (OR: 1.5, 95% CI (1.0, 2.4), $p = 0.03$) were independent predictors of major AEs. No variables were found to be independently predictive of local recurrence.

Conclusion: Both tumor diameter and volume were found to have an increased risk of major AEs after PA, however, only diameter remained an independent predictor in multivariate analysis. Neither tumor volume nor tumor diameter were found to be predictive of local recurrence. Despite technological advancements, this study supports the continued clinical utility of tumor diameter as a reliable predictor of adverse outcomes in renal tumor ablation, aligning with prior nephrometry-based findings. Although tumor volume has emerged as a promising predictive measure in multiple treatment modalities, it does not independently enhance risk stratification in PA for RCC. These findings may aid physicians by providing for a more accurate evaluation of tumor burden, ultimately improving pre-procedural risk assessment and patient counseling.

Scientific Session 21

General IR 2

Tuesday, April 14, 2026
3–4:30 p.m.

Abstract No. 197

Demographic Disparities Between Integrated Interventional Radiology Applicant Pool and Resident Cohort



(Article No. 108216)

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Purpose: The purpose of this study is to evaluate longitudinal trends in gender and race/ethnicity demographics among the integrated interventional radiology (IR) applicant pool and the entering resident cohort over the past 5 years.

Materials and Methods: Retrospective analysis of data obtained from the Association of American Medical Colleges (AAMC) Electronic Residency Application Service (ERAS) and Graduate Medical Education (GME) annual reports was conducted. Demographic variables were obtained including: gender (men/women), race/ethnicity (American Indian/Alaska Native, Asian, Black, Hispanic/Latino, Native Hawaiian/Other Pacific Islander, White, Other/Unknown), and citizenship (non-U.S. citizen/non-permanent resident) from 2020 to 2024.

Results: From 2020 to 2024, there were 4,202 Integrated IR applicants, of which 23.6% were women. Compound annual growth rate (CAGR) analysis demonstrated greater growth among women residents (21.9%/year) and men residents (17.6%/year) compared with applicants (women: 6.9%/year, men: 2.5%/year). Chi-square analysis showed a significant increase in the proportion of women applicants from 2020 to 2024 ($\chi^2 = 11.25$, $p = 0.024$), however, the gender distribution among residents remained stable ($\chi^2 = 1.35$, $p = 0.85$). By race and ethnicity, there was an overrepresentation of White and Asian residents relative to applicants. In 2024, 59.0% of residents were White compared with 35.3% of applicants, and 28.5% of residents were Asian compared with 21.3% of applicants. CAGR analysis demonstrated the greatest growth among Black residents (+43.6%/year) and AI/AN applicants (+29.4%/year), while White applicants declined (−0.3%/year). White and Asian residents continued to grow at a fast rate (+16.0% and +19.7%/year). Chi-square analysis demonstrated a significant difference between the racial/ethnic distribution of applicants and residents across the study period ($\chi^2 = 342.0$, $p < 0.0001$).

Conclusion: From 2020–2024, the Integrated IR applicant pool has become more diverse, particularly with increases in Women and Black candidates. However, resident cohorts remained disproportionately White and Asian, with persistent underrepresentation of Black, Hispanic/Latino, and other URiM applicants. These findings further shed light on the ongoing disparities that exist for the matriculation of underrepresented groups. Our study underscores the need for targeted outreach and robust initiatives to expand the pipeline of women and URiM applicants.

Abstract No. 198

The X-iest Radiologists: A Social Media Analysis of Diagnostic and Interventional Radiology Influencers



(Article No. 108217)

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Purpose: Social media influence has been studied in many medical specialties, but previous methodologies are no longer supported, and little information exists on interventional radiologists. A contemporary analysis of the most influential interventional radiologists and diagnostic radiologists on X is presented.

Materials and Methods: This study was institutional review board exempt. To identify interventional radiologists and DRs on X, a third-party keyword search of shared content, description in bios or links, and profile statistics was performed to identify users. Keywords included “radiology,” “radiologist,” “diagnostic radiology,” “interventional radiology,” “IR,” “DR,” and “medical imaging.” Identified users were refined by inclusion criteria: status as an interventional radiologist or diagnostic radiologist, activity within 90 days, and most of the content being medically related. Influence was analyzed by relative value scores according to reach, engagement, propensity to disseminate information, and centrality (in-degree centrality, betweenness centrality, and eigenvector centrality). Cumulative influence scores were compiled, and those with the highest relative value scores were given a final ranking. Additional demographic information, practice type/location and *h*-index were gathered about X users with the top 100 influence ranking through publicly available methods, including websites, LinkedIn, Doximity, and SCOPUS.

Results: Of the most influential interventional radiologists, 92% are male, 91% are attendings, and 75% work in academia. Of the most influential diagnostic radiologists, 73% are male, 95% are attendings, and 82% work in academia. A total of 91% of the interventional radiologists practiced general interventional radiology (IR) (91%). The most common sub-specialties in diagnostic radiology (DR) influencers are neuroradiology (25%), general diagnostic (20%), and musculoskeletal (17%). For interventional radiologists, Emory and Mount Sinai are the most well-represented institutions ($n=4$ each), while Emory, University of Pennsylvania, and NYU ($n=5$ each) are the most represented in DR. The most common locations for private practice for IR were Florida (5/25) followed by Virginia and North Carolina (2/25 each); for DR, locations for private practice did not overlap. The top IR influencers' *h*-index ranged from 0–73 with a median of 10 (SD 14.6). The top DR influencers' *h*-index ranged from 0–113 with a median of 11 (SD 17.0). No correlation was present between X influence and *h*-index for interventional radiologists or diagnostic radiologists. Comparing IR and DR, the male majority in IR is significantly higher than that in DR ($p=0.0004$).

Conclusion: Overall, a minority of IR and DR influencers were women, with a larger male majority in IR. No correlation between academic productivity and influence rank existed despite most of the influencers working in academia.

Abstract No. 199

Network Analysis of the 2016–2025 Interventional Radiology Residency Match: Algorithmic Identification of Geographic Association, Non-Geographic Clusters, and Influence



(Article No. 108218)

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Purpose: IR residency grew from 7 programs and 15 positions in 2016 to 96 programs and 196 positions in 2025. Analysis of prior years' match data reveals the most well-connected schools and programs, geographic and non-geographic associations, and the network's evolution over time.

Materials and Methods: A total of 1389 of 1458 (95.3%) IR matches between 2016 and 2025 were compiled from publicly available sources: NRMP data, department websites, and medical school match lists. Network plots were generated using Gephi. Medical schools and residency programs (nodes) and matches (edges) were assessed for number of connections, clusters, and Eigenvector centrality (relative influence determined by how well-connected a node is and how well-connected are its connections). Data was evaluated for statistical significance using chi-square or Fisher's exact tests.

Results: The medical schools graduating the most students matched to IR are Rosalind Franklin (26), Johns Hopkins (23), Temple (23), and the University of Washington (23), while residency programs matching the greatest number of students into IR are Emory (37), Rush (36), the University of Pennsylvania (34), and the University of Michigan (30). A significant association between a student's medical school region and their matched program region exists across the ten years of the IR match ($p < .05$), and this association persists when examining distinct time periods: 2016-2020, 2021-2022, and 2023-2025 defined by substantive match process changes. A force-directed network algorithm illustrates that even as the number of matched students invariably grows, non-geographic clusters of schools and programs appear and change temporally. Overall, the most well-connected nodes in the network of IR matches are Rush (52), the University of Pennsylvania (52), the University of Washington (51), and Duke (47). The most influential node in the 5-year network is Duke with an Eigenvector centrality of 1.0, followed by Rush (0.93) and the University of Pennsylvania (0.91).

Conclusion: IR is among the most competitive specialties with challenges for applicants and program directors alike—an issue exacerbated by the ease of virtual interviews and resultant increase in applications. Students may use network analysis to focus on programs within their own or other desirable clusters, or to identify an influential program for an away rotation to bridge clusters. Program directors may use network analysis to guide outreach and inform perceptions of a program's relative standing within and among clusters or the broader IR training network. The ABR or NRMP may use network analysis to evaluate effectiveness of reporting signals and regional preference.

Abstract No. 200

Attrition in Interventional Radiology Residency: A National Survey



(Article No. 108219)

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Purpose: The integrated interventional radiology (IR) residency remains highly competitive, yet the rate of attrition of integrated IR residents into diagnostic radiology residency exceeds diagnostic radiology and is comparable to surgery. This may affect the IR workforce as demand for image-guide procedures continues to grow. Surgical literature connects attrition to lifestyle, workload, and lack of support. However, the attrition rate in IR has not yet been characterized. To address this gap, a national resident survey was conducted to assess factors influencing retention in the integrated pathway.

Materials and Methods: A national survey was distributed through the Society of Interventional Radiology Residents and Fellows Section (RFS) email list-serves from 2023 to 2024. In total, 189 residents responded, including 166 integrated IR residents. Metrics included demographics, program structure, and open-text responses. Quantitative data was analyzed with ANOVA and t-tests.

Results: Among integrated IR residents, 38% reported questioning whether to continue in IR. Key reasons included lifestyle concerns (78%), job market uncertainty (31%), and combined DR and IR call burden in residency (22%). Less common factors were pre-residency misconceptions, toxic environments, and limited early IR exposure ($< 10\%$). Conversely, factors supporting retention included structured curricula (38%), case volume and procedural experience (35%), pre-residency IR exposure (22%), research opportunities (22%), mentorship (22%), and program camaraderie (18%). Additionally, there was no significant association between questioning IR and demographics or type of preliminary year program ($p > 0.05$).

Conclusion: Nearly two in five integrated IR residents have considered leaving IR, with a 3.2% attrition rate. This may reflect a risk for attrition, or conversely, highlight how program support and structured training retain residents. Importantly, residents expressed continued interest in practicing IR, often in combination with DR, suggesting dissatisfaction with training structure rather than the field itself. Program design, including limited early IR exposure, disproportionate diagnostic radiology call responsibilities, and variability in training curricula influence attrition. These findings highlight the importance of protecting early IR rotations, standardizing curricula, aligning call with educational goals, and fostering a supportive culture to improve retention and ensure the sustainability of the integrated pathway.

Abstract No. 201

Evaluation of Large Language Models (LLMs) for Patient-Oriented Explanations of Liver-Directed Therapies (LDT) in Hepatocellular Carcinoma (HCC)



(Article No. 108220)

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Purpose: To evaluate whether contemporary large language models (LLMs) can generate accurate, comprehensive, readable, and safe explanations of minimally invasive LDT for HCC in English and Spanish.

Materials and Methods: A structured framework of patient-oriented questions was developed based on guideline-endorsed management of HCC. Eight questions were applied across 11 therapies spanning 3 categories (ablation, transarterial, external radiation). One additional question addressed minimally invasive treatments overall, yielding 9 domains in total. Two LLMs (GPT-4.1mini and Gemini-2.5) were queried in English and Spanish at 3 temperature settings (0.0, 0.4, 0.7), generating $n = 1,068$ outputs. Responses were evaluated for factual concordance with guidelines, readability (Flesch Reading Ease), and linguistic variability (perplexity, lexical entropy). Automated metrics were supplemented with clinician review to provide multilayer validation of accuracy, comprehensiveness, and accessibility, while integration of fact checking indices (FactCC, FEVER, SMOG) further enhanced the robustness of the evaluation framework.

Results: Gemini demonstrated superior interpretability, with a higher reading score and lower grade level compared to GPT (simple words, short sentences). Readability for both versions were considered at college level; Gemini achieved slightly better scores in the Flesch Reading Ease (26.6) and Flesch-Kincaid Grade Level (14.66) compared to GPT (20.75 and 15.24, respectively), though responses by both were deemed challenging for the general public. GPT displayed significantly lower lexical entropy (6.93) than Gemini (7.40), proving Gemini responses favor word variety and richness, whereas GPT responses favor consistency and simpler language. Differences across all tests reached significance (Mann Whitney test, all $p < 0.01$). When matched on question, language, and temperature, the average median cosine similarity score between the two models (0.83) demonstrates that GPT and Gemini responses are semantically very close, using similar vocabulary, and following similar structures. However, in regard to style, nuance, and information, the models are distinct enough to matter for medical comprehensibility and safety.

Conclusion: LLMs generate accurate explanations of HCC therapies but remain limited by readability, depth, and recency. Gemini was most accurate, yet outputs stayed at college level, underscoring the need for clinical and AI expert oversight, literacy-focused tuning, and cross-language validation.

Abstract No. 202

Competency-Based Learning, Evaluation & Assessment in Real Time for Interventional Radiology (CLEAR-IR): Assessing Current Feedback Practices and Anticipated Utility of a New Tool



(Article No. 108221)

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Purpose: To evaluate perceptions of the existing feedback system among faculty and trainees within an IR program and to assess the perceived value of implementing CLEAR-IR, a competency-based assessment tool that allows for real-time documentation of the clinical and technical proficiency demonstrated by trainees during procedures through integration into the procedural dictation workflow.

Materials and Methods: A new tool was developed to allow for assessment of trainee performance based on clearly defined, PGY-specific competencies. Prior to implementation, an anonymous electronic survey was conducted among faculty and trainees in a program that includes two academic centers. Respondents were asked multiple Likert-style (5-point scale) questions regarding various aspects of the current feedback system, and the likelihood CLEAR-IR would lead to improvements. These questions were grouped into categories, and the responses were averaged for each respondent to generate a composite score within each category. Descriptive statistics were calculated, and composite scores were compared between faculty and trainee groups using a non-parametric test for ordinal data (Mann-Whitney U).

Results: 15 trainees (100%) and 13 attendings (86.6%) completed the survey. Mean composite scores for questions assessing the current feedback system were 3.23 ± 0.66 for faculty and 3.58 ± 0.81 for trainees ($p=0.32$), with comparable scores among PGY1-4 (3.74 ± 0.74) and PGY5-7 residents (3.51 ± 0.94 , $p=0.56$). For anticipated benefits of CLEAR-IR, mean scores were 4.17 ± 0.76 for faculty and 4.09 ± 0.83 for residents ($p=0.71$), with a trend toward higher perceived utility among PGY1-4 (4.43 ± 0.42) vs PGY5-7 (3.74 ± 1.02 ; $p=0.17$). Regarding the current feedback system, the lowest-rated items among faculty were awareness of trainees' medical knowledge (2.62 ± 0.96) and technical ability (2.69 ± 0.85) at the start of a rotation, and for residents it was awareness of performance relative to peers (2.93 ± 1.38). The highest-rated anticipated benefits were providing more effective critical feedback and improving standardization for faculty (4.38 ± 0.87) and improved quality (4.14 ± 0.95) and timeliness (4.07 ± 1.10) of formative feedback for residents.

Conclusion: Composite scores related to the existing feedback system were moderate and similar for trainees and attending physicians, highlighting opportunities to make improvements on current practices. Both trainees and faculty rated the anticipated utility of the new electronic tool highly and identified specific areas of particularly high perceived benefit.

Abstract No. 203

Enhanced PROcedural Information TRANSLATability for Patient-Centered Care in Interventional Radiology with Large Language Models (PRO-TRANSLATE IR)



(Article No. 108222)

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Purpose: To utilize GPT-4 to generate multilingual, patient facing interventional radiology instructions and evaluate their clinical appropriateness and lay comprehension across eight languages.

Materials and Methods: Sixteen survey sets (eight languages × clinical vs non clinical) yielded 387 Likert ratings (1–5) for uterine fibroid embolization (UFE), transarterial chemoembolization (TACE), and radiofrequency ablation (RFA). Languages (Mandarin, Cantonese, Spanish, Arabic, French, Tamil, Telugu, Korean) collectively represent ≈2.1 billion native speakers (~26% of the world population). To avoid double counting within Sinitic languages, unique coverage is estimated once; total potential reach (native + L2) is ≈2.6–3.0 billion (~32–37%). Primary endpoints were pooled mean ratings with 95% confidence intervals and Top 2 (good/excellent) proportions. Procedure level differences were examined within languages. Between language differences were tested using Kruskal–Wallis with Holm adjusted pairwise comparisons. Qualitative comments underwent thematic analysis.

Results: Clinical reviewers rated translations as highly appropriate (pooled mean ≈4.6–4.7/5). Non clinical participants demonstrated strong comprehension (pooled mean ≈4.5–4.6/5) with overall Top 2 ≈95%. No material within language differences were observed across UFE, TACE, and RFA. Kruskal–Wallis tests across languages showed no statistically significant disparities for clinical or nonclinical outcomes; however, Holm adjusted pairwise contrasts indicated lower non clinical comprehension for French versus Spanish and for Tamil and Cantonese relative to higher scoring languages (notably Telugu/Korean) ($p < 0.05$). Qualitative findings aligned with these patterns, highlighting strong clarity/cultural fit for Spanish/Arabic and Korean/

Telugu, recommended stylistic refinement for French, terminology/register corrections for Tamil, and a preference for proper written Mandarin for print alongside an RFA phrasing correction (emphasizing thermal tumor ablation) for Cantonese.

Conclusion: GPT-4 generated, non-post edited IR instructions achieved high clinical appropriateness and lay comprehension across eight languages spanning roughly one quarter of the world's native speakers and one third of potential readers.

Abstract No. 204

Clinical Outcomes of Internal Ureteral Stents Versus Image-Guided Percutaneous Nephrostomy Tubes for the Management of Pyonephrosis: A Propensity Score–Matched TriNetX US Collaborative Network Study



(Article No. 108223)

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Purpose: To analyze outcomes following internal ureteral stents compared to percutaneous nephrostomy tubes among propensity score–matched patients with pyonephrosis.

Materials and Methods: An institutional review board–exempt query was conducted through a large multi-institutional deidentified database for patients with pyonephrosis (ICD-10DM N13.6). Patients with a history of cystectomy, nephroureteral catheter, and pregnancy at the time of interest were excluded. The internal ureteral stent (IUS) cohort required the CPT code 50433. The image-guided percutaneous nephrostomy (PCN) tube cohort was identified as having CPT code 50432, SNOMED 31327000, and SNOMED 21904006. Propensity score matching was conducted for demographics, hydro-nephrosis, urolithiasis, acute kidney injury, INR, WBC count, platelet count, and BMI.

Results: Following propensity score matching, 16,128 patients were identified in both the PCN and IUS cohorts with the average age being statistically higher among IUS patients (63.4 ± 17.2 vs. 62.8 ± 17.3 ; $p = 0.01$). Preoperative INR, WBC count, platelet count, BMI, and all other patient demographics were not statistically different. Analysis of 30 day post-intervention data found IUS patients to have a lower risk of mortality (4.4% vs. 6.6%; risk difference [RD]: 2.2%; $p < 0.0001$), all-cause sepsis (23.2% vs. 27.1%; RD: 3.8%; $p < 0.0001$), and emergency or inpatient revisit (41.7% vs. 48.3% RD: 6.6%; $p < 0.0001$). Post-intervention laboratory findings found IUS patients to have a lower creatinine (mean±STD; p -value) (1.37 ± 1.08 vs 1.42 ± 1.17 ; $p < 0.0001$), while PCN patients were found to have a lower INR (1.28 ± 0.48 vs. 1.32 ± 0.53 ; $p < 0.0001$) and WBC count (13.16 ± 112.52 vs. 17.82 ± 188.69 ; $p = 0.03$).

Conclusion: This propensity score-matched study identified that IUS provides a safer approach to the management of patients with pyonephrosis with lower rates of mortality, all-cause sepsis, and revisits following the intervention along with labs trending towards normal ranges within 30 days postoperatively.

Abstract No. 205

Radiation Risk in Routine Interventional Radiology Procedures: Outlier Profiles, Predictive Factors, and Implications for Bedside Fluoroscopy

(Article No. 108224)

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Purpose: Radiation safety is essential in interventional radiology (IR). Current monitoring emphasizes threshold-based reporting at 5 Gy and 10 Gy. Routine procedures usually fall below thresholds and are not regularly monitored for outliers. Our objective was to determine which IR procedures are most appropriate for bedside mobile fluoroscopy by identifying those with predictable radiation profiles and low outlier rates and to characterize patient factors contributing to outliers.

Materials and Methods: We retrospectively analyzed 53,230 IR procedures. Four routine procedures were included central venous catheter (CVC) placement, nephrostomy tube exchange, biliary drain exchange, and gastrostomy tube exchange. Outliers were defined using the Tukey method when air kerma rate or fluoroscopy time exceeded the upper bound. Predictive modeling assessed associations with age, sex, BMI, race/ethnicity, and ICU status. Logistic regression (LR) identified predictors; random forest (RF) compared predictor importance. Model discrimination was evaluated using area under the receiver operating curve (AUC).

Results: A total of 18,516 routine cases were included. CVC placement (n=12,286) had 6.0% outliers, with significant predictors being BMI ≥ 50 (OR 4.6, 95% CI 2.1–10.1, $p < 0.001$), BMI ≥ 60 (OR 3.9, 95% CI 1.3–11.8, $p = 0.02$), and ICU status (OR 2.2, 95% CI 1.5–3.1, $p < 0.001$). G-tube exchange (n=2,341) had 10.6% outliers, with BMI ≥ 40 (OR 16.3, 95% CI 2.9–91.1, $p = 0.001$) as the only significant predictor. Nephrostomy tube exchange (n=1,927) had 8.9% outliers, with male sex (OR 2.5, 95% CI 1.5–3.9, $p < 0.001$) being a significant predictor. Biliary tube exchange (n=1,962) had 5.7% outliers with no significant predictors. Model performance was weak overall with AUCs 0.58–0.70 (LR) and 0.55–0.68 (RF), with nephrostomy performing best at 0.70 (LR) and 0.68 (RF).

Conclusion: Predictive models were weak overall but highlighted consistent risk factors relevant to bedside appropriateness. Severe obesity was the strongest predictor; ICU status, and sex contributed in select procedures. Procedure type and patient factors may guide bedside fluoroscopy use and minimize radiation risk.

AI Disclosure Statement: The authors used GPT-5 for language editing and formatting. Authors reviewed and edited the work and take full responsibility for the content of the abstract.

Abstract No. 206

Conflicting Counsel: Inherent Variability and Contextual Bias in Patient-Directed LLM Recommendations for Uterine Fibroids and Benign Prostatic Hyperplasia

(Article No. 108225)

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Purpose: To investigate the baseline variability of patient-directed procedural recommendations among different large language models (LLMs) for uterine fibroids and benign prostatic hyperplasia (BPH), and to quantify their susceptibility to bias from contextual clinical guidelines.

Materials and Methods: Three leading LLMs (Gemini 2.5; GPT-5; Grok-4) were repeatedly prompted with patient-centric queries about medication-refractory, symptomatic uterine fibroids and BPH (e.g., “I have fibroids. I’ve tried every possible medication, but nothing works. What specific treatment would you recommend to treat my fibroids?”). Prompts were evaluated with and without contextual clinical guidelines from professional societies (American College of Obstetricians and Gynecologists, American Urological Association, Society of Interventional Radiology [SIR]), including a test condition providing all relevant guidelines simultaneously. Lexical modifiers simulated patient intentions (e.g., “I want to minimize complications”). Each prompt condition was queried 10 times per model; if output variability was observed, it was repeated an additional 20 times (30 total) to characterize the response distribution. Procedural recommendations were labeled and analyzed using multinomial logistic regression.

Results: Significant inter- and intra-model variability was observed at baseline. For identical queries, different models provided significantly different recommendations ($p < 0.001$), and even the same model could offer different primary recommendations across queries. Providing the LLMs with some of the clinical guidelines as context significantly influenced their recommendations ($p < 0.001$), however, not all societal guidelines had this effect ($p > 0.05$ for some guidelines). Specific model biases were evident: Grok-4 consistently favored uterine artery embolization for fibroids regardless of context ($p < 0.001$), whereas GPT-5 preferentially recommended HoLEP for BPH ($p < 0.001$), often omitting PAE as a viable alternative, unless it was provided SIR guidelines for context.

Conclusion: Patients face a dual risk: the choice of LLM dictates the advice received due to high baseline variability, and this advice is vulnerable to undisclosed contextual biasing. Given that one in six U.S. adults uses AI chatbots monthly for health information, this inconsistency is a critical public health concern. As these models become de-facto ‘referrers’, their inherent biases and variability could significantly alter patient pathways and procedural volumes among medical specialties. A key limitation is the evolving nature of LLMs. Transparency and public education are urgently needed to manage these risks.

Scientific Session 22

General IR 3

Tuesday, April 14, 2026
3–4:30 p.m.

Abstract No. 207

Impact of Post-Procedural Evaluation & Management (E&M) Visits on Outcomes Following High-Risk Interventional Radiology Procedures



(Article No. 108227)

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Purpose: High-risk IR procedures carry risks for early complications and readmissions. While many institutions recommend early post-procedural follow-up, evidence linking structured outpatient visits to outcomes across health systems is limited. Short-interval clinical follow-up after IR procedures was evaluated to determine association with improved outcomes.

Materials and Methods: A retrospective cohort study using TriNetX (2020–2025) was conducted with adults undergoing high-risk IR procedures (CPT codes for biliary drainage/cholecystostomy, nephrostomy/ureteral access, TIPS, tumor embolization, and intra-arterial radiopharmaceutical therapy). Exposure was defined as an outpatient E&M visit within 30 days. Outcomes included ED utilization, inpatient admission, CCS use, infection (pneumonia/UTI/sepsis), and all-cause mortality. Propensity score matching was performed on demographics and comorbidities. Cox proportional hazards models estimated hazard ratios (HRs) with 95% CIs. A sensitivity analysis compared patients followed up within 1–7 vs 8–30 days.

Results: In the unmatched 30-day cohort (n=174,237), E&M+ patients had lower mortality (2.7% vs 8.0%, HR 0.32), inpatient/

observation admissions (21.9% vs 41.6%, HR 0.43), and CCS use (4.0% vs 11.7%, HR 0.31), with higher ED utilization (21.2% vs 9.2%, HR 2.31). After matching (n=52,152 per group), these associations persisted. At 90 days, outcomes were consistent with 30-day findings. In the sensitivity analysis, early versus delayed follow-up showed no significant differences in mortality, infection, nor ED/CCS utilization, though early follow-up was associated with significantly higher inpatient and outpatient contact.

Conclusion: Across >100,000 matched patients, < 30 days post-IR procedure E&M visits were strongly associated with lower mortality, inpatient/observation use, CCS utilization, and infections. These findings support standardized post-IR ambulatory follow-up pathways and their incorporation into quality metrics.

Abstract No. 208

Understanding the Canadian Interventional Radiology Landscape Through the Canadian Association of Interventional Radiology (CAIR) Database: A Descriptive Study



(Article No. 108228)

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Purpose: Physicians in Canada are disproportionately concentrated in urban centers, with rural regions facing significant gaps in specialist care. The geo-spatial characteristics of Interventional Radiology (IR) in Canada have not been systematically studied. This study examines the distribution of Canadian Association of Interventional Radiology (CAIR) members and the sociodemographic characteristics of the populations they serve.

Materials and Methods: A list of active members of the Canadian Association of IR (CAIR) was obtained in May 2025. Data from the Canadian Census was used to gather census division (CD)-level information on population size and demographics including data on ethnicity, income, education, employment, and income. CDs were grouped and compared between those with access to IR care and those without, compared between top and bottom quartiles for each population characteristic, and mapped.

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Outcome	Window	N per group	Events E&M+ (%)	Events E&M– (%)	HR (95% CI)
Inpatient admissions	30-day	52,152	10,761 (20.6)	25,718 (49.3)	0.32 (0.31–0.32)
	90-day	49,107	16,311 (33.2)	25,187 (51.3)	0.48 (0.47–0.49)
CCS use	30-day	52,152	1,934 (3.7)	7,667 (14.7)	0.23 (0.22–0.24)
	90-day	49,107	3,816 (7.8)	8,489 (17.3)	0.39 (0.38–0.41)
Infection	30-day	52,152	8,639 (16.6)	9,775 (18.7)	0.82 (0.80–0.85)
	90-day	49,107	11,932 (24.3)	12,838 (26.1)	0.82 (0.80–0.84)
Mortality	30-day	45,628	1,036 (2.3)	4,891 (10.7)	0.22 (0.20–0.23)
	90-day	45,628	3,317 (7.3)	7,524 (16.5)	0.39 (0.38–0.41)

Results: Of 293 CDs in Canada, only 48 (19.6%) had at least one IR, leaving 31.6% of the national population without local access. IRs were strongly clustered in high-population CDs, with Toronto, Vancouver, and Montreal alone accounting for 56.5% of IRs. CDs with IRs had significantly higher mean populations (527,322 vs. 47,675; $p < 0.001$), median incomes (\$82,760 vs. \$75,821; $p = 0.002$), and educational attainment (31% vs. 16%; $p < 0.001$). Conversely, CDs with higher proportions of the population being Indigenous were less likely to have IRs (5% vs. 14%; $p < 0.001$).

Conclusion: CAIR member IRs are disproportionately concentrated in large urban centers, leaving substantial geographic disparities. Addressing this maldistribution will require coordinated strategies, including outreach models, telehealth integration, and national workforce planning.

Abstract No. 209

Fluoroscopy-Guided Percutaneous Transthoracic Pleural Forceps Biopsy in Patients with Exudative Pleural Effusion



(Article No. 108229)

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Purpose: This study aimed to evaluate the diagnostic performance and procedural characteristics of fluoroscopy-guided percutaneous transthoracic pleural forceps biopsy (PTPFB) in patients with exudative pleural effusion.

Materials and Methods: Patients with exudative pleural effusion who underwent PTPFB between May 1, 2014, and February 28, 2023, were included in this retrospective study. The interval between percutaneous catheter drainage (PCD) and PTPFB, number of biopsies, procedural time, and procedure-related complications were evaluated. The sensitivity, specificity, and accuracy of diagnosing malignancy were computed for pleural cytology using PCD drainage, PTPFB, and combined PTPFB and pleural cytology.

Results: Seventy-one patients, comprising 50 male and 21 female (mean age, 69.5 ± 15.3 years), were included in this study. The final diagnoses were benign lesions in 48 patients (67.6%) and malignant in 23 patients (32.4%). The overall interval between PCD and biopsy was 2.4 ± 3.7 days. The interval between PCD and biopsy in the group that underwent delayed PTPFB was 5.2 ± 3.9 days. The mean number of biopsies was 4.5 ± 1.3 . The mean procedural time was 4.4 ± 2.1 minutes. Minor bleeding complications were reported in one patient (1.4%). The sensitivity, specificity, and accuracy for pleural cytology, PTPFB, and combined PTPFB and pleural cytology were 47.8% (11/23), 100% (48/48), and 83.1% (59/71), respectively; 65.2% (15/23), 100% (48/48), and 88.7% (63/71), respectively; and 78.3% (18/23), 100% (48/48), and 93.0% (66/71), respectively. The sensitivity and accuracy of cytology combined with PTPFB were significantly higher than those of cytological testing alone ($P = 0.008$ and 0.001 , respectively).

Conclusion: Fluoroscopy-guided PTPFB is an accurate and safe diagnostic technique for patients with exudative pleural effusion, with acceptable diagnostic performance, low complication rates, and reasonable procedural times.

Abstract No. 210

Pulmonary Function After Thermal Ablation Versus Stereotactic Body Radiation Therapy for Lung Metastases: A Systematic Review and Meta-Analysis



(Article No. 108230)

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Purpose: Stereotactic body radiation therapy (SBRT) has been reported to impact pulmonary function more significantly than percutaneous thermal ablation (TA) in patients treated for lung tumors. We performed a systematic review and meta-analysis to compare pulmonary function test (PFT) changes following TA versus SBRT in patients with primary or oligometastatic lung disease.

Materials and Methods: Following PRISMA guidelines, PubMed, Embase, and Cochrane Library were searched for studies reporting pre- and post-treatment PFTs in patients undergoing TA or SBRT. Eligible studies reported changes in forced vital capacity (FVC), forced expiratory volume in 1 second (FEV1), or diffusing capacity for carbon monoxide (DLCO). Pooled estimates were calculated using a random-effects model with the DerSimonian and Laird method.

Results: Twelve studies published between 2008 and 2022 met inclusion criteria ($n = 759$; TA: 179, SBRT: 580). SBRT was associated with a mean FVC reduction of 4.0% (95% CI, -0.6 to 8.6 , $p = 0.16$) versus 0.1% (95% CI, -2.3 to 2.2 , $p = 0.74$) for TA ($p = 0.12$). Mean FEV1 decreased by 9.0% (95% CI, 5.8 to 12.1 , $p < 0.001$) after SBRT, compared to 0.3% (95% CI, -2.5 to 3.2 , $p = 0.80$) after TA ($p < 0.001$). Mean DLCO reduction was 16.9% (95% CI, 12.5 to 21.3 , $p < 0.01$) after SBRT versus 1.3% (95% CI, -9.9 to 12.5 , $p = 0.99$) after TA ($p = 0.01$).

Conclusion: Compared to TA, SBRT results in significantly greater reductions in FEV1 and DLCO, whereas changes in FVC are not statistically different. TA may therefore better preserve pulmonary function in patients with limited respiratory reserve.

Abstract No. 211

Precision in the Mediastinum: An Insight Into the CT-Guided Biopsy Accuracy and Safety



(Article No. 108231)

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Purpose: The mediastinum can harbor a wide range of pathological conditions, so histopathology is a must before treatment. CT-guided percutaneous biopsy is widely used for tissue diagnosis. This study evaluated the diagnostic accuracy, safety, and factors influencing yield of CT-guided mediastinal biopsy, with emphasis on rapid on-site evaluation (ROSE).

Materials and Methods: In an institutional review board--approved retrospective study, which included 350 patients who

underwent CT-guided mediastinal biopsy from January 2019 to June 2024. Rapid On-Site Evaluation (ROSE) was used as a critical adjunct providing real-time assessment of specimen adequacy. The diagnostic yield and accuracy for the biopsy were calculated. Positive predictive value (PPV), Negative predictive value (NPV), sensitivity, and specificity were calculated. In addition, patient demographics, procedure-related factors, imaging-related factors, diagnosis-related factors and post-procedure-related factors were studied.

Results: Diagnostic accuracy was 97.1% with a yield of 93.4%. Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were 96.9%, 100%, 100%, and 55%, respectively. Diagnostic yield was significantly associated with technically targeted biopsies ($p < 0.001$), lesion size ($p = 0.03$), number of cores ($p = 0.05$), repeat procedures ($p = 0.02$), PET avidity ($p = 0.01$), and ROSE use ($p < 0.001$). ROSE was performed in 34 cases (11.1%), with 28 concordant with final histopathology; its use was significantly associated with diagnostic accuracy ($p = 0.01$). No major complications occurred. Minor (Grade A/B) events were seen in 12 patients (3.9%), Grade C in 2 (0.7%), and Grade D in 1 (0.3%), all managed successfully.

Conclusion: CT-guided mediastinal biopsy is accurate, safe, and reliable, with low complication rates. ROSE improves diagnostic precision, reduces needle passes, and expedites diagnosis. Findings are consistent with international standards, supporting CT-guided biopsy as the primary diagnostic tool for mediastinal lesions.

Abstract No. 212

Innovative Device for Percutaneous Biopsy Tract Closure: A Prospective Evaluation of Safety and Efficacy



(Article No. 108232)

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Purpose: The purpose of this study was to prospectively evaluate the clinical safety and efficacy of a novel percutaneous biopsy tract closure device. This single-use, battery-powered electrocautery tool enables physicians to proactively achieve hemostasis at the source by sealing the biopsy channel from within the guide needle. This innovative approach is designed to enhance patient safety and procedural efficiency by providing a previously unavailable level of control and assurance.

Materials and Methods: A prospective, single-institutional study was conducted on 109 patients who underwent percutaneous biopsy followed by tract closure with the device. 12 interventional radiologists with varying levels of experience performed the procedures. The patient cohort had a median age of 62 (range, 2–87). Biopsies were performed in both inpatient (37.6%) and outpatient (62.4%) settings. The biopsies targeted the kidney (30 cases, including 8 tumors), liver (52 cases, including 43 tumors), and a diverse “other” category (27 cases, including 24 tumors) comprising masses in the lung, tongue, retroperitoneum, intraperitoneum, adrenal gland, chest wall, lytic osseous, and transplant pancreas.

Results: Among the 109 biopsies, 6 (5.5%) biopsy-related complications were observed. No complications were directly attributable to the device itself. Complications included 0.0% for

liver biopsies (0 of 52), a 13.3% for renal biopsies (4 of 30), and a 7.4% for the “other” category (2 of 27). The 6 complications included 4 mild perinephric hemorrhages that resolved without intervention, 1 small pneumothorax that did not require chest tube placement, and 1 retroperitoneal hemorrhage that necessitated angiogram and embolization. Only 1 patient in the entire cohort required an overnight hospital stay.

Conclusion: This prospective evaluation demonstrates that the innovative percutaneous biopsy tract closure device is both safe and effective across a wide array of challenging and diverse anatomical locations. The low overall complication rate of 5.5%, a major complication rate of just 0.9%, and the complete absence of complications in the liver biopsy cohort suggest the device’s hemostatic capabilities are superior to existing methods. The ability to effectively seal the biopsy channel from within enhances patient safety and provides a high level of control. These results, coupled with the high rate of outpatient discharges, indicate that this device can significantly improve procedural efficiency and patient outcomes, positioning it as a new standard of care for percutaneous biopsies.

Abstract No. 213

Safety and Diagnostic Performance of a Novel Prostate Biopsy Technique Using MRI-Fused Cone-Beam CT



(Article No. 108233)

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Purpose: To evaluate the safety profile and diagnostic performance of a novel MRI-fused CBCT-guided transgluteal prostate biopsy technique.

Materials and Methods: A retrospective chart review was performed of patients who underwent MRI-fused CBCT-guided prostate biopsy at a single academic center between September 2019 and October 2024. Eligible patients had prostate lesions scored as PI-RADS 3 or greater on MRI with clinical suspicion for prostate cancer. Patient demographics, comorbidities, prostate-specific antigen (PSA) levels, biopsy outcomes, complications, and treatment decisions were recorded. Descriptive statistics were calculated, and Spearman’s rank correlation was used to assess the relationship between PI-RADS and Gleason scores.

Results: A total of 139 patients underwent 161 procedures. The mean age was 68.0 ± 7.1 years, and mean PSA was 10.7 ± 7.2 ng/mL. Most patients (80.7%) had at least one prior biopsy. Partial or complete inconclusive results occurred in 16 procedures (9.9%). Clinically significant cancers (Gleason ≥ 7) were more frequently identified in PI-RADS 5 lesions. Spearman correlation demonstrated a statistically significant weakly positive association between PI-RADS and Gleason scores ($p = 0.3$, $p < 0.001$). The overall complication rate was 2.5%, including two cases of sepsis, one urinary tract infection, and one episode of gross hematuria with urinary retention. Mild hematuria occurred in 9.3% of patients and resolved spontaneously prior to same-day discharge.

Conclusion: MRI-fused CBCT-guided transgluteal biopsy demonstrates a favorable safety profile and diagnostic performance, supporting its potential as a reliable alternative to traditional prostate biopsy methods.

Abstract No. 214

Hemostatic Agents After Renal Biopsy: Helpful or Habit?



(Article No. 108234)

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Purpose: To evaluate the impact of hemostatic agents and body mass index (BMI) on bleeding risks following percutaneous renal biopsy.

Materials and Methods: A retrospective review was done on patients who underwent percutaneous renal biopsy between 2020-2025 at a tertiary care center. Patients were grouped by use of hemostatic agent in biopsy tract versus no hemostatic agent following percutaneous renal biopsy. BMI and other patient demographics were also collected. The primary outcome was post-biopsy bleeding, defined as expanding hematoma on post-procedural imaging, hematoma associated with painful abdomen/flank, hemoglobin drop ≥ 2 g/dL, or syncope/hypotension.

Results: Hemostatic agent use was evaluated as a categorical variable using Fisher's exact test and showed no association with bleeding. Among 94 patients who received a hemostatic agent, 14 (15%) experienced hemorrhage compared with 31 of 206 patients (15%) who did not use hemostatic agent ($p=1.0$). In contrast, body mass index (BMI) was analyzed as a continuous variable in multivariable logistic regression. Controlled values included age, history of tobacco use, diabetes, and hypertension, number of specimens collected, and INR values. Results show BMI is inversely associated with bleeding risk. Each unit increase in BMI was associated with a 5% relative reduction in odds of bleeding (OR 0.95, 95% CI 0.90–0.99, $p=0.039$).

Conclusion: Higher BMI appeared protective against bleeding, while the use of hemostatic agents did not reduce bleeding complication rates. These findings suggest that routine placement of hemostatic agents may not provide added benefit and should not be used indiscriminately. This is especially important due to risk of hemostatic agent migration. Although major bleeding risks are low after percutaneous renal biopsy, a more judicious approach could improve resource allocation to ensure that adjunctive hemostatic interventions are reserved for patients at truly elevated risk. Our findings highlight the importance of post-biopsy interventions depending on patient-specific risk factors.

Abstract No. 215

Ablation as an Alternative to Surgery for Adrenal Cushing Syndrome: Preliminary Comparative Outcomes



(Article No. 108235)

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Purpose: To explore and compare radiofrequency ablation with surgery in treating patients with adrenal Cushing Syndrome.

Materials and Methods: This retrospective case series compared patients between 2014 and 2025 who underwent adrenalectomy or ablation for adrenal Cushing Syndrome. For each patient, the most recent available follow-up (at 2 weeks, 3 months, or 6 months) was used to assess clinical and biochemical outcomes. Treatment response was evaluated in three ways: (1) a negative post-treatment screening test for hypercortisolism, (2) overall clinical symptom improvement, and (3) improvement in hypertension or diabetes. Data collected included systolic and diastolic blood pressure (SBP, DBP), ACTH, cortisol, weight, glucose, and HbA1c, measured before and after the intervention. Outcomes were summarized descriptively and compared between groups.

Results: Eleven patients were included: six underwent adrenalectomy and five underwent ablation. Among surgical patients, 50% (3/6) had a negative screening test following treatment, 17% (1/6) showed overall symptom improvement, and 33% (2/6) improved in blood pressure or glycemic control. In the ablation group, 20% (1/5) had a negative screening test, 60% (3/5) had clinical improvement, and 20% (1/5) improved in blood pressure or diabetes. SBP declined from 154 mm Hg (121–170) to 116 mm Hg (106–132) in the surgery group and from 145 mm Hg (127–178) to 130 mm Hg (115–138) in the ablation group. DBP fell from 84.5 mm Hg (79–102) to 67 mm Hg (58–70) with surgery and from 81 mm Hg (78–90) to 70 mm Hg (65–85) with ablation. Cortisol dropped from 14.6 to 9.1 $\mu\text{g/dL}$ after surgery and from 11.3 to 10.6 $\mu\text{g/dL}$ after ablation. ACTH rose post-surgery (7.5 $\rightarrow$ 12.7 pg/mL) but decreased slightly with ablation (8.5 $\rightarrow$ 7.0 pg/mL). Glucose declined in the surgery group (115 $\rightarrow$ 101 mg/dL) but increased slightly with ablation (142.5 $\rightarrow$ 148 mg/dL); HbA1c followed a similar pattern (7.05% $\rightarrow$ 6.55% vs 6.55% $\rightarrow$ 7.1%). Because follow-up occurred at different time points across patients, these biochemical results should be interpreted with caution. Adrenal insufficiency was not observed in the ablation group, while its full extent in the surgery group could not be determined due to limited follow-up data.

Conclusion: Adrenal ablation is emerging as a safe and effective treatment for Cushing syndrome, offering comparable outcomes to surgery in improving clinical symptoms and hypertension. It may carry an advantage in avoiding adrenal insufficiency, though further studies with larger cohorts are needed to validate these findings and clarify its role as an alternative to adrenalectomy.

Abstract No. 216

Treatment of Aggressive Vertebral Hemangiomas Through Superselective Percutaneous Ethanolization of Epidural Components: An Innovative Minimally Invasive Technique



(Article No. 108236)

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Purpose: This retrospective study investigates a novel technique for treating aggressive vertebral hemangiomas, focusing on selective ethanol sclerotherapy of invasive epidural extensions.

Materials and Methods: All patients treated between 2012 and 2025 at two hospitals in Ghent (Belgium) were included. All procedures were performed by the same interventional radiology team. Eligible patients presented with progressive or impending neurological symptoms due to epidural extension of aggressive hemangiomas. Prior embolization or resection excluded patients, except in cases of urgent laminectomy. Under general anesthesia, patients were positioned on the angiography table (Artis Q/Artis Icono biplane, Siemens, Munich, Germany; Azurion 7 biplane, Philips, Amsterdam, Netherlands). Cone-beam CT (CBCT) was fused with preprocedural MRI for planning. Needle guidance software (myNeedle Companion, Siemens, Munich, Germany; XperGuide, Philips, Amsterdam, Netherlands) assisted selective puncture of epidural components directly using a fine diagnostic needle or coaxially through a bone biopsy needle. After aspiration, 1–2 mL of contrast was injected under biplane fluoroscopy to confirm intraleSIONal position and exclude leakage. A maximum of 3 mL of pure ethanol (96%) was then injected under subtraction fluoroscopy. CBCT confirmed diluted contrast stasis in the epidural extensions.

Results: Seven patients (mean age 48 years; 57% female) were included, with treated vertebral levels ranging from third thoracic to second sacral. Technical success was achieved in all procedures. One patient experienced transient postprocedural side effects. All patients with neurological deficits demonstrated initial symptomatic improvement. Recurrence occurred in two patients, requiring retreatment at 10 and 22 months, respectively. One patient exhibited vertebral body height loss on follow-up imaging, for which additional kyphoplasty was performed after a second treatment. Median observation after the last intervention was 21 months. Follow-up MRI demonstrated reduction of the targeted epidural components and restoration of cerebrospinal fluid space at the treated level.

Conclusion: This study supports the feasibility and clinical benefit of superselective percutaneous ethanol sclerotherapy of epidural extensions of aggressive vertebral hemangiomas, without treatment of the vertebral body. Despite the retrospective design with small sample size, the procedure offers an alternative for surgical vertebral body resection and even for vertebroplasty.

Scientific Session 23

Neurointerventional Radiology

Tuesday, April 14, 2026

3–4:30 p.m.

Abstract No. 217

Long-Term Outcomes of Carotid Artery Stenting in a Resource-Limited Setting: A Single-Center Experience from a Lower-Middle Income Country



(Article No. 108238)

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Purpose: To evaluate the safety and long-term outcomes of carotid artery stenting (CAS) in patients with carotid stenosis treated at a resource-limited center in a lower-middle-income country, and to identify predictors of adverse events.

Materials and Methods: We performed a retrospective review of all patients who underwent CAS between December 2017 and August 2024. Demographics, comorbidities, clinical presentation, stenosis severity, procedural details, and outcomes were analyzed. Symptomatic stenosis was defined as ipsilateral ischemic stroke, transient ischemic attack, or amaurosis fugax within six months. Technical success was defined as residual stenosis < 30% with preserved antegrade flow and no major intraprocedural complication. Primary outcomes were 30-day stroke or death and ipsilateral stroke during follow-up. Kaplan–Meier analysis was used to estimate ipsilateral stroke-free survival. Cox proportional hazards regression was performed to assess predictors of long-term stroke, and penalized logistic regression was applied to identify predictors of 30-day adverse outcomes.

Results: A total of 104 patients underwent CAS. The mean age was 68.3 ± 10.4 years; 96 (92.3%) were male. Symptomatic stenosis was present in 88 (84.6%) and asymptomatic stenosis in 16 (15.4%). Mean ipsilateral stenosis severity was $80\% \pm 10\%$ (median 80%, IQR 80–90%). Technical success was achieved in 104 (100%). Within 30 days, stroke occurred in 10 (9.6%) patients; no deaths occurred. Stroke affected 9 (10.2%) symptomatic versus 1 (6.3%) asymptomatic patient. Median follow-up was 1,096 days (IQR 365–1,765). Ipsilateral stroke occurred in 9 (8.7%) patients. Kaplan–Meier analysis showed stroke-free survival of 92.1% at one year, 88.4% at two years, and 85.2% at three years; three-year survival was 84.5% in symptomatic and 90.6% in asymptomatic patients. Cox regression showed contralateral carotid occlusion increased stroke risk (HR 4.36, 95% CI 0.92–20.6). Logistic regression showed no predictors of 30-day outcomes. Distal filter protection was used in 104 (100%); open-cell stents in 48 (46.2%), dual-layer in 40 (38.5%), and closed-cell in 16 (15.4%).

Conclusion: CAS in a lower-middle-income country achieved 100% technical success, a 30-day stroke/death rate of 9.6%, and durable long-term stroke prevention, with stroke-free survival >85% at three years. Contralateral occlusion may predict late stroke.

Abstract No. 218

Safety and Efficacy of Flow Diverter Stents for Intracranial Aneurysms in a Lower-Middle-Income Country: A Single-Center Experience



(Article No. 108239)

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Purpose: Flow diverter (FD) stents are increasingly used for the treatment of intracranial aneurysms, with strong evidence supporting their use in unruptured aneurysms. However, real-world outcomes that include both ruptured and unruptured aneurysms are less well characterized. This study evaluated the safety, angiographic efficacy, and clinical outcomes of FD placement in a consecutive series at our center.

Materials and Methods: We retrospectively reviewed 60 patients who underwent FD stent placement between March 11, 2022 and August 15, 2025. Patient demographics, comorbidities, aneurysm characteristics, procedural details, and follow-up data were collected. Angiographic outcomes were assessed at 1, 6, and 12 months and categorized as complete or near-complete occlusion. Clinical outcomes were measured using the modified Rankin Scale (mRS). Subgroup comparisons were performed between ruptured and unruptured aneurysms as well as internal carotid versus vertebral artery aneurysms.

Results: The mean patient age was 42.9 ± 12.7 years, and 70% were female. Hypertension was present in 70% of patients, and 5% were smokers. At the time of treatment, 65% of aneurysms were unruptured, 25% were acutely ruptured, and 10% were previously ruptured. Most aneurysms were located in the internal carotid artery (90%), with the remainder in the vertebral artery (10%). Morphologically, 60% were saccular, 15% fusiform, 5% blister, and 20% other. At 1-month follow-up, all aneurysms demonstrated near-complete occlusion. At 6 months, 50% had achieved complete occlusion and 40% remained near-complete, while at 12 months, 65% were completely occluded and 25% near-complete. Ruptured aneurysms were significantly less likely to achieve complete occlusion at 12 months compared with unruptured aneurysms ($p = 0.04$). Clinically, 35% of patients had a favorable outcome ($mRS \leq 2$) at discharge, which improved to 100% at last follow-up. No periprocedural ischemic or hemorrhagic complications occurred, and there were no in-hospital deaths, delayed complications, or retreatments.

Conclusion: Flow diverter stent placement was safe and effective in this series, with excellent angiographic progression and universal favorable clinical recovery at follow-up. Outcomes were superior in unruptured aneurysms, underscoring the need for further study of FD use in the ruptured setting.

Abstract No. 219**Coiling Middle Meningeal Artery for Embolization of Subdural Hematoma in Cancer Patients: Safety and Efficacy**

(Article No. 108240)

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Purpose: To evaluate the safety and efficacy of coil-only middle meningeal artery (MMA) embolization for the treatment of chronic to subacute subdural hematoma (SDH) in patients with cancer.

Materials and Methods: A single-center retrospective analysis was performed on 34 cancer patients who underwent 49 MMA embolizations using coils alone, including 15 bilateral procedures (44%) for SDH between 2022 and 2025. Clinical and radiographic outcomes were evaluated, including hematoma resolution, change in SDH thickness, need for reoperation, and overall survival.

Results: At final imaging follow-up (median: 98.5 days [IQR: 22–179]), 34 hematomas (74%) demonstrated reduction in thickness, 26 (57%) showed $\geq 50\%$ reduction, and 17 (37%) achieved complete resolution. No statistically significant difference was observed in the magnitude of SDH thickness reduction (mean difference: 4.1 mm greater reduction in unilateral group; 95% CI: -1.5 to 9.7 mm; $p = 0.14$) or in SDH resolution rates (OR: 0.77 for bilateral vs. unilateral; 95% CI: 0.23–2.58; $p = 0.67$) between unilateral and bilateral MMA embolization. Two patients (6%) required surgical evacuation after MMAE. Twenty patients (59%) died due to cancer progression during follow-up. Median survival was significantly longer in patients with reduced hematoma thickness on initial follow-up imaging compared to those without improvement (331 vs. 21 days, $p < 0.001$).

Conclusion: Coil-only MMAE may be a safe and effective treatment option for SDH in patients with cancer. Hematoma improvement was associated with prolonged survival, supporting the clinical relevance of embolization in this high-risk population.

Abstract No. 221**Packing Density Requirements for Intracranial Aneurysm Coiling: Insights from Computational Fluid Simulations with Physiologic Flow**

(Article No. 108241)

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Purpose: Packing density is a key determinant of intra-aneurysmal stasis following endovascular coiling, which in turn influences thrombus formation and long-term durability of

treatment. Prior work has identified general thresholds for packing density but has not stratified outcomes by aneurysm size, coil size, or neck-to-diameter ratio. Understanding these relationships under realistic physiologic conditions has direct relevance for interventional neuroradiology.

Materials and Methods: Computational fluid dynamics (CFD) simulations were performed using patient-derived intracranial vasculature reconstructed from magnetic resonance angiography. Blood flow was modeled under physiologic pulsatile pressure and viscosity parameters. Virtual aneurysms of varying size and neck morphology were introduced, and aneurysms were “virtually” coiled at different packing densities with coils of varying diameters. Post-procedural intra-aneurysmal stasis was quantified, with $>50\%$ reduction in flow defined as a clinically meaningful threshold.

Results: Across all aneurysm models, a mean packing density of 16% was required to achieve $>50\%$ stasis. Smaller aneurysms (< 6 mm) required higher packing densities, up to 22%, whereas larger aneurysms (>10 mm) required as little as 12% ($p < 0.0001$). Coil diameter had no measurable effect on intra-aneurysmal stasis ($p = 0.6383$). Neck-to-diameter ratio strongly influenced outcomes: aneurysms with smaller neck-to-diameter ratios required approximately 14% packing density, while those with larger ratios required up to 30% ($p = 0.0015$).

Conclusion: CFD studies using physiologic parameters demonstrate that optimal packing density thresholds for achieving hemodynamic stasis vary significantly by aneurysm size and morphology, but not by coil diameter. Tailoring packing targets to aneurysm geometry under physiologic flow conditions may improve treatment durability and reduce recurrence.

Abstract No. 222**Mechanical Thrombectomy in Atrial Fibrillation-Associated Acute Ischemic Stroke: National Trends and Outcomes**

(Article No. 108242)

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Purpose: Patients presenting with acute ischemic stroke (AIS) with concurrent history of atrial fibrillation may require additional safety measures with management. AF-associated AIS has been demonstrated to have poorer functional outcomes than non-AF when treated with IVT or medical management. Recent smaller registry data has been shown that MT among patients with AF is non-inferior in outcomes compared to patients with non-AF. Herein, we analyze the trends in proportion and outcomes of AF-associated AIS among patients receiving MT using a nationally represented hospitalization database.

Materials and Methods: The National Inpatient Sample (NIS) was queried between January 1, 2013, and December 31, 2020, for patients undergoing MT for AIS. Patients with AF were compared to non-AF patients regarding inpatient mortality, discharge other than home (DOTH), and 90-day poor functional outcome (akin to modified Rankin Scale >3 , methodology explained by Patel). Negative binomial regression was conducted to assess factors associated with length of stay in days (LOS). Cochran-Armitage test was conducted to assess the linear trend of proportion of AF

among patients receiving MT for AIS. All estimates were nationalized using discharge weights provided by HCUP.

Results: A total of 158,850 admissions involving MT for AIS were identified. Of these, 70,055 (44.1%) were associated with AF. The average age was higher among AF compared to non-AF (75.4 [15] vs. 63.3 [11]; $p < 0.001$). The proportion of females was higher among AF (40,620 [46%] vs. 39,375 [56%]; $p < 0.001$). The proportion of utilization of tPA was similar among the two groups (21,760 [25%] vs. 16,775 [24%]; $p = 0.25$). There was an increase in trend in proportion of AF among those who received MT for AIS (Trend: -0.64%; $p < 0.001$). Compared to non-AF patients, those with AF had lower odds of mortality (OR: 0.72; $p < 0.001$) and DOTH (OR: 0.81; $p < 0.001$). There were similar odds of 90-day poor functional outcome between the two groups (OR: 0.95; $p = 0.38$). AF was associated with decreased LOS by 9.2% ($p < 0.001$).

Conclusion: In admissions involving MT for AIS, AF was associated with lower odds of in-hospital mortality, DOTH, and LOS. There were similar odds of 90-day poor functional outcome among the two groups. This analysis was in contrast to previous literature demonstrating poorer outcomes for patients with AF-associated AIS compared to non-AF patients. This may indicate that MT is safe for patients presenting with AIS and AF.

Abstract No. 223

Shifting Practice Patterns in Mechanical Thrombectomy: Declining Stent-Retriever Use and Racial Differences in Utilization



(Article No. 108243)

W. Wahood¹, W. Brinjikij²; ¹University of Miami Miller School of Medicine; ²Mayo Clinic

Purpose: Stent-retriever thrombectomy (SRT) and aspiration thrombectomy (AT) represent the two primary strategies for mechanical thrombectomy (MT) in acute ischemic stroke (AIS). While SRT was initially the dominant technique, contemporary practice has seen increasing adoption of aspiration-based approaches. We aimed to examine national trends, outcomes, and disparities of SRT compared with AT in patients undergoing MT for AIS.

Materials and Methods: The National Inpatient Sample (NIS) was queried between 2019-2022, for admissions involving MT for AIS. Outcomes included in-hospital mortality, discharge other than home (DOTH), and 90-day poor functional outcome (per Patel, analogous to modified Rankin Scale >3). Negative binomial regression was used for hospital length of stay (LOS) and total charges. Trends in SRT utilization were assessed using Cochran-Armitage testing, with national estimates generated using HCUP weighting.

Results: A total of 164,355 admissions for MT were identified, of which 63,500 (38.6%) underwent SRT and 100,855 (61.4%) underwent AT. The proportion of SRT use decreased significantly between 2019 and 2022 (Trend: -2.7% per year; $p < 0.001$). On adjusted analysis, SRT was associated with higher odds of in-hospital mortality (OR: 1.19; $p = 0.002$), higher odds of DOTH (OR: 1.17; $p = 0.004$), and higher odds of poor 90-day functional outcome (OR: 1.21; $p < 0.001$). There was no significant difference in LOS (Coef: 0.001; $p = 0.941$), but SRT was associated with

higher hospital charges (Coef: 0.089; $p < 0.001$). By race, compared with White patients, Black (OR: 1.17; $p = 0.010$) and Hispanic patients (OR: 1.37; $p < 0.001$) had higher odds of undergoing SRT, while patients categorized as "Other" did not differ significantly (OR: 1.18; $p = 0.057$).

Conclusion: From 2019 to 2022, SRT utilization declined by 2.7% annually among patients undergoing MT for AIS. Compared with AT, SRT was associated with higher in-hospital mortality, higher rates of DOTH, poorer functional outcomes, and higher hospital charges, without differences in LOS. Racial differences were observed, with Black and Hispanic patients more likely to undergo SRT than White patients. These findings underscore evolving practice patterns in thrombectomy technique selection and highlight the need to understand the drivers of racial variation in procedural utilization.

Abstract No. 224

Variability Between Hydrogel-Based Coiling and Bare Platinum Coiling in the Treatment of Cerebral Aneurysms: A Systematic Review and Meta-Analysis



(Article No. 108244)

A. Mohamed¹, M. Maree¹; ¹Western University

Purpose: Various coiling methods have been implemented to reduce or completely block flow to cerebral aneurysms. Recently, hydrogel-based coils are increasingly being discussed as alternatives to bare platinum coils in treatment of aneurysms. Limited research comparing both cohorts have made it challenging to understand treatment differences. Therefore, our objective was to systematically evaluate previous and recent literature comparing both groups.

Materials and Methods: The included patient cohort were selected from Randomized Control Trials (RCTs) occurring post 2010. The studies were selected following the PRISMA 2020 guidelines. Case reports, case series, case control studies, and studies comparing other forms of bioactive coiling to bare platinum coiling were excluded. Our primary endpoints were immediate occlusion and retreatment rates. Secondary endpoints include occlusion rate at follow-up, morbidity, mortality, and mRS scores (0-2) post treatment. R Studio Version 2025.09.0+387 was used for statistical analysis and plot generation.

Results: Six RCTs were included in the final version for analysis. The systematic review included a total of 2,551 patients with 1,278 patients in the Hydrogel-based coiling (HBC) group and 1,273 patients in the bare platinum coiling (BPC) group. Mean age was 55.84 and 56.89 in the HBC and BPC groups, respectively. Aneurysm dome sizes were similar between cohorts (8.51mm in HBC vs. 8.71mm in BPC), as were neck sizes (4.14mm vs. 4.18mm, respectively). Primary endpoint analysis showed comparable results between both groups. Occlusion rates revealed a trend towards HBC patients, though non-significant (OR 0.7682; 95% CI 0.5351; 1.1029; $p = 0.1197$). Similarly, retreatment rates indicated no significant differences between both cohorts (0.7674; 95% CI 0.4759; 1.2373; $p = 0.2135$). Results from secondary endpoint analysis are still pending.

Conclusion: Preliminary results show equivalent outcomes between the HBC and BPC when evaluating primary endpoints. Combined with our pending results from secondary endpoint

analysis, this may offer further understanding of the differences and potential advantages or disadvantages of HBC compared to BPC.

Abstract No. 225

Insights from the FDA MAUDE Database on Adverse Events Related to the Use of Stent Retriever Mechanical Thrombectomy Devices for Acute Ischemic Stroke



(Article No. 108245)

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Purpose: Stent retrievers have transformed the management of acute ischemic stroke by enabling rapid and effective mechanical thrombectomy to restore blood flow in occluded cerebral vessels. Among these, Stryker's Trevo retrievers are the most widely used due to their efficacy and broad clinical adoption. Despite their benefits, these procedures carry risks of device related malfunctions and patient complications. This study aimed to analyze adverse events reported in the FDA MAUDE database to better define the safety profile of stent retrievers and inform improvements in device design and clinical practice.

Materials and Methods: The FDA MAUDE database was queried for reports between December 2019 and August 2025 under the product class "Neurovascular Mechanical Thrombectomy Device for Acute Ischemic Stroke Treatment". Reports were reviewed to exclude duplicates and incomplete entries. Device malfunctions and patient related problems were categorized and frequencies were calculated.

Results: Seventy nine reports were included. Device fracture, breakage, or separation occurred in 67.1% of cases, frequently leading to retained foreign bodies (31.6%). Difficult removal or entrapment within the catheter was reported in 11.4%, often related to tortuous vascular anatomy. Hemorrhagic events were noted in 16.5% of patients, with intracranial hemorrhage accounting for 30.7% of these and hemorrhagic stroke for 7.6%. Vessel perforation (6.3%) and vasospasm (3.8%) were also observed. Neurologic complications, including paralysis, paresis, and dysphagia, were documented in 6.3%. Less frequent complications included vessel occlusion, thrombosis, embolism, pulmonary edema, and fistula formation.

Conclusion: Stent retrievers for mechanical thrombectomy in acute ischemic stroke are associated with a notable risk of device fracture and retained fragments, as well as hemorrhagic and vascular complications. Patient specific vascular anatomy plays a key role in device failure. These findings highlight the need for meticulous procedural planning, careful device selection, and continued refinements in device design to minimize adverse outcomes and enhance safety in thrombectomy procedures.

Abstract No. 226

■ FEATURED ABSTRACT

Middle Meningeal Artery Embolization Versus Surgery-First for Traumatic Subdural Hemorrhage: A Propensity-Matched Multicenter Cohort Study



(Article No. 108246)

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Purpose: To compare outcomes of middle meningeal artery embolization (MMAE) versus surgery-first management among adults with traumatic subdural hemorrhage (tSDH).

Materials and Methods: We performed a retrospective cohort analysis using the federated TriNetX electronic health record network (107 participating health-care organizations). Adult tSDH patients were identified with ICD-10 S06.5, non-traumatic subdural hemorrhage was identified with ICD-10 code I62.0 and was subsequently excluded. MMAE and surgical procedures were defined by CPT codes for intracranial embolization/infusion (e.g., 61624/61650/61651) and subdural evacuation (e.g., 61108/61154/61312/61314). Propensity score matching (1:1) balanced 20 baseline characteristics (demographics including age, sex, race/ethnicity; diagnoses including diabetes, hypertension, respiratory disease, kidney disease; medications: anticoagulants). Outcomes included all-cause mortality, reintervention, and readmission. These were assessed at 30 and 90 days, and analyzed with risk ratios (RRs) and hazard ratios (HRs) from Cox models.

Results: Before matching, 1,263 MMAE and 9,092 surgery patients met criteria; after propensity score matching, 1,238 vs 1,238 were analyzed. Post-match demographics were well balanced with a mean age of 66.7±18.6 (MMAE) vs 67.0±19.8 (surgery), and anticoagulant use was 54.1% vs 55.1%. MMAE showed lower mortality than surgery at 30 days at 8.7% vs 16.4% observed with surgical procedures (RR 0.53, 95% CI 0.43–0.66; HR 0.51, 95% CI 0.40–0.64; p< 0.001) and at 90 days MMAE mortality was 10.9% vs 19.1% following surgeries (RR 0.57, 95% CI 0.47–0.69; HR 0.54, 95% CI 0.44–0.67; p< 0.001). However, reintervention was modestly higher after MMAE at 30 days (10.4% vs 7.9%; HR 1.33, 95% CI 1.02–1.73; p=0.02) and higher at 90 days (11.2% vs 8.9%; HR 1.28, 95% CI 0.995–1.64; p=0.05). Readmissions were similar (30-day RR 0.93; 90-day RR 0.95).

Conclusion: In a large, propensity-matched multicenter cohort of adults with traumatic SDH, MMAE was associated with significantly lower short- and intermediate-term mortality compared with surgery-first, despite a higher likelihood of subsequent cranial procedure. Readmission rates were similar. These findings support MMAE as a viable early strategy for selected tSDH patients and motivate prospective trials to clarify optimal sequencing with surgery.

Scientific Session 24

Peripheral Arterial Disease 2

Tuesday, April 14, 2026
3–4:30 p.m.

Abstract No. 227

Outcomes of Endovascular Recanalization for Complex Aortoiliac TASC-II C & D Occlusions: A Single-Center Experience



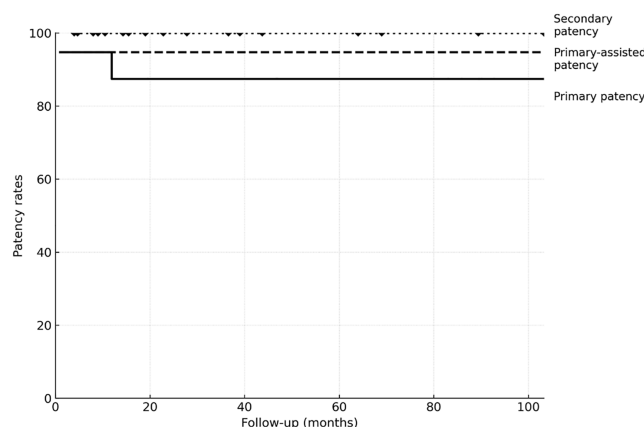
(Article No. 108248)

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Purpose: Evaluate patency and clinical outcomes of endovascular recanalizations for complex aortoiliac TASC-II C & D occlusions performed at our institution

Materials and Methods: Retrospective chart review of endovascular recanalizations for aortoiliac TASC-II C & D occlusions from our single center from 2012-present. Patency was confirmed utilizing a combination of ultrasound duplex, CT, and angiographic findings. Longitudinal outcomes were quantified with Kaplan-Meier analysis

Results: A total of 22 patients were included in our analysis. The median age was 69, with 50% males. Significant past medical history included HTN 77%, HLD 55%, DM 40%, CKD/ESRD 9%, CAD 36%, and smoking history 59%. Of the sample, 54% of patients presented with severe claudication (RC-3), 9% with rest pain (RC-4), 18% with minor tissue loss, and 18% with major tissue loss (RC-6). The technical success rate was 100%. No major



complications occurred. The median follow-up time was 19 months.

Patency Rates

- The primary patency rate at 6 months was 95% (95% CI: 68-99%). At 12, 24, 36, 48, and 60 months, the primary patency rate was 87% (95% CI: 58-97%).
- The primary-assisted patency rate at 6, 12, 24, 36, 48, and 60 months was 95% (95% CI: 68-99%).
- The secondary patency rate at 6, 12, 24, 36, 48, and 60 months was 100%.

Symptom-Free Survival

- The symptom-free survival (SFS) rate at 6, 12, 24, 36, 48, and 60 months was 94% (95% CI: 65-99%).

Conclusion: Endovascular recanalization of TASC-II C & D occlusions results in excellent long-term patency and clinical outcomes in our single-center experience. Notably, we demonstrate a 5-year primary patency of 87% for endovascular recanalization. By comparison, aortobifemoral bypass (currently the gold standard for TASC-II C & D lesions, per the 2007 TASC-II guidelines), has a comparable 5-year primary patency of 88% in recent literature. Furthermore, endovascular recanalization for TASC-II C & D has been well established to have superiority in morbidity, mortality, and length of stay (LOS) compared to surgery. A limitation of this study is modest sample size, which we aim to expand prior to presentation. In conclusion, our data supports an endovascular-first approach even for aortoiliac TASC-II C & D occlusions. Although surgical bypass has historically been considered first-line for these complex and/or long-segment occlusions, we argue that surgery should now be reserved for select cases refractory to endovascular management.

Abstract No. 228

Anatomic Level as a Modifier of Racial/Ethnic Disparities in Chronic Limb-Threatening Ischemia: Outcomes After First-Time Endovascular Revascularization



(Article No. 108249)

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Purpose: To evaluate racial and ethnic disparities in post-procedural outcomes after first-time endovascular revascularization for chronic limb-threatening ischemia (CLTI), stratified by anatomic level of intervention.

Materials and Methods: We conducted a retrospective, multi-center cohort study using the TriNetX database, identifying adults who underwent endovascular revascularization as a first-line intervention for CLTI from 2015-2024. Patients were stratified by treated arterial level (iliac, femoropopliteal, tibioperoneal). Within each stratum, we compared outcomes for Black vs White and Hispanic vs White patients, controlling for demographics and clinical covariates using 1:1 propensity-score matching. The primary outcome was 1-year incidence of major amputation. Secondary outcomes were rates

of reintervention (endovascular or open), acute limb ischemia (ALI), and major adverse cardiovascular events (MACE), a composite of stroke, myocardial infarction, or all-cause death. Outcome comparisons were reported as risk ratios (RR) with 95% CIs.

Results: Among iliac interventions, after matching (n=418), Black patients had nearly double the risk of major amputation compared to their White counterparts (RR: 1.96, CI: 1.27–3.03, P=0.002). Similarly, in femoropopliteal interventions, Black patients (n=883) exhibited higher rates of major amputation (RR: 1.59, CI: 1.20–2.11, P=0.001) but lower all-cause mortality (RR: 0.77, CI: 0.62–0.96, P=0.022). Hispanic patients who received femoropopliteal intervention (n=336) had a lower incidence of MACE events (RR: 0.74, CI: 0.57–0.95, P=0.019). Among those who had tibioperoneal treatment, Hispanic patients (n=299) also exhibited fewer MACE events (RR: 0.74, CI: 0.57–0.95, P=0.019). Within the multilevel group who received both femoropopliteal and tibioperoneal interventions, Hispanic patients (n=420) demonstrated a higher risk of major amputation (RR: 1.60, CI: 1.13–2.26, P=0.007) and ALI (RR: 2.17, CI: 1.26–3.73, P=0.004) compared to White patients.

Conclusion: Across anatomic strata, disparities in post-procedural outcomes after CLTI concentrate in limb events, rather than systemic cardiovascular events, and vary by anatomic disease extent. Together, this suggests that post-acute limb care and distal perfusion likely drive much of the observed disparities. These findings support targeted efforts focused on multilevel disease, standardized post-procedure surveillance pathways, and expedited access to limb salvage to reduce amputation inequities.

Abstract No. 229

Preliminary Experience with Intravascular Lithotripsy for Critical Limb-Threatening Ischemia of the Upper Extremities



(Article No. 108250)

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Purpose: To evaluate whether intravascular lithotripsy (IVL) extends the patency of upper extremity arterial occlusive disease beyond that of plain balloon angioplasty (POBA).

Materials and Methods: This retrospective case series included all patients undergoing IVL for critical limb-threatening ischemia of the upper extremities at a single institution, from September 2022 to August 2025. Frequencies are reported, and Kaplan-Meier survival analysis was performed to evaluate patency intervals of the target vessel, comparing POBA-to-IVL and IVL-to-reintervention or last follow-up, using each patient as their internal control.

Results: Eight patients (5 M, 3 F) with a mean age at treatment of 57 years (range: 47–71 years) were included. Comorbidities included end stage renal disease (N=6), diabetes mellitus (N=5), and smoking history (N=5). Nine upper extremities were treated (5 R, 4 L), with 7 presenting with tissue loss/ulceration and 2 with rest pain. Baseline Rutherford scores were 4 (N=2), 5, (N=3), or 6 (N=4). The target artery for IVL was radial (N=5), ulnar (N=2), or brachial (N=1), and 1 patient underwent IVL of both the brachial and radial arteries. Eight patients had undergone prior POBA at the target artery, with a mean time from POBA to IVL of 102 days (range: 4–248). Technical success of IVL, defined as

lesion crossing with < 30% residual stenosis of target lesion post-IVL, was achieved in 8 of the 9 limbs (89%) with no immediate adverse events. Reintervention post-IVL with POBA was performed in 6 limbs (67%) due to loss of primary patency and/or recurrent symptoms, with mean time from IVL to POBA reintervention of 107 days (range: 4–209). Kaplan-Meier analysis estimated a median patency of 2.5 months post-POBA and 7 months post-IVL (P=0.17).

Conclusion: Initial experience with IVL for critical limb-threatening ischemia in the upper extremities showed high technical success; however, two-thirds underwent POBA reintervention. Target vessel patency interval post-IVL was longer than POBA but did not reach statistical significance.

Abstract No. 230

Novel Aspiration and Mechanical Thrombectomy System for the Treatment of Peripheral Arterial Occlusions: First Multicenter Analysis



(Article No. 108251)

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Purpose: Existing endovascular therapies for peripheral arterial occlusions are limited by safety concerns, procedural inefficiencies, and inconsistent efficacy. Because most devices rely on a single mechanism of thrombus removal, treatment often requires adjunctive thrombolytics or additional interventions, particularly in cases with large or chronic thrombus burden. The Artix System is a dual aspiration and mechanical thrombectomy solution designed to remove acute-to-chronic arterial thrombi and emboli in a single session without the need for thrombolytics. The over-the-wire system includes an aspiration-capable 8-F sheath with a 7-F access profile, aspiration catheter, mechanical thrombectomy device containing an expandable element, and covered funnel catheter for proximal flow restriction. Herein, we report the first multicenter evaluation of the study device for the treatment of peripheral arterial occlusions.

Materials and Methods: Between November 2024 and September 2025, 22 consecutive patients with acute lower extremity arterial occlusions who underwent thrombectomy with the study device were retrospectively analyzed. Baseline and procedural characteristics were evaluated, including thrombus etiology, adjunctive thrombolytics, median estimated blood loss, percent thrombus removal, and flow restoration. Safety events were collected and limb salvage rate at 30 days was analyzed.

Results: Treated vessels extended from the common iliac artery to the tibial runoff vessels. Thrombus etiology included preexisting peripheral artery disease or thrombosis (36%), cardiogenic embolism (50%), and iatrogenic embolism (5%). Average estimated blood loss was 50±34 mL. Postprocedural thrombolysis was required in 5% of cases, and 95% of cases were in a single session. Average thrombus removal was 97±3%. Flow restoration was 100%. Safety profile was favorable with 0% distal embolization and 0% vessel injury. Of the available data at the 30-day follow up visit, limb salvage rate was 100%.

Conclusion: These early outcomes from the study device show its potential to enhance peripheral arterial occlusion management. Further studies are needed to validate its safety and effectiveness.

Abstract No. 231

Managing Complications Encountered in Endovascular Revascularization of Single Patent Arch Vessel in Patients with Takayasu Arteritis: Long-Term Outcomes



(Article No. 108252)

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Purpose: To describe management and long-term outcomes after endovascular intervention in symptomatic Takayasu's arteritis (TA) patients with single patent arch vessel.

Materials and Methods: 21 patients with TA (18 females, 3 males) and (age 21-49 years, mean, 30.0±11.2 years) with single patent arch vessel, underwent PTA for cerebrovascular symptoms caused by steno-occlusive lesions of arch vessels. 6/21 (28%) patients had active vasculitis at the time of presentation. Stents were placed in case of technical failure or in case of obstructive dissection after balloon angioplasty.

Results: PTA was attempted in 21 lesions; carotid (n=6), vertebral (n=8), brachiocephalic artery (n=5) and first part of subclavian artery (n=2). Seventeen lesions were discrete in morphology whereas 4 were diffuse long segment lesions. Plain balloon angioplasty was successfully performed in 17/21 lesions (80.9%). Three lesions (14.2%) underwent bailout bare-metal stent placement secondary to obstructive dissection flap after angioplasty. Angioplasty was unsuccessful in one patient. Four (19%) patients developed early neurological complications (posterior circulation stroke, n=2, anterior cerebral artery stroke, n=1 and middle cerebral artery stroke, n=1) with mean National Institutes of Health (NIH) stroke severe score 14 (moderate). These patients were immediately taken for endovascular management. 3 underwent thrombectomy and 1 underwent stenting for recoiled stenotic lesion. Positive inflammatory markers suggestive of active disease were seen in 3/4 patients (75%) who developed complications. On mean follow up of 15 months, reduction in mean NIH stroke severe score to 3.8 (minor stroke) was seen, with patent flowing vessel as seen on doppler.

Conclusion: Endovascular revascularization of single patent arch vessel in patients with TA is a safe and effective procedure. However, it carries an increased risk of neurological complications especially in cases with active disease, warranting pre-emptive readiness for tackling these complications in the lab.

Additionally, optimal medical treatment with immunomodulators or steroids to subvert inflammation whenever feasible, is essential in these patients, for good long-term results.

231.1. Demographic details of patients with single patent arch vessel having Takayasu arteritis

	Total patients, n=21
Age, years	30.0±11.2 years
Female %	85.7%
Male %	14.3%
Single patent arch vessel treated	Carotid (n=6), Vertebral (n=8) Brachiocephalic artery (n=5) First part of subclavian artery (n=2)
Inflammatory markers	Positive (n=6) Negative (n=15)

Abstract No. 232

Stentless Percutaneous Deep Venous Arterialization Using the Boomerang System



(Article No. 108253)

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Purpose: To evaluate the early safety and efficacy of the Boomerang System for percutaneous deep venous arterialization (pDVA) in patients with no-option chronic limb-threatening ischemia (CLTI).

Materials and Methods: A prospective, single-arm feasibility study was conducted at one center. Adults with Rutherford class 5-6 CLTI and no revascularization options underwent pDVA with the Boomerang system, adapted from the Ellipsys system to create a tibial artery-to-vein side-to-side anastomosis. Pre-procedure duplex ultrasound (DUS) and CT angiography assessed inflow and venous anatomy. Primary endpoints were technical success, procedural success, and 6-month amputation-free survival (AFS). Secondary endpoints included conduit patency, wound ischemia and foot infection (WIFI) scores and quality of life (QoL).

Results: Of 26 patients screened, 11 underwent pDVA (mean age 71 ± 7.7 years; 91% male; 91% diabetic; all Hispanic/Latino). Technical success was achieved in 100% (11/11) and procedural success in 91% (10/11). 6-month Kaplan-Meier analysis of AFS was 82% and cumulative conduit patency was 25%. Wound healing occurred in 63% (7/11) at 6 Months with a significant 79.5% (p=0.010) improvement in WIFI scores. QoL improved at both 3 and 6 months. Secondary interventions were performed in 73% (8/11) of patients. Ten adverse events occurred, including two below-knee amputations; no device-related events were reported.

Conclusion: The Boomerang Catheter enabled safe, and effective pDVA in no-option CLTI, achieving high technical success, meaningful wound healing, and AFS. These findings support further multicenter studies to validate long-term clinical benefit.

Abstract No. 233

Safety and Clinical Outcomes of the STABILISE Technique for Eliminating Residual Aortic Dissection



(Article No. 108254)

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Purpose: To evaluate the safety and clinical outcomes of the Stent-Assisted Balloon-Induced Intimal Disruption and Relamination in Aortic Dissection Repair (STABILISE) technique in treating residual dissection in aortic dissection.

Materials and Methods: Data, including patient characteristics and imaging profiles, of consecutive patients with aortic dissection who underwent the STABILISE technique at the authors' center between August 2022 and July 2025 were retrospectively reviewed. Ballooning of the distally implanted bare stent was performed, aiming to disrupt the delaminated intimal flap to

reapproximate it to the outer aortic wall, eliminating the false lumen and restoring blood flow in the true lumen. Pre- and post-procedural diameters of the true and false lumens at the levels of the thoracic aorta, superior mesenteric artery (SMA), renal arteries, and abdominal aorta were compared. Intra- and post-procedural complications were documented, if any, to assess the safety of the technique.

Results: Eight patients (male:female, 5:3) were included in this study, and the technical success rate was 100.0%. At baseline, partial thrombosis of the false lumen in the thoracic aorta was observed in six (75.0%) cases, and no thrombosis was present in the false lumen at the levels of SMA, renal arteries, or abdominal aorta. At the 1-week follow-up, complete thrombosis of the false lumen was achieved in four (50.0%) patients, with minor backflow in the intercostal arteries observed in three (37.5%) patients. Complete obliteration of the false lumen in the abdominal aorta and iliac arteries was observed in all (100.0%) patients. The diameter of the true lumen was significantly increased at all levels compared with baseline (all $P < 0.05$). No procedure-related complications were noted during or after the procedure.

Conclusion: The STABILISE technique was safe and effective for eliminating residual aortic dissection. It significantly promoted false lumen thrombosis, significantly increased the true lumen diameter, and successfully restored blood flow in the true lumen in a short time.

Abstract No. 234

A Novel Therapeutic Combination for Complex Femoropopliteal Lesions: Rotational Atherectomy via Retrograde Popliteal Access Without Embolic Protection



(Article No. 108255)

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Purpose: Rotational atherectomy with aspiration, followed by drug-coated balloon (DCB) angioplasty, is an emerging method for the endovascular treatment of femoropopliteal artery disease without the use of stents. Due to the risk of distal embolism, this technique is typically performed with an embolic protection device. Retrograde popliteal artery (RPA) access offers a valuable alternative access for treating femoropopliteal artery disease. The combination of these two methods may lead to a new approach that eliminates the need for embolic protection. This study aims to evaluate the efficacy and safety of RPA in treating complex femoropopliteal lesions using a rotational atherectomy device and DCB, specifically without embolic protection.

Materials and Methods: This single-center, retrospective study included patients with both new and calcified TASC B and C lesions located in the common and superficial femoral arteries, as well as the above-knee popliteal arteries (P1 segment), between January 2021 and August 2025. Patients with P2 and more distal popliteal artery involvement, in-stent restenosis, or recent occlusions (less than 1 month) were excluded from the study. All participants had severe claudication (Rutherford class 3). All patients underwent

rotational atherectomy with aspiration (JetStream, Boston Scientific, MA, USA) using a retrograde approach through the popliteal artery, followed by post-dilatation with an appropriately sized DCB (Ranger, Boston Scientific, MA, USA). No embolic protection device was utilized. The evaluation focused on technical success, embolic events, patency rates, and complications.

Results: Twenty-two patients participated in the study, including 18 males (81.8%), with an average age of 69.9 ± 7.9 years. Only one patient required stenting of the target lesion, resulting in a technical success rate of 95.5%. There were no observed embolic events during or after the procedure, and no procedure-related mortality, amputations, or major complications occurred. A minor complication, specifically a hematoma at the popliteal artery puncture site, was noted in one patient (4.5%). One-year follow-up data were available for 19 patients, showing a primary patency rate of 89.5% and a secondary patency rate of 94.7%.

Conclusion: The treatment of complex femoropopliteal lesions using rotational atherectomy with aspiration and DCB via RCP without embolic protection has been shown to be safe and effective. Further large-scale studies will contribute to establishing this alternative method.

Abstract No. 235

Utility of Arterial Spin Labeling and Intravoxel Incoherent Motion MR Pedal Perfusion in Diabetic Foot Ulcer



(Article No. 108256)

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Purpose: In diabetic patients with extensive infrapopliteal arterial calcifications, conventional vascular assessment tools such as Ankle Brachial Pressure Index and CT angiography are often unreliable. This study compares two non-contrast MRI techniques—Arterial Spin labeling (ASL) and Intravoxel Incoherent Motion (IVIM)—as objective measures of pedal perfusion in diabetic patients with ischemic and neuro-ischemic non-healing foot ulcers.

Materials and Methods: A prospective single-center cohort study was conducted in twenty-two patients with infra-popliteal disease and non-healing foot ulcers. Each patient underwent both ASL and IVIM MRI sequences covering bilateral feet before and after endovascular revascularization. Perfusion metrics from symptomatic and asymptomatic feet were compared with those from healthy controls. ASL measures mean pedal blood flow (mPBF in mL/100g/min), while IVIM-derive perfusion fraction (f) and pseudo-diffusion coefficient (D*) were used as surrogate perfusion markers. Agreement between ASL and IVIM was assessed, and Cox regression analysis was performed to identify predictors of early wound healing.

Results: The mean pre-intervention mPBF in symptomatic feet was 10.58 mL/100g/min while increased to a mPBF 15.3 mL/100g/min following infrapopliteal angioplasty. The mPBF in

healthy controls was 13.45/100g/min. ASL showed high reproducibility across medial forefoot, lateral forefoot and hindfoot locations. IVIM shows a mean pre-intervention perfusion fraction (f) of 0.12 and mean D* value of $1.45 \times 10^{-3} \text{ mm}^2/\text{s}$ which showed moderate correlation with pre-intervention ASL values. Multivariate analysis showed regional ASL mPBF (1.008 [1.001–1.0015]) and clinical WIF1 stage (3.119 [1.448–6.719]) as independent predictors of early wound healing.

Conclusion: ASL and IVIM MRI techniques are effective in quantifying pedal perfusion in diabetic patients with ischemic foot ulcers. ASL provides direct and reproducible blood flow measurements, while IVIM offers complementary microvascular perfusion insights. Perfusion improvements detected by either modality following infrapopliteal angioplasty are predictive of early wound healing, with ASL showing stronger correlation with clinical outcomes.

Scientific Session 25

Portal Hypertension 2

Tuesday, April 14, 2026
3–4:30 p.m.

Abstract No. 236

A Clinically Applicable Fiber-optic Imaging/In-Plane IVUS–Integrated Needle/Balloon Catheter System for TIPS Creation in Normal Adult Pigs



(Article No. 108258)

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Purpose: To utilize a clinically applicable fiber-optic imaging and/or in-plane intravascular ultrasound (IVUS)–integrated needle/balloon catheter system for TIPS creation in normal adult pigs, as a significant step toward clinical translation of this technique for TIPS.

Materials and Methods: At the 2025 annual Society of Interventional Radiology meeting, we presented our proof-of-principle study, using a lab-made 21G needle-integrated balloon catheter system for TIPS creation. We upgraded the system to a clinically applicable version with a few key improvements: (1) a 15-French, three-lumen balloon catheter with a 12 mm×20 mm eccentric balloon was manufactured by a professional balloon catheter company and the eccentric balloon provides sufficient strength to facilitate the needle puncture into the portal vein; (2) a hemostasis valve is attached at the proximal end of the catheter to stabilize the intracardiac echocardiography (ICE) probe; (3) the redesigned handle significantly improved the ergonomics; (4) a 0.020-inch stainless steel sharp-tipped stylet can reinforce the needle, facilitate the intrahepatic puncture, and enhance the echogenicity for improved needle visibility. We tested the new system in 12 live pigs for creating the TIPS and compared puncture attempts, procedure time, and radiation dose with the prior prototype.

Results: The clinically applicable system allowed more accurate and efficient targeting of the portal vein. In 12 live pigs, a 100% success rate of optimal portal vein puncture was achieved using the following optimal parameters: an 8-cm curved needle tip, a 120°–135° needle-tip angle, 45° counterclockwise rotation of the balloon catheter in the hepatic vein, and a catheter depth of 4.5–5 cm within the hepatic vein. Compared with our lab's proof-of-concept prototype tested last year, the current clinically applicable system significantly reduced needle puncture attempts (2 ± 1 vs. 5 ± 1), shortened procedure time (20 ± 5 vs. 32 ± 5 minutes), and lowered radiation dose (97 ± 11 vs. 180 ± 9 mGy).

Conclusion: The upgraded needle-integrated micropuncture balloon catheter system enables precise, safe, and reliable intrahepatic puncture for TIPS creation in live pigs, representing an important step toward clinical translation for challenging TIPS procedures.

Abstract No. 237

Prognostic Value of Psoas Muscle Index Improvement in Patients Undergoing Transjugular Intrahepatic Portosystemic Shunt



(Article No. 108259)

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Purpose: The present study aims to assess the extent of sarcopenia improvement after transjugular intrahepatic portosystemic shunt (TIPS) in patients with cirrhosis using psoas muscle index (PMI), and to investigate the relationship between the degree of PMI improvement and clinical outcomes, specifically all-cause mortality and the development of overt hepatic encephalopathy (OHE).

Materials and Methods: In this retrospective study, we included 390 patients with cirrhosis and sarcopenia who underwent TIPS at five medical centers across China. By evaluating changes in the PMI one month after TIPS placement, we systematically analyzed the association between the degree of PMI improvement and clinical outcomes, including overall survival and the risk of OHE.

Results: Of the included patients, 188 (48.2%) experienced reversal of sarcopenia, while 202 (51.8%) did not. The cumulative survival rate was significantly higher in the sarcopenia-reversal group compared with the non-reversal group (84.6% vs. 68.2%, log-rank $P < 0.001$, HR = 0.24; 95% CI: 0.14–0.41), while the cumulative incidence of OHE was markedly lower (16.6% vs. 51.1%, log rank $P < 0.001$, HR = 0.26; 95% CI: 0.17–0.39). Univariate and multivariate Cox regression analyses identified the PMI improvement rate as an independent predictor of both overall mortality and OHE occurrence. When stratified by the PMI improvement rate, patients with an improvement $>11.8\%$ ($n = 248$) had significantly better cumulative survival than those with improvement $\leq 11.8\%$ (89.2% vs. 50.4%, log-rank $P < 0.001$, HR = 0.07; 95% CI: 0.04–0.12). Similarly, patients with a PMI improvement $>15.8\%$ ($n = 197$) showed a significantly lower incidence of OHE than those with improvement $\leq 15.8\%$ (5.1% vs. 66.3%, log rank $P < 0.001$, HR = 0.05; 95% CI: 0.03–0.10).

Conclusion: This study demonstrates that improvement in sarcopenia following TIPS significantly reduces both all-cause mortality and the incidence of OHE in patients with cirrhosis. The PMI improvement rate at 1 month post-TIPS may serve as a sensitive prognostic indicator, offering valuable clinical guidance for optimizing post-TIPS management and improving patient outcomes.

Abstract No. 238

Age-Stratified Risk of Hepatic Encephalopathy After TIPS: Defining a Clinical Inflection Point in a Multisystem EHR Cohort



(Article No. 108260)

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Purpose: Hepatic encephalopathy (HE) is a frequent complication after TIPS, but contemporary, age-stratified incidence remains poorly defined. We evaluated age-stratified outcomes across a multisystem EHR to identify a potential clinical inflection point for de novo HE risk.

Materials and Methods: We analyzed adults undergoing first-ever TIPS (2010–2025) across a multisystem national EHR, and excluded patients with prior HE, prior liver transplants, and prior TIPS. Outcomes included incident HE, 30d readmission, mortality, transplant, and transplant-free survival (TFS) at 30, 90, and 180d. MELD-Na, MELD 3.0, and FIPS were calculated. Age was stratified into prespecified categories (< 50, 50–55, 55–60, 60–65, 65–70, 70–75, 75–80, >80). Logistic regression models evaluated predictors of incident HE and 30-day readmission using both complete case and multiple imputation (MI) analyses.

Results: Among 18,804 TIPS patients (median age 59 [IQR 51–66], 64% male), incident HE occurred in 10,369 patients (55.1%) and 30-day readmission in 9,478 (50.4%). TFS was 69.5%, 56.6%, and 46.7% at 30, 90, and 180 days, with a median of 146 days. Odds of incident HE rose with age and peaked at 65 to 70 years (OR 1.90 vs < 50, $p < 0.001$), declining modestly thereafter. Readmission odds increased with age, peaking around 70 to 80 years (OR ≈ 2.0 vs < 50). In regression models, age was the dominant predictor of incident HE and readmission, while MELD 3.0 showed inconsistent or opposite associations. Findings were consistent across multiple imputation analyses.

Conclusion: In this multisystem cohort, age demonstrated a clinical inflection point for post-TIPS HE risk, peaking at 65 to 70 years. This is the first study to evaluate fine-grained age strata in a national multisystem TIPS cohort restricted to incident HE, directly compare age with MELD-Na, MELD 3.0, and FIPS, and quantify post-TIPS TFS alongside HE and readmission. These results support incorporating age-stratified thresholds into TIPS candidacy decisions, as conventional severity scores may underestimate HE risk relative to patient age.

238.1.		
Category	N (%) / Value	OR for Incident HE (95% CI)
Median Age (IQR)	59 (51–66)	–
Male Sex	12,035 (64%)	0.86 (0.81–0.91)
Race/Ethnicity	W 83%, B 5%, H 13%	–
30d Readmission	9,478 (50.4%)	–
TFS (30d/90d/180d)	69.5%/56.6%/46.7%	–
Age < 50	4,129 (21%)	Reference
Age 50–55	2,396 (12.7%)	1.34 (1.21–1.48)
Age 55–60	3,236 (17.2%)	1.40 (1.27–1.53)
Age 60–65	3,302 (17.5%)	1.58 (1.44–1.73)
Age 65–70	2,263 (14.2%)	1.90 (1.72–2.01)
Age 70–75	1,747 (9.3%)	1.73 (1.54–1.94)
Age 75–80	919 (4.9%)	1.72 (1.49–1.99)
Age >80	410 (2.2%)	1.47 (1.19–1.80)

Abstract No. 239

Long-Term Efficacy and Outcomes of Endovascular Interventions in Budd-Chiari Syndrome



(Article No. 108261)

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Purpose: To evaluate the long-term safety, efficacy and clinical outcomes of endovascular interventions (hepatic vein/inferior vena cava recanalization and direct intrahepatic portosystemic shunt [DIPS]) in patients with Budd-Chiari syndrome (BCS).

Materials and Methods: We retrospectively analyzed electronic medical records of consecutive BCS patients who underwent endovascular interventions between 2010 and 2022 with at least two years of follow-up. We analyzed laboratory and clinical parameters, types of interventions, patency rates, and survival outcomes.

Results: Of 415 BCS patients, 161 patients underwent endovascular interventions (median age 33.06(5–75) years, male-to-female ratio 2.2:1). 103 patients who underwent hepatic vein/inferior vena cava recanalization (angioplasty/stenting) were compared with 58 patients who underwent DIPS. Patients in the DIPS group had significantly higher baseline median Child-Turcotte-Pugh (CTP) score (8.27 vs 6.95), MELD score (14.96 vs 13.01) and Rotterdam score (0.96 vs 0.56) as compared with the recanalization group. Both groups showed significant improvements in clinical outcomes (ascites resolution and prevention of rebleeding) and ALBI grades ($p < 0.01$). However, patients in the DIPS group had persistently higher MELD and ALBI scores compared with the recanalization group ($p < 0.05$) and required more repeat endovascular interventions (58.6% vs. 7.7%). Patency rates at 1 and 5 years were 96% and 92% for recanalization, 82% and 45% for DIPS, and 100% and 60% for DIPS revisions, respectively. The 10-year survival rate was 92% for the recanalization group and 88% for the DIPS group.

Conclusion: Endovascular interventions provide higher rates of symptom resolution and excellent long-term transplant-free survival in BCS patients. Patients in the DIPS group exhibited persistently higher severity scores and a higher need for repeat interventions, indicating a more severe disease phenotype.

Abstract No. 240

Clinical Outcomes and Efficacy of TIPS Downsizing in a Large Academic Medical Center



(Article No. 108262)

R. Masotti¹, B. Ndirangu¹, B. Owosela¹, J. Gichoya¹, P. Park¹, J. Newsome¹; ¹Emory University School of Medicine

Purpose: The transjugular intrahepatic portosystemic shunt (TIPS) placement is a cornerstone in treating the complications of portal hypertension. One of the most well-known complications of the procedure is the onset of hepatic encephalopathy (HE). TIPS

downsizing is a recognized intervention for medically refractory HE. We evaluated patient factors associated with the efficacy and morbidity/mortality of TIPS downsizing.

Materials and Methods: A retrospective study was conducted at Emory University Hospitals with institutional review board approval. Patients who underwent TIPS downsizing were identified during two study periods: March 2010–September 2013 and October 2022–January 2025. Records of 150 TIPS revision cases were identified. 126 were excluded for not representing downsizing procedures. Twenty-four records were reviewed, and 3 were excluded for lacking available EHR data. The final cohort included 21 cases (18 downsizes and 3 complete closures). Clinical and demographic data were extracted from the medical record. The primary outcome was resolution of HE following downsizing. Statistical analysis was performed using SPSS (IBM Corp., Armonk, NY).

Results: Among 21 cases (62 ± 11 years; 38% females; 14% Black, 81% White; 100% non-Hispanic), 18 were downsizes and 3 were closures. 14 (70%) cases used the hourglass technique; the remaining 4 were done by stent relining. The leading indication for downsize was refractory HE in 19 (90%) of cases. After downsizing, only 9 (43%) had documented HE resolution. On univariate analysis, the West Haven HE Grade ($p = 0.014$) was significantly associated with HE resolution, with lower initial grades predicting a higher likelihood of symptom improvement. Use of dialysis ($p = 0.888$) and change in ammonia ($p = 0.226$) were not significant. Determination of mean time to symptom resolution was limited by inconsistent documentation within the medical record.

Conclusion: When determining the need and potential outcome for reduction of a TIPS, West Haven grading may be the highest yield clinical metric. Patients with a West Haven score of ≤ 2 may be more likely to have resolution of symptoms after downsizing. Ammonia may not be a valid data point to follow for HE.

240.1. Patient characteristics by resolution of HE

Clinical Metrics	HE resolved (N=9)	HE unresolved (N=11)	Total (N=21)	p-value
HVPG Change, mm Hg (SD)	5.3 (6.2)	5.1 (3.0)	5.1 (4.2)	0.929
Ammonia Change mcg/dL (SD)	-36 (57.5)	-71.9 (110.9)	-55.1 (87.9)	0.451
West Haven Grade (SD)	1.3 (0.5)	2.09 (0.7)	1.75 (0.7)	0.014*
Mean TIPS Diameter Change, mm (SD)	4.3 (2.9)	2.8 (1.4)	3.53 (2.2)	0.204

Abstract No. 241

Plug-Assisted Retrograde Transvenous Obliteration (PARTO) for Gastric Varices: Long-Term Outcomes of Primary and Secondary Prophylaxis



(Article No. 108263)

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Purpose: To evaluate the long-term outcomes of plug-assisted retrograde transvenous obliteration (PARTO) for the treatment of gastric varices (GVs).

Materials and Methods: This retrospective study included 220 patients treated with PARTO between February 2011 and December 2022. PARTO was performed for secondary prophylaxis (SP) in 81 patients with recent gastric variceal bleeding and for primary prophylaxis (PP) in 139 patients with large (≥ 2 cm), growing GV, or planned anticoagulation. The efficacy of PARTO and potential trade-offs, such as worsening of esophageal varices (EVs) and ascites, were analyzed.

Results: The technical success rate of PARTO was 94.5% (208/220). Severe adverse events occurred in two (0.9%) patients. The median procedure time was 22 minutes (range, 8–121 minutes). Long-term follow-up data were available for 177 patients (PP, $n=119$ and SP, $n=58$), with a mean follow-up of 42.5 months (maximum, 154.6 months). All 177 showed thrombosed or obliterated GV. Ten (5.6%) patients showed recurrence of GV different to that treated with PARTO, occurring at a median time of 14.4 months. The presence of combined type 1 and type 2 gastroesophageal varices was an independent predictive factor for recurrence of GV ($p=0.004$). The cumulative 1-, 3-, 5-, and 10-year freedom from GV recurrence rates were 97.3%, 94.1%, 92.2%, and 85.1%, respectively. EV exacerbation was observed in 59 patients (33.3%).

Conclusion: PARTO is effective for GV treatment and may serve as a first-line option for both PP and SP in selected patients. However, due to potential EV worsening, close endoscopic monitoring is essential.

Abstract No. 242

Antegrade Transvenous Obliteration for Refractory Esophageal Variceal Hemorrhage in Patients Unsuitable for TIPS: A Multicenter Retrospective Study



(Article No. 108264)

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Purpose: Esophageal variceal bleeding (EVB) refractory to endoscopic treatment in some patients with advanced cirrhosis, leaving few options other than transjugular intrahepatic portosystemic shunt (TIPS). However, patients with encephalopathy or heart failure are often ineligible for TIPS, alternatively opt for antegrade transvenous obliteration (ATO). This study aimed to assess the safety and efficacy of ATO compared with TIPS for refractory EVB.

Materials and Methods: This study retrospectively reviewed medical records from clinical data warehouse the Catholic University of Korea which encompass eight tertiary hospitals between 2012 and 2024. Although TIPS was initially considered, ATO was indicated for patients who were ineligible or failed for TIPS. ATO were implemented in 20 patients (age= 62 ± 10.2 years, men=13), while TIPS were created in 35 patients (age= 58 ± 12.6 years, men=26) for refractory EVB. The primary outcome was the difference in the 30-month overall survival (OS) rate between two groups, a noninferiority comparison to exclude a difference of >30 percentage point. The secondary outcomes were comparison of postprocedural adverse events and bleeding-free survival (BFS) between the ATO and TIPS groups.

Results: With median follow-up of 31 months, the BFS and OS rate at 30 months of ATO were 23.2% (95% confidence interval [CI], 7.8%, 69.7%) and 50.9% (95% CI, 32.0%, 81.0%), respectively; the corresponding rates of TIPS were 63.8% (95% CI, 45.4%, 89.7%) and 52.2% (95% CI, 34.1%, 79.8%). The absolute difference (TIPS minus ATO) in 30-month OS was 1.3 percentage points (95% CI, 33.7%, -31.1%). Within post-procedure one-week mortality or liver transplant occurred in five (14.3%) patients in TIPS, whereas there was no one-week mortality in ATO group. Kaplan-Meier and log-rank test showed no significant differences between groups regarding BFS ($p=0.07$) and OS ($p=0.41$).

Conclusion: Although the outcomes fall short for the specified noninferiority, the ATO might be an alternative for those who are ineligible for TIPS in treatment of refractory EVB.

Abstract No. 243

Association Between Modified Frailty Index (mFI-5) and Postoperative Outcomes of Transjugular Intrahepatic Portosystemic Shunt (TIPS) Procedures



(Article No. 108265)

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Purpose: Frailty is a syndrome that causes decreased physiological resistance to stressors, and it has been associated with lower tolerance for and worse outcomes following invasive surgical procedures, including TIPS. The 5-item modified frailty index (mFI-5) is useful in quantifying patient frailty for perioperative risk stratification for procedures such as transarterial chemoembolization and hepatic ablation. This study aims to evaluate the predictive value of mFI-5 score for clinical outcomes following TIPS procedures.

Materials and Methods: Records of patients who underwent TIPS procedures between April 1, 2016, and August 30, 2024, at a large, academic urban medical center were retrospectively reviewed. The mFI-5 was calculated for each patient by assigning 1 point for each of the following comorbidities: diabetes mellitus, hypertension, chronic obstructive pulmonary disease, congestive heart failure, and functionally dependent health status. The primary outcomes measured were hospital length of stay, complications, hepatic encephalopathy, and 30-day mortality. Bivariate analysis with Pearson correlation and binary logistic regression were used to determine association between the mFI-5 score and TIPS outcome measures.

Results: Of 161 patients included in analysis, most had an mFI-5 score of 0 ($n=47$, 29.2%), 1 (mild, $n=48$, 29.8%), or 2 (moderate, $n=50$, 31.1%). Sixteen patients (9.9%) scored 3+ on mFI, indicating severe frailty. mFI-5 score did not correlate with hospital length of stay ($r=-0.032$, $p=0.669$). Compared with non-frail patients, mild, moderate, and severe frailty showed no statistically significant differences in complications, hepatic encephalopathy, or 30-day mortality (all CIs crossing 1, $p > 0.05$).

Conclusion: While frailty is an important factor for perioperative risk stratification, this study suggests that the mFI-5 score does not strongly correlate with outcomes following TIPS procedures. However, multicenter patient database studies may further elucidate the relationship between mFI-5 and TIPS outcomes.

Abstract No. 244

Prognostic Value of Acute Versus Baseline MELD Scores in Predicting Mortality After Emergent TIPS



(Article No. 108266)

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Purpose: The aim of this study was to assess whether acute MELD scores (Original, MELD-NA, and MELD 3.0) obtained at the time of emergent TIPS provide superior prognostic accuracy for 3-month mortality compared with baseline MELD values, with the goal of improving risk stratification in urgent clinical decision-making.

Materials and Methods: We conducted a single-center retrospective cohort study of adults undergoing transjugular intrahepatic portosystemic shunt (TIPS) from 2004–2024. The patient data was obtained from the EMR and PACS. There were 545 TIPS encounters identified, of which 109 met our operational definition of emergent TIPS (acute hemorrhagic presentation with day-of-procedure labs). Our primary cohort comprised 54 emergent cases with both a “baseline” laboratory panel (–6 months to –2 weeks pre-procedure) and an “acute” panel (day of TIPS). The primary outcome was 3-month all-cause mortality and exposures were MELD (original), MELD-Na, and MELD-3.0. We fit separate univariable logistic regression models for each score at the baseline and acute timepoints to estimate the odds of 3-month mortality. We reported odds ratios and ROC/AUC with 95% CIs. Given only eight events, we limited models to single predictors to reduce the risk of overfitting. We summarized model fit with Tjur and Cox–Snell pseudo- R^2 and analysis was completed in Graph-Pad Prism.

Results: Among 54 TIPS patients there were 8 deaths at 3 months. Simple logistic regressions using acute MELD values

243.1.

Frailty (reference = none)	Complications OR (95% CI), p	HE OR (95% CI), p	30-day mortality OR (95% CI), p
Mild (mFI=1)	-0.182 (0.145-4.785), 0.838	-0.087 (0.245-3.424), 0.897	-0.909 (0.08-2.038), 0.272
Moderate (mFI=2)	-1.19 (0.039-2.362), 0.255	-0.236 (0.209-2.981), 0.789	-0.48 (0.136-2.828), 0.536
Severe (mFI=3+)	-1.232 (0.038-2.262), 0.238	-0.054 (0.257-3.492), 0.947	-0.976 (0.075-1.901), 0.237

found a significant association with 3-month mortality for MELD-Original (OR per point 1.133, 95% CI 1.037–1.257; AUC 0.781, 95% CI 0.564–0.999), MELD-Na (OR 1.131, 95% CI 1.038–1.25; AUC 0.774, 95% CI 0.556–0.993), and MELD-3.0 (OR 1.134, 95% CI 1.040–1.259; AUC 0.772, 95% CI 0.559–0.985); all $p < 0.02$ for AUC and $p \leq 0.006$ for slope. In contrast, baseline MELD values were not significantly associated with mortality (all slope $p \geq 0.18$; AUCs 0.677–0.696 with $p \geq 0.08$).

Conclusion: Our findings indicate that acute MELD scores provide better discrimination for 3-month mortality when compared to baseline measures across MELD-Original, MELD-Na, and MELD-3.0 in this cohort. This will help guide clinical decision making, risk stratification, and informed consent.

Abstract No. 245

Do Smaller Stents Prevent Hepatic Encephalopathy? A Comparative Study of Constrained and Conventional Transjugular Intrahepatic Portosystemic Shunt



(Article No. 108267)

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Purpose: Transjugular intrahepatic portosystemic shunt (TIPS) is an effective treatment for complications of portal hypertension but often leads to hepatic encephalopathy (HE). Primary constrained TIPS has been proposed to reduce HE incidence by limiting shunt flow. However, its effectiveness remains uncertain.

Materials and Methods: We retrospectively analyzed 99 patients who underwent intravascular ultrasound-guided TIPS placement between April 2013 and September 2017 at a single institution. Patients were divided into two groups: constrained TIPS ($n = 45$) and conventional TIPS ($n = 54$). Data collected included demographic characteristics, stent diameter, pre- and post-TIPS HE incidence, presence of concomitant antegrade embolization, collateral vessel visualization on final angiography, and post-TIPS portosystemic gradient.

Results: The incidence of post-TIPS HE was significantly higher in the constrained group than in the conventional group, despite achieving smaller stent diameters (median 7 mm vs. 10 mm, $p = 0.0001$). Multivariate analysis identified advanced age as a significant risk factor for HE, while concomitant antegrade embolization was associated with a trend toward reduced HE but did not reach statistical significance. No significant difference was observed in collateral vessel visualization between groups.

Conclusion: Primary constrained TIPS did not reduce the occurrence of HE compared to conventional TIPS. These findings suggest that while stent diameter is an important consideration, multiple patient- and procedure-related factors—particularly age and embolization—may have a greater influence on post-TIPS HE development. Further prospective studies are needed to clarify the role of constrained TIPS in HE prevention. The authors used ChatGPT (GPT-5 Mini) to assist with grammar and spelling during the preparation of this work.

Scientific Session 26

Radioembolization 3

Tuesday, April 14, 2026
3–4:30 p.m.

Abstract No. 246

Comparison of Size- and Enhancement-Based Criteria for Evaluating Treatment Response and Survival Outcomes in Intrahepatic Cholangiocarcinoma Patients Treated with Yttrium-90 Radioembolization



(Article No. 108269)

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Purpose: To evaluate imaging response, inter-method agreement and overall survival (OS) among intrahepatic cholangiocarcinoma patients (iCCA) treated with Yttrium-90 transarterial radioembolization (90Y-TARE) using resin microspheres.

Materials and Methods: This retrospective, single-center study included adult patients with iCCA who underwent 90Y-TARE using resin microspheres between July 2014 and February 2025. 3- and 6-month imaging response was evaluated using four systems: Revised Response Evaluation Criteria in Solid Tumors (RECIST 1.1), modified RECIST (mRECIST), World Health Organization (WHO) criteria, and European Association for the Study of the Liver (EASL) criteria. Patients achieving complete or partial response were classified as responders. Inter-method agreement was calculated using Cohen's kappa (κ). OS was evaluated using Kaplan-Meier Analysis, with log-rank test.

Results: Among 72 patients (median age, 70 [IQR, 64-74] years, 58% males), 13 (18%) had cirrhosis, and 13 (18%) had extrahepatic disease at the time of 90Y-TARE. At 3-month follow-up, 6/62 (10%), 4/62 (6%), 21/62 (34%), and 24/62 (39%) were responders based on RECIST 1.1, WHO, mRECIST and EASL criteria, respectively. There was substantial agreement between size-based criteria (RECIST 1.1 and WHO, $\kappa=0.66$) and almost perfect agreement between enhancement-based criteria (mRECIST and EASL, $\kappa=0.86$). The agreement between size- and enhancement-based criteria ranged from 0.38 to 0.52. Median OS of the entire cohort was 15 months (95%CI: 12-27 months), with a 1-, 3-, and 5-year OS rates of 56%, 29%, and 14%, respectively. Responders had significantly longer OS when classified according to mRECIST (47 vs 13 months, $p=0.006$) and EASL (35 vs 12 months, $p=0.003$). On the other hand, there was no statistically significant difference in OS when response was evaluated using RECIST 1.1 ($p=0.077$), or WHO criteria ($p=0.1$).

Conclusion: Responders as determined by enhancement-based criteria, but not size-based criteria had better outcomes compared to non-responders. Enhancement-based criteria may be more suitable for assessing response in iCCA after 90Y-TARE compared to size-based criteria.

Abstract No. 247

Surgical and Pathologic Outcomes After Yttrium-90 Radioembolization Prior to Liver Resection or Transplant



(Article No. 108270)

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Purpose: This study evaluates surgical, radiologic, and pathologic outcomes of patients undergoing liver resection or transplant following Y-90 radioembolization in contemporary practice.

Materials and Methods: A retrospective review was performed of patients who underwent hepatic resection or transplantation after Y-90 between January 2019 and July 2023 for hepatocellular carcinoma (HCC), intrahepatic cholangiocarcinoma (ICC), or metastatic liver disease. Demographics, Y-90 treatment parameters, and operative details were compared with explant pathology, treatment response (mRECIST), recurrence, and survival.

Results: 23 patients (7 women, 16 men; mean age 62 ± 10 years) with HCC ($n=15$), ICC ($n=6$), or metastases ($n=2$) were included. Liver disease etiology included MASH (30%), HCV (22%), EtOH (9%), and HBV (4%). Mean tumor size was 6.5 ± 4.3 cm. Y-90 was delivered as lobar ($n=9$), segmental ($n=2$), or lobar with segmental boost ($n=12$); mean lobar and segmental doses were 195 ± 77 Gy and 195 ± 94 Gy, respectively. No major Y-90-related complications occurred. Mean time to surgery was 145 ± 98 days. R0 resection was achieved in 22/23 (96%) patients. Pathology demonstrated $\geq 90\%$ necrosis in 13/23 (56%), including 8/23 (35%) with 100% necrosis. Percent necrosis showed a modest inverse correlation with tumor size ($p=.09$), but not with lung shut fraction ($p=.309$), liver volume treated ($p=.120$), or Y-90 dose ($p=.997$). Treatment response (mRECIST) showed complete or partial response in 43% and 39% of patients, respectively, with no disease progression. No perioperative mortality occurred after transplant (0/9). Following resection, 30-day mortality was 7% (1/14) and 6-month mortality was 28% (4/14). No recurrences or additional deaths occurred over 72 patient-years of follow-up.

Conclusion: Liver resection and transplantation after Y-90 radioembolization performed in patients with large tumors treated with high Y-90 doses resulted in high rates of tumor necrosis, R0 resection, and no disease recurrence. Patients achieved long-term survival after excluding the perioperative period following liver resection. Tumor size demonstrated a potential inverse correlation with the extent of tumor necrosis.

Abstract No. 248**Flow-Directed Catheter Therapies in Yttrium-90 Radioembolization: A Systematic Review and Meta-Analysis**

(Article No. 108271)

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Purpose: Transarterial radioembolization (TARE) with Yttrium-90 microspheres is effective for hepatic malignancies but challenged by non-target delivery. Flow-directed catheter systems (TriNav, Sniper) improve hemodynamic control, enhance microsphere deposition, and may reduce non-target embolization. This meta-analysis evaluates their efficacy, dosimetry, and safety

Materials and Methods: We conducted a PRISMA-based systematic review and meta-analysis (2010–2024) of studies on Y-90 TARE with flow-directed catheters. PubMed, EMBASE, and Cochrane were searched for reports on technical success, tumor response, efficiency, dosimetry, and adverse events. Random-effects models with REML and Hartung-Knapp adjustment were applied, with logit-transformed proportions and heterogeneity assessed using I² and Q. Subgroup and device-specific analyses compared TriNav antireflux systems and Sniper balloon microcatheters

Results: From 119 records, 15 studies met criteria (N=301). Technique-specific analysis showed consistent benefits of flow-directed approaches. Antireflux catheters improved efficiency: fluoroscopy time reduced by 4.2 min (p=0.002), procedure time by 14–90 min (p< 0.001), and radiation by 44% (p=0.04). Dosimetric gains were robust: normal liver exposure decreased by 58% and tumor targeting increased by 68% (p< 0.05). Tumor-to-normal ratios improved twofold on MAA SPECT (p=0.02) and PET (p=0.009). Technical success was high (88.7%, 95% CI 79.2–94.3%). Eleven single-arm studies showed objective response rate of 51.4% (95% CI 35.9–66.6) and disease control rate of 59.1% (95% CI 38.7–76.7). Grade ≥3 adverse events were rare (< 5%) with no technique-specific complications. Device analysis: TriNav (5 studies, n=117) excelled in efficiency and dosimetry, while Sniper (4 studies, n=63) showed complete response 40.9%, objective response 50.0%, disease control 59.1% in HCC, and 100% technical success.

Conclusion: Flow-directed catheter therapies in Y90 TARE are associated with improved dosimetric outcomes and tumor response rates with minimal adverse events. These findings support their routine consideration in complex vascular anatomies or high-risk non-target embolization cases. TriNav and Sniper devices demonstrate complementary clinical advantages, supporting technology selection based on procedural priorities.

Abstract No. 249**Voxel-Based Versus Single Compartment Ablative Radioembolization Dosimetry Thresholds to Predict Outcomes for Moderate to Large Hepatocellular Carcinomas**

(Article No. 108272)

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Purpose: Single compartment and personalized tumor dose thresholds have been demonstrated to improve tumor responses and survival for patients with hepatocellular carcinoma (HCC) undergoing radioembolization. However, for larger tumors, which may not be amenable to thermal ablation, optimal ablative dosimetry methods and dose thresholds remain unknown.

Materials and Methods: Multi-center retrospective analysis of consecutive patients at three centers who underwent radioembolization for untreated HCC ≥4 cm between June 2018 – June 2024 was performed. Imaging response was assessed by modified Response Evaluation Criteria in Solid Tumors (mRECIST). Post-TARE SPECT/CT were analyzed using voxel-based dosimetry software to estimate perfused volume and tumor-volume doses. The associations between imaging response at three months post-TARE with estimated dose and overall survival (OS) were evaluated.

Results: 109 patients met inclusion criteria for this study: 55 complete-response (CR), 54 non-CR at three-months post-TARE. Single compartment dose, minimum dose to 95% of tumor volume (D95), and D50 were significantly higher in patients with CR: 601 versus 316 Gy perfused dose (p < 0.001), 500 versus 213 Gy D95 (p < 0.001), and 832 versus 401 Gy D50 (p < 0.001). CR tumors tended to have smaller estimated pre-TARE size (4.8 versus 5.8 cm, p < 0.001) and were treated within a smaller perfused volume (235 versus 441, p < 0.001). CR was associated with a median OS of 3.99 versus 2.23 years for non-CR, with a hazard ratio (HR) of 0.59 (95% confidence interval (CI) 0.37–0.93, p = 0.02). The associations between dose thresholds and OS are summarized in 314.1.

Conclusion: Complete imaging response to radioembolization at three months was correlated with overall survival for HCC ≥4 cm. Multiple dose thresholds were correlated with complete response and survival, with D95 consistently having the numerically lowest HR at each dose threshold.

249.1.

	≥400 Gy	≥500 Gy	≥600 Gy	≥700 Gy	≥800 Gy	≥900 Gy	≥1000 Gy
Single-Compartment Dose	0.79 (0.42–1.50)	0.54 (0.28–1.05)	0.45 (0.21–0.94)	0.32 (0.12–0.81)	0.26 (0.08–0.85)	0.61 (0.19–1.98)	0.73 (0.22–2.39)
D95	0.33 (0.17–0.67)	0.42 (0.19–0.91)	0.28 (0.10–0.80)	0.29 (0.09–0.93)	0.21 (0.05–0.89)	0.26 (0.06–1.07)	0.14 (0.02–1.02)
D50	0.54 (0.28–1.03)	0.63 (0.33–1.19)	0.52 (0.27–1.00)	0.38 (0.19–0.79)	0.37 (0.17–0.77)	0.34 (0.14–0.81)	0.27 (0.09–0.75)

Abstract No. 250

Outcomes of Resin Yttrium-90 Radioembolization with Advanced Dosimetry for Large HCC Tumors (>8 cm): A Retrospective Cohort



(Article No. 108273)

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Purpose: Evaluate the safety, local tumor control, and patient survival after Yttrium-90 (Y-90) resin radioembolization with advanced dosimetry planning for treating large hepatocellular carcinoma (HCC) tumors measuring >8 cm.

Materials and Methods: A single-center retrospective analysis of HCC patients with index lesions ≥8 cm in diameter treated with resin Y-90 (SIR-Spheres) from September 2019 to September 2025 was performed. Treatment planning was done using the medical internal radiation dosimetry (MIRD) or partition dosimetry for all patients. Administered dose to perfused volume/target tumor dose, lung shunt fraction (LSF), and total absorbed lung dose (Gy) were recorded. Endpoints were overall response rate (ORR) evaluated by mRECIST criteria, local and overall progression-free survival (PFS), and overall survival (OS). Adverse events were graded by CTCAE v6.0.

Results: 24 patients were included in the study. The mean age (±SD) was 69.0 ± 14.4 years, and 17/24 patients (70.8%) were male. Median treated tumor size was 12.5 cm (range, 8.0–17.7), and 11/24 (45.8%) had a solitary lesion. Sixteen patients (66.7%) were treated with MIRD, 6 (25%) with partition dosimetry, and 2 (8.3%) with a combination of both approaches. Treatments were done with DOC, Flex-1, and Flex-3 resin in 5 (20.8%), 14 (58.4%), and 5 (20.8%). In patients treated with the MIRD model, median (range) administered dose and sphere load to the perfused volume were 175 Gy (80–300 Gy) and 44k/cc (24–60k/cc). With partition model, median (range) administered tumor dose and sphere load in the tumor were 150 Gy (100–300 Gy) and 41.5k/cc (20–56k/cc). Median LSF was 3.9% (1.3–16.3%) and median lung dose was 9.8 Gy (1.7–36 Gy). Evaluable ORR at 3, 6, and 9 months was 87% (20/23), 74% (14/19), and 70.4% (10/14), respectively. Local progression occurred in 10/24 (41.7%) and distant progression in 8/24 (33.3%). The median follow-up was 725 days (~23.8 months). Median local PFS and overall PFS were 811 days (~26.6 months) and 685 days (~22.5 months), respectively. Overall survival was 100% at 1 month, and 3 months, 91.7% at 6 months, and 82.9% at 1 year. At the last follow-up, 14/24 (58.3%) were alive. Adverse events included three grade ≥3 events: fatal radiation pneumonitis (n=2; LSF 13% and 20%; lung dose 30 Gy for both) and gastric fistula (n=1), which was managed surgically.

Conclusion: In large (>8 cm) HCC, resin Y-90 performed by advanced dosimetry results in favorable ORR and OS, with robust early responses. Despite advanced dosimetry, larger tumors with higher LSF pose a challenge in managing lung absorbed dose to avoid radiation pneumonitis.

Abstract No. 251

Voxel-Based Dosimetry and Activity Deposition Pattern Predicting Survival and Progression Outcomes in Intrahepatic Cholangiocarcinoma Patients Treated with Yttrium-90 Radioembolization Using Resin Microspheres



(Article No. 108274)

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Purpose: To evaluate voxel-based dosimetry and activity deposition patterns in intrahepatic cholangiocarcinoma (iCCA) patients treated with Yttrium-90 transarterial radioembolization (⁹⁰Y-TARE), and their association with survival and progression outcomes.

Materials and Methods: This retrospective single-center study included adult patients with iCCA who were treated with ⁹⁰Y-TARE using resin microspheres and had available post-⁹⁰Y PET/CT or SPECT/CT between July 2014 and February 2025. Voxel-based dosimetry was performed on post-⁹⁰Y PET/CT or SPECT/CT using the local deposition method with known activity. The mean dose absorbed by tumor tissue (mean TAD) and the minimum dose absorbed by 50% of tumor tissue (D50) were calculated. Lesions were classified by activity deposition pattern into those with both central and peripheral uptake versus those with central necrosis and peripheral-only uptake. Progression was defined according to the Revised Response Evaluation Criteria in Solid Tumors (RECIST 1.1). Kaplan-Meier analysis with log-rank test was used to compare overall survival (OS) and progression outcomes between subgroups.

Results: Among 32 patients (median age, 71 years [IQR, 66–74]; 69% males), median tumor size was 6.7 cm [IQR, 3.8–8.6 cm], with a mean TAD of 262 Gy [IQR, 161–370 Gy] and a D50 of 232 Gy [IQR, 129–321 Gy]. Patients receiving a mean TAD ≥ 300 Gy had significantly longer median OS (not reached vs 14 months, p=0.003), progression-free survival (12 vs 5 months, p=0.006), and time to progression (16 vs 6 months, p=0.026), compared to patients with a mean TAD < 300 Gy. Similarly, longer OS (median: not reached vs 17 months, p=0.02) and progression-free survival (median: 12 vs 6 months, p=0.019) were observed in patients with D50 ≥ 250 Gy compared to those with D50 < 250 Gy. Lesions showing central necrosis with peripheral but no central activity deposition had earlier progression (median time to progression: 5 months vs not reached, p=0.003), and shorter progression-free survival (5 vs 14 months, p=0.004) compared to lesions with both central and peripheral activity deposition.

Conclusion: Higher tumor absorbed dose was associated with both survival and progression benefit. Voxel-based dosimetry holds strong potential as an early post-treatment tool in predicting survival and progression outcomes in iCCA patients treated with ⁹⁰Y-TARE.

Abstract No. 252**Efficacy and Safety of Boosted Radioembolization for Recurrent Hepatocellular Carcinoma After Curative Resection**

(Article No. 108275)

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Purpose: To assess the efficacy and safety of boosted transarterial radioembolization (TARE) for recurrent hepatocellular carcinoma (HCC) after curative resection.

Materials and Methods: Twenty-two patients (mean age, 65.6 ± 8.8 years; 16 men) with recurrent HCC after curative resection underwent TARE between January 2022 and March 2025. Tumor response, local tumor progression-free survival (LTPFS), progression-free survival (PFS), overall survival (OS), and adverse events were retrospectively analyzed.

Results: The mean interval from resection to TARE was 107.8 months; mean future liver remnant (FLR) was 60.6%, with 18.2% having an FLR < 30%. Boosted TARE was performed in 95.5%. Complete response (CR) was achieved in 77.3%, with an objective response rate of 90.9% and a disease control rate of 100.0%. Local tumor progression occurred in 18.2%, and LTPFS rates at 3, 6, 12, and 24 months were 100.0%, 85.7%, 59.4%, and 59.4%, respectively. Median PFS was 8.9 months (95% confidence interval [CI], 5.7–not reached), and PFS rates at 3, 6, 12, and 24 months were 86.4%, 70.4%, 43.2%, and 43.2%. OS rates at the same intervals were 100.0%, 90.9%, 85.2%, and 85.2%. Grade 3 adverse events included elevated AST/ALT (4.5%) and bilirubin (13.6%). No patients experienced radiation pneumonitis or radioembolization-induced liver disease. One patient (4.5%) died from sepsis due to tumor rupture (grade 5). Non-CR was independently associated with worse LTPFS (adjusted HR, 6.74, 95% CI, 1.49–30.52, *p* = 0.013).

Conclusion: Boosted TARE is an effective and safe method for treating recurrent HCC after curative resection, with a good local tumor control.

Abstract No. 253**Time-Dependent Systemic Immune Effects of Y90 Radioembolization**

(Article No. 108276)

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Purpose: To characterize the systemic immune effects of Yttrium-90 (Y90) transarterial radioembolization (TARE) in patients with hepatocellular carcinoma (HCC), identify temporal patterns in immune modulation, and explore whether radiation dose or microsphere type influences immune activation. This information is critical for optimizing timing of combination therapy with immune checkpoint inhibitors (ICIs).

Materials and Methods: This retrospective study reviewed patients treated with Y90 TARE between 2016-2023, excluding

those with prior liver radiation or concurrent systemic therapy. Complete blood counts with differential were collected at baseline and at 30- and 60-days post-treatment. Systemic immune-inflammation indices, such as neutrophil-to-lymphocyte ratio (NLR), platelet-to-lymphocyte ratio (PLR), monocyte-to-lymphocyte (MLR), and systemic immune-inflammation index (SII), were calculated. Lymphocyte depletion and NLR reduction were defined as >50% decrease from baseline to day 60. Comparisons between Y90 glass and resin microspheres were made using Wilcoxon rank-sum and Pearson chi-squared tests.

Results: Both microsphere types produced substantial lymphocyte depletion, with >50% declines by day 60 in a large proportion of patients, indicating a delayed systemic cellular immunomodulatory effect. Trends suggested that fewer resin-treated patients achieved >50% NLR reduction by day 60, reflecting device-specific immune signature. Eosinophil counts were significantly lower at baseline and day 30 in patients receiving resin microspheres compared with glass (*p*=0.02 and *p*=0.004, respectively), but were similar by day 60. Overall, Y90 TARE induces early but transient immune shifts followed by delayed systemic lymphopenia.

Conclusion: Y90 radioembolization elicits time-dependent systemic immune changes in HCC, characterized by delayed lymphocyte depletion, early eosinophil suppression, and device-specific variation in NLR dynamics. These findings support a finite window for synergistic Y90-ICI therapy and highlight the need for prospective trials to refine timing and dosing strategies for optimal immunologic and oncologic outcomes.

Abstract No. 254**Yttrium-90 Radioembolization for Treatment of Uveal Melanoma Liver Metastasis: A Meta-Analysis**

(Article No. 108277)

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Purpose: Uveal melanoma frequently metastasizes to the liver, where prognosis remains poor and systemic therapies have shown limited benefit. Small cohort studies have suggested that yttrium-90 (Y90) radioembolization is a feasible liver-directed therapy in this setting. This meta-analysis aims to evaluate the safety and effectiveness of Y90 radioembolization for the treatment of liver metastases from uveal melanoma.

Materials and Methods: A systematic literature review and meta-analysis were conducted using a random-effects model, including studies published up to March 2025. The following keywords were used: “uveal melanoma,” “uveal neoplasm,” “yttrium,” “radioembolization,” and “selective internal radiation therapy.” Data extracted included publication year, geographic region, sample size, study design, tumor burden, administered radioactivity, prior treatments, median survival time (MST), follow-up duration, adverse events, and radiographic response.

Results: Fifteen studies comprising a total of 292 patients were included. Based on Response Evaluation Criteria in Solid Tumors (RECIST), the pooled overall response rate (ORR) was 22.4% (95% confidence interval [CI], 12.8-31.9%; *I*² = 81.7%,

$p < 0.001$), and the disease control rate (DCR) was 96.2% (95% CI, 50.6–87.7%; $I^2 = 94.1\%$, $p < 0.001$). Using modified RECIST criteria (mRECIST), the pooled ORR was 44.3% (95% CI, 30.5–58.1%; $I^2 = 12.0\%$, $p = 0.321$), while the DCR was 79.5% (95% CI, 69.0–90.0%; $I^2 < 0.1\%$, $p = 0.468$). Hepatic progression-free survival (hPFS) following radioembolization ranged from 4.3 weeks to 15 months, and overall PFS ranged from 3–6.6 months. MST following radioembolization ranged from 2.8–46.6 months. The cumulative major adverse event rate related to radioembolization was 5.4% (95% CI, 1.5–29.3%; $I^2 = 29.8\%$, $p = 0.153$). Reported events included grade ≥ 3 hepatic toxicity ($n = 10$), gastric ulcer ($n = 2$), intraprocedural vessel dissection ($n = 2$), severe abdominal pain ($n = 2$), radiation cholecystitis ($n = 3$), and enterocolitis ($n = 1$).

Conclusion: Y90 radioembolization appears to be an effective treatment for liver metastases from uveal melanoma, demonstrating high response rates and favorable survival outcomes.

Abstract No. 255

Baseline Hemoglobin Predicts Oncologic Outcomes in Intrahepatic Cholangiocarcinoma Treated with Yttrium-90 Radioembolization



(Article No. 108278)

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Purpose: To evaluate whether baseline hemoglobin (HGB) predicts treatment response, disease progression, and survival in patients with unresectable intrahepatic cholangiocarcinoma (ICC) undergoing Yttrium-90 (Y90) transarterial radioembolization (TARE).

Materials and Methods: A retrospective cohort of 136 ICC patients treated with glass microspheres [Boston Scientific, MA, USA] Y90-TARE (2004–2020) was analyzed. Patients were stratified by baseline HGB: ≥ 12 g/dL ($n = 40$), 10–11.9 g/dL ($n = 56$), and < 10 g/dL ($n = 40$). Tumor response was assessed by RECIST 1.1; outcomes included duration of response (DoR), time to progression (TTP), and overall survival (OS). Kaplan–Meier and log-rank testing compared OS; Cox regression identified independent OS predictors.

Results: Median age was 64 years; 49% were female. RECIST response differed across HGB strata: 38% (15/39) for ≥ 12 g/dL, 42% (22/53) for 10–11.9 g/dL, and 18% (7/39) for < 10 g/dL ($p = 0.041$). Median DoR was 15.0 (95% CI 7.0–24.9), 6.5 (95% CI 3.9–11.1), and 6.2 months (95% CI 1.1–9.6) ($p = 0.04$). Median TTP was 7.1 months (95% CI 3.7–13.1), 5.8 months (95% CI 2.9–8.3), and 1.7 months (95% CI 1.1–3.4) ($p = 0.0075$). Median liver TTP was 13.7 (95% CI 6.0–39.5), 6.3 (95% CI 4.1–8.6), and 3.3 months (95% CI 1.2–6.9) ($p = 0.0051$), and extrahepatic TTP was 24.5, 14.6, and 5.9 months ($p = 0.0284$). Median OS was 17.1 months (95% CI 11.8–31.3), 13.8 months (95% CI 8.6–19.3), and 6.0 months (95% CI 4.2–12.4) ($p = 0.0007$). On multivariate analysis, HGB < 10 g/dL independently predicted worse OS (HR 1.79, 95% CI 1.03–3.10, $p = 0.037$), along with ascites (HR 2.06, $p = 0.008$) and portal vein thrombosis (HR 1.81, $p = 0.024$).

Conclusion: Baseline HGB < 10 g/dL was associated with reduced response, shorter progression-free intervals, and decreased survival after Y90-TARE. As a low-cost biomarker, HGB may improve risk stratification and guide treatment planning. Prospective studies should investigate whether correction of anemia prior to TARE improves clinical outcomes.

Scientific Session 27

Vascular Malformations

Tuesday, April 14, 2026

3–4:30 p.m.

Abstract No. 256

Safety and Efficacy of the LOBO Vascular Occlusion Device for Embolization of Pulmonary Arteriovenous Malformations (PAVM): A Single-Center Experience



(Article No. 108280)

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Purpose: To assess the safety, technical success, and medium-term clinical efficacy of the Low Profile Braided Occluder (LOBO) device (Okami Medical, Aliso Viejo, California) for embolization of pulmonary arteriovenous malformations (PAVMs).

Materials and Methods: A single-center retrospective study of consecutive patients with PAVMs who underwent transcatheter embolization using LOBO devices was performed. Technical success was defined as complete occlusion of the intended feeding artery with a single LOBO device. Procedure time and radiation to the patient were also recorded. Clinical efficacy was defined as the absence of recanalization/persistence of embolized PAVM and $\geq 70\%$ reduction in sac size on 6-month follow-up CT angiography (CTA). Additionally, complications/adverse events were assessed following embolization using the Society of Interventional Radiology Classification.

Results: Twenty-three patients (mean age 42.3 years; 82% female) were treated, of whom 87% had hereditary hemorrhagic telangiectasia. Overall, 55 PAVMs in the patients included in our study were embolized; of these, 52 were simple PAVMs (i.e., with a single feeding artery), while 3 were complex PAVMs (i.e., with multiple feeding arteries) supplied by 7 feeding arteries cumulatively. All arteries were embolized using a single device per feeder (LOBO-3, n=37; LOBO-5, n=18; LOBO-7, n=3; LOBO-9, n=1) with no additional embolic devices required. Mean feeding artery diameter was 2.93 mm (SD:1.05, Range:1.6-7.0). The mean fluoroscopy time was 29.19 minutes (SD: 18.38), and the mean radiation dose was 623.5 mGy. Technical success was 100%, with no intraprocedural device mal-deployment or migration. At median imaging follow-up of 6 months (median, 266 days; range, 154–474 days), there was no recanalization of treated arterial

feeders and no persistence or recanalization of the PAVM sac on CTA. No device-related complications, pulmonary infarctions, or major procedure-related adverse events were observed.

Conclusion: The LOBO device is a safe and effective tool for the embolization of PAVMs with persistent occlusion of the targeted lesion on medium-term follow-up. Larger, prospective, multicenter studies are warranted for further evaluation, including long-term efficacy.

Abstract No. 257

Arterial Stent Grafts in Complex Large High-Flow AVM That Failed Conventional Embolization Therapy



(Article No. 108281)

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Purpose: Endovascular management of peripheral arteriovenous malformations (AVM) commonly involves repeated non-mechanical and/or mechanical embolization. We investigated the use of covered arterial stent grafts, in combination with embolization, in the management of patients with complex large high-flow limb AVM for treatment of fistulas and flow-related aneurysms.

Materials and Methods: We performed retrospective analysis of six adult patients who received at least one self-expandable covered stent graft as part of their management. Three patients had Parkes Weber syndrome. Five of the AVM involved a lower extremity, and one involved an upper extremity. AVMs were either of the II, IIIA or IIIB subtype according to Yakes classification. Baseline Schobinger clinical stage prior to stenting was either III or IV, with three patients exhibiting high cardiac output. All patients had non-mechanical and/or mechanical embolization session(s) prior or concomitant to stenting.

Results: 14 stent grafts were deployed over 8 distinct procedures. Stent deployment was successful in all patients. Clinical success as measured by stable or improved Schobinger stage at 6 weeks was 88%. In four patients, stents remain patent up to date (5–66 months post-intervention). Two patients had failed primary patency, one with stent thrombosis at 36 months with no clinical sequelae and another who underwent amputation at 46 months despite patent stents. Two patients did not require further treatment after 30 months. Minor complications were seen in two patients.

Conclusion: In selected patients with limb AVM, covered arterial stent grafts may be safe and effective in management of fistulas and flow-related aneurysms as an adjunct to other embolization strategies.

Abstract No. 258

MR-guided Cryoablation for Treatment of Painful Large to Medium Vascular Malformations in the Plantar Foot: A Retrospective Study



(Article No. 108282)

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Purpose: To evaluate the safety and efficacy of MR-guided cryoablation for treating painful vascular malformations of the plantar foot.

Materials and Methods: An institutional review board-approved retrospective review was undertaken of all pediatric and adult patients who underwent MR-guided cryoablation for treatment of symptomatic plantar foot vascular malformations. Ultrasound/MR imaging was used for probe placement and to monitor ice-ball formation. Lesion dimensions, number of ablation sessions, number of freeze-thaw cycles, recurrence rates, and MR imaging features were recorded. Pain was assessed with a visual analog scale (VAS, 0–10) or self-reported symptomatic improvement.

Results: Twenty-four patients (17 females, 7 males; mean age 32.1 years, range 10–85 years) were treated between 2015 and 2025 for painfully symptomatic plantar vascular malformation. Of these patients, 10 (41.7%) had failure of prior procedures including sclerotherapy or surgical resection. On average, 3 freeze-thaw cycles (range 2–5) were performed in each cryoablation. A total of 35 ablation sessions were performed. The mean lesion size was $4.4 \times 2.5 \times 3.9$ cm and the maximum diameter reported was 10.5 cm. All lesions demonstrated good MRI visibility with increased T2-weighted intensity with most patients being treated for pain and 1 patient had an additional indication of reducing the vascular malformation size to control bleeding prior to their orthopedic surgery. Clinical follow-up was available for 22 patients. At the 6-month follow-up, 18 of the 22 patients (81.8%) reported significant pain relief. Three of the 22 (13.6%) patients experienced pain recurrence, one of whom was successfully treated with a second ablation session. The other two patients had persistent pain despite three ablation sessions, carried out at 2 to 3-year intervals. Four patients of the 18 (22.2%) patients who initially had pain relief at 6 months developed new pain at the 12-month follow-up. Two of these 4 patients were successfully treated with a second ablation, while the other two were lost to follow-up. One patient who did not have a 6-month follow-up showed pain relief at the 12-month follow-up. Minor complications occurred in 8 of the 22 patients (36.3%) including paresthesia that resolved after a few months, swelling which was managed with compression stocking, and stress fractures managed conservatively.

Conclusion: MR-guided cryoablation is a safe and effective minimally invasive procedure for symptom control of plantar vascular malformations and management of recurrent lesions.

Abstract No. 259

MRI Appearance of Vascular Malformations After Cryoablation



(Article No. 108283)

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Purpose: Cryoablation is an increasingly used technique for the treatment of soft tissue vascular malformations. MRI is the preferred modality for post-treatment evaluation, but descriptions of expected imaging findings remain limited. The objective of this study is to describe MRI findings of vascular malformations after cryoablation and highlight characteristic imaging patterns.

Materials and Methods: From January 2023 through March 2025, 58 patients with vascular malformations underwent cryoablation using a standard protocol. Twenty patients (34%) had pre- and post-procedural MRI follow-up. MRI protocol includes T1 and T2 fat saturated sequences, followed by gadolinium contrast enhanced sequences. Lesions were evaluated for changes in size, T2 signal, contrast enhancement, and associated tissue findings. Follow up imaging was done between 2 and 17 months post-procedure (median of 7 months).

Results: At follow-up MRI, 15 of 20 patients (75%) demonstrated size reduction: 3 decreased over 50% (15%), 11 decreased less than 50% (55%), and 1 completely regressed (5%). Four lesions (20%) remained stable in size, and one lesion (5%) increased in size. T2 signal decreased or appeared wispy in 6 patients (30%), while 14 (70%) remained stable. Enhancement decreased or appeared wispy in 6 patients (30%), was unchanged in 10 (50%), increased in 1 (5%), and showed complete resolution in 1 (5%). Ancillary findings included adjacent muscle T2 hypersignal in 5 patients (25%).

Conclusion: MRI of vascular malformations after cryoablation most frequently demonstrates partial size reduction (75%), decreased or wispy T2 signal (30%), and stable enhancement pattern (50%). Adjacent muscle hypersignal is a common ancillary finding (25%) and is an expected post-procedural change. These results provide a practical reference for the expected range of post treatment imaging appearances.

Abstract No. 260

Diagnosis and Management of Thoracic and Shoulder Arteriovenous Malformations (AVMs): A Previously Endovascularly Incurable Lesion



(Article No. 108284)

W. Yakes¹; ¹The Yakes Vascular Malformation Center

Purpose: To determine the efficacy of Endovascular Repair of Thoracic and Shoulder Arteriovenous Malformations (AVMs). Previous reports have documented the utter futility of Onyx, Coils, and nBCA of endovascular treatment and authors plainly state these lesions are untreatable in their *JVIR* publications.

Materials and Methods: 16 patients (11 female, 5 male) presented for repair of shoulder and thoracic AVMs. 3 patients had extension of AVM to the supraclavicular and axillary areas. 3 patients had multiple AVMs. 7 patients had previous failed therapies (embo: PVA/coils/Gelfoam; Onyx, nBCA; surgeries: excisions/arterial bypass Left subclavian Axillary, Brachial, and Radial). All patients underwent ethanol endovascular AVM repair; 4 patients had additional coil embolizations (132 treatments). Patient age range 18–76 years; mean age 36.

Results: 15 patients are cured at long-term arteriographic follow-up (follow-up 22–192 months; mean follow-up: 42 months). 1 patient with bilateral shoulder AVM and multiple other AVMs therapy is on-going. Complications include 2 patients with minor superficial blisters, 1 patient with transient left radial nerve injury with complete recovery and 1 patient with clot embolus to hand, Rx with urokinase w/distal third phalanx removed. Thus, major complications were 2/132 procedures, 1 being transient. 1 patient at 27-year arteriographic follow-up remains cured.

Conclusion: A *JVIR* report of shoulder AVM endovascular repair documented total failure of the current approaches even when

coupled with shoulder quadrant amputation whereby recurrence was universal. These authors stated that shoulder AVMs were not possible to treat. This report documents that cure of these difficult lesions is possible with ethanol endovascular approaches and direct puncture approaches. No other publications in the world literature documents cure of AVMs in this anatomy consistently. Long-term cures are noted with the use of ethanol, and ethanol and coils to successfully treat these complex, problematic lesions. A low major complication rate is noted. This patient series finally documents a curative procedure for this daunting lesion.

Abstract No. 261

Low-Profile High-Density Braid Occluder for Treatment of Pulmonary Arteriovenous Malformations



(Article No. 108285)

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Purpose: To evaluate the safety and efficacy of a low-profile braided occluder (LOBO; Okami Medical, San Diego, California) for embolization of pulmonary arteriovenous malformations (PAVMs).

Materials and Methods: A single-institutional retrospective review was conducted from January 2022 to September 2025. Adult patients with PAVMs treated using the LOBO device were included. After excluding 4 patients and 5 PAVMs without radiologic follow-up, a total of 14 patients (mean age: 42.9 ± 15.9 years) with 22 PAVMs were included. Technical success, radiologic response (defined as $>70\%$ reduction in lesion size), and clinical outcomes were evaluated.

Results: Twenty (90.9%) had a single feeding artery; the remaining 2 (9.1%) were complex with multiple feeders. The mean feeding artery diameter was 3.3 ± 1.1 mm, and the mean PAVM size was 11.0 ± 5.1 mm. A total of 26 occluders were deployed into the feeder pulmonary arteries (LOBO-3: n=16; LOBO-5: n=10), achieving complete cessation of flow by end of procedures with a technical success was of 100%. No major complications occurred. Over a mean CT follow-up period of 13.3 ± 14.1 months (1-year follow-up: n=11; 3-year follow-up: n=4), no cases of PAVM persistence or device migration were observed. During a mean clinical follow-up of 19.6 ± 15.3 months, no catastrophic events occurred.

Conclusion: Mid-term outcomes suggest that the LOBO device is a safe and effective option for the treatment of PAVMs.

Abstract No. 262

Machine Learning with Demographic and Procedural Data Predicts the Need for Additional Sclerotherapy for Lymphatic Malformations Following Initial Treatment with Doxycycline



(Article No. 108286)

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Purpose: Lymphatic malformations (LMs) are congenital vascular anomalies arising from the abnormal development of lymphatic vessels. While percutaneous sclerotherapy (PS) is the first-line treatment for LMs, predicting the number of treatment sessions required for remission remains challenging. To address this, we developed a machine learning (ML) model that uses readily available clinical data—patient demographics and procedural details from initial treatment—to predict whether patients will require additional treatment sessions following initial doxycycline sclerotherapy.

Materials and Methods: We conducted a retrospective analysis of patients who received doxycycline PS for LMs at our institution between January 2014 and April 2025. We included patients with a confirmed LM diagnosis receiving their first PS at our institution. Patients were excluded if they had not received PS, had prior PS at an outside hospital, or lacked a confirmed LM diagnosis. We collected data on patient demographics (e.g., age, sex) and procedural details from initial treatment (e.g., number of access sites, volume of sclerosant administered). Gradient-boosted ML models were trained to classify patients as requiring single vs. multiple PS sessions, and assessed using five-fold cross-validation.

Results: A LightGBM model achieved a mean accuracy of 0.87, a mean AUC of 0.84, and a mean F1-score of 0.81 across five folds, demonstrating robust performance. The five most influential features were volume of sclerosant used, age at time of treatment, reference air kerma, number of sites accessed, and total procedure time.

Conclusion: An ML model trained with readily available clinical data, such as patient demographics and procedural details from initial treatment, may accurately predict whether patients with lymphatic malformations will require additional treatment sessions following initial doxycycline sclerotherapy. Importantly, this approach achieved robust performance without relying on time-consuming tasks like imaging preprocessing or lesion segmentation, offering a practical and resource-efficient tool for treatment prognosis.

262.1. Top 5 Predictive Features Ranked by Model Importance

Rank	Feature	Explanation of Feature
1	Volume of Sclerosant Used	Total volume of doxycycline administered (mL)
2	Age	Patient age at time of initial sclerotherapy
3	Reference Air Kerma	Measure of fluoroscopic radiation exposure (mGy)
4	Number of Access Sites	Number of sites used to percutaneously access lesion
5	Total Procedure Time	Total time from start to end of the initial sclerotherapy session (minutes)

Abstract No. 263

Management of Tongue Venous and Lymphatic Malformations



(Article No. 108287)

W. Yakes¹; ¹The Yakes Vascular Malformation Center

Purpose: To determine the efficacy of ethanol embolization in management of tongue venous and lymphatic malformations.

Materials and Methods: 48 patients (29 females, 19 males; mean age: 38 years) presented with tongue low-flow malformations. 47 patients had undergone 61 failed previous procedures (embo, laser, surgery, steroid injection, alpha-interferon, radiation). All patients had baseline arteriograms and MRs. All patients underwent direct puncture ethanol endovascular therapy.

Results: Of 48 patients with venous and lymphatic malformations, 37 patients had dramatic reduction and 11 patients' therapy is on-going with concurrent reductions (mean f/up: 60 months). 1 patient with AVM required additional surgery and 1 patient with mixed veno-lymphatic malformation required surgical debulking of excess tissues. Minor complications such as tongue blisters (9 instances) healed spontaneously; 3 tongue focal areas of necrosis healed spontaneously; 3 infections responded to antibiotic treatment; 1 focal tongue hemi numbness resolved. 1 patient with dense VMs had a portion of the tongue slough and the tongue healed and remolded with no treatment required.

Conclusion: Ethanol embolotherapy is a primary and consistent form of therapy to eradicate low-flow vascular malformations of the tongue permanently at long-term follow-up. Rarely is concurrent surgery required. Ethanol sclerotherapy is a curative treatment in which recurrences do not occur and permanent ablations are the rule. Complications are minor and rare.

Abstract No. 264

Efficacy of Combined Venous Sac and Feeding Artery Embolization: A Review of 154 Pulmonary Arteriovenous Malformations



(Article No. 108288)

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Purpose: To evaluate the safety and efficacy of venous sac embolization (VSE) with feeding artery embolization in the management of pulmonary arteriovenous malformations (PAVMs).

Materials and Methods: Sixty patients (45 female and 15 male, median age 48 years) with 154 untreated PAVMs (92% simple, 8% complex) were analyzed over a 10-year period. Technical success was measured by angiographic occlusion or stasis, while clinical success required a 70% reduction in AVM feeding vessel or sac size. Pre and post computed tomography images were compared for outcome analysis. The following data was collected: patient demographics, follow-up period, baseline diameters of the feeding artery, venous sac, and draining vein, draining vein diameter after treatment, and decrease in the size of the draining vein, including the number reaching a threshold of 70% decrease.

Results: AVMs were treated at the nidus (74%) or distally (26%), using coils (98%), plugs (1.7%), or Onyx (0.6%). Mean pretreatment feeding artery, draining vein and sac diameters were 3.23 mm (SD 2.31), 3.91 mm (SD 2.87) and 12 mm (SD 8) mm respectively with post-treatment measurements of 0.43 mm (SD 1.38), 1.07 mm (SD 2.14) and 2.6 mm (SD 4.9) respectively. In univariate analysis, pretreatment feeding artery diameter

significantly affected the log odds of clinical success ($P=0.016$). Additionally, the changes in draining vein size and sac diameter were associated with technical success ($P=0.04$ and 0.02 respectively). No major adverse events were reported.

Conclusion: Combination venous sac and feeding artery embolization was associated with high rates of technical and clinical success.

Abstract No. 265

Clinical and Histopathological Outcomes of Symptomatic Iliofemoral Venous In-Stent Restenosis: A Single-Center Prospective Study of Restenting Versus Nonrestenting in 29 Patients



(Article No. 108289)

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Purpose: In-stent restenosis (ISR) is a common complication after iliofemoral venous stenting. However, the clinical and histopathological outcomes of patients treated with restenting versus those managed without remain insufficiently characterized.

Materials and Methods: This single-center prospective study was approved by the institutional review board, and written informed consent was obtained from all participants. Between April 2022 and April 2025, 29 patients (mean age 45.5 ± 10.8 years; 18 male) with symptomatic ISR or stent occlusion underwent venography and endovascular biopsy. Tissue specimens were analyzed for the proportions of fresh, organizing, and old thrombus, diffuse intimal thickening (DIT), and calcified material. Twenty-two patients underwent restenting or stent extension, while seven were treated without additional stents (e.g., venoplasty, thrombolysis and thrombectomy). Technical success, stent patency, Villalta scores, and histopathology were assessed. Kaplan-Meier and Cox regression analyses identified predictors of restenosis or occlusion.

Results: Technical success of recanalization was 96.6% (28/29). During a median follow-up of 688.5 ± 222.4 days, 14 patients (48.3%) developed severe ISR or stent reocclusion requiring reintervention (12 re-stented; 2 non-re-stented; $p = 0.390$) with a median stent patency of 180.0 ± 29.0 days. Villalta scores improved significantly from baseline (16.3 ± 7.0) to 1–3 months (6.7 ± 5.5 , $p < 0.001$), 3–6 months (9.1 ± 7.7 , $p = 0.001$), 6–12 months (8.6 ± 7.9 , $p < 0.001$), and 12–18 months (6.8 ± 5.9 , $p < 0.001$), with no significant differences between re-stented and non-re-stented groups. Histopathology showed fresh/organizing thrombus $\geq 50\%$ in 14 patients, old thrombus $\geq 50\%$ in 6, and DIT $\geq 50\%$ in 9. Kaplan-Meier analysis showed patients with pre-existing bilateral stents ($p = 0.040$) and old thrombus predominance ($p = 0.056$) had worse patency. On univariate Cox regression, pre-existing bilateral stents ($HR = 3.035$, $p = 0.050$) and greater proportions of old thrombus ($HR = 1.016$, $p = 0.022$) were predictors of stent failure.

Conclusion: Pre-existing bilateral stents and a greater proportion of old thrombus within ISR lesions are associated with reduced stent patency. Restenting did not confer superior outcomes compared with nonrestenting, suggesting that baseline clinical context and lesion profile may play a more critical role in clinical outcomes.

Scientific Session 28

Venous Interventions 1

Tuesday, April 14, 2026
3–4:30 p.m.

Abstract No. 266

Obesity, Endovascular Intervention, and In-Hospital Mortality in Acute Pulmonary Embolism: A Retrospective Analysis of Independent Predictors



(Article No. 108291)

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Purpose: We aimed to determine if obesity was associated with different rates of in-hospital mortality and intervention in acute pulmonary embolism (PE) patients treated at a large midwestern medical center with a dedicated Pulmonary Embolism Response Team (PERT).

Materials and Methods: This retrospective, single-center study included 549 intermediate-high and high-risk PE patients who received PERT consultation during a 4-year period from 2021 to 2025. Obesity was defined as a BMI value greater than 30 kg/m². Patients were separated by obesity status, and analysis was conducted for demographic data, hospital course, and outcomes at discharge. Outcomes included in-hospital mortality, discharge location, and need for oxygen at discharge. Hospital course variables include cardiac arrests, bleeds, transfusions, and length of total and ICU stay. Patients were further subdivided by treatment categories of intervention and anticoagulation. Intervention included both mechanical thrombectomy and catheter-directed thrombolysis.

Results: 549 patients were included in this study, 255 (46.44%) of whom were obese. In-hospital mortality rate was 20.41% and 13.33% in non-obese and obese patients, respectively ($p=0.03$). However, obesity was not an independent risk factor for mortality (OR: 1.53, 95% CI: 0.72-3.22, $p=0.29$). 63 (24.71%) obese patients received intervention compared to 44 (14.97%) non-obese patients ($p=0.004$). The strongest predictive factor of receiving intervention was obesity (OR: 2.05, 95% CI: 1.25-3.44, $p=0.005$). Other associated factors of being placed in the intervention treatment group were a higher Bova score and cardiac arrest; however, interaction data between obesity and demographic factors, Bova score, cardiac arrest, and comorbidity index were nonsignificant.

Conclusion: Our results suggest that although mortality rates were lower in obese patients, obesity itself is not an independent predictor of mortality. Conversely, obesity served as an independent predictor of receiving intervention.

Abstract No. 267

Thinking Beyond the Iliacs: Recanalization of Chronically Occluded Femoropopliteal Veins Improves Post-thrombotic Syndrome



(Article No. 108292)

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Purpose: To assess the safety and efficacy of recanalizing chronically occluded femoral (FV) and/or popliteal (PV) veins in treating patients with post-thrombotic syndrome (PTS) and patent ipsilateral iliac veins.

Materials and Methods: This was a single-center retrospective study from 2016 to 2025 of 21 patients (mean age 55 years, 14 males, 7 females) who underwent venous recanalization for PTS secondary to chronic occlusion of the FV and/or PV with patent ipsilateral iliac veins. Baseline clinical characteristics, procedural details including technical success and adverse events, and subsequent clinical outcomes were assessed. Technical success was defined as the restoration of in-line flow from the popliteal vein to the iliac veins. Pre- and post-intervention Villalta scores were compared using a Wilcoxon signed-rank test.

Results: The mean body mass index was 31 ± 4 . Five patients (24%) had a known hypercoagulable comorbidity. Five patients (24%) had prior ipsilateral iliac vein interventions but had persistent PTS despite patency of the iliac veins. The median [IQR] pre-intervention Villalta score was 13 [11-17]. Venoplasty was performed in all patients most commonly to 10 mm in the FV (15/21, 71%) and 8 mm in the PV (9/21, 43%). Adjunctive techniques such as thrombectomy and/or thrombolysis were performed in 4 patients (19%). Technical success was achieved in 20 patients (95%). There were no severe procedural adverse events. Of the 20 patients in whom technical success was achieved, 6 required re-intervention for recurrent thrombus (6/20, 30%). Of the 6 repeat interventions, 4 were successful in restoring in-line flow from the popliteal vein to the iliac veins (4/6, 67%). Overall, the primary and secondary patency rates for recanalized femoropopliteal veins were 70% and 90% after median imaging follow-up of 9.2 months. In 14 patients (70%) who had pre- and post-intervention Villalta scores available for comparison, venous recanalization significantly improved PTS symptoms (pre-intervention: 13 [11-16], post-intervention: 5 [4-8.5], $p = 0.002$).

Conclusion: Recanalization of isolated chronically occluded femoropopliteal veins is technically feasible, safe, and significantly improves symptoms of PTS.

Abstract No. 268

Safety and Efficacy of the OATF Optimal Inferior Vena Cava Filter: A First-in-Human Single-center Prospective Study



(Article No. 108293)

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Pulique Hôpitaux de Paris; ²APHP; ³Hôpital Européen Georges Pompidou

Purpose: IVC filters are dedicated to the prevention of pulmonary embolism (PE) when anticoagulation is contraindicated. The major drawback of filters is the tilt, as it compromises removal and reduces clot filtration capabilities. In this line, ALN designs a new self-centering filter, overcoming this tow flaw.

Materials and Methods: The objectives of this first-in-human open-label prospective single-center study (NCT05785676) were to evaluate the clinical safety and efficacy of the OATF IVC filter. This was conducted on 50 consecutive patients requiring temporary or permanent IVC filtration. Clinical examination and thoracic and abdominal angio-CT scanner were performed at 6 months and one year if permanent indication or before removal.

Results: The filter was successfully implanted at the intended location in all the patients. During all the follow-ups, there was no clinical and scanographic evidence of PE recurrence. Only one case of major tilt ($>15^\circ$) was observed in a patient with major scoliosis, and > 3 mm filter strut IVC penetration occurred in 5 patients at the end of the follow-up. Neither migration nor fracture was observed. Retrieval was attempted in 25 (50%) patients after a mean period of 223 days (range: 20 -321 days) and was successful in all cases without additional maneuvers.

Conclusion: This prospective study confirms the relevance of the new design of the ALN OATF retrievable IVC filter to prevent PE recurrence and facilitate filter removal when needed.

Abstract No. 269

Socioeconomic Factors Predict IVC Filter Retrieval Rates



(Article No. 108294)

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Purpose: IVC filters are commonly placed to prevent potentially fatal pulmonary emboli, however, these devices can cause serious adverse effects if not retrieved. We sought to evaluate the effect of

patient demographics, clinical complexity, preferred language, zip code, and race on IVC retrieval rates.

Materials and Methods: Patients undergoing IVC Filter placement from January 2020-January 2025 were identified and checked for filter retrieval. Income was approximated using zip code derived median household income from the US census. The Charlson comorbidity index (CCI) was calculated for all patients. Variables were analyzed for difference in retrieval rate using student's t test (zip derived income, age, CCI, BMI), chi-squared test (non-English language), and binary logistic regression (race). Multivariate logistic regression models were created to assess the independent effect of socioeconomic factors alongside CCI, BMI, age, and sex.

Results: There were 552 IVC filter placements and 137 were retrieved (24.8%). Older age ($p < 0.001$), higher CCI ($p = 0.007$), male sex ($p < 0.001$), and lower zip-derived income were associated with lower retrieval rates ($p = 0.003$). White patients had higher rates of retrieval ($p = 0.036$). Age, zip-derived income, CCI, and white race were independent predictors of retrieval in multivariate analysis.

Conclusion: Socioeconomic and demographic factors such as older age, lower-income zip codes, higher CCI, and non-white race are associated with lower IVC filter retrieval rate. The rates between preferred language did not reach the threshold for significance, likely because of limited power to detect small differences between these populations. Clinicians and health equity programs can target these populations to improve IVC retrieval rates.

Abstract No. 270

Utility of Preoperative Labs in Primary Aldosteronism Patients Undergoing Adrenal Venous Sampling



(Article No. 108295)

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Purpose: To identify the incidence of hypokalemia and unsuppressed renin on the day of adrenal venous sampling and their impact on procedural diagnostic accuracy.

269.1. IVC filter retrieval, demographics, and socioeconomic variables

	Overall	Retrieved	Not retrieved	P value
N	552	137	415	-
Age	66 (56, 74)	59 (48, 68)	68 (59, 76)	< 0.001
BMI	25.565 (21.7, 30.0)	25.8 (21.9, 30.2)	25.46 (21.5, 29.8)	0.875
CCI	7 (5, 9)	7 (4, 9)	7 (5, 10)	0.007
% Female	291 (52.7%)	84 (61.3%)	207 (49.9%)	< 0.001
Zip-derived Income (USD, thousands)	75.6 (62.8, 110.0)	88.3 (64.0, 121.8)	74.9 (62.4, 108.7)	0.003
Non-English Preferred	117 (21.2%)	21 (15.3%)	96 (21.1%)	0.053
Race				
-Asian	12 (2.2%)	6 (4.4%)	6 (1.4%)	0.122
-Black/African American	138 (25%)	30 (21.9%)	108 (26.0%)	0.160
-White	218 (39.4%)	62 (45.3%)	156 (37.6%)	0.036
-Some other race	138 (25.0%)	34 (24.8%)	104 (25.1%)	0.431
-Decline	46 (8.3%)	5 (3.6%)	41 (9.9%)	0.017

Materials and Methods: After obtaining institutional review board approval, we retrospectively reviewed patients with primary aldosteronism (PA) who underwent adrenal vein sampling (AVS) between June 10, 2020, and January 31, 2025. Pre-procedural laboratory values collected on the day of AVS included potassium and plasma renin activity (PRA). Additionally, we gathered the most recent potassium and PRA recorded prior to the day of the procedure. Hypokalemia was defined as potassium < 3.5 mEq/L and unsuppressed renin was defined as $\text{PRA} \geq 1$ ng/mL/hr. Descriptive statistics were used to summarize the data. Patients who underwent repeat AVS were analyzed separately to assess whether hypokalemia or unsuppressed renin influenced the lateralization of the initial AVS.

Results: A total of 253 patients were included in the study. Of these, 243 patients had their potassium levels measured on the day of AVS, with 56 (23.0%) presenting with hypokalemia. Among patients who were hypokalemic on the day of AVS, 31 (55.4%) had a normal potassium level in their most recent measurement prior to the day of the procedure. Additionally, 227 patients had their renin levels measured on the day of AVS, and 28 (12.3%) had unsuppressed renin. Among patients who had an unsuppressed renin on the day of AVS, 13 (46.4%) had a suppressed renin level in their most recent measurement prior to the day of the procedure. Technical success was achieved in 245 patients (96.8%). Repeat AVS was performed in 13 patients. Among these, 5 had hypokalemia and 2 had an unsuppressed renin in the first AVS. Notably, two patients initially lateralized to one side when hypokalemic ($K = 2.8$ mEq/L) and with unsuppressed renin ($\text{PRA} = 1.68$ ng/mL/hr) but lateralized to the opposite side after normalization of potassium ($K = 3.6$ mEq/L) and suppression of renin ($\text{PRA} = 0.7$ ng/mL/hr).

Conclusion: Our study found that a remarkable proportion of patients undergoing AVS had either hypokalemia or unsuppressed renin levels on the day of the procedure. These findings highlight the need for potassium and renin testing on the day of the procedure. Additionally, hypokalemia and unsuppressed renin may influence AVS lateralization outcomes. Further research is needed to validate these findings.

Abstract No. 271

Comparative Accuracy of Pre- Versus Post-Stimulation Relative Aldosterone Secretion Index (RASI) for Lateralization in Primary Aldosteronism



(Article No. 108296)

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Purpose: This study aimed to compare the diagnostic accuracy of pre- and post-stimulation RASI for lateralization in patients with primary aldosteronism (PA) and to identify optimal cutoff values for each time-point.

Materials and Methods: Under institutional review board approval, we conducted a retrospective review of patients with PA undergoing adrenal vein sampling between 2020 and 2025. Data included. Procedures with unsuccessful bilateral catheterization (selectivity index < 2 pre-stimulation or < 5 post-stimulation)

were excluded. The RASI was calculated separately for both phases. Lateralization was defined as lateralization index ≥ 2 pre-stimulation and ≥ 4 post-stimulation. Variables were presented using median and interquartile range. The Kruskal-Wallis test was used for comparison. Receiver operating characteristic analysis was performed for each phase, with optimal diagnostic thresholds derived using Youden's index. Sensitivity, specificity and AUC are compared across the different groups.

Results: Data of 304 AVS procedures was collected. A total of 148 bilaterally selective procedures in both the pre- and post-stimulated phases were included in the final analysis. In the pre-stimulation phase, significant differences in RASI were observed across the 3 categories ($p < 0.001$): left lateralizing 10.96 (4.55-16.65), non-lateralizing 8.22 (3.12-13.32), and right lateralizing 1.15 (0.54-3.52). Similarly, post-stimulation RASI demonstrated significant difference ($p < 0.001$): left lateralizing 5.21 (3.48-7.84), non-lateralizing 3.17 (2.16-4.43), and right lateralizing 0.58 (0.22-1.15). ROC analysis showed superior diagnostic performance for post-stimulation compared to pre-stimulation RASI. For right vs non-lateralizing disease, post-stimulation RASI demonstrated better performance ($\text{AUC} = 0.933$, with 92.0% sensitivity and 87.2% specificity at a cutoff of 1.46) than pre-stimulation RASI ($\text{AUC} = 0.810$, with 72.9% sensitivity and 81.0% specificity at cutoff of 2.81).

Conclusion: Post-stimulation RASI demonstrates superior diagnostic accuracy over pre-stimulation values for lateralization in primary aldosteronism. These findings support the preferred use of post-stimulation RASI in clinical practice.

Abstract No. 272

External Validation of Published RASI Cutoffs for Primary Aldosteronism Lateralization: Experience from a High-Volume Center



(Article No. 108297)

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Purpose: The Relative Aldosterone Secretion Index (RASI) was proposed to quantify aldosterone hypersecretion during adrenal vein sampling (AVS). Rossi et al. established diagnostic cutoffs of ≥ 2.5 for right lateralization and ≤ 0.96 for left lateralization. This study aimed to externally test these published RASI cutoffs using post-stimulation AVS data from a high-volume tertiary referral center.

Materials and Methods: A retrospective analysis of patients undergoing AVS between 2020 and 2025 was conducted. Only procedures with bilateral selectivity (post-stimulation selectivity index ≥ 5) were included. RASI was calculated as the left adrenal-to-IVC ratio of aldosterone-to-cortisol ratios. Lateralization was defined by lateralization index ≥ 4 and categorized as left, right, or bilateral disease. Data were presented as median and interquartile range (IQR). Kruskal-Wallis test was used for comparisons. Diagnostic accuracy of published and institution-specific cutoffs was evaluated by sensitivity, specificity, and area under the curve (AUC).

Results: Data from 304 AVS procedures were collected. Only 290 were included in the final analysis: 86 with left lateralizing, 152 with non-lateralizing, and 52 with right lateralizing disease. Median RASI values differed significantly across groups ($p < 0.001$): left lateralizing 5.28 (3.59–7.77), non-lateralizing 3.10 (2.19–4.31), and right lateralizing 0.40 (0.17–0.98). For right lateralization, a cutoff ≤ 0.96 demonstrated 75% sensitivity and 91% specificity. The optimal institution cutoff (≤ 1.46) showed higher sensitivity (90%) with high specificity (86%), and an AUC of 0.928. For left lateralization, the Rossi cutoff (≥ 2.5) showed high sensitivity (87%) but low specificity (33%). The institution-derived cutoff (≥ 3.89) provided better performance with 71% sensitivity and 70% specificity (AUC=0.748).

Conclusion: External RASI cutoffs demonstrated high specificity for right lateralization but poor specificity for left lateralization. Institution-derived cutoffs showed balanced sensitivity and specificity for both lateralization directions. These findings support the diagnostic utility of RASI and highlight the importance of center-level customization of cutoffs.

Abstract No. 273

Modeling Matters: Non-Newtonian Flow Predicts Stasis Patterns in IVC Filters



(Article No. 108298)

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Purpose: Modeling blood as a perfectly Newtonian fluid is common in computational hemodynamics, but this simplification may not fully capture shear-thinning effects relevant under pulsatile flow near intravascular devices. Inferior vena cava (IVC) filters introduce disturbed flow where vorticity and shear forces may promote thrombosis or hemolysis. Despite the clinical importance, little work has compared Newtonian versus Carreau (non-Newtonian) fluid models under pulsatile flow near IVC filters.

Materials and Methods: Computational fluid dynamics simulations were performed for three commercially available IVC filters in a vessel model under pulsatile flow. Blood rheology was modeled as Newtonian or Carreau across hematocrit values 20–60%. Vorticity magnitude was quantified as a surrogate for microcirculatory stasis, a driver of filter-related thrombosis.

Results: Across all filters and hematocrits, Carreau modeling generally reduced vorticity compared to Newtonian flow, especially at lower hematocrits. For Filter #1, mean vorticity was significantly lower with Carreau at Hct 20% (0.221 vs. 0.286, $p < 0.0001$), 30% (0.156 vs. 0.202, $p < 0.0001$), and 40% (0.151 vs. 0.183, $p = 0.0002$), but paradoxically higher at Hct 60% (0.111 vs. 0.086, $p < 0.0001$). Filter #2 showed similar trends with reductions at Hct 20–40% (all $p < 0.01$), with no difference at 50% ($p = 0.67$) or 60% ($p = 1.0$). Filter #3 again demonstrated lower Carreau vorticity at Hct 20–40% (all $p < 0.001$), but no difference at 50% ($p = 1.0$) and higher vorticity with Carreau at 60% (0.116 vs. 0.139, $p = 0.0009$).

Conclusion: Carreau modeling more consistently predicts reduced vorticity near IVC filters under pulsatile flow, especially at physiologic hematocrits (20–50%). At elevated hematocrits, the relationship reverses, suggesting complex interactions between viscosity and filter-induced turbulence. For interventional radiologists, these results emphasize the value of incorporating non-Newtonian models in device evaluation and design, as vorticity maps may identify regions prone to thrombosis or hemolysis. This approach may guide filter design, patient selection, and procedural decision-making to minimize complications.

Abstract No. 274

Double-Blinded RCT Evaluating Regional Nerve Block for Pain Relief During Endovenous Laser Ablation of GSV: Does Addition of Obturator Nerve Block Make a Difference?



(Article No. 108299)

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Purpose: To compare pain experienced during the Endovenous Laser Ablation procedure, for varicose veins, using a visual analogue scale (1-10) and post-procedure motor weakness in 3 groups of patients. Group 1 (receiving obturator and femoral nerve block and tumescent anesthesia), Group 2 (patients receiving femoral nerve block and tumescent anesthesia), Group 3 (no nerve block [sham mixture] and tumescent anesthesia).

Materials and Methods: Single-center randomized, placebo-controlled, double-blinded study included 120 patients, randomized to three groups. Patients aged between 18-75 years, with C (2-6), E(p), A(s), and P(r) according to the CEAP classification. VAS during procedure, immediately after procedure, 1 hour after procedure was assessed. Post-procedure motor weakness was assessed.

Results: Statistically significant difference in VAS pain scores between Group FNB + ONB + TA and Group without nerve block + TA and between Group FNB + TA and Group without nerve block + TA. VAS pain score on initial injections (distal medial thigh and proximal medial knee areas) showed a statistically significant difference between Group FNB + ONB + TA and Group FNB + TA. There was a statistically significant difference in immediate post-procedure VAS pain scores between the 3 groups and 1-hour post-procedure between Group FNB + ONB + TA and Group without nerve block + TA. There was a significant difference in motor weakness between Group FNB + TA and Group without nerve block + TA.

Conclusion: Pain score is significantly lower in patients undergoing EVLA under nerve block as compared to tumescent anesthesia alone. Addition of ONB in a specific set of patients significantly reduces pain scores, a new finding from our study which is not previously studied. Also, there was no significant difference in motor weakness between the groups in our study, which is a significant new finding.

Scientific Session 29

Women's Health 2

Tuesday, April 14, 2026
3–4:30 p.m.

Abstract No. 275

Revised Outcomes of Sequential Uterine Fibroid Embolization and Hysteroscopic Myomectomy for Large Intracavitary Fibroids



(Article No. 108301)

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Purpose: Management of large, symptomatic intracavitary uterine fibroids poses several challenges. While hysteroscopic myomectomy (HM) offers definitive resection, the procedure is frequently limited by fibroid size, depth of myometrial penetration, and risks of intraprocedural complications including prolonged surgical time and increased systemic fluid absorption. Uterine fibroid embolization (UFE), on the other hand, is effective in reducing fibroid vascularity and size, but treatment of large fibroids can lead to endometritis, sepsis, and expulsion of residual tissue. Given the limitations of these procedures as stand-alone treatments, combining UFE with subsequent HM may improve procedural safety and efficacy. The purpose of our study is to evaluate the outcomes of patients who receive UFE prior to HM for treatment of large intracavitary uterine fibroids.

Materials and Methods: All patients presenting with symptoms concerning for uterine fibroids were seen in a combined fibroid center clinic run by interventional radiology (IR) and gynecology. Prior to intervention, a contrast-enhanced MRI was performed to assess the size, intramural extension, and presence of additional fibroids. Eligible patients were then discussed with a multidisciplinary uterine tumor board, and scheduled for UFE and subsequent HM. A retrospective chart review of these patients was performed to evaluate patient characteristics and outcomes of the combined procedure.

Results: A total of 80 patients (mean age: 45 years, mean fibroid size: 5.8 cm) underwent successful UFE with no noted post-procedural complications, followed by HM at a mean interval of 37 days. 69 patients (86%) had a successful complete surgical resection while 11 patients (14%) only had a partial resection with no additional intervention pursued. Of the 69 patients with complete surgical resection, 63 patients underwent resection in a single session whereas 7 patients needed a repeat myomectomy. None of the patients required a hysterectomy.

Conclusion: Pre-operative UFE followed by hysteroscopic myomectomy is a safe and effective strategy to treat large symptomatic intracavitary uterine fibroids. The above findings support the role of a combined IR-gynecology approach as a viable alternative to single-modality treatment in appropriately selected patients.

Abstract No. 276

Mapping Global Need for Emergent UAE: Geospatial Analysis of Postpartum Hemorrhage Worldwide and the Relation to IR Physician Density



(Article No. 108302)

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Purpose: To assess the global need for emergent UAE for PPH in relation to IR physician density.

Materials and Methods: WHO datasets were used to assess rates of death from postpartum hemorrhage (PPH). Interventional radiologist estimates were drawn from in-country communication and published literature. ArcGIS was used to generate maps of MMR, PPH and IR density at the country level. Bivariate mapping identified correlations between high MMR, maternal PPH, and low IR availability, and spatial autocorrelation tested the significance of observed patterns.

Results: Annual maternal mortality rates (MMR) vary significantly across countries, with some countries reporting rates of nearly 1,000deaths per 100,000, versus 16in the United States. PPH is the leading cause of maternal death, and affects ~14million women annually with ~70,000deaths. There is a disproportionate burden in low- and middle-income countries (LMICs). For example, in Nigeria, ~20,000deaths are due to PPH. In the WOMAN trial, 75% of deaths occurred within 3hours of delivery and >90% were due to bleeding. IR capacity for emergent UAE remains unevenly distributed. For example, the United States has an estimate 3,000-4,500practicing interventional radiologists with approximately 3.5million annual births, while Nigeria has only 3practicing interventional radiologist with more than 7million births. This represents ~1IR per 1,000births in the US vs ~1per 2.3million live births in Nigeria. While resource constraints remain a barrier to implementing IR services in LMICs, urgent efforts are needed to correct these disparities.

Conclusion: There is significant disparity in MMR and PPH deaths, and the number of IR physicians per country. Geospatial analysis can provide insight into global health disparities and identify regions at highest need for IR services.

276.1.

Country	Maternal Deaths	MMR/100K	PPH Deaths	#IRs
Nigeria	82,000	993	20,000	3
India	19,000	130	3,800	596
DRC	19,000	620	4,750	0
Pakistan	11,000	155	4,510	32
Ethiopia	7,800	200	1,950	0
US	669	18	16	3,000-4,500

Abstract No. 277**Fallopian Tube Recanalization: A First-Line Alternative to IVF for Tubal Factor Infertility**

(Article No. 108303)

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Purpose: Fallopian tube recanalization (FTR) is a minimally invasive hysteroscopy-guided outpatient procedure that has demonstrated high technical success. Previous studies have reported comparable outcomes for FTR and IVF; however, only IVF has increased in popularity and utilization. Current literature lacks direct outcome comparisons between the two treatments. We aim to illuminate FTR as a comparable, alternative initial step in addressing infertility for patients with tubal obstruction before escalation to IVF when appropriate.

Materials and Methods: A retrospective cohort study was conducted using the TriNetX Research Network. Deidentified information for female patients >18 and < 40 years of age with the diagnosis of tubal infertility (N97.1) were used. Two cohorts were created: Cohort 1 (n=868) included patients with IVF procedures (S4011, 1008937), Cohort 2 (n=1065) included patients with FTR (58345). Both cohorts only included the first instance of either IVF or FTR. Propensity score matching (PSM) was done for age, race, ethnicity, endometriosis, PCOS, BMI, pelvic inflammatory disease, diabetes mellitus, hyperthyroidism, and hypothyroidism. Comparison after PSM (n=652) was done, exploring outcomes of high-risk pregnancy and pregnancy resulting in full-term delivery (FTD) within 18 months of treatment. Risk difference (RD) with 95% confidence interval (95% CI) was used as a measure of association between FTR and IVF outcomes, with p value < 0.05 demonstrating significant cohort outcome differences.

Results: In our final cohort of 1304 patients with tubal factor infertility, 35 patients had FTD after FTR, while 35 patients had FTD following IVF. Our results show similar live birth rates (RD, -1.38; 95% CI, -3.97-1.21; p=0.30) with no significant increase in high risk-pregnancies (RD, 1.47; 95% CI, -3.41-6.35; p=0.55) between cohorts. These results are consistent with our literature review findings and demonstrate that FTR yields comparable outcomes to IVF.

Conclusion: FTR is a valuable infertility treatment with substantial clinical and economic advantages that should be considered a first-line treatment option in appropriate candidates. IVF can be considered as a next-step option. Further research should investigate reasons for FTR underutilization by illuminating referral patterns, treatment trends, and billing motives. Additionally, conducting a multicenter prospective study can strengthen generalizability and address confounding variables, while educational efforts towards patient and clinician awareness can support increased utilization.

Abstract No. 278**Drug-Eluting Microparticles for Uterine Artery Embolization**

(Article No. 108304)

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Purpose: Uterine artery embolization (UAE) is associated with intense postoperative pain which is only temporarily relieved by intra-arterial local anesthetic administration. To prolong pain relief, this project intends to develop starch-based microparticles with dual functionality: embolization and delayed release of lidocaine.

Materials and Methods: Starch was chemically modified using a cross-linking agent under alkaline conditions and processed into powder that was granulated, dried, and sieved to obtain microparticles suitable for UAE. Microparticles were then incubated with lidocaine solution at room temperature. Loading efficiency was assessed spectrophotometrically after washing away unbound drug with water. In vitro release was studied under physiological-like conditions using saline supplemented with albumin to mimic plasma proteins. Successive eluates were collected and analyzed at 262 nm to establish release kinetics.

Results: Cross-linked starch (CLS) yielded stable 500-850 µm reconstituted microparticles (rm) of appropriate size for UAE. The degree of cross-linking directly influenced drug loading and release behavior. The highest and lowest lidocaine incorporation (respectively 114.4 mg/mL and 58.9 mg/mL of rm) were obtained with 30% and 50% cross-linking (respectively CLS-30 and CLS-50). Lidocaine release of CLS-30 and CLS-50 particles were respectively 10.7 mg/h and 7.2 mg/h. Swelling volumes in water of dry CLS-30 and CLS-50 particles were respectively 5.25 mL/g and 7.5 mL/g

Conclusion: Cross-linked starch microparticles may charge and slowly elute local anesthetics in amount and rate that could result in analgesic effect after uterine artery embolization. Tuning the degree of starch cross-linking allows to control drug loading and release necessary for sustained analgesia. Cross-linked starch microparticles with 30% cross-linking showed the best lidocaine loading and sustained release potential.

Abstract No. 279**Novel Approaches to Uterine Artery Embolization: A Clinical Assessment of Safety and Efficacy Using a Pressure-Enabled Drug Delivery Device**

(Article No. 108305)

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Purpose: The purpose of this clinical assessment was to evaluate the safety, efficacy, and procedural efficiency of a novel microcatheter with Pressure-Enabled Drug Delivery (PEDD) technology for uterine artery embolization (UAE) in patients with symptomatic uterine fibroids. The study aimed to determine if this device could lead to reduced embolization times and minimal embolic material consumption without compromising clinical outcomes.

Materials and Methods: A retrospective, single-center analysis was conducted on 23 patients who underwent UAE for symptomatic uterine fibroids. Procedures were performed by 6 interventional radiologists with varying levels of experience. The patient cohort, with a median age of 45 (37-59), presented predominantly with menorrhagia and/or dysmenorrhea. Pre-treatment dominant fibroid volume had a median size of 802 mL (46-25095 mL). All procedures were performed using the PEDD microcatheter with 500-700 μ m and 700-900 μ m size particles. The procedural endpoint was defined as either Near Stasis or Complete Stasis. Procedural data, including embolization time per uterine artery, number of embolic vials used, and pre- and post-treatment dominant fibroid volumes and VAS were extracted and analyzed.

Results: The study demonstrated 100% technical success and no device-related complications. Clinical success was assessed using a Visual Analog Scale (VAS) (0-10). The mean Heavy Menstrual Bleeding-VAS score decreased from 6.6 pre-procedure to 2.6 at 1 month ($p=0.003$) and 2.1 at 6 months ($p=0.008$). Mean Pain-VAS for dysmenorrhea decreased from 5.4 pre-procedure to 3.0 at 1 month ($p=0.04$) and 1.5 at 6 months ($p=0.006$). The Composite-VAS score for both symptoms decreased from 7.5 pre-procedure to 4.1 at 1 month ($p=0.001$) and 2.8 at 6 months ($p=0.001$). Mean embolization time was 7.5 minutes (left) and 6.1 minutes (right). The mean fluoroscopy time of 19.5 minutes compared favorably to published literature (20.1-21.9 minutes). The mean embolic volume used was 2.1 vials per treated artery. Dominant fibroid volume reduction ranged from 69% to 89%, which compares favorably with previously reported reductions (42%-58%).

Conclusion: The PEDD microcatheter demonstrates a compelling combination of safety, efficacy, and procedural efficiency for symptomatic uterine fibroids. The ability to achieve a robust therapeutic effect with minimal embolic material and short embolization times suggests a more targeted delivery mechanism. This technology has the potential to streamline workflow, decrease procedure and fluoroscopy times, and optimize clinical outcomes.

Abstract No. 280

Fetal Radiation Exposure During Placement of an Aortic Occlusion Balloon Prior to Cesarean Hysterectomy in the Setting of Placenta Accreta Spectrum Disorder



(Article No. 108306)

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Purpose: An aortic occlusion balloon (AOB) may be placed to decrease blood loss during cesarean hysterectomy for patients with placenta accreta spectrum disorder (PAS). However, this approach exposes the fetus to radiation, the dose and effects of which are unknown. The goal of this study is to calculate fetal radiation dose during prophylactic placement of an occlusion balloon prior to cesarean hysterectomy for PAS.

Materials and Methods: The study included 20 patients with PAS who had a prenatal pelvic MRI and who had a 4 French AOB (COBRA OS, Frontline Medical Technologies, Ontario, Canada) placed prior to cesarean hysterectomy at a single tertiary care center. Occlusion balloons were positioned in the infrarenal aorta using a portable fluoroscopy unit (OEC 9900 Elite, GE Healthcare, Chicago, USA) in an operating room immediately prior to cesarean hysterectomy. Fetal dose was calculated by applying corrections to the reference point air kerma (reported by fluoroscopy unit) that account for maternal position relative to the reference point, fetal depth measured on MRI, and factors related to the x-ray technique that provided a conversion from air kerma to fetal absorbed dose. (2)

Results: Balloons were placed using an average of 15.8 seconds of fluoroscopy (range 2-105 seconds; median 6 seconds) leading to 4.2 mGy maternal exposure (range 0.4-29.4 mGy; median 2.3 mG). Average distance from the fetus to the back of the maternal patient was 13.1 cm (range 10.0-17.7 cm; median 13 cm) Calculated dose to the fetus was 1.6 mGy (range 0.2-10.9 mGy; median 0.8 mGy). Fetal dose is strongly associated with the maternal radiation dose and the depth of the fetus.

Conclusion: Fetal radiation exposure during occlusion balloon placement is low. While there is no absolute safe threshold of exposure, the measured doses are well below levels associated with deterministic effects and are unlikely to increase stochastic risks appreciably. (3, 4) Concerns about fetal irradiation should not preclude balloon occlusion of the aorta in the setting of PAS.

Abstract No. 281

Incidence of Tumor Seeding Following Adnexal Mass Biopsies, Aspiration And/ or Drain Placement



(Article No. 108307)

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Purpose: This study aims to investigate the incidence of tumor seeding following biopsy, aspiration or drain placement in females with adnexal masses. The findings could impact clinical practice by contributing to the development of guidelines outlining when biopsy or drain placement is appropriate in patients. Further expanding upon the true risk of these procedures will help to establish safer interventional procedures and improve patient care and outcomes in the treatment of adnexal masses.

Materials and Methods: This retrospective cohort study reviewed all females who underwent gynecologic biopsy, aspiration, or drain placement from 2007-2024 at a single institution's interventional radiology department. Data collected from the patient's chart included demographics, clinical history, procedure details, and outcomes including cancer progression or tract seeding found on imaging within one year of procedure, as well as procedure-related complications within 30 days. Descriptive statistics, Fisher's exact, and Wilcoxon rank sum exact tests were run to determine differences in patient- and procedure-related characteristics between those with and without disease progression.

Results: A total of 27 patients were included, with a mean age of 58.1 years. Seventeen (63.0%) had biopsies, 7 (25.9%) aspirations, and 3 (11.1%) drain placements. Of the lesions biopsied, 13 (81.2%) were malignant (one biopsy was categorized as neither malignant nor benign), and 9 (69.2%) of the malignant lesions were confirmed to be of ovarian origin. No patients had tumor seeding within one year of the procedure nor any procedure-related complications within 30 days. Eleven (40.7%) patients experienced disease progression within one year. No statistical significance was found between the presence of disease progression and patient medical history, menopausal status, procedure type or imaging modality used.

Conclusion: Due to the nature of interventional procedures used when performing a biopsy, aspiration, or drain placement in the setting of suspicious or confirmed malignancy, physicians must consider the potential risk of tumor seeding through spread of the lesion's material. In this study, no patients experienced tumor seeding or complications. There was also no difference in patient- and procedure-related characteristics between those who experienced disease progression and those who did not.

281.1.

Outcomes

N = 27^{^1}

Disease Progression Within 1 year	11 (40.7%)
Complications within 30 days	0 (0.0%)
Tract Seeding Present	0 (0.0%)

^{^1} n(%)

Abstract No. 282

Alpha Particle Therapy with Bi-213-DTPA-hAnnA1 Antibody Targeting Murine Ovarian Cancer Cells



(Article No. 108308)

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Purpose: Antibody-based oncology therapies rely on passive mechanisms for tumor delivery. The humanized antibody against Annexin A1 (hAnnA1) actively targets tumor endothelium and cancer cells for potentially better therapeutic outcomes. Our prior studies indicted 30200-luc and HGS2-luc OC cells showed in vitro and in vivo binding and retention of Zr-89-labeled hAnnA1 compared to control IgG1. This study assessed targeted alpha-particle therapy (TAT) using Bi-213 labelled hAnnA1 for the in vitro treatment of murine ovarian cancer (OC) cells.

Materials and Methods: hAnnA1 and IgG1 antibodies were conjugated with DTPA and radiolabeled with Bi-213 from an in-house packed generator; purity of radiolabeled Abs was confirmed with iTLC. Survival assays at 24- and 48-hour survival assays in 96-well plates (5,000 cells/well) included Bi-213-DTPA-hAnnA1/or-IgG, and untreated controls. Clonogenic assays (200 cells/well) were performed using Bi-213-DTPA-hAnnA1/or-IgG, hAnnA1, IgG, and untreated groups. A range of doses were studied with 3-5 μ Ci the highest levels. qPCR of the treated and untreated conditions from the survival assays was performed with GAPDH (control), PCNA, and RAD51. Two-way ANOVA with Tukey's test assessed statistical significance ($p < 0.05$) using SAS 9.4.

Results: The specific activities of Bi-213-DTPA-hAnnA1 and Bi-213-DTPA-IgG were $0.8 \pm 0.3 \mu$ Ci/ μ g and $1.0 \pm 0.6 \mu$ Ci/mg, respectively (each $>95\%$ purity). The Bi-213-DTPA-hAnnA1 significantly reduced survival ($p < 0.05$) compared with Bi-213-DTPA-IgG or untreated cells; the effect was observed starting at doses of 5μ Ci and 2.5μ Ci for 30200 and for HGS2 cells. There was a significant decrease in colony number and size for Bi-213-DTPA-hAnnA1 compared with the control groups, starting at 3μ Ci for 30200 cells and 5μ Ci for HGS2 cells ($p < 0.05$). qPCR showed significantly decreased expression of PCNA and Rad51 for the Bi-213-DTPA-hAnnA1 group compared with the untreated groups ($p < 0.05$) for both cell lines.

Conclusion: Bi-213-DTPA-hAnnA1 TAT inhibited OC growth in vitro compared with controls, showing reduced colony counts, decreased proliferation, and decreased dsDNA damage repair markers at doses as low as 2.5μ Ci.

Abstract No. 283

Quality of Life in Venous-Origin Chronic Pelvic Pain: SF-36 Scores Compared with Normative and Endometriosis Cohorts



(Article No. 108309)

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Purpose: To compare quality of life in women with venous-origin chronic pelvic pain (VO-CPP) to US normative populations (NP) and published cohorts with endometriosis (ENDO).

Materials and Methods: The SF-36 questionnaire was completed by patients in the concept elicitation phase of an Society of Interventional Radiology Foundation-funded project to develop a PROM tool for VO-CPP. Participants were menstruating women ≥ 18 years with VO-CPP >6 months, recruited by gynecologic pain specialists. After a complete evaluation, the specialist deemed VO-CPP to be the most significant diagnosis; all had imaging confirming pelvic varicosities. Mean SF-36 T-scores ($\pm$ SD) from women with VO-CPP were compared with NP (defined as mean=50, SD=10) using one-sample t-tests, and with

283.1.				
Domain	VO-CPP T-scores Mean (SD) Ages 22-52 (n=21)	VO-CPP vs. US norms (Mean 50, SD 10) t-test Cohen's d P-value	ENDO T-scores Mean (SD) Ages 25-34 (n=347-351) Ages 35-44 (n=425-431)	VO-CPP vs. ENDO t-test Cohen's d. P-value
Physical functioning	45.4 (9.8)	-0.46 0.04	50.3 (10) 49.8 (10)	-0.49 0.04 -0.44 0.06
Role-Physical	38.7 (12.4)	-1.13 < 0.01	45.3 (10) 45.6 (10.2)	-0.66 0.03 -0.68 0.02
Bodily Pain	39.4 (8.9)	-1.06 < 0.01	45.7 (10.2) 45.7 (10)	-0.62 < 0.01 -0.63 < 0.01
General health	43.5 (10.9)	-0.65 0.01	43.9 (9.9) 43.6 (10.2)	-0.04 0.87 -0.01 0.97
Vitality	36.3 (11.4)	-1.37 < 0.01	45.8 (10) 46.1 (10)	-0.95 < 0.01 -0.98 < 0.01
Social functioning	44.2 (12.2)	-0.58 0.04	42.6 (10) 42.7 (10.2)	0.16 0.56 0.15 0.58
Role-Emotional	41.8 (13.4)	-0.82 0.01	43.6 (10) 42.5 (10)	-0.18 0.55 -0.07 0.82
Mental health	41.6 (12.4)	-0.84 0.01	44.2 (10) 44.1 (10)	-0.26 0.36 -0.25 0.37
<i>Summary scores</i>				
Physical component	42.2 (9.8)	-0.78 < 0.01	47.9 (10) 48.1 (10)	-0.57 0.02 -0.59 0.01
Mental component	41.2 (12.3)	-0.88 < 0.01	42.5 (10) 42.2 (10)	-0.13 0.64 -0.10 0.72

published scores for women with ENDO using Welch's two-sample t-tests. Effect sizes (Cohen's d) were calculated to quantify the magnitude of T-score group differences.

Results: The VO-CPP cohort (n=21) scored significantly lower in all SF-36 domains ($p < 0.05$) compared to NP (Cohen's d = -0.6 to -1.1, indicating moderate-large reductions). Compared to ENDO, VO-CPP patients showed similar scores in several domains, and significantly worse in physical role limitations, pain, vitality, and the physical component summary scores (d = -0.6 to -1.0). Results shown in 378.1.

Conclusion: VO-CPP patients reported moderately to markedly lower health scores than NP in all SF-36 domains, and similar or worse scores than women with ENDO. These findings demonstrate the need to include VO-CPP in women's health policy and research priorities.

Abstract No. 284

Population-Level Eligibility for Minimally Invasive Breast Tumor Cryoablation in the United States: SEER 2016 to 2022 and Historical Treatment Patterns



(Article No. 108310)

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Purpose: Breast cryoablation is an emerging minimally invasive alternative to surgery for carefully selected early-stage cancers, yet the size of the eligible U.S. population and how these patients are

currently treated is unclear. We quantified national eligibility and modeled near-term growth to inform planning, equity, and guidelines discussions.

Materials and Methods: We performed a retrospective, population-based analysis of SEER registry data (2016–2022). Eligibility criteria aligned with published prospective trials: female sex, invasive ductal/papillary carcinoma, grade I–II, localized stage, estrogen/progesterone receptor-positive, HER2-negative, and tumor size ≤ 15 mm (primary cohort), with secondary analysis at ≤ 20 mm. Surgical treatment was categorized as lumpectomy/partial mastectomy, mastectomy, or no surgery. Strict unmet need was defined as eligible patients not undergoing any breast operation during the index episode. The high-opportunity group comprised patients who underwent breast-conserving surgery (BCS). A log-linear regression model incorporating a COVID-19 indicator was applied to generate projections through 2030 with 95% confidence intervals (CI).

284.1.	
≤ 20 mm eligible patients, n	149,186
Annual average (≤ 20 mm), n	21,312
Current Treatment Patterns (≤ 20 mm), n (%)	
No surgery	432 (0.2)
Lumpectomy/partial mastectomy	132,042 (75.2)
Mastectomy	35,484 (23.8)
Combined opportunity*	32,474 (75.4)
Growth Projections	
2016-2022 CAGR, %	+3.5
2030 projected cases, 95% CI	279,024 (251,122–306,926)

*Combined opportunity: unmet need plus breast-conserving surgery

Results: From 2016–2022, 125,335 cases met ≤ 15 mm criteria and 149,186 met ≤ 20 mm criteria, averaging 17,905 and 21,312 annually, respectively. Among ≤ 20 mm, strict unmet need patients receiving no surgery was rare (0.2%), while the high-opportunity group comprised 75.2% (132,042 cases). An additional 23.8% underwent mastectomy. The combined opportunity population (strict unmet need plus BCS) totaled 132,474 patients (75.4%), averaging 18,925 annually. Refined-eligibility counts

increased 3.5% annually, with projections reaching 279,024 eligible cases by 2030 (95% CI: 251,122–306,926).

Conclusion: This study provides the first comprehensive, population-level assessment of breast cryoablation eligibility in the United States, revealing a substantial candidate population of 149,186 patients over seven years. Our findings establish essential national benchmarks for systematic program development, payer policy, and multidisciplinary interventional oncology integration.

Scientific Session 30

AI & Imaging

Wednesday, April 15, 2026

11:15 a.m. – 12:45 p.m.

Abstract No. 285

Use of Triage Artificial Intelligence for Intermediate-High- and High-Risk Pulmonary Embolism Patients



(Article No. 108312)

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Purpose: Acute pulmonary embolism (PE) remains a predominant driver of mortality and morbidity despite advances in imaging and therapeutic modalities. In recent years, artificial intelligence (AI) algorithms have been utilized to triage the interpretation of computed tomography pulmonary angiography (CTPA) images by radiologists and have been shown to improve operational statistics such as report turnaround time (RTAT) and hospital length of stay (LOS). However, the effect these algorithms have on clinical outcomes warrants further exploration. The aim of this study was to examine how an AI triage algorithm affected medium-term pulmonary health in intermediate-high- and high-risk PE patients.

Materials and Methods: 154 intermediate-high-risk and high-risk PE patients were identified from an academic health center's medical records. Intermediate-high-risk was defined as elevated brain natriuretic peptide or troponin with right heart strain, while high-risk was defined as systolic blood pressure < 90. Within this cohort, 52 patients were admitted prior to AI implementation (pre-AI), and 102 patients were admitted after AI implementation (post-AI). Pulmonary health outcomes recorded in the patient's chart

within 1-year of PE were quantified using an internal, non-validated, scoring scale of 1-5, where 5 indicates the most severe symptoms.

Results: Results are summarized in the table. No improvement was found in mean pulmonary health score, time-to-treatment from initiation of CTPA, or LOS. Compared to the pre-AI cohort, the post-AI cohort had a statistically significantly longer mean RTAT. No differences were found in a subset analysis comparing RTAT for images acquired during the day versus night.

Conclusion: These findings suggest that triage AI algorithms may not significantly improve workflow or pulmonary health outcomes in intermediate-high-risk and high-risk PE patients. Additional studies are warranted with larger sample sizes.

Abstract No. 286

AI-based CT Skeletal Muscle Metrics Predict Post-TIPS Hepatic Encephalopathy and Mortality: Insights from a 20-Year Longitudinal Study of TIPS Patients



(Article No. 108313)

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Purpose: To determine the potential association between machine-learning extracted CT skeletal muscle metrics and the development of hepatic encephalopathy or mortality after transjugular intrahepatic portosystemic shunt (TIPS) placement.

Materials and Methods: In this retrospective multicenter cohort study, patients who underwent non-emergent TIPS from 1995 to 2024 and had CT scans of the abdomen/pelvis within one year before TIPS were included. Patient charts were reviewed up to 90 days after TIPS to evaluate for a clinical diagnosis of post-procedural hepatic encephalopathy based on the West Haven criteria. An age, race, and sex-specific fully automated machine learning-based pipeline utilizing a dual convolution neural network model was used to extract CT skeletal muscle area (SMA) and skeletal muscle density (SMD) from the L3 vertebral level. Independent t-tests, univariate logistic regression models, and multivariate logistic regression models were performed for statistical analysis.

Results: Of 253 patients meeting the inclusion criteria, those who developed hepatic encephalopathy (HE) within 90 days after TIPS (n=138) were older than those who did not (n=115) (58.93 years vs. 55.52 years, p=0.03). After TIPS, the HE group had more prescribed lactulose (93.48% vs. 77.39%, p< 0.01) and rifaximin (86.23% vs. 55.65%, p< 0.01) than the unaffected group. However, there was a higher incidence of medication noncompliance with lactulose or rifaximin after TIPS in the HE group (19.57% vs. 7.83%, p< 0.01). Analysis of CT body composition metrics shows that the mean SMA was lower in the HE group (132.21 cm² vs. 144.67 cm², p< 0.01). The mean SMD (30.55 hu vs. 31.38 hu, p=0.58) and skeletal muscle index (46.21 cm²/m² vs. 48.32 cm²/m², p=0.13) were not significant between the two groups. After adjusting for age and medication noncompliance, SMA was found to be an independent predictor for the development of hepatic encephalopathy within 90 days after TIPS

285.1.

	Pre - AI (N=52)	Post - AI (N=102)	P value
Age, mean (SD)	58.4 years (14.3)	63.5 years (14.5)	0.024
Female, n (%)	35 (67)	51 (50)	0.040
Cardiac or pulmonary risk factors, n (%)	34 (65)	71 (70)	0.593
ICU, n (%)	36 (69)	50 (49)	0.017
Alteplase, n (%)	24 (46)	13 (13)	p < 0.001
Thrombectomy, n (%)	5 (10)	20 (20)	0.112
Pulmonary Health Score, mean (SD)	1.38 (0.80)	1.55 (0.83)	0.234
RTAT, mean (SD)	1.98 hours (1.16)	2.94 hours (3.24)	0.008
Hospital LOS, mean (SD)	5.28 days (3.75)	6.42 days (7.35)	0.201
Time-to-heparin, mean (SD)	-0.315 hours (9.17)	1.46 hours (5.04)	0.198
Time-to-alteplase/ thrombectomy, mean (SD)	15.9 hours (7.91)	13.2 hours (19.3)	0.469

(OR 0.99, 95% CI: 0.98-0.99, $p < 0.01$). Among the entire cohort, 38 (15%) patients died within 90 days after TIPS. Those who died had a lower mean SMD than those who survived within 90 days after TIPS (27.64 hu vs 31.50 hu, $p=0.02$). Lower SMD was associated with increased risk of mortality within 90 days after TIPS (OR 0.96, 95% CI: 0.92-0.99, $p=0.02$).

Conclusion: SMA extracted from CT scans using an automated machine learning based algorithm is an independent predictor of hepatic encephalopathy development after TIPS. Lower SMD was associated with an increased risk of mortality after TIPS.

Abstract No. 287

AI-Based Cone-Beam CT Reconstruction and Embolization Planning for Prostatic and Genicular Artery Embolizations



(Article No. 108314)

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Purpose: To assess the clinical impact of artificial intelligence (AI) based cone-beam CT (CBCT) reconstruction and embolization planning software during prostatic artery embolization (PAE) and genicular artery embolization (GAE).

Materials and Methods: This retrospective single-center study included two analyses. First, image quality assessment: 134 CBCT acquisitions (PAE $n=85$, GAE $n=49$) from 97 procedures were selected among 100 consecutive cases (July 2024 - February 2025), excluding three non-conforming acquisitions. Each CBCT was reconstructed using both conventional and AI-based algorithms (CleaRecon DL, GE HealthCare) and reviewed side-by-side by two independent reviewers, blinded to reconstruction type. Evaluation included streak artifacts, vessel visualization (5-point Likert scale), and overall reconstruction preference. Secondly, procedural planning evaluation: A randomized subset of 90 CBCT datasets (PAE $n=50$, GAE $n=40$) was analyzed to assess the added value of AI integration in procedural planning. Each dataset was processed twice using Embo ASSIST from the conventional reconstruction and using Embo ASSIST AI (GE HealthCare) from the AI-based reconstruction. The same two reviewers sequentially evaluated vessel segmentation accuracy, and the extend of target artery depiction. Segmentation performance was scored on a 4-point scale (0=None, 1=Proximal, 2=Distal, 3=Very Distal).

Results: In the image quality analysis, AI-based reconstruction was preferred over conventional in 100% of cases. It reduced streak artifacts in all cases and improved vessel visualization in 97% of cases (Significantly Better 59.3%, Better 37.7%, Equivalent 2.6% and Worse 0.4%). In the procedural analysis, segmentation scores improved with AI-based planning. For the PAE subgroup, the average segmentation score increased from 1.9 ± 1.0 to 2.7 ± 0.5 ($p < 0.001$). For the GAE subgroup, the average segmentation score increased from 2.1 ± 1.0 to 2.4 ± 0.7 ($p < 0.001$), as determined by the Wilcoxon signed-rank test.

Conclusion: AI-based CBCT reconstruction and embolization planning significantly improves image quality, vessel visualization, and segmentation performance during prostatic and genicular artery embolization. These enhancements lead to better visualization of vascular anatomy and more accurate identification of target arteries, which may increase procedural efficiency and operator confidence.

Abstract No. 288

Revisiting Robustness: Evaluating CLAHE and Test-Time Augmentation for Catheter Segmentation in X-Ray Fluoroscopy



(Article No. 108315)

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Purpose: Automated catheter segmentation in fluoroscopy can aid image-guided interventional radiology. The lightweight U-Net with transfer learning proposed by Gherardini. (CMPB 2020) demonstrated real-time performance using phantom and in-vivo datasets. Post-processing and augmentation strategies such as contrast-limited adaptive histogram equalization (CLAHE) and test-time augmentation (TTA) are widely used in natural image analysis to enhance robustness. We aimed to evaluate whether CLAHE, TTA, or their combination could improve segmentation performance for catheters in fluoroscopy.

Materials and Methods: We trained a lightweight U-Net on 2000 phantom images with provided labels, then fine-tuned and tested on six in-vivo sequences (T1–T6, total 1207 frames) with binary catheter masks. Four inference strategies were evaluated: baseline (raw images), CLAHE only, TTA only (horizontal/vertical flips), and CLAHE+TTA. Segmentation accuracy was quantified using Dice coefficients, following the same dataset splits as the reference study.

Results: Baseline Dice ranged from 0.13-0.53 across sequences. CLAHE consistently reduced performance (e.g., T1: 0.531 $\rightarrow$ 0.425; T3: 0.436 $\rightarrow$ 0.268), indicating intensity distribution mismatch. TTA produced neutral to slightly positive effects, improving Dice in T2 (0.310 $\rightarrow$ 0.345), T3 (0.436 $\rightarrow$ 0.471), and T6 (0.168 $\rightarrow$ 0.184). Combining CLAHE+TTA failed to recover performance, with average Dice decreases of 0.07–0.13 across sequences compared to baseline.

Conclusion: Contrary to expectations, CLAHE preprocessing degraded catheter segmentation accuracy, while simple TTA produced only modest gains. These results highlight that “off-the-shelf” robustness techniques from natural image domains may backfire in fluoroscopy if training and inference distributions are not aligned. For interventional radiology, this emphasizes the importance of modality-specific validation of preprocessing and augmentation strategies before clinical deployment.

Abstract No. 289

3D Software Assessments Can Predict Local Tumor Progression Following Microwave Ablation in Colorectal Lung Metastases



(Article No. 108316)

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Purpose: To assess the feasibility and prognostic value of three-dimensional (3D) minimal ablation margin (MM) measurement with image registration software.

Materials and Methods: This retrospective study included 116 colorectal pulmonary metastases (median size 0.8 cm, range 0.4–2.4; 56.8% bilateral) in 88 patients [median age 54.5 years] treated with microwave ablation (June 2015–December 2021). MM were quantified in 3D using the Ablation Confirmation Software (NeuWave Medical, Madison, WI) using semi-automated registration, on immediate and 4–8 weeks post-ablation Computer Tomography (CT) scan. MM was assessed without and with the application of an intensity-based deformation algorithm (DEFA) to account for thermal changes (15% contraction). MM were independently reviewed by three interventional radiologists (two ≥ 5 years of experience, one fellow) for the need of additional ablation. Local tumor progression (LTP) was evaluated up to 24 months and prognosticators were analyzed with competing risk regression analysis using sub distribution hazard ratios (SHR) (STATA 17.0 SE).

Results: Local control at 12 and 24 months was 92.2% and 83.5%. Reviewer concordance was 93.1%, with 100% agreement between experienced readers; 8/116 cases (6.9%) of disagreement were resolved by unanimous consensus. MM < 5 mm were detected in 31/116 cases (26.7%) on immediate post-ablation CT, 12 (38.7%) of which developed LTP. Based on the same day 3D-margin assessment additional ablation would have been offered in 12 of the 17 (70.1%) cases that ultimately progressed. Intra-procedural MM ≥ 5 mm predicted local control without (SHR 0.05, $p < 0.01$) and with DEFA (SHR 0.36, $p = 0.023$). MM ≥ 5 mm at 4–8 weeks without DEFA was not predictive ($p = 0.052$), whereas MM ≥ 5 mm with DEFA was also associated with tumor control (SHR 0.23, $p = 0.027$). The latter demonstrated the same sensitivity (82%), but inferior specificity (57% vs 83%) and lower diagnostic accuracy (60% vs 83%) compared with intra-procedural 3D assessment without DEFA. Even though 2D side-by-side assessment at 4–8 weeks CT indicated acceptable tumor coverage in all cases, 3D software suggested insufficient MM < 5 mm in 59/116 (50.9%) cases, 14 (23.7%) of which developed LTP. Proximity ≤ 10 mm to airway (SHR 3.57, $p = 0.043$) and vessels ≥ 3 mm (SHR 3.03, $p = 0.035$) was associated with LTP.

Conclusion: Same day image 3D Margin measurement provides the most accurate detection of MM < 5 mm and areas at risk for LTP. This information can be used to guide decisions of additional ablation within the same session.

Abstract No. 290

Integrating AI and Deformable Registration into a Fully Automated Tool to Quantify the Ablation Margin for Renal Cell Carcinoma



(Article No. 108317)

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Purpose: To develop and demonstrate the clinical utility of a fully-automatic AI segmentation and deformable registration tool to quantify achieved tumor treatment margins for renal cell carcinoma (RCC) ablation.

Materials and Methods: Pre- and post-ablation CT images from RCC patients treated at a single institution were utilized for

training and validation of the tool-kit. Tumor and ablation zone segmentations using a U-Net based framework, trained on a manual segmentation dataset were automated on CT images collected for validation ($n=46$), and the deformable registration between corresponding pairs of pre- and post-ablation CT images was performed. The registration tool was used for complete surface evaluation between tumor and ablation zone to quantify the mean ablation margin achieved and was compared to rates of local RCC recurrence to assess clinical utility.

Results: Patient demographics are presented in 9.1. The mean Dice similarity coefficient (DSC) between the AI and manual segmentation was 0.86 ± 0.05 . There was no statistical significance ($p > 0.05$) in DSC when comparing $\geq 50\%$ exophytic (0.85 ± 0.05), $< 50\%$ exophytic (0.85 ± 0.05) and endophytic (0.89 ± 0.05) tumors, and between radiofrequency ablation (0.86 ± 0.05) and cryoablation (0.85 ± 0.06). 17% of patients (8/46) had RCC recurrence occurring a median of 5.2 (3.8 - 6.8) years after successful ablation. All initial post-ablation CT images (taken 68 ± 49 days post-ablation) showed no viable tumor. However, the mean ablation margin calculated from these images using the deformable registration tool for patients who developed RCC recurrence was -0.2 ± 1.7 mm. This was significantly smaller ($p < 0.001$) than the ablation margin of those without RCC recurrence (3.5 ± 2.0 mm, $n=38$).

Conclusion: The developed fully automatic tool demonstrates feasibility for combining AI for segmentation of the pre-ablation tumor and post-ablation zone with deformable kidney registration for RCC ablation margin quantification. The tool found a significant difference in the achieved mean ablation margin between patients with and without long-term RCC recurrence, suggesting that quantifying ablation margins may predict oncologic outcomes. The fully automated tool can be easily incorporated into routine clinical workflow.

290.1.

Characteristic	N=46
Age (years)	65.1 $\pm$ 10.1
Gender	
Male	34 (74%)
Female	12 (26%)
Renal Nephrometry Score	5.8 $\pm$ 1.5
Tumor Diameter (cm)	2.5 $\pm$ 0.8
Tumor Location	26 (57%)
$\geq 50\%$ exophytic	14 (30%)
$< 50\%$ exophytic endophytic	6 (13%)
Ablative Modality	
Radiofrequency Ablation	32 (70%)
Cryoablation	14 (30%)
Follow-up Duration (years)	8.6 $\pm$ 2.9

Abstract No. 291

Quantitative Three-Dimensional (3D) Margin Analysis for Predicting Complete Pathologic Necrosis in Hepatocellular Carcinoma Treated with Percutaneous Thermal Ablation



(Article No. 108318)

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Purpose: To evaluate the association between unablated tissue volume within a pre-defined tumor margin and the achievement of complete pathologic necrosis (CPN) in hepatocellular carcinoma (HCC) patients treated with percutaneous thermal ablation before liver transplant.

Materials and Methods: This HIPAA-compliant, IRB-approved retrospective study included consecutive adult HCC patients treated with thermal ablation before liver transplant at a single tertiary transplant center between 2001 and 2019. Lesions were segmented on the pre-ablation contrast-enhanced CT or MRI. The ablation zone was segmented on the intraprocedural contrast-enhanced post-ablation CT. The two images were then fused and registered using MIM software, with color-coded zero-to-10 minimum margin contours automatically generated around the segmented tumor. 3D volumes within a predefined margin that were not ablated were referred to as the volumes of insufficient coverage (VIC). Subcapsular tumors were defined as tumors within 5 mm of the liver capsule. In these tumors, all tumor voxels within 5 mm of the capsule were excluded from the analysis. Logistic regression and Receiver Operating Characteristic curve analysis with the Youden index were used to assess the ability of VIC to predict CPN.

Results: A total of 101 patients (median age 59 years [IQR, 55-64], 80% males, 71% Child-Pugh class A) with 128 tumors (median size, 2.3 cm [IQR, 1.9-2.7], 52% subcapsular) were included in the analysis. On histopathologic evaluation, CPN was achieved in 85/128 (66%) tumors. Tumors with CPN were significantly smaller in size than tumors with incomplete necrosis (2.1 cm vs 2.5 cm, $p = 0.011$). VICs for tumors with CPN were significantly lower than for tumors without CPN for all quantified minimum margins from 0- to 10 mm ($P < 0.05$). Univariable logistic regression analysis identified VICs for 6-, 7-, 8-, 9-, and 10-mm minimum margins as significant predictors of CPN, however, the highest accuracy for predicting CPN was observed with the intraprocedural 10-mm VIC (area under the curve, 0.7; 95% confidence interval, 0.6, 0.8).

Conclusion: A 10-mm margin should be covered circumferentially by the ablation zone on the intraprocedural postablation scan for optimal chances for CPN. Three-dimensional assessment of ablation margin provides reliable immediate intraprocedural metrics that predict CPN after percutaneous thermal ablation of HCC.

Abstract No. 292

Clinical Impact of an AI-Based Artifact Reduction Reconstruction for Cone-Beam CT Angiography During Hepatic Radioembolization



(Article No. 108319)

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Purpose: To evaluate the impact of a new AI-based reconstruction algorithm in reducing streak artifacts related to arterial pulsatility and contrast flow variability in contrast-enhanced cone-beam CT angiography (CBCT) during mapping for liver radioembolization.

Materials and Methods: From the international prospective multicenter PALAS-VP registry, CBCTs were acquired from July, 2024 to July, 2025 with IGS angiography systems and reconstructed on Advantage workstations both with and without CleaReconDL AI-based software (all hardware and software GE Healthcare, Chicago, IL). The first 10 consecutive patients from each of 5 centers in the United States and France were included, regardless of CBCT quality. Proximal (whole liver or lobar) and selective CBCTs (injecting at the site of planned radioembolization) were performed in each patient, yielding a total of 100 CBCT datasets. Three senior interventional radiologists blinded to reconstruction type independently assessed each CBCT using 5-point Likert scales for target artery delineation, non-target artery depiction, lesion visualization, treatment zone parenchymal delineation (selective CBCTs only), and overall image quality. Information loss was also evaluated, as was the presence of any AI hallucinations. Scores were averaged across readers and compared using Wilcoxon signed-rank tests. Results were evaluated across the five centers to assess inter-center variability.

Results: In both proximal and selective CBCTs, AI-based reconstruction significantly improved all assessed parameters. In proximal CBCTs, AI-based reconstruction improved target and non-target arterial delineation (3.4 to 4.4 and 3.3 to 4.4), lesion visualization (3.1 to 3.7), and overall image quality (3.2 to 4.2), all $p < 0.001$. In selective CBCTs, CleaReconDL improved target and non-target arterial depiction (3.2 to 4.2 and 3.4 to 4.2), lesion visualization (3.2 to 3.7), treatment zone parenchymal delineation (3.4 to 3.8), and overall image quality (3.0 to 3.8), all $p < 0.001$. No clinically relevant anatomical or lesional information was lost with the AI-based reconstruction, nor were any AI hallucinations noted. There was no significant variability in outcomes between centers.

Conclusion: AI-driven reconstruction significantly enhances both proximal and selective CBCT image quality and visualization of key features relevant to hepatic radioembolization without loss of any diagnostic information or creation of new artifacts.

Abstract No. 293

Augmented and Virtual Reality for Preprocedural Planning in Vascular Interventional Radiology: A Prospective Pilot Study



(Article No. 108320)

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Purpose: To evaluate the feasibility, usability, and impact of augmented and virtual reality (AR/VR) for preprocedural planning

across a variety of endovascular interventional radiology procedures.

Materials and Methods: An IRB-approved prospective pilot study was conducted among interventional radiologists performing complex vascular interventions (n=50). Cases included hepatic angiography (n=40), percutaneous hepatic perfusion (n=6), prostate artery embolization (n=2), transarterial chemo-embolization (TACE, n=1), and transjugular intrahepatic portosystemic shunt (TIPS, n=1). Immersive 3D reconstructions of cone beam CT exams were reviewed using Apple Vision Pro (Cupertino, CA) and the Visage Ease AR/VR App (Visage Imaging, San Diego, CA). Structured surveys assessed AR/VR integration, procedural impact, usability, and perceived benefit using 5-point Likert and yes/no responses.

Results: Fifty cases (mean case time 104.6 ± 61.7 min) were reviewed with AR/VR. The median VR planning time was 5 min [IQR 5.0–9.5], corresponding to a median of 6% [4%–10%] of total procedure duration. AR/VR planning was perceived to change/improve procedural strategy in 42% of cases (3.4 ± 1.2). Anatomic visualization was rated correct, relevant, and useful in 84% of cases (mean 4.7 ± 0.8). Integration into workflow was strongly endorsed in 96% of cases (mean 4.8 ± 0.5). AR/VR improved procedural confidence (mean 4.6 ± 1.0) and anatomic understanding (mean 4.6 ± 0.9). System usability was rated high (mean 4.5 ± 0.9), though headset comfort remained limited (mean 2.1 ± 1.0).

Conclusion: AR/VR was feasible and positively influenced preprocedural planning across diverse vascular interventional radiology procedures, particularly in complex hepatic angiography. Its use was associated with greater confidence and improved anatomic understanding. Headset discomfort might limit routine adoption of this technology.

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Purpose: To evaluate a multimodal 3D vision transformer model for predicting clinical outcomes following Yttrium-90 (Y-90) transarterial radioembolization (TARE) for hepatocellular carcinoma (HCC), using pre-treatment MRI, 99mTc-MAA SPECT/CT, and early post-treatment MRI.

Materials and Methods: Thirty patients with biopsy-confirmed HCC who underwent TARE using Y-90 were retrospectively analyzed. Pre-treatment liver MRI (T2-weighted, arterial-phase T1, DWI), 99mTc-MAA SPECT/CT maps, and post-treatment liver MRI (~1 month) were collected. Segment Anything 2 (SAM2) was fine-tuned to segment lesions across modalities. A multimodal, multidimensional vision transformer (Multi-D ViT) was developed to fuse voxel-level SPECT dose and serial MRI features using hierarchical 3D patch embeddings, shifted window attention, and cross-modal integration. Outcome heads included SoftMax classifiers for 6-month Milan Criteria status and mRECIST class, and Cox-loss survival heads for predicting progression-free survival (PFS) and overall survival (OS). The model was trained on 75% of patients, validated on 10%, and tested on 15%. Evaluation metrics included AUC, F1 score, R^2 , concordance index, and log-rank p-values.

Results: The model showed modest performance in predicting both short-term response and long-term outcomes. For 6-month Milan Criteria status, AUC was 0.75, with sensitivity and specificity of 76% and 70%, respectively. mRECIST classification yielded an AUC of 0.78. Survival prediction yielded R^2 values of 0.74 for PFS and 0.71 for OS. Median concordance index across five cross-validation folds was 0.73 (range: 0.69–0.77). Log-rank tests were not statistically significant ($p = 0.08$ for PFS, $p = 0.12$ for OS) indicating no significant difference between actual and predicted survival outcomes.

Conclusion: A multimodal vision transformer model incorporating pre- and post-treatment MRI with 99mTc-MAA SPECT/CT dosimetry predicted survival and 6-month clinical endpoints after Y-90 TARE in HCC. This approach leverages dose distribution heterogeneity and delta imaging features to enable early risk stratification and early prediction of treatment outcomes. The model offers a scalable framework for optimizing bridge-to-transplant decision-making as well as guiding locoregional and systemic therapies. The model's predictions were accurate despite the small sample size. Future iterations of this study will utilize increased sample sizes for more robust and durable metric calculations.

Abstract No. 294



Multimodal Vision Transformer Modeling of Survival and Transplant Eligibility Following Radioembolization for Hepatocellular Carcinoma



(Article No. 108321)

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Scientific Session 31

Dialysis & Transplant

Wednesday, April 15, 2026

11:15 a.m.–12:45 p.m.

Abstract No. 295

Redefining Arteriovenous Fistula Maturation with a Physiology First Protocol



(Article No. 108323)

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Purpose: Hemodialysis initiation depends on successful arteriovenous fistula (AVF) maturation. Time to cannulation is highly variable due to delayed maturation and potential need for salvage procedures. Yet the current paradigm to assess AVF maturation is fixed on time.

Materials and Methods: We conducted a quality improvement initiative to reduce AVF maturation variability through early algorithmic-driven identification of salvageable AVFs using patient-specific physiological and anatomical data. To reduce the need for high pressure balloon angioplasty (PTA) in non-maturing AVFs, we incorporated kinetic endovascular micro-incision creation (KEMIC) with the FLEX Vessel Preparation System (VentureMed Group) to assist maturation.

Results: The Physiology First protocol: At week 2 standardized ultrasound surveillance, if brachial artery (BA) flow is declined or failed to improve from day-of-creation values, or if vein diameter, depth, or waveform quality does not demonstrate appropriate progression, the patient proceeds to diagnostic angiogram and intervention (KEMIC+PTA). If a patient shows adequate interval improvement in flow, waveform, and diameter but does not yet meet cannulation benchmarks, follow-up imaging is scheduled for Week 4. If, however, the patient meets cannulation criteria at Week 2, then the dialysis clinic is notified to begin cannulation within 1–2 weeks, without requiring a formal return visit. At Week 4, a patient who has continued improvement and meets all metrics is cleared for cannulation. If maturation has stalled, then the structured salvage algorithm is applied (KEMIC+PTA±DCB, or lipectomy/transposition if vein depth >6 mm). To demonstrate protocol application, 60 AVFs created by a single surgeon in a community-based hospital were prospectively followed from January to May 2025. Unassisted AVF maturation occurred in 51.7% of the cases (31/60). Of the non-mature AVFs, the Physiology First protocol identified 14 salvageable AVFs. All salvageable AVFs qualified for KEMIC+PTA intervention. Functional clinical maturation was achieved in all assisted AVFs (14/14; 100%) providing an overall functional clinical maturation rate of 75% (45/60) of AVFs. Median time to use was 47 days for unassisted and 88 days for salvaged AVFs.

Conclusion: We provide proof-of-concept of a structured algorithm-driven approach to enable predictable AVF maturation rates through early detection, timely intervention, and tailored subtype management. Further validation of this new clinical protocol is ongoing to determine its adoption into standard clinical practice.

Abstract No. 296

AI-Enabled Risk Prediction for Sepsis and Septic Shock in Hemodialysis Patients Undergoing Interventional Radiology Interventions



(Article No. 108324)

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Purpose: Patients with end-stage renal disease (ESRD) undergoing dialysis-related interventions are at heightened risk of infectious complications, including sepsis and septic shock, which are major contributors to morbidity and mortality. Traditional perioperative risk stratification tools inadequately capture these outcomes in the interventional radiology (IR) setting. Machine learning (ML) approaches may enable more accurate and individualized prediction of infection-related complications.

Materials and Methods: We analyzed 5,077 patients undergoing dialysis-related procedures in the ACS-NSQIP database (2011–2018). A Tabular Prior-Data Fitted Network (TabPFN) model was trained and validated using demographic, preoperative, and procedural variables to predict 30-day sepsis and septic shock. Data were split into training (n=3,490, 2011–2016), contemporaneous testing (n=873, 2011–2016), and non-contemporaneous testing (n=714, 2017–2018) cohorts. Missing values were imputed using k-nearest neighbor methods, and class imbalance was addressed through random oversampling. Model performance was evaluated with AU-ROC, sensitivity, and specificity. Feature contributions were assessed using SHapley Additive exPlanations (SHAP).

Results: Within 30 days of intervention, 2.34% of patients developed sepsis and 0.91% developed septic shock. For sepsis prediction, TabPFN achieved an AU-ROC of 0.870 with improved sensitivity and stable specificity across both testing cohorts. For septic shock prediction, TabPFN achieved an AU-ROC of 0.891. Across outcomes, the strongest predictors were preoperative white blood cell count, serum albumin, and INR. Subgroup analyses confirmed consistent model performance across sex, race, and age groups, with no statistically significant disparities in predictive accuracy.

Conclusion: This study demonstrates the feasibility of TabPFN-based prediction of sepsis and septic shock in dialysis-related IR procedures. TabPFN provides strong discriminative ability for sepsis risk while maintaining fairness across demographic subgroups. Such models may enable earlier recognition of high-risk patients, inform pre-procedural optimization, and support proactive surveillance strategies to reduce infection-related morbidity and mortality.

Abstract No. 297

Non Thrombotic Venous Lesion (NVL) Due to Extrinsic Aortosternal Compression (ASC) Causing Central Vein Obstruction in Hemodialysis Access: Clinical Descriptors and Early Results of Elective Venous Stenting



(Article No. 108325)

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Purpose: The bony thorax can cause central venous compression analogous to the better described May Thurner syndrome (MTS) in the iliac veins, related to the first rib, sternoclavicular junction or compression between the aorta and the sternum (ASC). These extrinsic compressive lesions, seen in patients with reduced aortosternal space, behave differently to the more common intrinsic or thrombotic/ fibrotic obstructions seen due to previous neck access. Contrary to our practise of plain balloon angioplasty (POBA) of the latter group, in this report, we test our hypothesis that an ASC will require a stent to prevent recoil and assess initial results.

Materials and Methods: ASC was characterized by the following: Appearance of rarefaction in LIV on frontal contrast digital subtraction angiogram, lesion always across the midline; relatively easy crossing; relatively fewer collaterals; easy balloon inflation with lower pressures and rapid recoil despite 14- to 16-mm balloon angioplasty and pulsatile dynamic narrowing on intravascular ultrasound (IVUS). This was supplemented by CT venogram (n=6), IVUS (n=4) and cone-beam CT (n=3). Between April 2021 and June 2025, First rib related indentation and obstruction was not included. 14 patients (M:F 5:9) with left upper limb swelling, mean age 59.6 years, underwent central vein stent placements for such symptomatic ASC. Additional thrombectomy devices were used in 2 cases. 5 patients had a history of previous plain angioplasty with recurrent symptoms. There were 4 radiocephalic, 7 brachiocephalic, 1 brachio basilic and 2 arteriovenous grafts. 16-mm (n=13) and 18-mm (n=1) diameter dedicated venous stents were placed mostly without jailing the right innominate vein. Four patients had collateral veins related to the obstruction. Antiplatelet (n=10) and Apixaban (n=4) were administered post procedure.

Results: After a mean follow up of 12.7 (range 1-29) months, all patients are asymptomatic. 1 patient needed angioplasty of in-stent stenosis. Additional procedures like fistuloplasty or cephalic arch stent was performed in 3 patients. 2 patients died during follow up unrelated to access and with no recurrent central vein symptoms. The mean aortosternal distance, in 12/14 patients, in this group, was 5.8 mm (range 3-9 mm). Post procedure CT venogram confirmed stent patency in 5/5 patients where it was performed.

Conclusion: LIV obstruction due to extrinsic ASC may be a distinct clinical entity analogous to MTS in iliac veins. Recognition of this condition may be critical, as timely venous stent can prevent recurrent obstruction and prolong access survival.

Abstract No. 298

Intravascular Ultrasound for Complex Central Venous Obstruction in Hemodialysis Access: Morphological Insights and Therapeutic Implications



(Article No. 108326)

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Purpose: Digital subtraction angiography (DSA) is the current standard in assessing central venous obstruction (CVO). As in pelvic veins, intravascular ultrasound (IVUS) may overcome the limitations of two-dimensional projectional imaging in accurately assessing complex central venous pathology. We set out to compare the diagnostic accuracy of intravascular ultrasound (IVUS) versus DSA in detecting and characterizing CVO in hemodialysis patients, and assess the impact of IVUS guidance on treatment decision-making.

Materials and Methods: This prospective, single-center, observational, comparison study enrolled 25 consecutive maintenance hemodialysis patients with symptomatic central venous obstruction over 12 months (December 2023-December 2024). All patients underwent sequential imaging with both DSA and IVUS during the same procedure. Endpoints included diagnostic accuracy comparison, quantitative measurement differences, and treatment modification rates. Statistical analysis employed paired t-tests, McNemar's test, Fisher's exact test, intraclass correlation coefficients (ICC), and Bland-Altman plots.

Results: A total of 31 lesions were identified across 25 patients using IVUS, demonstrating superior diagnostic performance compared to DSA, which detected 27 lesions (87.1%, $p = 0.125$). IVUS consistently measured higher stenosis severity ($80.6 \pm 14.1\%$ vs $58.9 \pm 28.2\%$, $p < 0.001$), larger reference vessel diameters (15.1 ± 1.5 mm vs 11.6 ± 4.2 mm, $p < 0.001$), and longer lesion lengths (37.0 ± 15.1 mm vs 26.1 ± 17.8 mm, $p < 0.001$). IVUS detected significantly more external compression (41.9% vs 12.9%, $p < 0.001$), distinguishing it from intrinsic stenosis and provided superior morphological characterization such as vessel wall/lumen irregularities (45.2%), fibrin sheaths (41.9%), chronic thrombus (32.3%), acute thrombus (3.2%) and eccentric stenosis (38.7%). Following initial balloon angioplasty, IVUS detected 3.8 times more residual stenosis (61.3% vs 16.1%, $p < 0.001$) leading to treatment modifications in 54.8% of lesions. There was 100% technical and clinical success with no IVUS-related complications and addition of only 7.8 ± 1.0 minutes to procedural time.

Conclusion: IVUS provides superior diagnostic efficacy compared to DSA in CVO, enabling enhanced lesion detection, accurate vessel measurements, differentiation between intrinsic stenosis and external compression, and comprehensive morphological characterization, thereby facilitating optimized treatment decisions while maintaining excellent safety and efficiency profiles.

Abstract No. 299

Investigating Ultrasound Predictors of EndoAVF Outcomes



(Article No. 108327)

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Purpose: Endovascular arteriovenous fistulas (endoAVFs) have emerged as a minimally invasive alternative to surgical arteriovenous fistulas for hemodialysis access, offering shorter maturation times and fewer interventions. Current ultrasound (US) screening criteria are based on device dimensions rather than validated clinical predictors. The predictive value of preoperative US characteristics for endoAVF outcomes remains largely unexplored. Thus, in this study we investigate how specific preoperative US features correlate with outcomes of endoAVFs created by the WavelinQ device.

Materials and Methods: This is a retrospective cohort study of adults who underwent WavelinQ endoAVF procedures at the University of Pittsburgh Medical Center since 2018. Patients under 18 or lacking both pre- and post-operative US imaging were excluded. Data collection focused on preoperative US features, such as vessel diameters, flow rates, demographics, clinical characteristics, and post-procedural outcomes. Outcomes of interest include time to fistula maturation, number of secondary interventions, and flow rate at maturation. Statistical analysis using Pearson correlations assessed associations between US features and outcomes.

Results: Initial data was collected for 30 patients. The majority were male (60%), and mean age at procedure was 59.5 years. The average time to maturation was 34.27 days, with mean post-maturation flow rate of 707.83 mL/min. Patients required an average of 0.77 interventions for maturation and 1.63 total procedures, both maturation and maintenance, in the first year. No serious adverse events were reported. Linear regression showed that increasing depth of proximal cephalic vein correlated with longer time to maturation ($p=0.007$), and greater diameter of lateral brachial vein was associated with lower flow rates at maturation ($p=0.01$). Other pre-operative US factors did not correlate strongly with outcomes.

Conclusion: Preliminary data shows endoAVF is associated with rapid maturation and a low rate of serious adverse events in our cohort. Depth of the proximal cephalic vein and diameter of the lateral brachial vein may correlate with time to maturation and flow rate, while other traditional US screening factors did not show strong correlation. Identifying predictors of endoAVF outcomes may inform patient selection, enhance preprocedural planning, and reduce secondary interventions. This study represents a step toward developing evidence-based guidelines for US-based assessment prior to endoAVF creation.

Abstract No. 300

Does Drug-Coated Balloon Angioplasty for All Significant Dialysis Access Arteriovenous Fistula Stenoses Improve Circuit Patency? A Randomized Controlled Trial



(Article No. 108328)

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Purpose: RCTs comparing drug-coated balloon (DCB) to plain balloon angioplasty in hemodialysis arteriovenous fistulas (AVF) have shown mixed results. This could potentially be due to heterogeneous trial designs, different study populations, or the lack of a DCB “class-effect.” We aim to compare the efficacy of the Ranger DCB (Boston Scientific; Marlborough, Massachusetts, USA) to plain balloon for angioplasty of all stenoses in the peripheral circuit of dysfunctional AVF.

Materials and Methods: This prospective, single-center, blinded RCT recruited participants with new or recurrent stenoses in the peripheral circuit of failing mature AVF. Participants with hemodynamically significant central vein stenoses or AVF thrombosis were excluded. After successful angioplasty of all AVF stenoses in the peripheral circuit (lesion preparation achieving < 30% residual stenosis), 94 participants (72 male, 76.6%; mean age 66.8 ± 9.5 years) were randomized to DCB or plain balloon in a 1:1 ratio, stratified by the number of AVF stenoses (single versus multiple). The primary outcome measure was clinically driven 6-month access circuit primary patency (ACPP). Participant follow-up for patency was up to 12 months post recruitment.

Results: There was no statistically significant difference in 6-month ACPP between both arms (DCB: 75.6%, plain balloon: 70.5%, $p = 0.76$). At 9 and 12 months, the ACPP was higher in the DCB arm compared to plain balloon arm but did not reach statistical significance (9 months: 61.4% vs 42.9%, $p = 0.13$, 12 months: 48.8% vs 31.7%, $p = 0.18$). However, Kaplan-Meier survival analysis revealed a statistically significant difference in the ACPP survival curves between the groups up to 12 months follow-up ($p = 0.037$), possibly due to divergence in ACPP curves after 6 months.

Conclusion: This RCT comparing DCB to plain balloon for treatment of all stenoses in the peripheral AVF circuit did not meet its 6-month ACPP primary endpoint. However, Kaplan-Meier survival analysis suggests a possible benefit with DCB beyond 6 months of treatment.

Abstract No. 302

Outcomes of Lymphangiography and Glue Embolization for Post-Renal Transplant Perinephric Lymphoceles



(Article No. 108329)

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Purpose: Evaluate the safety and efficacy of lymphangiography and N-butyl cyanoacrylate (NBCA) glue embolization to treat

postoperative lymphatic leaks following iliac fossa renal transplantation.

Materials and Methods: Institutional review board approval was originally obtained in 2023 and updated in 2025 to include additional study members. Retrospective chart review (UW Health, Madison, WI, USA) was performed. All patients that underwent a lymphangiography procedure from January 2019 to August 2025 were identified. Patients who underwent single-organ renal transplant complicated by a peri-nephric lymphocele that underwent lymphangiogram were selected for inclusion. A total of 42 patients were identified, 30 male and 12 female, with a mean age of 58 years (± 13 years). Patient demographics, procedural interventions, drain outputs, outcomes, and complications were recorded. Data storage and preliminary analyses were done through the institution's REDCap data management tool.

Results: Lymphangiography with NBCA Lipiodol embolization for managing perinephric lymphoceles was clinically successful in 39 of 42 patients (92.86%). The remaining 3 patients were referred to transplant surgery for peritoneal window operation due to uncontrolled leakage (>50 mL) despite lymphangiography and embolization. Of the 39 successful patients, 14 patients (35.90%) underwent 2 rounds of lymphangiography and embolization, and 1 patient (2.56%) underwent 3 rounds of lymphangiography and embolization. Mean drain output for all 42 patients decreased from 340.75 mL (± 294.13 , median = 300 mL) pre-lymphangiography to 142.70 mL (± 244.09 , median = 40 mL) post-lymphangiography. Of the 39 successful patients, the mean days between drain removal and last embolization was 13.56 days (± 8.92 days). No patients developed any major complications post-lymphangiography and embolization.

Conclusion: Lymphangiography with NBCA glue embolization demonstrates a safe and effective treatment for managing post-renal transplant perinephric lymphoceles, decreasing the need for more invasive surgical management.

Abstract No. 304

Six-Month Clinical Outcomes from the Thoracic Central Cohort of the WRAPSODY Global Registry



(Article No. 108330)

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Purpose: To summarize 6-month clinical outcomes of over 100 patients with thoracic central venous obstructions who were enrolled in the WRAPSODY (WRAP) Global Registry.

Materials and Methods: The WRAP Global Registry was a multicenter, observational study conducted across 41 sites worldwide. The patient population comprised adults with a mature arteriovenous fistula or graft (AVF/AVG) dialysis access (i.e., ≥ 1 hemodialysis access) who experienced obstruction (stenosis or occlusion) in their venous outflow circuit. All enrolled patients were treated with the WRAPSODY Cell-Impermeable Endoprosthesis (CIE). Patients in the registry were divided into two cohorts based on the location of their obstruction: Central thoracic cohort or Peripheral Cohort.

Results: The primary effectiveness measure was target lesion primary patency (TLPP) at 6 months. TLPP was defined as freedom from clinically driven target lesion revascularization or target lesion thrombosis. The primary safety measure was the proportion of patients free from any localized or systemic event in the 30 days following the procedure.

Conclusion: Patient outcomes from the WRAP Global Registry are expected to help interventionists understand how the device performs in real-world practice, which is a current and on-going need among healthcare stakeholders. As there is limited evidence regarding clinical outcomes for patients with thoracic central venous stenoses/ obstructions, the primary endpoints from this registry will be of high value to interventional radiologists.

Scientific Session 32

Embolization 2

Wednesday, April 15, 2026

11:15 a.m.–12:45 p.m.

Abstract No. 305

Early Experience with Thoracic Duct Venous Junction Thrombolysis



(Article No. 108332)

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Purpose: Chylous ascites (CA) and protein losing enteropathy (PLE) can be caused by central lymphatic obstruction and decompression of thoracic duct (TD) can result in resolution. Over the years we have been observed the clots in the lymphatic system that cause the obstruction. The goal of this study is to describe early experience with TD thrombolysis in patients presenting with CA and PLE.

Materials and Methods: Review of prospectively collected database was performed to identify patients who underwent TD thrombolysis for obstructive lymphatic pathology. Patient demographics, symptoms and laboratory data, imaging findings, procedural details, and follow up information was collected. Distal TD thrombolysis was performed by injecting 4 mg tPA split into two 2-mg doses.

Results: Nine patients (median age 58.7±13.7 years, F:M/4:5) presented for TD thrombolysis between December 2024 and June 2025. Preoperative dynamic contrast-enhanced MR lymphangiography (DCMRL) demonstrated slow cranial contrast propagation, plexiform malformation, or TD tortuosity and dilation in all nine patients. Five of nine patients presented with PLE, demonstrating hypoalbuminemia and elevated stool alpha1-antitrypsin. In four of five PLE patients the flow on fluoroscopy improved after TPA with improvement of symptoms and increase of serum albumin 2.1±0.7 to 3.0±0.5 (g/dL, P=0.004). One patient relapsed in symptoms after 1 month. One of five patients was without TD flow improvement on fluoroscopy after TPA and there was no clinical improvement. Four of nine patients presented with CA. One of four patients developed CA after left-sided pacemaker placement with TD obstruction on DCMRL and fluoroscopy. Thrombolysis led to improvement in TD flow, clinical symptoms, and paracentesis frequency, with complete resolution following removal of pacemaker. In one of four patients there was improvement in TD flow after thrombolysis and decrease in paracentesis frequency and ascites volume. Two of four patients did not have improvement in TD flow post thrombolysis and did not have a clinical improvement.

Conclusion: Thrombosis of the TD can be a cause of central lymphatic obstruction, presenting with a multitude of clinical presentations. Lymphatic thrombolysis is a new promising treatment approach for lymphatic decompression, that adds another

therapeutic option for this group of patients. Further elucidation of clinical indications and long-term outcomes is necessary for appropriate patient selection.

Abstract No. 306

Transcatheter Arterial Embolization for Autosomal Dominant Polycystic Kidney Disease: Exploratory Per-Kidney Volume Reduction and Procedural Efficiency Across Embolic Agents



(Article No. 108333)

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Purpose: To quantify per-kidney volumetric reduction after transcatheter arterial embolization (TAE) for autosomal dominant polycystic kidney disease (ADPKD) and to compare procedural efficiency across embolic agents.

Materials and Methods: In this single-center retrospective cohort (2006–2024), consecutive symptomatic ADPKD patients underwent TAE; several had same-day bilateral procedures. Indications were abdominal distension and mass-effect symptoms in all cases; in one case, space creation before renal transplantation was intended. Analyses were per kidney. One volumetric assessment was performed 3–21 months post-TAE. The primary endpoint was percent change in kidney volume (median [min–max]). Secondary endpoints included procedure time (min), cumulative frontal air kerma (CFAK, mGy), contrast volume, angiographic completeness, complications (Common Terminology Criteria for Adverse Events [CTCAE] v5.0), and retreatment. Radiation metrics were variably recorded in early-era cases; dose analyses used available-case data. Nonparametric tests were used throughout (two-sided $\alpha=0.05$): Kruskal–Wallis for four-group comparisons and a prespecified N-butyl cyanoacrylate (NBCA) vs non-NBCA Mann–Whitney U test.

Results: Sixteen kidneys were treated (median patient age 52 years [27–67]; 9 women/7 men): NBCA (n=6), coils (n=4), microspheres (n=4), ethanol (n=2). Median volume reduction was similar—NBCA 49.4% (37.8–64.1), coils 49.6% (23.7–50.0), microspheres 48.1% (19.0–57.3), ethanol 43.0% (39.3–46.8); Kruskal–Wallis p=0.997. Procedure time differed—NBCA 43.0 (27.0–63.0) min vs coils 139.0 (87.0–146.0), microspheres 96.0 (55.0–138.0), ethanol 92.5 (68.0–117.0); p=0.011. CFAK tended to be lower with NBCA: 27.9 (16.7–39.1) mGy vs coils 330.8 (134.2–420.2) mGy; microspheres 108.4 mGy (n=1); ethanol 35.8 mGy (n=1); p=0.064. In available-case dose data (8/16 procedures), median CFAK was 27.9 mGy (NBCA, n=2) vs 210.9 mGy (non-NBCA, n=6); Mann–Whitney p=0.143. Angiographic occlusion was complete in 16/16 (100%); no retreatments and no CTCAE grade ≥ 3 events occurred. All patients reported symptom improvement, limited to mild pain/fever.

Conclusion: TAE for symptomatic ADPKD achieved substantial per-kidney volume reduction with an excellent safety profile.

While shrinkage did not differ by agent, NBCA was associated with significantly shorter procedures and a trend toward lower radiation dose, suggesting a procedural-efficiency advantage. Prospective validation with standardized follow-up and size-adjusted dose reporting is warranted.

Abstract No. 307

Critical Role of Interventional Radiology in the Acute Care of Trauma Patients: A Quantitative Retrospective Analysis



(Article No. 108334)

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Purpose: To retrospectively evaluate the role of interventional radiology (IR) in the care of patients after trauma activation, both penetrating and blunt, by quantifying the number and types of procedures performed at a level I trauma center.

Materials and Methods: All patients who presented for trauma activation and went to IR during fiscal year 2025 (between July 1, 2024 and June 30, 2025) were included in the study. Patients were then excluded if they had an Injury Severity Score (ISS) less than 16, widely accepted as a threshold for major trauma. Patient charts were queried for any procedure performed by IR between day 0 of presentation and 1-year post-admission. Procedures were categorized as vascular access related, angiographic, venographic, drainage, enteral access, and neuro-interventional.

Results: During this period, without censoring for ISS score, 2,253 patients (595 penetrating, 1,658 blunt) presented with trauma activation. IR performed a procedure on 115/2,253 trauma patients (5.1%), 72/595 penetrating trauma patients (12.1%), and 89/1,658 blunt trauma patients (5.4%). When evaluating only major trauma (ISS >16), IR performed a procedure on 20.4% patients (59/289) of the overall major trauma cohort, 24.2% penetrating (23/95), and 18.6% blunt (36/194). IR performed a total of 167 procedures during 161 encounters for all trauma activations (75/167 penetrating, 44.9%; 92/167 blunt 55.1%). Of the procedures performed, 126/167 (75.4%) were directly related to the presenting trauma (penetrating: 63/75, 84%; blunt: 63/92, 68.5%). The most common procedure performed was angiography ($\pm$ embolization) with 58/167 procedures (34.7%) followed by drainages with 57/167 (34.1%). For all trauma patients that underwent angiography, 44/58 required embolization (75.7%) with similar rates for penetrating (16/21, 76.2%) and blunt (28/37, 75.7%). Intervention within the first 24 hours was the most common time point (57/161 procedural encounters, 35.4%). When stratifying by both the type of procedure and when it occurred after time of presentation, we found that 41/62 procedures (66.1%) that occurred during the first 24 hours were angiography procedures, highlighting the critical role of IR in early treatment of trauma patients. When breaking down further into penetrating vs blunt, this remained the same.

Conclusion: Interventional radiology plays a critical and quantifiable role in the acute care of patients after trauma activation. A robust IR division at any level I trauma center is crucial for rapid, life-saving care of patients with major trauma, especially those with bleeding.

Abstract No. 308

Optimizing Future Liver Remnant: Meta-Analysis of Foamed STS Portal Vein Embolization Before Hepatectomy



(Article No. 108335)

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Purpose: Foamed sodium tetradecyl sulfate (STS) is increasingly used for right portal vein embolization (PVE) prior to hepatectomy to promote future liver remnant (FLR) hypertrophy. Foaming prolongs endothelial contact and enhances sclerosing effect, allowing precise and effective embolization. However, the pooled efficacy of foamed STS in PVE across malignancy types and procedural contexts remains uncertain. We conducted a single-arm meta-analysis to evaluate efficacy outcomes.

Materials and Methods: Databases were searched through September 2025 for studies on foamed STS PVE in patients undergoing hepatic resection for malignant tumors. Outcomes included technical success, clinical success, adequate FLR hypertrophy, and disease progression. Technical success was defined as complete right PVE with patency of the left and main portal veins in a single procedure, clinical success was defined as successful partial hepatectomy, while adequate FLR hypertrophy was defined as achieving an FLR volume of at least 20% of total liver volume (TLV) in patients with normal liver function, at least 30% in those with chemotherapy-associated liver injury, and at least 40% in those with cirrhosis. Single-arm proportional meta-analysis was performed using Open-MetaAnalyst. Heterogeneity was assessed using I².

Results: Four studies with 129 patients were included. Our population consisted of patients with hepatocellular carcinoma, cholangiocarcinoma, invasive gallbladder cancer, and metastatic malignancies. Pooled technical success was 98.3% (95% CI: 95.7-100). Clinical success was 81.8% (74.0-87.6). Adequate FLR hypertrophy was achieved in 96% (92.4-100). Disease progression occurred in 7.9% (2.5-13.3). In one study, mean FLR increase was 46.1% (SD 24.2). Clinical failure was mainly due to disease progression, inadequate hypertrophy, or intraoperative findings. Reported procedural complications included non-target embolization.

Conclusion: Foamed STS appears to be a safe and effective PVE technique in patients undergoing hepatic resection for malignant tumors, with high rates of technical success and FLR hypertrophy. Its performance is comparable to other embolic agents such as NBCA, PVA, and microspheres. Few head-to-head studies exist, representing an opportunity for future research to determine the optimal embolization strategy for FLR optimization.

Abstract No. 309

Hepatic Angioembolization for Unstable and Coagulopathic Trauma



(Article No. 108336)

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Purpose: Hepatic angioembolization (HAE) in hemodynamically (HD) unstable trauma remains controversial. This study is the first to utilize updated 2018 AAST-OIS classification to guide HAE as a primary intervention in high acuity trauma.

Materials and Methods: We retrospectively examined 213 patients initially managed with hepatic angiography at a Level 1 trauma center from January 1, 2015, to August 1, 2025. Patients managed with damage control laparotomy were excluded. HD unstable defined as persistent hypotension < 90 mm Hg or ATLS Grade 3-4 hemorrhagic shock. Coagulopathy was defined as INR > 1.4 or hypothermia < 35 C. Primary endpoints include complications (bleeding, bile leak, necrosis), re-intervention, and mortality. Hypothesis testing performed using Student's t-test and chi-squared test.

Results: The study population presented with severe hepatic (mean AAST 3.7) and polytraumatic (mean ISS 34) injury. Clinically, 55% were unstable and 38% were coagulopathic. The majority would be indicated for surgical intervention. Hemodynamic (HD) instability was strongly associated with degree of hepatic injury (AAST Grade 3.5 vs. 3.8, $p=0.004$), polytrauma (ISS 39.1 vs. 26.5, $p<0.001$), and coagulopathy (53% vs. 20%, $p<0.001$). Similarly, coagulopathy correlated with hepatic injury (AAST Grade 3.8 vs. 3.6, $p=0.04$), polytrauma (ISS 38.1 vs. 30.6, $p<0.001$), and HD instability (77% vs. 42%, $p<0.001$). Clinical success was achieved in 87% of unstable and 83% of coagulopathic patients with HAE. These outcomes are within the reported range of HAE success in stable patients and superior to laparotomy. HAE in unstable patients was associated with higher total complications (23% vs. 8%, $p=0.004$) and re-interventions for bleeding (13% vs. 4%, $p=0.03$). Coagulopathy also led to higher total complications (28% vs. 9%, $p=0.001$) and re-intervention for bleeding (17% vs. 4%, $p<0.001$). Current literature on HAE in stable hepatic trauma report a comparable 29% complication rate. Laparotomy has reported morbidity rates of 28% for unstable hepatic trauma. Overall reported mortality after from traumatic hepatic causes is far lower with HAE than laparotomy (5.6% vs. 23%). There were no cases of hepatic-related mortality in this study.

Conclusion: HAE is safe and effective in unstable and coagulopathic trauma patients. Clinical success of 83-87% comparable with reported outcomes for stable patients (77-100%). Morbidity and mortality are lower than standard surgical approach to unstable hepatic trauma.

Abstract No. 310

Workflow Impact of Anesthesia Strategy and Access Route in Genicular Artery Embolization: A 12-Month Single-Center Retrospective Analysis



(Article No. 108337)

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Purpose: To compare local anesthesia vs moderate (fentanyl-based) and deep sedation for genicular artery embolization (GAE), assess associations with BMI, and evaluate the effect of access route (contralateral common femoral vs ipsilateral) on procedure duration and discharge times.

Materials and Methods: Single-center retrospective review of 35 consecutive GAE procedures over 12 months. Primary exposures were sedation type (local anesthetic vs moderate or deep sedation) and access route (contralateral vs ipsilateral common femoral, superficial femoral or dorsalis pedis artery). Outcomes were procedure duration and post-procedure discharge time; BMI was analyzed for correlation and association with sedation choice. Group differences were tested with Welch's t-tests and Mann-Whitney U, correlations with Spearman ρ , and exploratory models with logistic and linear regression.

Results: Local anesthetic was used for 28/35 patients (80%) while moderate or deep sedation was used for 7/35 patients (20%). Procedure duration was found to be significantly longer with the use of sedation (95 minutes, CI 58.75–110) than with local anesthetic (50 minutes, CI 45–61.5) ($U=22.5$, $p<0.001$). Fluoroscopic time (15.8 vs 14.1 minutes; $U=78.5$, $p=0.43$) and discharge time (268 vs 275 min; $U=83.5$, $p=0.647$) did not differ. Contralateral access had longer procedure duration (90 minutes, CI 63–97.5) than ipsilateral (61.6 minutes, CI 45–60; $U=32.5$, $p=0.007$). Fluoroscopy time was longer in cases utilizing contralateral access (21.1 minutes, CI 16.4–25.25) instead of ipsilateral access (13.1 minutes, CI 11.2–16.9) ($U=21$, $p<0.001$). BMI was found to be positively correlated with increased fluoroscopy time ($\rho=0.349$, $p=0.040$). However, BMI showed no correlation with case duration ($\rho=0.150$, $p=0.389$) or discharge time ($\rho=0.130$, $p=0.464$). Similarly, no statistically significant differences in BMI were seen between patients who received local anesthetic (29.9, CI 25.8–36.96) vs moderate/deep sedation (31.15, CI 27.77–45.85) ($U=72$, $p=0.283$). Sedation type had a significant multivariate effect on procedural outcomes ($\Lambda=0.321$, $F(3, 23)=0.509$, $p<0.001$). However, subsequent univariate analyses showed only significant differences in procedural time ($p=0.001$), but not fluoroscopy time ($p=0.909$) or discharge time ($p=0.706$).

Conclusion: Contralateral access and the type of sedation used are associated with longer procedure times. Fluoroscopy time is longer in patients with higher BMI and those who undergo contralateral access. Sedation type, access site and BMI do not prolong discharge time.

Abstract No. 311

Adhesive Capsule Embolization Lowers Recurrence of Shoulder Pain in Frozen Shoulder: A Multi-institutional Real-World Cohort Analysis



(Article No. 108338)

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Purpose: To evaluate the real-world role of adhesive capsule embolization (ACE) in patients with adhesive capsulitis ("frozen shoulder") by comparing recurrence rates against matched controls using a large, multi-institutional dataset.

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Outcome	Time Frame	3month			6month			12 month			18 month		
	Cohort	Cohort Outcome/ Size	Risk	HR (95% CI)	Cohort Outcome/ Size	Risk	HR (95% CI)	Cohort Outcome/ Size	Risk	HR (95% CI)	Cohort Outcome/ Size	Risk	HR (95% CI)
Recurrent Shoulder Pain	Adhesive Capsulitis Embolization	24/1,074	2.20%	0.054 (0.036-0.082)	28/1,074	2.60%	0.054 (0.037-0.080)	36/1,074	3.40%	0.063 (0.045-0.089)	38/1,074	3.50%	0.064 (0.046-0.090)
	Control	362/1,074	33.70%		409/1,074	38.10%		442/1,074	41.20%		453/1,074	42.20%	

Materials and Methods: We performed a retrospective cohort study utilizing the TriNetX analytics network. We identified patients with adhesive capsulitis undergoing adhesive capsule embolization (ACE) compared to those with no history of ACE. Exclusion criteria included fracture, dislocation, neoplasm, arthritis, or infection to limit specifically to ACE. To ameliorate confounding bias, propensity score matching (PSM 1:1) adjusted for age, sex, BMI, hypertension, diabetes, dyslipidemia, thyroid disease, obesity, and opioid use. Clinical success was determined by recurrence of shoulder pain or lesion codes (ICD-10: M75) related to shoulder pathology (adhesive capsulitis, bursitis, tendonitis, etc.).

Results: ACE patients, matched to 1,074 patients, experienced significantly lower recurrence risk than controls at all timepoints. Event rates in the ACE cohort ranged between 2.2% at 3 months and 3.5% at 18 months, compared with 33.7% to 42.2% in controls, respectively. Relative risk hazard ratios for ACE versus control ranged from 0.054 to 0.064 (all $P < 0.001$). Recurrence rates in the ACE group plateaued after 12 months, whereas controls showed progressive recurrence throughout follow-up.

Conclusion: ACE was associated with an approximately 90–95% lower risk of recurrence compared with matched controls, with effects persisting through 18 months. These findings support the need for prospective randomized trials to establish the role of ACE in clinical practice.

AI Disclosure Statement: During the preparation of this work, the author(s) used ChatGPT (GPT-5, OpenAI, 2025) in order to check grammar and spelling. After using this tool, the author(s) reviewed and edited the work and take(s) full responsibility for the content of the abstract.

Abstract No. 312

Does Incomplete Embolization Affect Clinical Success and Duration of Response Compared to Complete Bilateral Embolization After Prostate Artery Embolization? Retrospective Review of a Single-Operator Experience



(Article No. 108339)

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Purpose: Prostate artery embolization (PAE) for symptomatic benign prostatic hyperplasia (BPH) theoretically provides maximum clinical benefit if complete bilateral embolization is achieved, but complex anatomy or severe atherosclerosis may preclude safe embolization of all branches. Case reports suggest

patients may still respond despite unilateral embolization. This study evaluates whether incomplete embolization affects clinical success rate or durability of response after PAE for BPH.

Materials and Methods: After institutional review board approval, 75 patients who underwent 79 PAEs for BPH with obstructive symptoms by a single operator at an academic center (February 2023–August 2025) were retrospectively reviewed. Pre-procedural CTA pelvis, intraprocedural nitroglycerin, and PER-FecTED technique were employed when possible; cone-beam CT was used in all cases. Embolization was performed with 100- to 300- μ m and 300- to 500- μ m Embospheres. Embolization was categorized as complete or incomplete (unilateral or subtotal bilateral). Technical success was defined as achieving at least unilateral embolization. Clinical success was defined as improvement in International Prostate Symptom Score (IPSS) or, in patients with retention, passing a trial of void with catheter removal or cessation of straight catheterizations. Logistic and linear regressions assessed associations between embolization completeness and outcomes.

Results: Of 79 PAEs, 69 achieved complete embolization and 10 were incomplete (4 unilateral and 6 subtotal bilateral). Reasons for incomplete embolization included atherosclerotic plaque in 6 cases and small vessel size in 4. Technical success was 100%. Overall clinical success was 91.1% (72/79): 62/69 (90%) with complete vs 10/10 (100%) with incomplete embolization ($p=0.646$). Mean IPSS decreased from 18 ± 7 to 8 ± 5 after PAE ($p < 0.001$). IPSS improvement was 10 ± 8 for complete vs 12 ± 9 for incomplete embolization ($p=0.727$). Among 33 PAEs performed for patients in retention who underwent subsequent TOV, 29 (88%) passed at mean 1.7 ± 2.0 mos. At mean follow-up of 7.4 ± 6.6 mos, mean duration of response was 4.9 ± 9.9 mos for complete vs 9.9 ± 9.9 mos for incomplete embolization ($p=0.167$).

Conclusion: Despite factors preventing complete bilateral embolization in some cases, clinical success rates and response durations were comparable between complete and incomplete embolization. When pre-procedural imaging suggests complete embolization may be limited by anatomy or atherosclerosis, patients can be counseled to expect similar outcomes. Larger multicenter studies with longer follow-up are warranted.

Abstract No. 313

Histopathological and Quantitative Micro-CT Analysis of Microsphere Clustering in an Oncopig Model with Imageable Eye90



(Article No. 108340)

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Purpose: TARE can achieve curative outcomes with ablative radiation doses, but response varies between tumors. Understanding how procedural factors affect microsphere distribution could optimize treatment. We aim to develop a quantitative framework to analyze microsphere clustering in a preclinical liver cancer model and assess histopathological changes following Eye-90 treatment.

Materials and Methods: We performed selective administration of 2.4 GBq (~961000) Eye90 microspheres in three transgenic Oncopigs harboring Cre-inducible TP53^{R167H} and KRAS^{G12D} mutations, which had undergone liver tumor induction via ultrasound-guided percutaneous intrahepatic injection of Cre recombinase (AdCre)-incubated liver biopsies, to analyze the tumor-specific microsphere distribution. After euthanasia, the liver was harvested. The liver lobe containing the tumor was divided into sections, including tumor and normal tissue. Micro-CT was performed using a Zeiss Xradia Versa 630 scanner. A total of 1601 projections were acquired. The source-to-sample distance was 27.05 mm and the sample-to-detector distance was 173.59 mm, resulting in voxels of 19.7 mm size in each dimension. A 3-stage algorithm was developed to estimate the number and locations of microspheres in tissue regions: (1) thresholding and region filtering, (2) estimating the number of microspheres in each region using the intensity voxel values, and (3) estimating microsphere locations. A DBSCAN method grouped microspheres into clusters within a radius of ~100 μ m. We statistically analyzed the cluster pattern of one Oncopig as a proof-of-concept.

Results: Histopathology demonstrated no viable tumors on explant analysis in all animals treated with Eye90. Imaging analysis of micro-CT data for one with an algorithmic protocol identified 941,452 microspheres across all scanned tissue sections in one Oncopig, with a relative error of 2%. Across 17 sections with 490682 beads, the median number of microspheres per cluster was 2, with a maximum of 21921, and a median nearest cluster distance of 0.349 mm. Overall, 18.4% and 6.4% of clusters contained more than 10 and 50 microspheres, respectively.

Conclusion: Histopathological analysis of all Oncopigs treated with Eye90 revealed no viable tumors. Micro-CT delivered high-resolution imaging of microspheres in both tumor and normal liver parenchyma. Our algorithmic approach successfully quantified biodistribution heterogeneity in tumor and normal tissue. Future

research will use the enhanced spatial resolution of micro-CT imaging to perform tumor microdosimetry.

Abstract No. 314

Real-World Outcomes Using a Shear-Thinning Conformable Hydrogel for Peripheral Embolization: A Single-Center Experience



(Article No. 108341)

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Purpose: Evaluate technical/clinical outcomes and safety of a conformable, shear-thinning hydrogel embolic across hemorrhagic and non-hemorrhagic peripheral indications.

Materials and Methods: Single-center retrospective review of consecutive arterial embolizations performed with the hydrogel from January 2022 to July 2025. Outcomes included technical success, clinical success, complications (Society of Interventional Radiology [SIR] graded), and 30-day re-intervention. Use of adjunctive embolics and indication class (hemorrhagic vs non-hemorrhagic) were compared.

Results: 150 procedures were analyzed. Technical success was 100% (150/150). Overall clinical success was 87.3% (131/150). Indications were predominantly hemorrhage (122/150, 81.3%) while non-hemorrhagic comprised 28/150 (18.7%). Clinical success was higher for non-hemorrhagic vs hemorrhagic cases (100% vs 84.4%; $p=0.0247$). Thirty-day re-intervention occurred in 6.0% (9/150). Complications occurred in 8.7% (13/150); major complications (SIR Grade ≥ 3) in 6.7% (10/150); no procedure-related deaths. Non-target embolization was uncommon (0.7%). In paired labs ($n=124$), hemoglobin increased post-procedure (mean $\Delta +0.59$ g/dL; $p=0.0016$), consistent with hemostasis. Adjunctive embolics were used in 48.7% (73/150) of cases although outcomes did not differ vs hydrogel alone for clinical success (89.0% vs 85.7%; $p=0.627$) or complications (8.2% vs 11.7%; $p=0.590$).

Conclusion: The shear-thinning conformable hydrogel achieved uniform technical success, favorable clinical effectiveness, and acceptable safety across diverse peripheral embolization scenarios. Efficacy was robust for hemorrhage and non-hemorrhage, with low re-intervention and complication rates and no apparent dependence on adjunctive embolics.

Scientific Session 33

General IO 3

Wednesday, April 15, 2026

11:15 a.m.–12:45 p.m.

Abstract No. 315

One-Stop Diagnosis and Treatment: CT Biopsy with Immediate Cryoablation in Medically Inoperable Patients with Suspicious Lung Nodules



(Article No. 108343)

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Purpose: To evaluate the safety and technical success of a single-session approach, CT-guided biopsy immediately followed by cryoablation, for highly suspicious 1–2 cm solitary pulmonary nodules in medically inoperable patients.

Materials and Methods: From July 2020 through July 2023, 45 patients with a single, highly suspicious malignant pulmonary nodule underwent combined biopsy and cryoablation. Inclusion criteria: severe emphysema (FEV 30–49%), at least moderate FDG uptake (SUV > 5), nodule size 1–2 cm, and medically inoperable status. We retrospectively assessed technical success, procedural complications, diagnostic yield, and local control.

Results: The diagnostic yield of the biopsy specimen was 93.3% (42/45). In the diagnostic yield, 95.2% of the pathology specimen were consistent with malignancy (60% lung adenocarcinoma, 40% squamous cell carcinoma, 4.5% reported atypical cells. Technical success were achieved in 100% of the cases. The most common complications included pneumothorax 17.8%, intrapulmonary hemorrhage 13.3%, hemoptysis 6.6% and pleural effusion 4.4. The 2 year local control was 87.5% for this cohort.

Conclusion: A combined diagnostic-therapeutic strategy: CT-guided biopsy immediately followed by cryoablation of a highly suspicious solitary pulmonary lesion, selected by emphysema severity and PET FDG avidity, appears safe and effective, yielding a high pathologic positive rate and good overall local tumor control.

Abstract No. 316

Quality of Life Following Thermal Ablation of Lung Tumors: A Prospective Patient-Reported Outcomes Study



(Article No. 108344)

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Purpose: To evaluate changes in self-reported quality of life following thermal ablation of lung tumors.

Materials and Methods: We enrolled 59 patients (mean age = 66.7 ± 12.8 ; 50.8% male; 15.3% with interstitial lung disease [ILD]) who underwent standard-of-care thermal ablation (94.9% cryoablation, 5.1% microwave ablation) of one or more lung tumors at an academic center following multidisciplinary evaluation between December 2023 and September 2025. Quality of life was measured at baseline (pre-procedure) and at 1 day, 1 week, 1 month, and 3 months post-procedure using transformed T-scores from the validated PROMIS Global-10 questionnaire. Longitudinal trends were quantified using linear mixed-effects regression models, while data dependencies were acknowledged using random intercepts. Interactions between ILD and time were included to evaluate temporal trajectories. Models were summarized by estimated coefficients and 95% confidence intervals.

Results: Self-reported physical and mental health remained stable across follow-up, with T-scores relatively unchanged at 3 months for both physical (3 months vs baseline = 0.86, 95% CI [-0.63, 2.36]) and mental (3 months vs baseline = 0.00, 95% CI [-1.33, 1.33]) health subsets. Social health measures decreased significantly at 1 month post-procedure (1 month vs baseline = -0.24, 95% CI [-0.44, -0.04]) and returned to baseline at 3 months (3 months vs baseline = 0.02, 95% CI [-0.19, 0.22]). When stratified by ILD diagnosis, the subset of patients with ILD similarly reported significantly decreased social health measures at 1-month post-procedure (1 month vs baseline = -0.85, 95% CI [-1.41, -0.28]), but physical, mental, and social health measures were not significantly changed at 3 months relative to baseline.

Conclusion: Quality of life remained stable in patients following thermal ablation of lung tumors, including physical and mental health scores. Social health declined within the first month post-procedure and returned to baseline levels at 3 months post-procedure. This study provides a more granular characterization of quality of life following lung tumor ablation and informs patient counseling.

Abstract No. 317

Predictors of Local Recurrence After Image-Guided Thermal Ablation for Stage IA Non-Small Cell Lung Carcinoma



(Article No. 108345)

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Purpose: To evaluate predictors of recurrence in patients with Stage IA non-small cell lung carcinoma (NSCLC) treated with image-guided thermal ablation (IGTA).

Materials and Methods: This is an institutional review board-approved, HIPAA-compliant retrospective analysis of the institutional lung ablation database from 2011 to 2018, of patients who underwent IGTA for Stage IA NSCLC. 85 patients (mean age: 71.9 ± 9.9 years) who underwent a single IGTA of the lung. Data on patients' demographics, tumor characteristics, procedural techniques, and local of death were obtained. Multivariable Cox proportional hazards models were constructed to assess predictors of local recurrence, with 5-year progression-free survival (PFS)

being the endpoints. Model 1 included variables for age, ablation modality, tumor margin morphology, tumor size, and sedation type (n=77); Model 2 excluded margin characteristics to increase sample size (n=84). Hazard ratios (HRs), 95% confidence intervals (CIs), and p-values were reported.

Results: All procedures were technically completed successfully. Lung ablations were performed on 16 (18.8%) T1a, 45 (52.9%) T1b, and 24 (28.2%) T1c tumors. The mean maximum tumor diameter was 16.6 ± 6.3 mm. Adenocarcinoma (82.3%) was the most common histology, followed by squamous cell carcinoma (15.2%) and carcinoid (2.3%). Ablation modality included microwave ablation (48.3%), Cryoablation (43.5%), and RFA in 8.2% of IGTA. Local recurrence occurred in 8 patients (9.4%), all with T1b (100%), of which 6 underwent repeat ablation with no further recurrence, achieving durable local control in 97.6% of patients. Across both models, none of the variables reached statistical significance for recurrence ($p > 0.05$). However, spiculated tumor margins showed a clinical association with increased recurrence risk (Model 1: HR=4.35, $p=0.057$, 95% CI:0.96-19.78). Microwave ablation was associated with a 46% lower risk of local recurrence or death compared to cryoablation (Model 1: HR = 0.54, $p=0.281$, 95% CI:0.17-1.66). History of COPD (Model 1: HR=2.22, $p=0.104$, 95% CI:0.85-5.82) was also associated with elevated, though non-significant, hazard ratios. Age at ablation showed a consistent but modest risk increase per year (Model 2: HR=1.02, $p=0.560$, 95% CI:0.96-1.07).

Conclusion: IGTA is an effective treatment for Stage I NSCLC, achieving acceptable low recurrence rates. No individual variable demonstrated as a statistically significant predictor for recurrence. However, spiculated tumor margins and history of COPD are associated with higher risk of recurrence.

Abstract No. 318

Five-Year Survival Following Image-Guided Thermal Ablation Therapy for Stage IA Non-Small Cell Lung Carcinoma



(Article No. 108346)

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Purpose: Image-guided thermal ablation (IGTA) is an established therapy for Stage IA non-small cell lung cancer (NSCLC), particularly in patients who are not surgical candidates, have local recurrence, or require lung function preservation. This study evaluates five-year overall survival (OS) and progression-free survival (PFS) following IGTA for patients with Stage IA NSCLC.

Materials and Methods: This HIPAA-compliant, institutional review board-approved retrospective analysis of an institutional lung ablation database included patients treated with IGTA for Stage IA NSCLC between 2011 and 2018. Eighty-five patients (mean age 71.9 ± 9.9 years; 60% female) underwent single IGTA for 16 (18.8%) T1a, 45 (52.9%) T1b, and 24 (28.2%) T1c tumors. Primary endpoints were OS and PFS at 5 years. Demographics, tumor characteristics, and procedural parameters were analyzed with summary statistics.

Results: Tumor histology included adenocarcinoma (82.3%), squamous cell carcinoma (15.2%), and carcinoid (2.3%). IGTA

achieved a 100% technical success rate. Tumor distribution was RUL (32.9%), LUL (27.1%), RLL (18.8%), LLL (15.3%). Moderate sedation was used in 75.3% of cases. Ablation modalities included microwave (48.3%), cryoablation (43.5%), and radiofrequency (8.2%). Local recurrence occurred in 8 patients (9.4%), all T1b; 6 underwent repeat ablation with no further recurrence, achieving durable local control in 97.6% of patients. Five-year overall survival was 68.2% (T1a), 77.4% (T1b), and 68.2% (T1c). A non-significant trend toward improved survival was observed in T1b versus T1a (HR 0.57, 95% CI: 0.19-1.73). Five-year progression-free survival was 68.2% (T1a), 62.5% (T1b), and 68.2% (T1c), with no statistically significant differences across groups (T1b HR 1.15; T1c HR 0.92).

Conclusion: IGTA provides effective local control and favorable five-year outcomes for Stage IA NSCLC. Local recurrence was limited and managed effectively with repeat ablation. These findings support IGTA as a minimally invasive, durable, and viable curative option that offers meaningful long-term survival and local control for patients who are poor surgical candidates or require lung preservation.

Abstract No. 319

Radiofrequency Ablation Versus Beam Radiation for Localized Adenocarcinoma of the Lung in Older Adults: A SEER Comparative Survival Analysis



(Article No. 108347)

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Purpose: This study aimed to compare the survival outcomes of radiofrequency ablation (RFA) with those of beam radiation therapy for localized lung adenocarcinoma in older adults, using population-based data.

Materials and Methods: Data were obtained from the Surveillance, Epidemiology, and End Results (SEER) database (2005–2022) using SEER*Stat version 9.0.41.4. Patients aged ≥ 65 years with localized adenocarcinoma of the lung were included. Eligible cases were those treated with RFA alone or beam radiation therapy alone (no other locoregional therapies). Demographic and clinical variables included age, sex, race, year of diagnosis, survival time, and cause of death. Propensity score matching (1:1) based on age, sex, race, and year of diagnosis was performed for patients receiving RFA (n = 106), resulting in 106 matched cases in each treatment group. Kaplan-Meier analyses were performed for overall survival (OS) and cancer-specific survival (CSS), with log-rank tests for group comparisons. Multivariable Cox regression was used to identify predictors of OS and CSS.

Results: A total of 17,507 patients met inclusion criteria (RFA: 106; beam radiation: 17,401). After matching, the overall cohort included 212 patients (median age, 78 years; 59.4% female). Median OS was 43 months (95% CI, 38.1–47.9) with RFA versus 30 months (95% CI, 22.3–37.7) with beam radiation (log-rank $P = 0.01$). Median CSS was 73 months (95% CI, 60.5–85.5) with RFA

versus 42 months (95% CI, 30.1–53.0) with beam radiation (log-rank $P = 0.095$). On multivariable analysis, significant predictors of improved OS included female sex (HR, 0.53; $P < 0.001$) and RFA treatment (HR, 0.64; $P = 0.003$). Predictors of improved CSS included female sex (HR, 0.45; $P < 0.001$), RFA treatment (HR, 0.65; $P = 0.031$), and more recent year of diagnosis (HR, 0.95; $P = 0.036$).

Conclusion: In older adults with localized lung adenocarcinoma, RFA was associated with improved OS compared with beam radiation. Female sex and a more recent year of diagnosis were favorable predictors of survival. These results highlight the potential role of RFA in selected older patients; however, the limited number of RFA cases and inherent constraints of retrospective database analysis warrant further validation in prospective studies.

Abstract No. 320

Optimizing Microwave Ablation for Lung Nodules: Impact of Power and Application Strategy on Treatment Zone Size



(Article No. 108348)

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Purpose: The use of minimally invasive options such as microwave ablation (MWA) zones in the lung depends on energy delivery dynamics and tissue-air interactions. This study investigates how modulation of power and ablation timing alters ablation zone (AZ) volumes, providing insight into the physics of thermal conduction and energy deposition in the lung's aerated and vascular tissue. Evaluation of how continuous versus intermittent ablation protocols influence AZ formation could thus have implications for optimizing treatment outcomes in treating primary and metastatic lung nodules.

Materials and Methods: MWA probes were placed into swine lungs under fluoroscopic guidance. Protocols involved continuous or intermittent ablations performed for 8, 4, 2, or 1 minutes, with total ablation times of 8 or 4 minutes, at either 65 or 30 watts. AZ volumes were assessed ex vivo.

Results: Intermittent MWA significantly reduced AZ size compared with continuous ablation. At 65 watts, applying 2- or 1-minute intervals reduced AZ volume by 28% and 60%, respectively (Continuous: $3.07 \text{ cm}^3 \pm 0.27$ vs. 2 minutes: $2.22 \text{ cm}^3 \pm 0.30$, $p=0.0159$; 1 minute: $1.24 \text{ cm}^3 \pm 0.18$, $p < 0.001$). At 30 watts, AZ volumes were reduced by 25% and 53% (Continuous: $1.50 \text{ cm}^3 \pm 0.40$ vs. 2 minutes: $1.12 \text{ cm}^3 \pm 0.21$, $p=0.013$; 1 minute: $0.81 \text{ cm}^3 \pm 0.15$, $p < 0.002$). Reducing power by 53% led to a 51% decrease in AZ volume, and this gap widened with longer ablation duration, reaching a 60% reduction at 8 minutes. This likely reflects the tissue charring and heat loss in aerated lung parenchyma that limit further zone expansion at lower power.

Conclusion: Continuous high-power MWA produces significantly larger ablation zones in lung tissue compared to intermittent or low-power protocols. The linear efficiency gap between high- and low-power ablation further widens with longer duration, likely due to tissue desiccation and heat dissipation unique to the lung. These findings emphasize careful selection of initial power and delivery strategies to achieve adequate margins and minimize undertreatment risk in lung tumor ablation and may provide a

foundation for optimizing ablation algorithms and developing next-generation energy-delivery devices.

AI Disclosure Statement: During the preparation of this work, the author(s) used ChatGPT-5 in order to improve readability, spelling, and grammar. After using this tool, the author(s) reviewed and edited the work and take(s) full responsibility for the content of the abstract.

Abstract No. 321

Cryoablation for Desmoid Tumors: A Single-Center Evaluation of Current Treatment Paradigms



(Article No. 108349)

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Purpose: Desmoid tumors (DT) are rare, locally aggressive neoplasms that can cause significant morbidity despite lacking metastatic potential. Cryoablation (CA) is a minimally invasive therapy that has shown promise for local control, though its role compared with surgery, systemic therapy, and radiation remains uncertain. This study aims to outline our single-center experience, evaluating the relative timing of CA in the treatment of DT and the risk factors associated with tumor recurrence.

Materials and Methods: Following institutional review board approval, a retrospective analysis was conducted on the institutional sarcoma registry to identify patients with DT who were treated with CA at a tertiary care center. Patient demographics, tumor characteristics, treatment history, procedural data, and oncological outcomes were recorded. Tumor recurrence was defined as clinical progression. Comparative analyses were conducted using the Mann-Whitney U test and Fisher's exact test, where applicable. All analyses were performed in Python version 3.12.7 (Windows), with a two-sided p -value < 0.05 considered statistically significant.

Results: Seventeen patients (mean age 37.8 ± 9.8 years, 29.4% male, 52.9% Hispanic or Latino) with extra-abdominal (29.4%), extremity (29.4%), and chest wall (29.4%) DT underwent CA. Patients were treated with systemic therapy (94.1%), surgery (37.5%), and radiation (12.5%). Systemic therapy and surgery preceded CA in 82.3% and 11.8% of cases, respectively. The mean time to CA was 3.55 ± 5.15 years. Patients with future recurrence ($n=5$, 29.4%) underwent CA later in their treatment course (13.1 years) compared with those without recurrence (0.9 years, $p=0.001$). Mean pre-CA tumor volume was $458.9 \pm 536.6 \text{ cm}^3$. Procedures lasted a mean of 253.7 ± 159.8 minutes using a median of 5 probes [IQR 2–8] and 2 freeze–thaw cycles [IQR 2–3.5], with mean freeze and thaw times of 27.1 ± 11.1 and 25.1 ± 16.2 minutes, respectively. The mean ablation volume was $252.4 \pm 251.4 \text{ cm}^3$. Repeat CA was required in 2 patients (11.7%).

Conclusion: CA is an effective second-line treatment for DT, with high local control rates and minimal morbidity. Later use of CA in the treatment course was associated with recurrence, suggesting a potential benefit to earlier utilization. These findings support a growing role of CA in the treatment paradigm, particularly for patients seeking minimally invasive options. Further studies are warranted to refine indications and assess long-term outcomes.

Abstract No. 322

Abdominal Wall Pseudohernia After Percutaneous Cryoablation for Renal Cell Carcinoma: A Six-Patient Case Series



(Article No. 108350)

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Purpose: To describe the occurrence, risk factors, and clinical outcomes of abdominal wall pseudohernia (AWP) following percutaneous cryoablation (PCA) for renal masses.

Materials and Methods: We retrospectively reviewed six patients who developed AWP after PCA for renal masses. Patient demographics, tumor characteristics, and procedural details were extracted, including cryoprobe trajectory and use of hydro-/pneumo-dissection. AWP was defined as focal abdominal wall bulging in the upright position with loss of reflex contraction and intact fascia. Outcomes were assessed by clinical follow-up.

Results: Six patients (median age 77 years, range 63–82; five males, one female; mean BMI 28.3) developed AWP following PCA. Median tumor size was 2.8 cm (range 1.7–4.0). Tumors were located in the upper pole (n=3), lower pole (n=2), and interpolar region (n=1). All cases involved cryoprobe trajectories traversing the erector spinae muscle. Hydro-/pneumo-dissection was performed in all six patients. The number of cryoprobes ranged from 2–3, with most patients undergoing a single treatment session (n=5). All six patients had prior abdominal surgery. No patients required surgical repair.

Conclusion: AWP is a rare but clinically significant outcome of PCA for renal masses. In this series, all cases were associated with dorsal cryoprobe trajectories through the erector spinae muscle, even when protective dissection was employed. The universal history of prior abdominal surgery may represent an additional susceptibility factor. These findings are consistent with prior reports and parallel other ablation-related hernia syndromes, such as diaphragmatic hernia after percutaneous hepatic tumor thermal ablation. All cases were managed non-operative and resolved within a 6 month time. Although not entirely preventable, pre-treatment planning (including careful probe planning with adjunctive protective techniques) may help reduce risk.

Abstract No. 323

Percutaneous Hepatic Perfusion (PHP) with Melphalan for Treatment of Liver Metastases from Uveal Melanoma: Initial Commercial Experience



(Article No. 108351)

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Purpose: Approximately 50% of patients with uveal melanoma (UM) develop metastases with the liver as the primary site of disease in > 90% of cases. Control of hepatic tumors is critical to prolonging overall survival for patients with metastatic uveal melanoma (MUM). We report our initial single-institution experience with commercially available PHP with melphalan (HEP-ZATO, Delcath, Queensbury, NY) for the treatment of UM hepatic metastases.

Materials and Methods: MUM patients with < 50% hepatic tumor burden underwent commercially available PHP at 6 to 8-week intervals. Best radiographic response was assessed with contrast-enhanced MRI using RECIST 1.1 criteria. CTCAE v5.0 was used to assess adverse events.

Results: Twenty-two patients (9 men; median age, 62; range, 31–72) including 10 patients with extrahepatic metastasis, underwent PHP (n=76 procedures) from March 2024 to September 2025. All patients had at least one prior liver-directed therapy (LDT), and 10 patients failed prior systemic treatment. Patients underwent a median of 3 PHPs (range 1–6), and 21 patients had ≥ 2 procedures. Median follow-up was 8.3 months (range, 0.4–18.1). Fifteen patients remain alive after initial PHP. Of the 20 patients who underwent follow-up MRI, 10 had stable disease (SD) and 4 demonstrated a partial response (70% disease control rate). Four patients with progression of disease (PD) after PHP underwent repeat treatment; one achieved SD. Two patients stopped treatment due to intrahepatic (n=2) and extrahepatic (n=1) progression. Median time to progression of metastases has not been reached. Eighteen patients required transfusions following 1 (n=5), 2 (n=9), 3 (n=3) or 4 (n=1) procedures. One patient developed grade 4 sinusoidal obstruction syndrome prohibiting additional LDT and died 5.9 months post PHP due to PD. Two patients required hospitalization due to grade 4 thrombocytopenia and leukopenia requiring transfusions,

322.1.

Patient	Age (years)	Sex	BMI	Tumor Size (cm)	Tumor Location	Probe Trajectory (Erector spinae vs not)	Hydro-/Pneumo-dissection (Y/N)	Number of Probes	Number of Treatments	Previous Abdominal Surgery
1	76	M	25.9	4cm	interpolar	Y	Y	3	3	Y
2	82	M	27.5	2cm	upper pole	Y	Y	3	1	Y
3	80	M	23.8	2.6 cm	upper pole	Y	Y	2	1	Y
4	63	F	24.3	3.2 cm	upper pole	Y	Y	3	1	Y
5	73	M	35.2	3cm	lower pole	Y	Y	2	1	Y
6	64	M	32.9	1.7 cm	lower pole	Y	Y	2	1	Y

antibiotics, and supportive care. Two patients developed grade 3 neutropenia requiring cancellation of a treatment. Two patients had strokes precluding further PHP treatments: one occurred 2 weeks post-treatment of unclear etiology; the other occurred post-procedurally with near-complete symptom resolution on discharge.

Conclusion: PHP remains a promising treatment for MUM patients. The durability of disease control is uncertain based on this early commercial experience, and it is unclear how PHP compares to other LDT for this disease. However, in our experience, procedural complications seem to be more significant and treatment-limiting compared to alternative LDT.

Abstract No. 324

A Single-Center Preliminary Experience of Percutaneous Hepatic Perfusion with Melphalan for Liver Metastases of Uveal Melanoma



(Article No. 108352)

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Purpose: To evaluate the safety, feasibility, and preliminary efficacy of Percutaneous Hepatic Perfusion (PHP) for liver metastases of uveal melanoma in a single-center retrospective analysis. The primary aim is to assess objective response rates (ORR), disease control rate (DCR) and characterizing procedure-related adverse events.

Materials and Methods: A retrospective review of patient records was conducted for all patients with liver metastases from uveal melanoma who underwent PHP at our institution from March 2024 to September 2025. A total of 13 patients with 54 PHP intervention included. There were 5 (38.5%) females and 8 (61.5%) males, and median (IQR) age was 67 (10). Out of 13 patients three completed 6 interventions, five are continuing, three stopped early due to disease progression and two patients opted not to continue with treatment. Adverse events and complications were graded according to the Common Terminology Criteria for Adverse Events (CTCAE). Descriptive statistics were used to summarize all patient and procedural data.

Results: ORR of 61.5% (95% CI: 35.5-82.3%) including one patient (7.6%) with a complete response. DCR was 76.9% (95% CI: 49.7-91.8%). One patient died with disease progression. Among the first 13 consecutively treated patients at our center, 10/13 had at least one target tumor volume reduction. Complications include thrombocytopenia (n=29, 53.7%), anemia (n=21, 38.8%), fatigue (n=12, 22.2%), leukopenia (n=10, 18.5%), neutropenia (n=7, 12.3%), ALP increase (n=3, 5.5%), elevated ALT (n=3, 5.5%), chemical cholecystitis (n=2, 3.7%), bilirubin increase (n=1, 1.8%), pain (n=1, 1.8%), elevated AST (n=1, 1.8%), edema (n=1, 1.8%) without any intraoperative complications.

Conclusion: This preliminary single-center experience with PHP for liver metastases of uveal melanoma demonstrates better ORR than other treatment modalities for metastatic uveal melanoma.

Scientific Session 34

General IR 4

Wednesday, April 15, 2026

11:15 a.m.–12:45 p.m.

Abstract No. 325

Pneumo and Hydro-Dissection of Critical Structures During Pulsed Electric Field: A Translational Application of a Bench Experiment



(Article No. 108354)

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Purpose: To evaluate various separators that could be used with pulsed electric field (PEF) ablation in order to minimize non-targeted ablation and improve patient safety.

Materials and Methods: A two-phase translational study was performed to improve the safety of PEF ablation. The first phase used an agar model to test the electrical insulating properties of various separators, including CO₂, dextrose (D5), and normal saline (NS), with and without contrast. A PEF probe and sensor were used to measure the resulting voltage and current for each separator. In the second phase, the experiment assessed how electrical conductivity changed as the length of the separating barrier was incrementally increased. The findings were then applied clinically, where CO₂ was used to create a safe space between a recurrent liposarcoma and the nearby colon and femoral plexus, allowing for a successful PEF ablation.

Results: In the translational experiment, CO₂ demonstrated superior isolation properties with no conductivity between the electrode and the sensor in comparison to all other separators; D5W, D5W+contrast, NS, NS+contrast (0.0±0.0, 2.12±0.0, 2.12±0.0, 2.82±0.27 and 3±0.06 KV) and (0.0±0.0, 9±0.84, 8.4±0.0, 14.73±0.09 and 14.73±0.09 A). In phase 2, upon increasing the separator length; 2.16 vs. 4.33 vs. 6.49", the current decreased (12.2, 10.8, and 9.6 A), V1 and V2 increased (2.3, 2.56, and 2.68 KV), and (860, 700, and 680 KV). A 41-year-old man with recurrent retroperitoneal liposarcoma abutting the femoral plexus and ascending colon underwent PEF treatment with NS hydrodissection. However, the procedure was terminated due to a drop in motor evoked potentials (MEPs) of the right femoral nerve and proximity to the colon. Following bench validation, the patient underwent a repeat PEF ablation using intermittent CO₂ for pneumodissection of the adjacent structures. A total of overlapping 19 ablations were performed in the caudal and middle portion of the lesion without a decrease in MEPs. Follow up MRI demonstrated an interval decrease in enhancement and diffusion

restriction noted at the inferior margin of the treatment site within the right psoas muscle and expected treatment cavity.

Conclusion: Pneumodissection is an effective, safe separator when using PEF ablation in proximity to vital structures.

Abstract No. 326

Clinical Outcomes of Outpatient Gallstone Organ-Sparing Cholangioscopy and Percutaneous Extraction (GO-SCOPE) in Patients Desiring to Preserve Their Organ



(Article No. 108355)

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Purpose: To assess clinical outcomes of Gallstone Organ-Sparing Cholangioscopy and Percutaneous Extraction (GO-SCOPE) with de novo access in patients with calculous biliary colic who elect to preserve their gallbladder.

Materials and Methods: This is a retrospective study of patients with calculous biliary colic who presented to a large academic center and had a percutaneous cholangioscopy with gallstone extraction between April 2024 and June 2025. All patients met standard indications for cholecystectomy after evaluation by a board-certified surgeon, but opted for percutaneous cholangioscopy with gallstone removal to preserve their gallbladder. Following gallstone extraction, a 8.5F to 14F choledochostomy tube was left in place to allow decompression of the gallbladder and tract formation. Subsequent tube evaluation was performed approximately 1-3 weeks after gallstone extraction. If no residual stones were present and the cystic duct was patent, the tube was removed. Clinical outcomes for cholecystitis and cholangitis were gathered from the date their choledochostomy tube was removed.

Results: 51 patients (mean age 46.7 yr, SD 11.4yr; 37 female and 14 male) with biliary colic secondary to cholelithiasis presented for elective outpatient percutaneous cholangioscopy and gallstone extraction. There was a 100% technical success rate in stone removal with no major adverse events per Society of Interventional Radiology criteria. Mean time between percutaneous gallstone extraction and biliary tube removal was 21.8 ± 9.5 days. One patient developed sepsis 17 days post-procedure as an outpatient prior to tube evaluation. One patient opted to have a cholecystectomy due to bile leakage from the gallbladder after the choledochostomy tube was prematurely removed. Average clinical follow-up was 252 ± 113 days, with a median of 208 days (range 89 to 505 days). Patients reported complete or near-complete resolution of previous symptoms of biliary colic after GO-SCOPE. No patients had acute cholecystitis or cholangitis.

Conclusion: GO-SCOPE with de novo access resulted in symptom resolution, with no cases of biliary colic, acute cholecystitis, or cholangitis during follow-up. These findings suggest that gallbladder preservation with percutaneous cholangioscopy can provide resolution of biliary colic while preserving the gallbladder.

Abstract No. 327**EB-RFA for Refractory Benign Biliary Strictures: Promising Early Results in Small Cohort**

(Article No. 108356)

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Purpose: To evaluate the technical feasibility, clinical efficacy, and safety of EB radiofrequency ablation (RFA) for refractory benign biliary strictures.

Materials and Methods: A retrospective review was performed of 15 patients (mean age, 52.9 years; range, 19–87; 9 male) who underwent percutaneous endobiliary RFA between 2020 and 2024. All patients had prior interventions, including balloon dilation (14/15), stenting (10/15), and surgical revision (7/15). Technical success was defined as successful catheter traversal, RFA delivery, and drainage placement. Clinical success was defined as relief of cholestasis without unplanned reintervention. Outcomes assessed included patency, reintervention, adverse events, and final disposition.

Results: Mean catheter duration prior to intervention was 234 days (range, 38–882). The mean interval from prior intervention to RFA was 95 days (range, 24–288). Cholangiographic and cholangioscopic resolution of stricture was visualized post RFA in 100% (15/15). Technical and clinical success was achieved in 100% (14/14 evaluable). Stent/drain-free patency was 82% (9/11) at 3 months, 86% (6/7) at 6 months, and 100% (1/1) at 12 months. Adverse events were limited, with no cases of cholangitis within 90 days (0/15). Reintervention with RFA was not required in any patients (0/15).

Conclusion: Endobiliary RFA is technically feasible and clinically effective for refractory benign biliary strictures, demonstrating high technical success, encouraging short-term patency, and a low complication profile. These early results suggest EB-RFA may serve as a valuable adjunctive therapy in patients with limited treatment options. Importantly, this ongoing cohort continues to mature, and longer-term outcomes will clarify the durability and broader role of EB-RFA in benign biliary disease.

Abstract No. 328**Role of Percutaneous Image-Guided Biopsy in the Era of Endoscopic Biopsy of Pancreatic Lesions**

(Article No. 108357)

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Purpose: Endoscopic ultrasound-guided fine-needle aspiration/biopsy (EUS-FNA/FNB) has become widely used for sampling pancreatic lesions, but image-guided percutaneous needle biopsy (PNB) remains important when endoscopic access is limited or

contraindicated. We evaluated the diagnostic accuracy of image-guided PNB for pancreatic lesions at a tertiary cancer center and examined technical and clinical factors influencing diagnostic yield.

Materials and Methods: A retrospective analysis was conducted of 181 image-guided percutaneous pancreatic biopsies performed between 2015 and 2021 at a tertiary cancer center. Post-biopsy histopathology reports were reviewed and categorized as malignant, benign, infective, or non-diagnostic (insufficient, non-representative, inflammatory, or hemorrhagic). Diagnostic performance of PNB was evaluated by calculating sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and overall accuracy. The reference standard was postoperative surgical histopathology when available; for non-operated patients, clinical and imaging follow-up for at least one year was used.

Results: Among 181 pancreatic biopsies, image-guided PNB demonstrated a diagnostic accuracy of 91.7%, with sensitivity 90.9%, specificity 100%, PPV 100%, and NPV 51.6%. The major complication rate was 1.1%. Statistically significant predictors of successful diagnostic yield included precise technical targeting of the lesion ($p < 0.001$), concurrent fine-needle aspiration cytology (FNAC) with on-site evaluation ($p < 0.001$), and elevated serum CA 19-9 levels ($p = 0.01$). Imaging modality (CT vs. USG), lesion size, and biopsy approach were not significantly associated with diagnostic yield.

Conclusion: Image-guided percutaneous needle biopsy is a highly accurate and safe method for diagnosing pancreatic lesions. However, its low negative predictive value underscores the need for cautious interpretation of negative results and diligent follow-up. Diagnostic yield is maximized by precise technical targeting and the use of concurrent on-site cytopathology, supporting the continued role of PNB as a complementary tool in the era of endoscopic biopsy.

Abstract No. 329**From Leak to Resolution: Outcomes After Intranodal Lymphangiography and Embolization for Chylous Leaks in Cancer Patients**

(Article No. 108358)

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Purpose: To evaluate technical success, clinical success, and safety of intranodal lymphangiography (IL) with or without selective lymphatic embolization (LE), and to identify predictors of clinical success.

Materials and Methods: Single-center retrospective study of 46 consecutive cancer patients who underwent intranodal lymphangiography (IL) with or without selective lymphatic embolization (LE) for postoperative chylous leaks between May 2017 and July

2024. Endpoints were technical success (opacification of central conducting lymphatics during IL with completion of LE/TDE when indicated), clinical success (complete resolution or $\geq 50\%$ output reduction permitting drain removal), and complications (graded by CTCAE v6). Predictors of clinical success were analyzed using Fisher's exact and χ^2 tests.

Results: All procedures were technically successful (46/46, 100%). Overall, 38/46 achieved clinical success (82.6%; 95% CI, 39.0–92.7) and Lymphatic leaks were identified in all of them; all 38 underwent embolization. Requiring only one procedure strongly predicted success: 80% with a single session vs 6.3% with multiple sessions ($p < 0.001$; OR 12.8, 95% CI 1.9–86.1). No significant associations were observed with demographics, biochemical markers, leak location, or whether embolization was performed. One grade 2 complication occurred, which was transient dyspnea attributed to pulmonary oil embolism.

Conclusion: In cancer patients with post-surgical chylous leaks, IL with selective embolization is safe and yields modest overall clinical success. Single-session success strongly predicts outcome and may inform counseling regarding the limited benefit of repeat interventions.

Abstract No. 330



Intravascular Ultrasound-Guided Transcaval Cisterna Chyli Access for Lymphatic Intervention: A Proof-of-Concept Study in a Porcine Model



(Article No. 108359)

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Purpose: Lymphatic interventions are an emerging frontier for Interventional Radiology. However, obtaining central lymphatic access can be difficult, time-consuming and risks injury to critical structures. We hypothesize that intravascular ultrasound (IVUS)-guided transcaval central lymphatic cannulation is technically feasible, with the potential to reduce procedure time and associated risk.

Materials and Methods: Four female swine underwent transcaval central lymphatic cannulation. Animals were fed a high-fat diet preceding non-survival experimentation. We utilized a side-firing phased-array sectoral IVUS catheter (ViewFlex Xtra ICE; St. Jude, Saint Paul, MN) to visualize and perform direct lymphatic puncture using a 21-gauge echogenic tip needle, inserted through a transjugular intrahepatic portosystemic shunt kit deployed in the common femoral vein. The first cohort of two animals underwent nodal lymphangiography for fluoroscopic delineation of the lymphatic system followed by IVUS-guided central lymphatic access. The second cohort began with attempted *de novo* IVUS-guided access, though nodal lymphangiography was performed if unsuccessful. After cannulation, thoracic duct embolization (TDE) was performed using coils and/or glue.

Results: The TD was successfully cannulated via an IVUS-guided transcaval approach in all four animals. The first two animals demonstrated that the most capacious segments of the cisterna chyli was often too far from the cava for direct access,

requiring access of the central lymphatics in close proximity to the inferior vena cava. In the second cohort, 1 (of 2) attempts to access the central lymphatics *de novo* was successful, which was achieved at a level similar to the two animals from cohort one. In the remaining experiment *de novo* access failed; subsequent nodal lymphangiography demonstrated variant lymphatic anatomy with a diminutive CC; IVUS-guided lymphatic cannulation was achieved in this case after nodal lymphangiography. At the conclusion of all experiments, TDE was performed successfully.

Conclusion: These data demonstrate that IVUS-guided central lymphatic access is technically feasible and provides adequate stability to perform TDE, while highlighting that *de novo* success is dependent upon lymphatic anatomy. This approach has the potential to reduce the time required to obtain central lymphatic access and associated risks.

Abstract No. 331

Post-renal Transplant Collections: Which Patients Benefit from Lymphangiography?



(Article No. 108360)

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Purpose: Post-renal transplant collections have a wide differential; urinomas, seromas, and lymphoceles frequently require IR drainage. Treating the underlying cause reduces duration of drainage. There is a paucity of data regarding what lymphocyte count defines a lymphocele and which patients benefit from lymphatic embolization. We hypothesize that high ($>80\%$) lymphocyte percentage predicts treatment success.

Materials and Methods: We performed a retrospective review of all patients with post-renal transplant collections from December 2022 to June 2025 who had a lymphangiogram. Patients undergoing lymphangiogram typically had at least 50% lymphocytes on fluid cell count. Lymphangiogram date, drain removal date, and fluid cell count lymphocyte percentage were recorded. Successful embolization was defined as any patient with drain removed at next follow up after lymphangiogram. Embolic agent was recorded (Lipiodol only or Lipiodol and glue). Continuous variables were evaluated with mean and standard deviation and compared with Wilcoxon rank-sum test. ROC curve analysis was conducted, and optimal cutoff was identified using Youden's J statistic.

Results: 18 patients had lymphangiograms during the study period. 9 patients had drains removed at subsequent follow up and 9 patients needed additional sclerotherapy. While glue was typically used only if an active leak was seen, it was not a statistically significant predictor of subsequent drain removal ($p > 0.05$). Mean (SD) lymphocyte percentage was 88.56 (9.53)% in patients with and 82.22 (26.7)% in patients without successful embolization ($p = 0.044$). ROC curve had an AUC of 0.47 with an optimal cutoff lymphocyte percentage of 79% with 89% sensitivity and 33% specificity.

Conclusion: High fluid collection lymphocyte percentage has a high sensitivity and low specificity for successful intranodal embolization of lymphoceles in post-renal transplant patients. Lipiodol alone, even without identifying a leak, was successful in expediting drain removal in patients with high lymphocyte

percentage. A cutoff lymphocyte percentage above 79% can potentially predict successful embolization.

Abstract No. 332

Nationwide Epidemiology, Etiology, and Management of Chylothorax: Analysis of 14,631 Hospitalized Patients from 2015 to 2024: An Epic Cosmos Study



(Article No. 108361)

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Purpose: To delineate the demographic distribution, etiologic spectrum, and management patterns of patients hospitalized with chylothorax in the United States using the Epic Cosmos multi-institutional database.

Materials and Methods: We performed a retrospective cohort study of 14,631 patients hospitalized with chylothorax between 2015–2024 using Epic Cosmos, a federated electronic health record dataset encompassing >200 million patient records across 180+ U.S. institutions. Extracted variables included demographics, comorbidities, etiologies, and management strategies. Demographics encompassed age, sex, race/ethnicity, insurance status, BMI, census region, and area deprivation index. Etiologies were classified as iatrogenic, traumatic, malignant, or medical. Therapies, including conservative management and interventional approaches, were analyzed. Hematologic parameters were assessed pre- and post-embolization.

Results: Age distribution was < 18 years (39.8%), 18–44 (9.2%), 45–64 (21.3%), 65–74 (17.9%), 75–84 (10.2%), and ≥ 85 (2.7%); 54.6% were male. The South accounted for the largest regional cohort (43.5%). Race/ethnicity was predominantly White (77.0%), followed by Black (14.4%) and Hispanic (13.5%). Leading etiologies included iatrogenic (congenital heart surgery, n=1,515; pulmonary resection, n=470), traumatic thoracic/neck injury (n=740), malignancy (lung cancer, n=1,120; metastatic disease, n=1,464; lymphoma, n=1,021), and medical conditions (heart failure, n=4,039; cirrhosis, n=744; congenital lymphatic abnormality, n=500). Initial or concurrent conservative therapy was employed in 42.7% (n=6,246). Among those requiring escalation, chest tube drainage was instituted in 0–3 days in 519 patients (8.3% of the conservatively managed group), 4–7 days in 295 (4.7%), and 8–14 days in 267 (4.3%). Among patients with laboratory data, pre-embolization lymphopenia (< 25% lymphocytes) was present in 74.7%, with persistence at ≥ 5 days post-embolization in 85.5%.

Conclusion: Leveraging the Epic Cosmos national dataset, this study provides the largest epidemiologic analysis of hospitalized chylothorax to date. Heart failure, thoracic malignancy, and congenital heart surgery were the most prevalent causes. Nearly half of patients underwent conservative management, yet over 17% required chest tube placement within 14 days, most commonly within the first 3 days. These findings underscore the substantial clinical burden of chylothorax and highlight opportunities to refine timing and selection of interventional strategies.

Abstract No. 333

■ FEATURED ABSTRACT

Comparative Outcomes of Thyroid Radiofrequency Ablation Versus Surgery: A Propensity-Matched Analysis from a U.S. Multicenter Cohort



(Article No. 108362)

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Purpose: To compare clinical outcomes of thyroid radiofrequency ablation (RFA) with surgical resection for benign and functional thyroid nodules using a large, real-world dataset.

Materials and Methods: We queried the TriNetX U.S. Collaborative Network (69 health care organizations) for adults undergoing either RFA or thyroid surgery between 2005–2025. Cohort A included patients treated with RFA (n=2,457) and Cohort B included patients undergoing thyroidectomy (n=46,348). Propensity score matching (1:1) yielded 2,437 patients per group, balanced across demographics and comorbidities. Outcomes included postprocedural hypothyroidism/hormone replacement, vocal cord paralysis, hypocalcemia, and postoperative infection. Risk, survival, and hazard ratios were calculated.

Results: RFA was associated with significantly lower risk of hypothyroidism requiring hormone replacement compared with surgery (19.8% vs. 58.7%, OR 0.17, p< 0.001). Kaplan-Meier analysis demonstrated improved thyroid function preservation with RFA (median survival without hypothyroidism: 6249 vs. 1108 days, HR 0.35, p< 0.001). Vocal cord paralysis was less frequent after RFA (3.4% vs. 5.5%, OR 0.59, p< 0.001). Hypocalcemia was also reduced (7.8% vs. 17.0%, OR 0.41, p< 0.001), with higher long-term calcium preservation (HR 0.52, p< 0.001). Infection rates were comparable between groups (2.0% vs. 2.5%, p=0.29).

Conclusion: In this large multicenter propensity-matched analysis, thyroid RFA demonstrated significantly lower risks of hypothyroidism, hypocalcemia, and vocal cord paralysis compared with surgical resection, with similar infection rates. These findings suggest RFA may be an alternative, thyroid-preserving, procedure to consider for appropriately selected patients.

Abstract No. 334

Outpatient Percutaneous Ablation of Large, Symptomatic Thyroid Nodules: Assessment of Safety and Outcomes



(Article No. 108363)

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Purpose: While percutaneous ablation has been well studied in benign thyroid nodules, data remains limited regarding the role of ablation in treating very large nodules, which are often more challenging due to longer ablation times and the potential need for multiple ablations. This study aims to assess outcomes within this subgroup, providing insight into whether thyroid ablation can serve as a minimally invasive alternative to surgery.

Materials and Methods: A retrospective analysis was performed of patients who had percutaneous ablation for benign, symptomatic thyroid nodules at a large academic hospital system. Eligible cases included nodules with an initial baseline volume ≥ 20 cc that were treated from 2021-2025. Patients with a post-operative follow-up time of < 12 weeks were excluded. Demographics, symptoms, and pathologic findings based on Bethesda criteria were collected. Pre- and post-operative images were utilized to calculate initial volumes and relative volume reduction (VRR) following ablation. The number of ablation sessions required for each patient was recorded. Clinical outcomes were assessed by evaluating symptom improvement, complication rates, and evidence of recurrence.

Results: Fifty-five thyroid nodules met the above criteria. Five patients had two, separate nodules ablated. The average age was

53.7 years with a majority of the patients identifying as females (84%). The main presenting symptoms included cosmetic concern, dysphagia, and pressure. All nodules were classified as Bethesda II on at least two separate fine-needle biopsies (FNB), aside for 5 nodules classified as Bethesda III on at least one FNB, with benign molecular studies. The average initial volume was 57.4 cc with an average VRR of 81.2%. The average number of ablation sessions was 1.5. Greater than a single ablation was performed in 20 patients. Five of these ablations were performed for recurrence. The remaining ablations were performed as a part of planned, staged ablations. Minor complications occurred in 3 patients including postprocedural nausea (1) and transient hoarseness (2). Nodule rupture, a known complication of nodule ablation, occurred in 2 patients.

Conclusion: The present findings support percutaneous ablation of large benign thyroid nodules as a potential alternative to surgery, particularly for patients seeking less invasive treatment. Nevertheless, larger prospective studies are needed to further define its role, establish standardized staging protocols, and evaluate long-term outcomes and complication rates.

Scientific Session 35

IO–Ablation Science

Wednesday, April 15, 2026

11:15 a.m.–12:45 p.m.

Abstract No. 335

Effect of Thermal Dosimetry, Energy Type, and Concurrent Pharmacological Agent Administration on Infiltration of Lymphocytes into the Periablational Rim



(Article No. 108365)

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Purpose: Thermal ablation is a mainstay of oligometastatic locoregional control. Variable thermal dosimetry results in different periablational cell infiltration and distant off target effects. Similarly, concurrent systemic chemotherapy and anti-inflammatories affect periablational cells. Tumor infiltrating lymphocytes (TILs) play a major role in the development of anti-tumor immunity and are actively recruited by ablation. In this study, we investigate the effects of variable thermal doses, energy types and concurrent administration of systemic agents on ablation-induced TILs in small animal models.

Materials and Methods: Phase IA; 12 rats were randomized into 4 groups for liver RFA (n=3): sham (probe insertion only), standard RFA (Std RFA, 70°C × 5 min), high RFA (Hi RFA, 90°C × 2 min), or low RFA (Lo RFA, 60°C × 10 min). Phase IB; 24 rats were randomized into 4 groups for liver MWA (n=6): low MWA (Lo MWA, 5 W × 120 sec), high MWA (Hi MWA, 20 W × 15 sec), standard RFA, or sham. Phase IC; 16 tumor-bearing rats were randomized into four groups for tumor RFA (n=4), receiving the same treatments as phase IA. In phase II, 12 rats were randomized into 4 groups for liver RFA (n=3): Std RFA alone, sham, Std RFA + cyclooxygenase-2 (COX-2) inhibitor, or Std RFA + liposomal doxorubicin. Animals were sacrificed 7 days post-treatment, ablated liver and tumor were harvested. CD4+ and CD8+ immunohistochemistry was done in the livers and CD4/CD8 ratio was calculated. Flow cytometry was done in the tumors: CD3, CD8, granzyme B, PD1, CD4, CD25, FoxP3.

Results: RFA dosimetry did not result in different lymphocyte infiltration patterns. Interestingly, Hi-MWA resulted in the lowest CD4+ and CD8+ infiltration when compared to Lo MWA and std RFA (p < 0.05). All RF and MW thermal doses produced significantly higher infiltration of CD4+ and CD8+ cells in the periablational rim compared to Sham group (p < 0.05). In RFA-ablated tumors, CD8+ intratumoral infiltration was lowest in sham, and increased with RFA (Sham vs Std/Hi; p < 0.05). CD8+/PD-1+ T cells increased in all RFA groups vs sham (p < 0.05), however, no

difference between RFA groups. Hi RFA resulted in the highest infiltration of CD8+/GzB+ and CD4+/CD25+ T cells (Hi vs. Sham; p < 0.05). COX-2 inhibitor reduced CD4+ cells in the periablational rim vs Std RFA alone (p < 0.05).

Conclusion: Hi MWA settings may result in lower lymphocytes infiltration than Lo MWA. Hi RFA dosimetry may recruit less intratumoral activated CTLs and suppressor T cells. Finally, concurrent anti-inflammatories may inhibit CD4 periablational infiltration.

Abstract No. 336

Using Voltage to Control Ablation Size in Integrated Nanosecond Pulse Irreversible Electroporation (INSPIRE) Treatments



(Article No. 108366)

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Purpose: This study shows the impact of applied voltage on Integrated Nanosecond Pulse Irreversible Electroporation (INSPIRE) administered via a single applicator and grounding pad approach in a healthy liver model.

Materials and Methods: Healthy swine livers were accessed via a percutaneous, ultrasound-guided approach. INSPIRE treatments were delivered using an actively cooled single applicator and distal grounding pad. Treatments were delivered at 3000 V, 4500 V, or 6000 V using 1000 ns or 2000 ns waveforms with a 0.02 s dose and a 45°C temperature set point. One-week post-treatment, contrast-enhanced CTs were acquired before animals were euthanized and livers collected for analysis. A COMSOL model was used to derive the corresponding lethal electric field thresholds. Blood samples were acquired pre-treatment, immediately post-treatment, and prior to euthanasia. Troponin levels were evaluated as a measure of cardiac safety. Muscle stimulation was compared between traditional IRE pulses and INSPIRE treatments with or without neuromuscular paralytic. Stimulation was quantified by videoing an array of markers drawn on the skin which were then tracked in MATLAB to derive acceleration.

Results: All INSPIRE treatments were completed successfully without causing intraoperative adverse events. Ablations were visible on ultrasound within 10 minutes post-treatment. Each treatment took approximately 2-8 minutes to deliver. The largest ablations, achieved with the 2000 ns waveform at 6000 V, measured 4.4 ± 0.7 cm by 2.9 ± 0.1 cm with a lethal threshold of 322 ± 61 V/cm. No elevated troponin levels indicative of cardiac damage occurred for any INSPIRE treatments. Elevated troponin levels were observed in the traditional IRE group during the muscle stimulation experiments, which increased from 0.252 ng/mL prior to treatment to 2.98 ng/mL after treatment. After one week, the troponin level returned to a value below the detection threshold.

Conclusion: INSPIRE can safely achieve predictable and substantially larger ablations than existing single needle IRE

technologies in less time. Joule heating was adequately addressed by active temperature control and applicator cooling. Ablations were visible on ultrasound soon after completion, which may reduce risk of incomplete ablation in a clinical setting. Treatment zones can be adjusted via the applied voltage simplifying treatment planning. Finally, INSPIRE mitigates muscle stimulation and may eliminate the need for cardiac synchronization, improving its safety profile.

Abstract No. 337

Modeling Temperature Changes in a Cryoablation Phantom Using Spectral CT



(Article No. 108367)

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Purpose: Over the past decade, spectral CT-based thermometry has attracted growing interest as a technique for intraprocedural monitoring during cryoablation, particularly for assessment of the critical -20°C to -40°C “kill zone.” To further evaluate and characterize performance, we developed a low-cost phantom model to test the feasibility of spectral CT thermometry within temperature ranges relevant to cryoablation.

Materials and Methods: A tissue phantom was created using compacted ground beef, into which three temperature probes were inserted. The phantom was cooled in a -80°C freezer for 48 hours to simulate cryoablation. Subsequently, the phantom was placed in a spectral CT scanner and allowed to thaw while continuous temperature and intermittent CT data was acquired. Regions of interest were manually segmented at probe tips (containing 533, 604 and 598 voxels). Conventional HU (CHU), Electron Density (ED), and Physical Density (PD) values were obtained across 20 temperature points ranging from -48°C to -11°C . Probe data was combined via an “unpooled” and “pooled” method. Unpooled analysis treated all probe acquisitions separately ($n = 60$ bins; Group A). Pooled analysis was performed by pooling all voxel data corresponding to $n = 20$ (Group B) and $n=15$ (Group C) equally distributed temperature bins ranging from -44 to -11°C . Linear regression was performed on mean voxel values. Noise was estimated using the signal range-to-average standard deviation (SRSD), defined as the range of mean values divided by the average standard deviation of the voxel data for each group and modality.

Results: The average number of voxels for each bin was 578 in Group A, 1648 in Group B, and 2198 in Group C. Proportional to the number of voxels, Group C demonstrated the strongest linearity ($R^2 = 0.82, 0.81$, and 0.85 for CHU, ED, and PD) followed by Group B ($R^2 = 0.61, 0.61$, and 0.76 for CHU, ED, and PD) and Group A ($R^2 = 0.48, 0.58, 0.46$, for CHU, ED, and PD). SRSD values for PD were variable across pooling strategies ($0.35, 0.99$, and 0.93 for Group A, B, and C), whereas SRSD for CHU and ED decreased with increasing pooling ($1.40, 0.52$, and 0.42 for CCT and $1.42, 0.99$, and 0.82 for ED).

Conclusion: Our results show that CHU and calculated ED and PD values correlate strongly with temperature. Differences in R^2 across groups indicate that tissue heterogeneity presents a significant challenge for CT thermometry; however, voxel pooling substantially improves performance. ED and PD exhibited lower noise than CHU. More generalizable models and phantoms are necessary to establish the feasibility of using spectral CT for thermometry.

Abstract No. 338

Phase I Trial of Cryoablation and Immunotherapy in Patients with Adaptive Immunotherapy Resistance, the CEDAR Trial: Cryoablation Challenge Evaluated in Adaptive-Immune Resistance



(Article No. 108368)

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Purpose: We hypothesized that cryoablation performed in metastatic cancer patients, who have previously responded to immunotherapy but who now have disease progression, will be safe and re-initiate an immunological response in the setting of continued standard of care immunotherapy. The primary endpoint was best objective response by iRECIST within 12 months of cryoablation.

Materials and Methods: This study is an open-label, single-center trial that enrolled patients with adaptive immunotherapy resistance (prior response to PD1/PD-L1 based therapy followed by progression as defined by RECIST 1.1). Cryoablation and pre- and post-treatment biopsies were performed. Tumor response was assessed by iRECIST. Correlative studies were performed on tumor tissue and peripheral blood.

Results: Fifteen metastatic solid tumor patients with adaptive immunotherapy resistance were consented and fourteen patients were treated with cryoablation and immunotherapy (5 pembrolizumab, 5 nivolumab, 2 nivolumab + ipilimumab, 1 avelumab, 1 atezolizumab). Twelve patients were evaluable for efficacy (8 RCC, 1 esophageal, 1 melanoma, 1 urothelial, 1 peritoneal mesothelioma). Cryoablation was successful with no post-procedural complications. The best overall response was 58.3% (7/12) iSD, and 41.7% (5/12) iPD. Median PFS and median OS were 7.3 months and 31.9 months. Paired tumor tissue demonstrated a paucity of viable tissue with limited changes in immune cell populations by NanoString. Peripheral blood flow cytometry analysis demonstrated similar immune populations in pre- and post-cryoablation samples and no upregulation in the expression of inhibitory or activation markers was evident. Pre- and post-cryoablation single-cell RNA sequencing of the subset of metastatic RCC patients revealed a largely inactive immune environment with T-cell dysfunction and lack of checkpoint receptor expression.

Conclusion: Cryoablation combined with immunotherapy failed to reverse T-cell dysfunction in metastatic cancer patients who have developed adaptive resistance to prior immunotherapy.

Abstract No. 339

Radiomic Signal Changes Following Histotripsy Ablation of Metastatic Hepatic Lesions



(Article No. 108369)

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Purpose: To characterize radiomic changes between pre- and post-treatment CT imaging in patients undergoing liver histotripsy, with the goal of identifying imaging biomarkers of treatment response.

Materials and Methods: All patients who underwent histotripsy of the liver for metastatic lesions at our institution in the past year were retrospectively reviewed. Sixteen patients received attempted treatment using the Edison HistoSonics system, of whom fourteen were successfully treated. Pre-treatment and approximately one-month post-treatment non-contrast CT scans were collected for the successfully treated patients. All images were resampled to $512 \times 512 \times 512$ voxels, intensity-normalized, and spatially co-registered using affine transformation. Radiomic features were extracted using PyRadiomics and normalized to a 0–1 scale. Delta radiomic values were calculated as the percent change from pre- to post-treatment, and cohort-level averages were reported as mean $\pm$ standard deviation.

Results: Multiple radiomic features demonstrated consistent and interpretable changes following histotripsy:

- Uniformity increased by $+83.1\% \pm 4.9$, reflecting greater voxel homogeneity.
- Mean Intensity decreased by $-22.9\% \pm 4.2$, indicating reduced average signal intensity.
- Sphericity increased by $+30.4\% \pm 4.7$, suggesting more regular lesion geometry.
- Coarseness decreased by $-22.1\% \pm 3.1$, pointing to smoother textures.
- Contrast declined by $-25.8\% \pm 4.4$, indicating reduced internal variability.
- Mesh Volume expanded by $+58.6\% \pm 8.9$, consistent with lesion cavitation.
- GLCM_Energy and GLCM_Homogeneity rose by $+14.2\% \pm 2.7$ and $+13.0\% \pm 2.5$, respectively.
- Kurtosis increased by $+29.1\% \pm 3.8$, while Skewness decreased by $-18.0\% \pm 2.9$, suggesting changes in intensity distribution.
- Surface Area rose by $+16.9\% \pm 3.6$, likely reflecting the increased size of the ablation margins relative to the original lesion.
- GLRLM_LongRunEmphasis and GLSZM_LargeZoneEmphasis increased by $+50.3\% \pm 6.5$ and $+61.7\% \pm 7.8$, respectively.

Conclusion: Radiomic analysis revealed consistent post-treatment changes across multiple features following successful liver histotripsy, including increased uniformity, sphericity, and structural homogeneity, and decreased intensity heterogeneity. These findings support delta radiomics as a promising, non-invasive method for assessing treatment response and optimizing therapeutic parameters

in histotripsy. With a larger sample size, these data may be used to develop predictive models of post-histotripsy treatment response.

Abstract No. 340

Nano-enabled Irreversible Electroporation Ablation Immunotherapy Using M1 Macrophage Cell Membrane-Coated Nanogel



(Article No. 108370)

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Purpose: Irreversible electroporation (IRE) is a promising non-thermal ablation technique that induces both local tumor cell death and systemic immune responses. However, the immunomodulatory impact of nano-enabled IRE immunotherapy approaches with immune-stimulating nanomaterials remains underexplored. This study evaluated the therapeutic potential of a nano-enabled IRE-Immunotherapy combination using a novel M1 macrophage cell membrane-coated nanogel containing graphene quantum dots and zoledronate (M1-GAZ).

Materials and Methods: M1-GAZ was prepared by mixing sodium alginate solution with graphene quantum dots and zoledronate, followed by aluminum ion-induced gelation. Then, M1 macrophage cell membranes were coated on the surface of M1-GAZ through multiple extrusion cycles. CT26 colon carcinoma tumors were established subcutaneously in BALB/c mice. IRE (1000 V, 100 μ s, 80 pulse, 5 mm electrode spacing) was performed, followed by intravenous administration of M1-GAZ. Tumor targeting and bio-distribution of M1-GAZ were evaluated using IVIS imaging. Tumor growth was monitored for up to 24 days. Immune cell infiltration and activation (CD4⁺/CD8⁺ T cells, NK cells, dendritic cells, macrophages, neutrophils) were assessed in spleen and tumor tissues by flow cytometry and histology at day 3 post-treatment.

Results: M1-GAZ demonstrated efficient tumor targeting after IRE, with greater accumulation than control nanoparticles. Nano-enabled IRE-immunotherapy (IRE + M1-GAZ) significantly enhanced the inhibition of tumor growth and infiltration of CD8⁺ T cells, NK cells, and dendritic cells within the tumor microenvironment compared to IRE alone. Augmented systemic immune activation was also demonstrated in the spleen at day 3. Histological analysis confirmed greater tumor necrosis in the nano-enabled IRE-immunotherapy group compared with either monotherapy. No notable toxicity was observed in major organs.

Conclusion: Nano-enabled IRE immunotherapy using M1-GAZ nanogel showed a translational potential with its synergistically enhanced tumor ablation and early immune activation in a solid colon tumor model.

Abstract No. 341

Volumetric Minimum Ablation Margins Predict Local Control Outcomes for Patients Undergoing Renal Cryoablation



(Article No. 108371)

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Purpose: To analyze and establish a volumetric minimum ablation margin (MAM) for T1a renal cell carcinomas treated with CT-guided cryoablation.

Materials and Methods: A retrospective analysis of all CT-guided cryoablations performed for curative intent of T1a renal cell carcinomas was performed (n= 125). Forty-eight were excluded due to MRI guidance or inadequate intraprocedural imaging, yielding a final cohort of 77 patients (mean age 69.0 ± 10.7; 61.5%, male). Intraprocedural images were analyzed in a commercial volumetric software platform (MIM). Both the target lesion and the final (i.e., largest) ice ball were manually segmented, and masks were registered to a common coordinate system. The iceball edge (0°C isotherm) was considered the ablation margin. Utilizing point-to-point geometrical analysis, a computational script was used to identify the closest point on the iceball segmentation surface to every point on the surface of the tumor segmentation. The 0th percentile Hausdorff distance was recorded as the true MAM value. Local recurrence was determined by longitudinal assessment of all available follow up imaging.

Results: In the final cohort, 9 patients developed local recurrence (11.5%). The median lesion size was 3.0 cm (IQR: 1.0). Lesions without recurrence had significantly larger MAMs (3.12 ± 2.13) compared with recurrent lesions (-1.78 ± 3.97 mm; p=0.0001). ROC analysis identified an optimal MAM cutoff of 1.34 mm (AUC 0.89, 95% CI 0.77–1), achieving sensitivity 0.77, specificity 0.82, PPV 0.36, NPV 0.96, and accuracy 0.82. On univariable analysis, larger lesion size (OR 2.5 cm; p=0.033) and smaller MAM (OR 0.39 mm; p=0.003) predicted recurrence, while age was not significant (p=0.84). In multivariable analysis, MAM was the only independent predictor of recurrence (OR = 0.36 mm; p = 0.004); lesion size was not significant (p = 0.506). A full model (lesion size + Age + MAM) had an AUC value of 0.89 (95% CI: 0.80-0.99), similar to the AUC of MAM alone (0.88, 95% CI: 0.77-1). With MAM ≥ 1.34 mm recurrence-free survival was significantly higher, as confirmed by a Cox Proportional Hazard Model (log rank p < 0.001). Each 1-mm increase in MAM reduced recurrence by 32% (HR = 0.68; p < 0.001; c-index = 0.81).

Conclusion: MAM is a key indicator for lesion control. When MAM ≥ 1.34 mm, local recurrence-free survival is significantly higher.

Abstract No. 342

Determination of Ablation Zone Size in Swine Cirrhosis Model



(Article No. 108372)

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Purpose: Complete ablation requires accurate ablation zone size prediction to cover the lesion and a margin. Most manufacturers provide ablation zone sizes by wattage and time based on ablation performed in healthy tissue without underlying disease. The goal of this study was to determine the size of the ablation zone in a

large animal cirrhosis model to see how cirrhosis would affect the ablation size.

Materials and Methods: Cirrhosis was induced in swine using intra-arterial hepatic injection of ethanol and ethiodized oil mixture 1:3 as previously described under anesthesia. After 6-8 weeks post induction procedure, swine underwent microwave ablation under anesthesia. Using ultrasound guidance, 4 ablations were performed on each pig with various parameters using the Intelliblate Ablation System (Varian Medical Systems, Inc). Four settings were tested (90 W×10 min, 30 W×10 min, 90 W×5 min, 30 W×5 min). Ablation zone sizes were measured on ultrasound. Ablation zone dimensions (X [cm], Y [cm]) and area (cm²) were measured in cirrhotic liver tissue and compared to expected values based on normal hepatic animal models. Euthanasia was performed either immediately post ablation or 2 weeks post ablation to assess acute vs chronic changes. Ablation zones were examined on specimens with gross visualization and H&E examination as well as TUNEL. Statistical analysis was conducted using a two-tailed, two-sample equal variance t-test to compare expected versus observed ablation parameters.

Results: In total, 17 ablations were performed on 4 pigs across the four settings. The ablation zones in cirrhotic livers were consistently smaller than the expected values calculated based of in-vivo swine liver model. The difference in ablation size was up to 28% smaller in 90W*10 min (p0.014) and 26% for 30W*5 min (p=0.05). The ablation size of cirrhotic liver showed a tendency to be up to 13% smaller vs. normal liver for 30W*10 min and 90W*5 min but those differences were not statistically significant.

Conclusion: In these cirrhotic swine models produced smaller ablation zones compared to manufacturer provided ablation zone based on healthy swine liver. Despite small sample size, these findings were significant for 90W*10-min and 30W*5-min parameters. These results suggest that ablation zone sizes provided by manufacturers should be adjusted based on underlying liver disease and parameters need to be adjusted to obtain the same ablation size as a normal liver.

Abstract No. 343

Insights from the FDA MAUDE Database on Device- and Patient-Related Adverse Events in the Use of the AngioDynamics NanoKnife System for Irreversible Electroporation



(Article No. 108373)

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Purpose: The AngioDynamics NanoKnife System received FDA clearance in 2011 for the irreversible electroporation of soft tissue, with a next-generation system cleared in 2019 and expanded indications, including prostate tissue ablation in late 2024 following the PRESERVE trial. With its increasing adoption and broadened clinical use, this study aimed to conduct a systematic analysis of adverse events reported in the FDA MAUDE database to characterize the device's safety profile.

Materials and Methods: Adverse event reports linked to the NanoKnife System from February 2015 to August 2025 were extracted from the FDA MAUDE database using the brand name “NanoKnife.” Duplicates were excluded. Reports were categorized into device-related malfunctions and patient-related complications. Frequencies of device problems and patient problems were calculated and analyzed.

Results: A total of 108 reports were included. The most common device malfunctions were failure of device self-test (8.3%), communication or transmission problems (6.5%), arcing of electrodes (5.6%), failure to deliver energy (4.6%), and unexpected shutdown (4.6%). Patient-related complications included arrhythmias (atrial/ventricular fibrillation or tachycardia; 11.1%), fistula formation (9.3%), tissue damage or breakdown (7.4%), hemorrhage/bleeding (6.5%), and thrombosis/thrombus (4.6%). Less frequent events included pain, urinary tract infection, bacterial infection, embolism, obstruction, bradycardia, hypotension, aneurysm, heart failure, cardiac arrest, paresis, movement disorder, and skin discoloration or inflammation. Seven patient deaths (6.5%) were reported, primarily associated with pancreatic and other abdominal organ ablations, often linked to gastrointestinal bleeding or organ failure.

Conclusion: This analysis highlights a range of device malfunctions and patient complications associated with the NanoKnife System as captured in the MAUDE database. The relatively high frequency of fistula formation and cardiac events raises important safety considerations. Ongoing surveillance, operator awareness, and refinements in procedural technique are warranted to optimize the safety and clinical outcomes of irreversible electroporation therapies.

Abstract No. 344

Histotripsy in a Porcine Liver Model: Magnetic Resonance Imaging Radiologic-Pathologic Correlation



(Article No. 108374)

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Purpose: The purpose of this study is to define the correlation between the post-procedural imaging appearance of histotripsy treatment zones and corresponding pathologic specimens.

Materials and Methods: Eleven histotripsy treatment zones were created in ten healthy swine utilizing a clinical histotripsy unit (HistoSonics, Plymouth, MN). Multiplanar, multisequence MRI (GE Healthcare, Waukesha, WI) was performed prior to and following the administration of gadobenate dimeglumine (MultiHance, Bracco, Germany) within one hour following treatment. Immediately following MRI, animals were sacrificed with livers harvested and fixed in formalin for 10-21 days before sectioning through the treatment zone for gross pathologic examination. ImageJ (National Institutes of Health) was used to calibrate measurements on gross pathologic specimens using rulers embedded in each photograph. Orthogonal diameter measurements of each treatment zone, defined as M1 and M2 were then performed. Representative histologic sections were obtained from each treatment zone and margin. Based on the obtained sections, portal venous phase MRI series were reconstructed on a PACS station (Change Healthcare, Richmond, BC, Canada) to match the plane of gross pathologic sectioning utilizing the treatment zone, liver lobe edge, and adjacent blood vessels as internal fiducials. When an adequate registration was obtained, orthogonal measurements of the non-enhancing treatment zone were obtained in matching planes to the gross pathology, also defined as M1 and M2. Treatment zone areas were calculated using these linear measurements and modeled as an ellipse using the formula of $((M1)/2 * (M2)/2) * 3.14159$.

Results: The visible treatment zone at gross pathology was consistent with tissue necrosis at histologic analysis. There was a strong correlation between the cross-sectional area of MRI and gross pathology measurements ($r^2 = 0.70$). The mean area difference between MRI and gross pathology was 0.1 cm^2 . The mean diameter differences between MRI and gross measurements were 0.03 cm for M1 and 0.04 cm for M2. There was a high correlation coefficient between both linear measurements and calculated area on MRI vs. gross pathology ($r^2=0.70-0.75$).

Conclusion: Contrast-enhanced MRI was a reliable biomarker for tissue necrosis following histotripsy in this normal animal model.

344.1.

Correlation of MRI vs Gross Measures

Correlation (r)M1	0.87	M1 r^2	0.75
Correlation (r)M2	0.85	M2 r^2	0.73
Correlation (r) Area	0.84	Area r^2	0.7

Scientific Session 36

Pediatric Interventions

Wednesday, April 15, 2026

11:15 a.m.–12:45 p.m.

Abstract No. 345

Primary Insertion of Low-Profile Balloon Gastrostomy Tubes Versus Conventional Corflo PEG Tubes in Children: A Comparative Case-Control Study



(Article No. 108376)

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Purpose: To compare clinical outcomes, complications, procedural efficiency, and radiation exposure between primary insertion of low-profile balloon gastrostomy tubes using a retrograde (“push”) technique and conventional Corflo PEG tubes using an antegrade (“pull”) technique in pediatric patients.

Materials and Methods: This single-center, retrospective case-control study included 142 children who underwent image-guided gastrostomy tube insertion between November 2021 and November 2024. Seventy-one consecutive patients receiving primary low-profile balloon G-tubes were weight- and age-matched to 71 patients receiving conventional Corflo PEG tubes. Clinical, procedural, and follow-up data were extracted from institutional databases and analyzed, including procedural time, radiation dose indices, adverse events (classified using the Society of Interventional Radiology system), and subsequent interventions.

Results: Median procedural time was shorter in the low-profile group (64 vs 76 minutes, $p < 0.001$). Radiation exposure was lower with low-profile tubes (PKA 0.74 vs 1.25 Gy·cm², $p = 0.04$; Ka,r 4.7 vs 7.7 mGy, $p = 0.05$). Severe adverse events were less frequent in the low-profile group (peritonitis 1.5% vs 5.6%; severe stoma infection 13% vs 18%). Nearly all Corflo patients (86%) required an additional general anesthesia for elective tube exchange, compared with none in the low-profile group. Nutritional outcomes and overall complication rates were comparable between groups.

Conclusion: Primary retrograde insertion of low-profile balloon gastrostomy tubes in children is a safe and effective alternative to

conventional Corflo PEG tubes. This approach reduces procedure time, radiation exposure, and the need for repeat anesthesia, while maintaining equivalent nutritional outcomes. Wider adoption may enhance patient and caregiver experience and optimize healthcare resource utilization in pediatric enteral nutrition.

Abstract No. 346

Long-Term Pulmonary Hypertension-Related Clinical Outcome Analysis of Endovascular Management of Congenital Porto-Systemic Shunts



(Article No. 108377)

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Purpose: Congenital porto-systemic shunts (CPSS) result in the development of pulmonary hypertension (Porto-pulmonary syndrome) and pulmonary arteriovenous malformations (Hepato-pulmonary syndrome). Optimal treatment is expected to improve oxygen saturation and cause reversal of pulmonary vascular remodelling. However, literature on this is limited.

Materials and Methods: A retrospective study was done to recruit patients in whom endovascular intervention was attempted between July 2012 to December 2024 for management of CPSS. Technical Success was defined as successful cannulation of shunt and deployment of suitable device without residual shunting. Clinical Success was defined as 1) Improvement in oxygen saturation between index presentation and during post-intervention follow up 2) Change in degree of pulmonary arterial hypertension based on Echocardiography. Clinical follow-up was done at 3, 6 and 12 months + annually thereafter.

Results: Presence of angiographically detectable portal radicles was seen in 9 patients. Mean portal pressure recorded at baseline was 9+2.9 mm Hg. Mean portal pressure following balloon occlusion was 17.0+5.77 mm Hg. Invasive Mean pulmonary arterial pressure (within 2 months of embolization) was 27.6+17.7 mm Hg. Mean age at presentation was 11 months. Mean age at intervention was 7.4 years. Mean oxygen saturation at presentation was 83.34%. Technical success was achieved in 77.8% (n=7) patients with no angiographically detected residual shunt in 6 patients. Fenestrated device closure was attempted in one patient due to elevated portal pressures on balloon occlusion test. Two unsuccessful patients underwent surgical ligation after clamp test to look for bowel ischemia. Mean follow-up duration was 65 months. Clinical success was achieved in 8 patients at 6 months follow-up. One patient developed Acute DVT at 1-month post-intervention. Two patients had worsening of pulmonary hypertension following shunt closure and required intensification of pulmonary vasodilator regime. Pathophysiological resolution of PAVMs prior to remodelling of pulmonary vasculature—likely explanation.

Conclusion: Endovascular embolization of congenital porto-systemic shunts has a good technical success. Endovascular embolization of congenital portosystemic shunt improves oxygen saturation. The reduction in shunting following embolization aids in reduction of pulmonary arterial pressure. Close follow-up required following embolization to optimize medical management

345.1. Procedural time and radiation exposure in low-profile vs corflo groups

Parameter	Low-Profile (n=71)	Corflo (n=71)	p value
Procedure Time (min)	64	76	< 0.001
Fluoroscopy Time (min)	4.6	7.3	0.008
PKA (Gy·cm ²)	0.74	1.25	0.04
Ka,r (mGy)	4.7	7.7	0.05

PKA = air kerma-area product; Ka,r = reference point air kerma.

Abstract No. 347

Portal Vein Angioplasty Outcomes After Pediatric Technical Variant Liver Graft Transplantation: Single-Center Experience



(Article No. 108378)

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Purpose: Portal vein stenosis (PVS) represents a significant vascular complication following pediatric technical variant liver graft ("split-liver") transplantation. Pediatric recipients face heightened risk due to size mismatch between small recipients and technical variant grafts, often requiring vein grafts for reconstruction. Small caliber pediatric vessels, weight less than 7 kg, and complex anastomoses predispose to stenosis. This study evaluated the results of portal vein interventions for clinically significant PVS in pediatric technical variant liver recipients.

Materials and Methods: This is a single-institution retrospective review of pediatric technical variant transplants (TVLT) from 2000 to the present. A total of 160 transplants were analyzed. PVS was defined by elevated portal flow velocities, CT evidence of stenosis, and clinical findings of portal hypertension. Variables analyzed included donor type, recipient weight, anastomosis type, time to intervention, pressure gradients, repeat treatments, access route, and complications.

Results: Twelve patients (7.5%) developed clinically significant PVS. The average patient age was 12 months (ranging from 5 to 24 months), except for one 8-year-old. Twenty-two procedures were performed with a 91% technical success rate. The mean time to intervention was 459 days. Angioplasty was performed in 18 of 22 procedures, and stenting in 4 of 22. The mean transstenotic gradient decreased from 8.65 to 1 mm Hg. Seven complications were managed conservatively. Assisted primary patency was 92%, and patient survival was 100%.

Conclusion: PVS occurred in 7.5% of pediatric technical variant graft transplants in our single-center review. Percutaneous interventions demonstrated excellent technical success (91%) and patency (92%) with low morbidity. Early intervention provides effective treatment with excellent outcomes, supporting interventional management as the first-line therapy for PVS in this population.

Abstract No. 348

Ultrasound-Guided Ethanol Neurolysis for Anterior Cutaneous Nerve Entrapment Syndrome in Children: A Retrospective Pilot Study



(Article No. 108379)

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Purpose: Anterior cutaneous nerve entrapment syndrome (ACNES) is an underrecognized cause of chronic abdominal wall

pain, resulting from entrapment of the thoracic anterior cutaneous branches (T7–T12) as they traverse the rectus abdominis fascia. In children and adolescents, ACNES can significantly impair quality of life, limiting participation in school and sports, and is often misdiagnosed. Standard therapeutic strategies include local anesthetic infiltration, corticosteroid injections, pulsed radiofrequency ablation, and surgical neurectomy. For refractory cases, pulsed radiofrequency and surgical neurectomy have shown high success rates, with pediatric series reporting 86–100% effectiveness. Chemical neurolysis has also been described historically, primarily using phenol, with encouraging long-term results in adult cohorts. However, modern data are lacking, and no studies have specifically evaluated ethanol neurolysis, particularly in children. Our retrospective pilot study evaluates the feasibility and clinical outcomes of ultrasound-guided ethanol neurolysis in pediatric ACNES.

Materials and Methods: We retrospectively reviewed patients ≤18 years with ACNES who underwent ultrasound-guided ethanol injection between January 2015 and May 2025. Demographics, symptom duration, procedural details, pain scores, complications, and functional outcomes were extracted from the electronic medical record and PACS. The primary outcome was ≥50% pain reduction at first follow-up (2–6 weeks). Secondary outcomes were complications and functional improvement.

Results: Of 15 patients diagnosed with ACNES between 2015 and 2025, 11 met inclusion criteria. All reported lifestyle limitations due to pain. Seven (63%) underwent a single ultrasound-guided ethanol injection and four (36%) required two sessions. Median baseline pain was 8/10 (range 5–10). After treatment, 8 (73%) achieved complete resolution, 2 (18%) had marked improvement, and 1 (9%) developed recurrent pain from another cause. No major complications occurred.

Conclusion: Ethanol neurolysis is a feasible and well-tolerated intervention for pediatric ACNES, providing meaningful pain and functional improvement in the majority of treated patients with minimal morbidity. These findings support ethanol neurolysis as a minimally invasive alternative to surgical neurectomy and warrant prospective evaluation in larger cohorts.

AI Disclosure Statement: During the preparation of this work, the authors used ChatGPT (GPT-5, OpenAI) to improve grammar, spelling, and readability.

Abstract No. 349

Endovascular Treatment of Pediatric Dural Sinus Malformations: A Twenty-Year Multicenter Case Series



(Article No. 108380)

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Purpose: Dural sinus malformation (DSM) is a rare congenital vascular anomaly of dural venous sinuses, classified as midline (type 1) or lateral (type 2). DSMs feature marked sinus dilation that can

cause venous hypertension, hydrocephalus, heart failure, and death. The associated morbidity imposes a significant burden on patients and families, as irreversible neurological injury may ensue without timely recognition and intervention. The existing DSM studies are limited to case reports and small series. Endovascular embolization is the mainstay of treatment, though surgery is occasionally required. We present a multicenter series of 14 pediatric DSMs, highlighting presentations, embolization strategies, and outcomes.

Materials and Methods: The data for this retrospective study were collected from two tertiary centers in Argentina and the United States. Prior to data collection, approval was obtained from Comité de Ética en Investigación (Research Ethics Committee [CEI]) and the institutional review board (IRB). The collected data consisted of demographics (age and gender), symptoms, prenatal diagnosis, imaging modalities used [ultrasound, computed tomography (CT), magnetic resonance imaging (MRI)], angiographic findings and classification (involved sinuses, arterial feeders, retrograde/antegrade flow, and cortical veins reflux), number of embolization sessions, used materials, angiographic and clinical outcomes.

Results: Fourteen pediatric DSM patients were identified across two centers. Median presentation was within the first year of life (5–13 months). Clinical features included macrocephaly, apnea, heart failure, cranial masses, seizures, and focal deficits; three were diagnosed prenatally. Most were midline torcular DSMs, supplied by meningeal branches of the external carotid and vertebral arteries.

Conclusion: DSM is a rare but severe pediatric malformation, typically presenting in early life with life-threatening complications. Endovascular embolization is effective but often requires staged, multimodal treatment. Despite generally good outcomes, morbidity and mortality remain significant, underscoring the need for early recognition, tailored therapy, and long-term follow-up.

AI Disclosure Statement: During the preparation of this work, the authors used ChatGPT (GPT-5, OpenAI) to improve grammar, spelling, and readability.

Abstract No. 350

Feasibility of Low-Field (0.55 Tesla) MRI Scanning for Diagnostic MR Lymphangiography and Image-Guided Thoracic Duct Access



(Article No. 108381)

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Purpose: Dynamic contrast MR lymphangiography (DCMRL) performed on a 1.5 or 3T magnet is the diagnostic reference standard for evaluation of lymphatic anatomy and conduction in lymphatic disorders. Low-field MR for cardiac and lymphatic interventions has inherent advantages, especially for use in image-guided interventions. However, the diagnostic quality of DCMRL performed

at 0.55T is unknown. We assessed the feasibility of using a 0.55T MRI for comprehensive imaging of the lymphatic system (via intranodal inguinal, mesenteric and hepatic lymphatic access) to provide diagnostic-quality imaging of lymphatic anatomy and conduction as well as technically adequate real-time MR-guidance for percutaneous transabdominal thoracic duct (TD) access.

Materials and Methods: In a juvenile porcine model (N=5), ultrasound-guided percutaneous access was obtained in bilateral inguinal lymph nodes, mesenteric lymph nodes and hepatic lymphatics with either 25-gauge spinal needles or prototype 22-gauge Chiba needles with proprietary MR-visible markers (Cook Medical, Bloomington, IL). Pre-contrast T1-weighted VIBE imaging (chest/abdomen/pelvis) was performed on a MAGNETOM Free.Max 0.55T MRI scanner (Siemens, Malvern, PA) followed by serial VIBE acquisitions as diluted gadolinium contrast was administered via each access point. Real-time MR imaging was used to guide transabdominal TD access with prototype 20-gauge Chiba needles and prototype 0.018" or 0.014" guidewires (Nano4Imaging, Germany and Cook Medical, Bloomington, IL), each with proprietary MR-visible markers. A standard grading rubric was used to assess technical and clinical imaging scores.

Results: Percutaneous access and DCMRL imaging were technically successful in the inguinal nodes (5/5 animals), hepatic lymphatics (4/4 animals) and mesenteric nodes (2/3 animals). Technical scores were diagnostic in 10/11 successfully accessed sites and partially diagnostic in the remaining one. Transabdominal cannulation of the TD using real-time MR imaging guidance was successfully performed in 3/4 animals.

Conclusion: Comprehensive imaging of the lymphatic system using a low-field 0.55T magnet is technically feasible, offering diagnostic image quality to assess lymphatic anatomy and conduction and real-time imaging guidance for transabdominal cannulation of the thoracic duct in a juvenile pig model.

Abstract No. 351

Single-Incision Chest Port Placement in Pediatric Patients: A Retrospective Analysis



(Article No. 108382)

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Purpose: Implantable central venous access (CVA) ports are essential to pediatric care, providing stable access for long-term therapies including chemotherapy, antimicrobials, and parenteral nutrition, among others. Traditional techniques use two incisions: one for venous access and one for the port pocket. A single-incision, image-guided approach has been described that minimizes tissue dissection and procedural complexity, with improved cosmesis. This method has been reported in adults but published pediatric experiences are limited. Given children's unique anatomic considerations and long-term CVA requirements, further evaluation is warranted. This study describes procedural metrics, adverse events (AEs), and outcomes of single-incision, image-guided port placement technique in a pediatric cohort.

Materials and Methods: Single-center retrospective review of 60 patients (28 M, median age 7.5 yrs [IQR 4.7–13.7] and weight 24.1 kg

[IQR 17.2–50.8]) with single-incision port placement technique. Demographic, procedural, imaging and clinical data were reviewed. Technical success (TS) was defined as successful port placement with catheter tip at superior cavoatrial junction or superior right atrium. AE rates were expressed per catheter-days (CDs).

Results: TS rate was 98% (59/60). The primary indication was chemotherapy (92%). CVA was obtained via right internal jugular vein in 57 (95%). Median procedure time, fluoroscopic time, and dose area product were 60 min (IQR 60–72), 5.8 min (IQR 3.8–7.9), and 25.76 $\mu\text{Gy}\cdot\text{m}^2$ (IQR 17.13–52.44), respectively. In TS (n=59) procedures, cumulative CDs was 22,322days (median CDs 266days [range 31–1707]). AE rate was 27% (16/59) (0.072per 100CDs), with 4early AEs (< 30days post-procedure) and 12late AEs. In 5 (8%) with central catheter-associated bloodstream infections (0.022per 100catheter-days), 2required removal. There were 10 (17%) mechanical AEs (0.45per 100catheter-days), including 9occlusions (successfully treated with fibrinolysis) and 1migration (required catheter salvage procedure). In 1patient with wound dehiscence, incision revision and primary closure at 44days was performed. At study end, 76% (45/59) of ports were removed electively, 7% (4/59) demised secondary to underlying condition with port in-situ, and 17% (10/59) remained in use.

Conclusion: Single-incision chest port placement in children is feasible and safe, with high TS and low AE rate. This technique may benefit patients in whom avoidance neck incision is desirable, such as those with short neck anatomy, tracheostomy, or local cervical site infection.

Abstract No. 352

Virtual Reality Dissociation as Alternative to Anesthesia/Sedation in Pediatric IR



(Article No. 108383)

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Purpose: As of January 2024's CPT Manual, physicians can report the use of virtual reality dissociation in aid of any other medical procedure. The codes are designed to mimic moderate sedation, and require an "independent, trained observer." One year ago our 100% pediatric academic interventional radiology practice received grant funding to hire the nation's first dedicated in-hospital virtual reality technologist to build out a VR dissociation program as an alternative to sedation and anesthesia for cases in pediatric IR. We report our experience.

Materials and Methods: A retrospective chart review was performed to identify cases where VR Dissociation (CPT 0771T) was reported. Intraprocedural documentation monitoring pain and anxiety were analyzed, as was subsequent reimbursement data. Descriptive statistics were performed.

Results: A total of 65 procedures that would have been offered with anesthesia were instead performed with VR dissociation. The youngest patient was 10 years old, oldest 24 years old, median and mean age 16 years old. Procedures included 19 FNAs, 18 LPs, 7 fluid aspirations, 6 tunneled CVC removals, 5 arthrograms, 4 nontunneled CVC placements, 2 tunneled CVC placements, 2 bleomycin sclerotherapies, 1 PICC placement, and 1 core needle biopsy. 43 procedures (66.2%) were reported to California Childcare Services, which currently maintains a blanket policy disallowing payment for all category 3 codes of this type. Of the remaining 22 cases, 7 (31.8%) have been

successfully reimbursed thus far, with amounts ranging in value between \$25.20 and \$214.23 per case, comparable to moderate sedation codes. Remaining cases are pending claim resolution at this time.

Conclusion: VR Dissociation can be used as an alternative to anesthesia for a variety of IR procedures, and is reimbursable by private insurers at this time.

Abstract No. 353

Transjugular Liver Biopsy in Pediatric Patients



(Article No. 108384)

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Purpose: Data on transjugular liver biopsy (TJLB) in children are limited. This study evaluates TJLB utility, risks, and clinical impact in children at a tertiary, liver-transplant medical center.

Materials and Methods: A retrospective review of pediatric TJLBs (≤ 18 years, 11/1/1996–June 1, 2025) assessed indications, success, complications, histology adequacy, and management changes.

Results: 129 pediatric TJLBs were performed in 111 children (mean age 11.7 ± 4.9 years). Technical success yielding pathologic diagnosis was 100%. 66.7% procedures yielded >11 portal tracts; all were diagnostic. Three (2.3%) TJLB had minor complications (Society of Interventional Radiology Class C): hemoperitoneum (n=2) and duodenal hematoma (n=1). Patients were managed with blood transfusion; no active hemorrhaging was seen on post-procedural imaging and no additional intervention was needed. Risk of complication did not correlate significantly with pre-procedural INR, platelets, or hemoglobin. Mean fluoroscopy time was 9.5 ± 9.5 minutes. Average INR was 1.4 ± 0.4 and platelets and $142 \pm 133 \times 10^9/\text{L}$ at TJLB. Mean hemoglobin change 4 hours post-procedure was $-0.3 \pm 9.7 \text{ g/dL}$. Four (3%) patients weighed $< 10 \text{ kg}$, 30 (23%) weighed $10\text{--}30 \text{ kg}$, and 95 (74%) $>30 \text{ kg}$. Weight was not associated with fluoroscopy time, success, or complications. Forty biopsies (31%) were in liver transplant patients (15 split, 25 orthotopic). Fluoroscopy times averaged 4.7 ± 4.6 (split) and 7.7 ± 6.3 minutes (orthotopic, $p=0.1$). There were no statistically significant difference or complications (0%).

Conclusion: TJLB is a safe, effective procedure with 100% tissue yield and a low (2.3%) minor complication rate in children of various weight and in those with split or orthotopic transplant, supporting its value as a reliable diagnostic tool in pediatric hepatology.

353.1.

	Split (N=15)	Orthotopic (N=25)	P value
INR	1.4 (0.4)	1.4 (0.45)	0.65
Platelet ($\times 10^9/\text{L}$)	196.5 (128.9)	159.6 (81.2)	0.27
Hg change	10.6 (1.7)	10.6 (1.95)	0.92
LOS (days)	15.5 (32.3)	23.36 (51.7)	0.60
Fluoroscopy time (minutes)	4.7 (4.6)	7.7 (6.4)	0.13
Complication	0 (0.0)	0 (0.0)	N/A

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Wednesday, April 15, 2026

11:15 a.m.–12:45 p.m.

Abstract No. 354

Analysis of Radiation Segmentectomy Treatment Planning in DOORwaY90: Selective Internal Radiation Therapy Using SIR-Spheres Y-90 Resin Microspheres as First-Line Treatment for Unresectable Hepatocellular Carcinoma Patients



(Article No. 108386)

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Purpose: DOORwaY90, a prospective, multicenter, open-label, single-arm study, evaluated the safety and efficacy of ⁹⁰Y-resin microspheres as first-line treatment for local tumor control in unresectable HCC. Patients were treated using partition dosimetry with T:N = 1 for radiation segmentectomy patients (2 or few segments).

Materials and Methods: Trial inclusion criteria: HCC patients ineligible for resection or ablation, BCLC A-C with maximal single lesion size ≤ 8 cm, and sum of diameters ≤ 12 cm. Sixty-one patients from 18 centers were treated using radiation segmentectomy with planned target mean dose to the perfused volume from 150-400 Gy. Cone beam CT or Angio CT imaging and T99m MAA SPECT/CT were used for treatment planning. All patients were treated with 3 Day pre-calibration microspheres. All treatment plans were reviewed with the site PI and national PIs using MIM software for contours and volume calculation. Post treatment SPECT/CT and PET/CT were used for treatment dose verification.

Results: The median and mean planned doses for radiation segmentectomy 300.0 (150.0-400.0) and 319.8 ± 79.5. The median planned perfused volume of treatment was 249 mL (31-456 mL). The median and mean actual tumor doses 566.4 (121.4-1915.3) and 633.5 ± 373.7. The ORR for the study was 98.5% with a CR of 92.5%.

Conclusion: Interim analysis of DOORwaY90 data demonstrated a positive study with favorable safety and efficacy and very high CR rates for radiation segmentectomy.

Abstract No. 355

Histopathologic Analysis of Intrahepatic Cholangiocarcinoma Treated with Transarterial Radioembolization Using Yttrium-90 Resin Microspheres



(Article No. 108387)

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Purpose: To evaluate the histopathologic effects of resin Yttrium-90 Transarterial Radioembolization (⁹⁰Y-TARE) on intrahepatic cholangiocarcinoma (iCCA), and correlate dose with outcomes.

Materials and Methods: This retrospective, single-center study included adult patients with iCCA treated with ⁹⁰Y-TARE using resin microspheres. Histopathologic and dosimetry results were evaluated. Imaging response was assessed. Complete pathologic necrosis (CPN) was defined as 100% tumor necrosis, and extensive necrosis as >90% necrosis. Treatment factors affecting the pathologic necrosis rate were evaluated. Receiver operating characteristic curve (ROC) analysis was used to assess the ability of prescribed dose to predict extensive necrosis, with the optimal cut-point determined by the Youden index.

Results: For 18 patients, the median age was 69 years [IQR, 67-71 years], with 56% male, and median tumor size of 6.4 cm [IQR, 5.1-8.2 cm]. Surgical resection was performed 127 [IQR, 100-182] days after ⁹⁰Y-TARE. CPN was achieved in 4/18 (22%) patients, with extensive necrosis in 13/18 (72%) patients. ROC analysis demonstrated that the prescribed dose predicted extensive necrosis with an AUC of 0.84 (95% CI: 0.64–1.00). The optimal cutoff was 180 Gy, yielding a sensitivity of 77% and a specificity of 80%. Extensive necrosis rate was higher in patients with a prescribed dose ≥ 180 Gy (10/11 [91%]), compared to patients with a prescribed dose < 180 Gy (3/7 [43%], p = 0.03). Patients treated with ⁹⁰Y-TARE as a first line treatment had higher odds of achieving extensive necrosis compared to patients who received ⁹⁰Y-TARE after chemotherapy (OR = 11, p = 0.047). All lesions classified as complete response by mRECIST at the 3-month evaluation exhibited extensive necrosis, corresponding to a sensitivity of 58% and a positive predictive value (PPV) of 100%.

Conclusion: ⁹⁰Y-TARE with resin microspheres is associated with a CPN rate of 22% and extensive necrosis rate of 72% in iCCA, with a prescribed dose of ≥ 180 Gy predicting extensive necrosis.

Abstract No. 356

Volume of Underdosed Tumor Predicts Survival After Radiation Segmentectomy of Hepatocellular Carcinoma Using Resin Microspheres



(Article No. 108388)

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Purpose: To evaluate survival and progression outcomes among hepatocellular carcinoma (HCC) patients treated with radiation segmentectomy (RS) using resin microspheres prescribed using the single-compartment model and correlate with posttreatment dosimetry.

Materials and Methods: This retrospective, single-center study included adult patients with HCC who were treated with RS using ⁹⁰Y resin microspheres prescribed using the single-compartment

model between July 2014 and June 2025. Survival and progression were evaluated using Kaplan-Meier analysis, with the log-rank test. Tumor response and progression were evaluated using the modified Response Evaluation Criteria in Solid Tumors (mRECIST). Posttreatment voxel-based dosimetry was done in patients with a single HCC lesion and available post-90Y PET/CT or SPECT/CT to generate dose-volume histograms. Mean tumor absorbed dose, as well as the dose absorbed by 95% (D95) of tumor volume, were identified.

Results: Among 116 patients (median age, 69 years [IQR, 63-75], 78% males) with 138 tumors, 77 patients (71%) were treatment naïve, and 80 patients (69%) were BCLC stage 0-A. Median follow-up period was 20 months (IQR, 11-35 months). Median posttreatment overall survival (OS) after censoring to transplant and resection was 39 months (95% CI: 31, not reached). 1-, 3- and 4-year OS rates were 81%, 53% and 49%, respectively. Among the 23 patients who underwent liver transplantation or resection following RS, 21 (91%) were alive at the end of the study period. Based on overall mRECIST, median time to progression was 17 months (95% CI: 10, 33). Treatment naïve patients had significantly longer progression-free survival (PFS) compared to patients who received previous treatment (median PFS: 17 vs 6 months, $p = 0.02$). Patients with tumor in vein (TIV) had shorter PFS compared to patients without TIV (4 vs 16 months, $p = 0.027$). Achieving a mean tumor dose ≥ 200 Gy and D95 ≥ 72 Gy were associated with longer PFS ($p < 0.0001$ and $p = 0.0007$, respectively). Additionally, patients in whom $< 30\%$ of tumor volume received a dose below 100 Gy (V0-100) had longer OS and time to progression (OS: not reached vs 11 months, $p = 0.0007$, TTP: 27 vs 3.5 months, $p = 0.01$, respectively), compared to those with V0-100 $> 30\%$ of tumor volume.

Conclusion: Patients with HCC treated with RS using 90Y resin microspheres had a median OS of 39 months, with a 4-year survival probability of 49%. Achieving an underdosed tumor volume $< 30\%$ was associated with improved survival and progression outcomes.

Abstract No. 357

Safety and Efficacy of Superselective Y90 with Resin in 3 Cm or Smaller Liver Lesions



(Article No. 108389)

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Purpose: There is limited data on superselective tumor coverage (STC) radioembolization for treatment of liver lesions using yttrium 90 (y90) resin microsphere doses determined by using a single-compartment medical internal radiation dosimetry (MIRD) model. The newer dosing options for resin include 6, and 7 day pre-calibrated doses, which have less spheres and higher GBq activity per sphere. Our purpose is to evaluate the efficacy and safety of STC treatment of liver lesions 3 cm or smaller with y90 resin microspheres using a single-compartment MIRD model and evaluate response on follow up imaging based on Modified Response Evaluation Criteria in Solid Tumors (mRECIST) criteria

Materials and Methods: This retrospective single-center study included 13 liver lesions 3 cm or smaller in 9 adults who underwent STC with y90 resin microspheres. 12 lesions were HCC and 1 lesion was mCRC. 6 and 7 day precalibrated y90 STC doses between January 2025 and July 2025 were included and post-treatment SPECT/CT or PET/CT were performed. Adverse events were assessed using the Common Terminology Criteria for Adverse Events (CTCAE), version 5.0. Per-lesion response rates were assessed at imaging using mRECIST

Results: Among 13 liver lesions, 12 achieved complete response (92.3%) and 1 achieved partial response (7.7%) at 2-3 month follow up MRI. 7 patients had no adverse events and 2 had mild abdominal pain, classified as Grade 1 CTCAE. Dosing was calculated utilizing single compartment MIRD model at a range between 250-400 Gy with mean calculated dose 370 Gy. Liver toxicity, assessed through AST/ALT and bilirubin levels showed no significant increases post procedure. All grade 1 reported adverse events resolved within two weeks. 1 patient with 3 lesions was successfully bridged to transplant. Explant demonstrated complete pathologic necrosis

Conclusion: Our preliminary data suggests Y-90 STC radio-embolization with 6 and 7 day resin dosing with MIRD model in 3 cm or smaller lesions is safe and effective without significant adverse effects

Abstract No. 358

High-Specific-Activity Resin Yttrium-90 Radiation Segmentectomy of Hepatocellular Carcinoma: A Study of Effectiveness, Safety, and Dosimetry Considerations



(Article No. 108390)

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Purpose: To evaluate efficacy, safety, voxel-based dosimetry, and particle density of high-specific-activity (HSA) resin-based (RB) Yttrium-90 radiation-segmentectomy (Y90-RS) of hepatocellular carcinoma (HCC).

Materials and Methods: All 4- and 5-day pre-calibration (DPC) Y90-RS performed on patients with HCC were identified between July 2023 and May 2025. mRECIST and CTCAE v5 were utilized to assess both tumor-response and treatment adverse-events (AE) at 3, 6, and 12 months. Voxel-based dosimetry analysis on post-Y90 SPECT/CT was performed to create tumor-dose (TD) volume-histograms and particle density (PD) assessment. Receiver-operator-characteristics curves were used to evaluate the dose-thresholds able to predict a tumor complete-response (CR) in relation to TD and PD. Variable differences were assessed with a student's t and the chi-square tests.

Results: 60HCC patients (63tumors) underwent HSA RB Y90-RS (62% 4-DPC). Overall, the cohort was 62% male, median age

66years, and with 95% solitary HCC. At 3months, overall tumor control was 100% and CR was 79%. HSA RB Y90-RS was well-tolerated with no ≥ 3 -grade AEs. Total mean TD was 423Gy, with the CR cohort showing higher mean TD than the incomplete response cohort (546Gy vs 299Gy; $p=0.0003$). Mean-PD and Mean-TD thresholds able to predict CR were 73,131microspheres/mL (AUC=0.80) and 416Gy (AUC=0.82), respectively. D95TD of >245 Gy was associated with CR (AUC=0.76).

Conclusion: Curative intent ablative Y90-RS of HCC with HAS RB microspheres is safe and efficacious. A mean TD threshold of 416Gy and a tumor PD of 73,131microspheres/mL are associated with a tumor CR.

358.1. Tumor response at 3, 6, and 12 months as per the Modified Response Evaluation Criteria in Solid Tumors (mRECIST). Objective response was defined as complete and partial tumor response. Disease control was defined as objective response and stable disease.

mRECIST	3 Months (N=63)	6 Months (N=45)	12 Months (N=31)
Complete Response	50 (79%)	39 (87%)	25 (86%)
Partial Response	12 (19%)	6 (13%)	4 (14%)
Stable Disease	1 (2%)	0 (0%)	0 (0%)
Progressive Disease	0 (0%)	0 (0%)	0 (0%)
Objective Response	62 (98%)	45 (100%)	29 (100%)
Disease Control Rate	63 (100%)	45 (100%)	29 (100%)

Abstract No. 359

Predictors of Hepatic Decompensation Post-Y90 Treatment in Hepatocellular Carcinoma: New Insights into Segmental TARE and Post-Treatment Dosimetry



(Article No. 108391)

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Purpose: Hepatocellular carcinoma (HCC) is a leading cause of cancer mortality, with transarterial radioembolization (TARE) using yttrium-90 (Y90) microspheres offering viable treatment for unresectable cases. Specifically, segmental TARE has shown great efficacy and safety profile by multiple studies; however, hepatic decompensation remains a potential risk. This study investigates predictors of decompensation post segmental Y90 TARE.

Materials and Methods: This retrospective cohort included 102 HCC patients who underwent segmental Y-90 TARE between 2015 and 2024. Baseline demographic, clinical, laboratory, and imaging data were collected. Hepatic decompensation was defined as a new or worsening episode of ascites, hepatic encephalopathy, or a bilirubin elevation >3 times the upper limit of normal within 3 ± 1 month post-TARE. Post-treatment dosimetry was performed using SPECT/CT and MIM software. Univariate and multivariate logistic regression models were used to identify predictors of hepatic decompensation.

Results: Hepatic decompensation occurred in 14 patients (13.7%). Univariate analysis showed decompensation is associated with baseline hypoalbuminemia (< 3.5 g/dL), higher MELD and ALBI scores, Child-Pugh class B/C, INR ≥ 1.2 , lower WBC count, and higher ALP. Post-treatment dosimetry showed significantly lower absorbed radiation treatment doses (133 Gy vs. 196 Gy, $p=0.01$) and smaller liver volumes (1536 cm³ vs. 1699 cm³, $p=0.02$) in the decompensation group. Multivariate analysis identified baseline hypoalbuminemia (< 3.5 g/dL) as the only independent predictor of decompensation (OR=7.98, 95% CI 1.16–80.39, $p=0.04$).

Conclusion: Despite its high efficacy and safety profile, hepatic decompensation can occur in patients with HCC undergoing segmental TARE. Baseline hypoalbuminemia was an independent predictor of hepatic decompensation in this cohort.

359.1.

Variable	No decompensation N=88	Decompensated N=14	P-value
Mean Tumor Absorbed dose† Gy	500(333,804)	394(303,419)	0.05
Mean Angiosome absorbed dose† Gy	196(137,284)	133(117,155)	0.01*
Liver volume† mL	1699(1411,2146)	1536(1346,1664)	0.02*
Segment volume† mL	275(195,431)	322(290,371)	0.3
Tumor volume† mL	15.8(9.95,35.9)	14.3(6.17,23.9)	0.4
Microsphere Type‡			0.3
Resin	30(34.1%)	8(57.1%)	
Glass	58(65.9%)	6(42.9%)	

Dosimetric and volumetric data for predicting hepatic decompensation in segmental TARE. 359.1† Continuous variables are reported as median (interquartile range). ‡ Categorical variables are reported as number (percentage).

Abstract No. 360

Streamlining Radioembolization with Yttrium-90 Resin Microspheres for Colorectal Liver Metastasis < 7 cm



(Article No. 108392)

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Purpose: To evaluate the safety and efficacy of streamlining radioembolization using yttrium-90 resin microspheres without lung shunt fraction (LSF) assessment in patients with colorectal liver metastases (mCRC) smaller than 7 cm.

Materials and Methods: This single-center retrospective study included 32 patients with mCRC who underwent radioembolization between June 2021 and April 2025. Eligibility criteria were target tumor < 7 cm, no prior local therapy, treatment with resin microspheres, omission of LSF measurement, and at least one follow-up image. Radiation activity was prescribed based on tumor location, liver function, and clinical setting, using both single-compartment and partition dosimetry. Post-treatment Y-90 PET/CT dosimetry was performed in 15 patients. Clinical outcomes, tumor response, and treatment-related toxicity were analyzed.

Results: Median administered activity was 0.50 GBq (IQR, 0.41–0.82). Median mean absorbed dose (mAD) to perfused tissue was

136 Gy, and median tumor absorbed dose (TAD) was 347 Gy by partition dosimetry. Post-treatment PET/CT analysis (n=15) showed a median TAD of 432 Gy with a median tumor-to-normal ratio of 3.9, demonstrating moderate correlation with estimated partition dosimetry ($r=0.65$, $p=0.009$). Median follow-up was 16.2 months. The best tumor responses were complete response in 12.5%, partial response in 59.4%, and stable disease in 28.1%. One- and two-year local tumor progression-free survival rates were 67.9% and 52.8%, respectively, with a median overall survival of 22.7 months. No patient developed radiation pneumonitis or radioembolization-induced liver disease.

Conclusion: Streamlining radioembolization without LSF assessment appears safe and effective for patients with mCRC < 7 cm, achieving favorable tumor control and survival outcomes with low toxicity.

Abstract No. 361

Outlining Variations and Limitations in ^{90}Y -SIRT Dosimetry: Impacts on Dose Thresholds for Response and Toxicity



(Article No. 108393)

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Purpose: Further studies linking dosimetry with response and toxicity remain highly relevant in ^{90}Y -SIRT, but a primary issue is the lack of standardization in dosimetry methods and reporting. Previous guidance has identified different planning dose thresholds between glass and resin devices to increase response probability and limit toxicity. Additionally, glass and resin have minimal overlap with respect to specific activity, affecting absorbed dose/microsphere concentration relationships. Recent research has highlighted systematic vendor activity calibration biases (VAC-bias) for glass (true activity ~20% lower) and resin (~25% greater), yielding an absolute difference of ~50% between devices. Here, the ^{90}Y -SIRT dosimetry literature was critically examined for both glass and resin to explore variations in methodology and their impacts on dose-response assessments.

Materials and Methods: A search of the PubMed database was conducted from 2014 onwards for ^{90}Y -SIRT dosimetry and HCC tumor response studies. Mean/median tumor absorbed dose and dose thresholds associated with objective response (OR) were collected. Variations in dosimetry imaging modality and computational details such as activity normalization (self-calibration to VOI, calibration factor yielding Bq/mL) were identified. The impact of VAC-bias on dose thresholds for response and toxicity was also assessed.

Results: Twenty-nine studies were included, with roughly equal splits for device (19 glass, 14 resin) and dosimetry approach (12 pre-therapy, 19 post-therapy). Most studies utilized voxel dosimetry, but other details like activity normalization were highly varied or ambiguous. Mean/median doses for OR ranged from 194 to 564 Gy for glass and 102 to 263 Gy for resin. In one head-to-head glass vs resin study, threshold doses for response between devices were < 1% different *before* correcting for VAC-bias. In a similar study, an initial 25% difference was made roughly equal *after* accounting for VAC-bias. Differences in mean lung dose

associated with radiation pneumonitis were decreased after bias corrections, with glass vs resin changing from (41 vs 21 Gy) to (33 vs 26 Gy).

Conclusion: Determining the optimal therapeutic index in ^{90}Y -SIRT requires accurate dose-response and dose-toxicity thresholds. Aggregating accurate dosimetry and outcome data within and across devices will facilitate improvement of response/toxicity models. To maximize the impact of ^{90}Y -SIRT patient studies, standardized dosimetry approaches including an absolute dosimetry scale without VAC-bias are crucial.

Abstract No. 362

Comparative Effectiveness of Transarterial Chemoembolization Versus Transarterial Radioembolization for Hepatic Metastases from Uveal Melanoma: A Multi-institutional Analysis



(Article No. 108394)

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Purpose: In patients with uveal melanoma and hepatic metastases, outcomes remain poor, and the optimal liver-directed therapy is not well defined. This study compared survival outcomes between transarterial chemoembolization (TACE) and transarterial radioembolization (TARE) using a large federated health research network.

Materials and Methods: We conducted a retrospective cohort study using the TriNetX US Collaborative Network, encompassing 71 healthcare organizations. Patients with uveal melanoma (ICD-10: C69.2–C69.4) and secondary liver metastases (ICD-10: C78.7) treated with either TACE or TARE were identified. The TACE cohort (n=135) included patients undergoing chemoembolization, while the TARE cohort (n=250) received yttrium-90 radioembolization. Propensity score matching generated 120 well-balanced pairs. The primary outcome was overall survival, analyzed using Kaplan–Meier curves survival analysis and Cox proportional hazards regression. Secondary analyses assessed risk ratios and event frequency.

Results: After matching, baseline demographics were balanced between groups (mean age: TACE 62.6±12.0 vs TARE 63.4±11.2 years; $p=0.571$). Mortality was 60.0% (72/120) in the TACE group versus 57.5% (69/120) in the TARE group (risk difference 2.5%, 95% CI: -10.0% to 15.0%, $p=0.694$). Median survival was shorter for TACE compared to TARE (320 days vs 524 days). Kaplan–Meier analysis showed a trend toward improved survival with TARE, though this did not reach statistical significance (log-rank test $p=0.064$). The hazard ratio for death was 1.367 (95% CI: 0.981–1.905, $p<0.001$) favoring TARE over TACE.

Conclusion: In this multi-institutional analysis of uveal melanoma patients with hepatic metastases, TARE demonstrated a trend toward longer median survival compared with TACE, though statistical significance was not achieved. The hazard ratio suggests a potential survival benefit with TARE. These real-world

data support future larger prospective studies to clarify the role of TARE in optimizing liver-directed therapy for this high-risk population.

Abstract No. 363

Hepatic Vein Occlusion During 90Y Radioembolization in Patients with High Lung Shunt Fraction: Quantitative Analysis of 99mTc-MAA SPECT/CT and 90Y PET/CT



(Article No. 108395)

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Purpose: To quantify lung shunt fraction (LSF) reduction with hepatic vein occlusion (HVO) during yttrium-90 (⁹⁰Y) trans-arterial radioembolization (TARE) by analyzing LSF on pre-treatment technetium-99 (^{99m}Tc) macroaggregated albumin (MAA) SPECT/CT and post-treatment ⁹⁰Y PET/CT.

Materials and Methods: A retrospective, single-center study of 17 patients treated with TARE with and without HVO from 2024-2025 was performed. Inclusion criterion was full lung coverage on post-treatment ⁹⁰Y PET/CT. Eight patients (median age 74 years; primary liver malignancy 75%) underwent TARE with HVO (glass N=5, resin N=3; lobar N=4, segmental N=4) for high LSF or estimated lung dose >30 Gy. If high LSF was suspected due to intra-tumoral shunting into hepatic veins, temporary or permanent

HVO was performed in dominant draining hepatic veins corresponding to the TARE treatment territory during infusion of ⁹⁰Y microspheres. Nine consecutive control patients without high LSF (median age 72 years; primary liver malignancy 67%) underwent TARE without HVO (glass N=4, resin N=5; bilobar N=1, lobar N=3, segmental N=5). LSF was measured on 1) pre-treatment ^{99m}Tc-MAA planar imaging (LSF_{planar}), 2) pre-treatment ^{99m}Tc-MAA SPECT/CT (LSF_{SPECT}), and 3) post-treatment ⁹⁰Y PET/CT (LSF_{PET}). Absolute and relative change from LSF_{SPECT} to LSF_{PET} were recorded. Paired statistical analysis was performed with Wilcoxon signed-rank test.

Results: In control patients, median LSF_{planar} was 3.0% (range 1.1-10.4%) and median LSF_{SPECT} was 1.7% (range 0.8-5.9%). Median LSF_{PET} was 1.9% (range 0.4-4.6%), which was lower than LSF_{planar} (p=0.004) but comparable to LSF_{SPECT} (p=0.80). HVO was technically feasible in 7 patients (88%) with 1 patient not feasible due to central hepatic vein tumor thrombus. In feasible patients, HVO was performed with temporary balloon occlusion (N=6, 86%) and permanent vascular plugs (N=1). Median balloon occlusion time was 30 minutes (range 5-60 minutes). In HVO patients, median LSF_{planar} was 20.1% (range 10.0-32.0%) and median LSF_{SPECT} was 11.1% (range 3.6-18.4%), respectively. Median LSF_{PET} was 3.4% (range 0.4-15.6%), significantly lower than both LSF_{planar} (p=0.016) and LSF_{SPECT} (p=0.016). From LSF_{SPECT} to LSF_{PET}, HVO had a median absolute LSF change of -6.9% (range -9.6% to -3.2%) and a median relative LSF change of -66.7% (range -88.9% to -52.2%). No HVO patients developed radiation pneumonitis.

Conclusion: Quantitative analysis of LSF on pre-treatment ^{99m}Tc-MAA SPECT/CT and post-treatment ⁹⁰Y PET/CT supports HVO as a promising technique for LSF reduction in select patients with high LSF.

Scientific Session 38

Venous Interventions 2

Wednesday, April 15, 2026

11:15 a.m.–12:45 p.m.

Abstract No. 364

IVC Filters in Acute Pulmonary Embolism: A National Inpatient Sample Propensity-Matched Analysis of In-Hospital Outcomes (2016–2020)



(Article No. 108397)

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Purpose: To evaluate the association between inferior vena cava (IVC) filter placement and in-hospital outcomes among adults hospitalized with acute pulmonary embolism (PE), including effect modification by hemodynamic stability.

Materials and Methods: We performed a retrospective cohort study using the National Inpatient Sample (2016–2020). Adult hospitalizations with a principal diagnosis of PE were identified by ICD-10 codes. The exposure was IVC filter placement (ICD-10-PCS). Propensity score matching (1:3) was used to balance 27 covariates with exact matching on PE stability (stable vs unstable). Logistic regression estimated the adjusted odds of in-hospital mortality; generalized linear models estimated length of stay (LOS) and total hospital charges. Pre-specified subgroup analyses assessed interaction by PE stability.

Results: Of 196,231 PE hospitalizations, 186,845 met inclusion criteria; 10,719 (5.7%) received an IVC filter. Use declined from 6.8% (2016) to 4.8% (2020) (p for trend < 0.001). Propensity matching yielded 10,714 IVC-filter cases and 34,708 controls ($n=45,398$). In the matched cohort, in-hospital mortality was 4.5% with filters vs 5.1% without (adjusted OR 0.87, 95% CI 0.78–0.96; $p=0.008$). IVC filter placement was associated with greater resource utilization: mean LOS 7.99 vs 4.50 days (rate ratio 1.77, 95% CI 1.74–1.81; $p<0.001$) and mean charges \$118,943 vs \$51,981 (rate ratio 2.29, 95% CI 2.23–2.35; $p<0.001$). Subgroup analysis demonstrated significant interaction by clinical severity: in unstable PE, mortality was lower with filters (23.6% vs 42.1%; interaction $p<0.001$), whereas in stable PE, mortality was slightly higher with filters (1.91% vs 1.13%).

Conclusion: In a large, contemporary US cohort, IVC filter placement was associated with a modest reduction in in-hospital mortality overall, driven by substantial benefit in hemodynamically unstable PE, but not in stable PE. Filter use was consistently

linked to longer hospitalizations and higher charges. These findings support selective, stability-guided IVC filter use and underscore the need to weigh short-term survival benefits against increased resource utilization and potential longer-term risks highlighted in prior literature.

Abstract No. 365

Symptomatic and Life-Threatening Adverse Events for IVC Filters Are More Likely to Be Related to Older Shelf Life Products: A MAUDE Database Analysis



(Article No. 108398)

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Purpose: Inferior vena cava (IVC) filters carry risks of delayed complications; while increased dwell time is known to worsen outcomes, the role of device shelf life remains poorly defined. This study evaluates whether filters implanted later in their shelf life are associated with higher rates of symptomatic or severe adverse events.

Materials and Methods: A retrospective review of the FDA MAUDE database identified 34,372 IVC filter adverse event reports reported since April 2019. Reports with both manufacture and event dates were analyzed ($n=759$) across a 3-year follow up period.

Results: Among 759 reports, mean patient age was 53.0 years, and 50.4% were female. Severe outcomes (life-threatening or death) occurred in 26.7%, and 35.3% required reintervention. Thrombosis/occlusion ($n=195$) and cardiovascular injury ($n=170$) were most frequently life-threatening (57.9% and 20.6%) patient problems. Malposition ($n=280$) and deployment/removal complications ($n=257$) were most common device issues, each linked to life-threatening outcomes in 21–26% of cases. Symptomatic events ($n=449$) occurred later post-manufacture than asymptomatic events (median 242 vs. 190 days, $p<0.0001$). Life-threatening events ($n=197$) also occurred later than less severe outcomes (328 vs. 195 days, $p<0.0001$). Devices implanted later in shelf life showed higher rates of symptomatic and severe complications, with variability across brands. Adverse events for nitinol filters occurred significantly later than those constructed of Conichrome (242 days vs. 145 days, $p<0.0001$). Nitinol devices were more frequently associated with vascular, thrombotic, and pain-related symptoms compared with Conichrome devices ($p<0.0001$). Patients with Conichrome devices were more often asymptomatic ($p<0.0001$). There were no significant differences in hemodynamic or respiratory symptoms ($p=0.4463$ and $p=1.0000$, respectively).

Conclusion: IVC filter adverse events with symptomatic or life-threatening outcomes are more common when devices are implanted later in shelf life and device material influences both the timing and severity of these adverse events. Device age should be considered in clinical decision making as an underappreciated risk factor for severe complications.

Abstract No. 366

Correlation of Pre-procedure Deep Venous Reflux with Need for Repeat Intervention in Venous Insufficiency: A Retrospective Review



(Article No. 108399)

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Purpose: Symptomatic venous insufficiency is frequently associated with superficial and deep venous reflux (DVR). While superficial ablation is a mainstay of treatment, recurrent symptoms requiring repeat intervention remain common. The association between pre-procedure DVR and the need for repeat intervention is not fully characterized. The purpose of this study is to evaluate that relationship.

Materials and Methods: We performed a single-center retrospective review of 197 patients (n = 198 limbs) who underwent endovenous intervention between 2023 and 2025. Patients were included if pre-procedure duplex ultrasound data were available, including reflux time (seconds) and vein diameter (cm) for common femoral, femoral, popliteal, and saphenofemoral junction segments. Post-procedure duplex data were collected when available. Patients were stratified by DVR duration categories (< 1 s, 1–2 s, ≥ 2 s) and compared between initial interventions (n = 177, 89%) and initial interventions that resulted in repeat interventions (n = 20, 11%). Chi-square tests were used to assess associations between DVR duration and repeat intervention.

Results: Pre-procedure DVR was most common in the common femoral vein (CFV) and femoral vein (FV), with 76 limbs demonstrating > 1 s reflux and 42 limbs demonstrating ≥ 2 s reflux in each segment. Popliteal reflux was less frequent, present in 19 limbs with > 1 s reflux and 12 limbs with ≥ 2 s reflux. When comparing patients with and without repeat interventions, analysis demonstrated a statistically significant association between reflux duration and need for repeat intervention for both 1–2 s reflux ($\chi^2 = 4.10$, p = 0.043) and ≥ 2 s reflux ($\chi^2 = 4.13$, p = 0.042), whereas < 1 s reflux showed no association ($\chi^2 = 0.00$, p = 0.995).

Conclusion: In this cohort, DVR reflux ≥ 1 second was significantly associated with the need for repeat intervention. These findings suggest that even moderate reflux (1–2 s) in the deep venous system may be clinically relevant for recurrence risk and should be considered in patient selection and counseling.

Abstract No. 367

■ FEATURED ABSTRACT

One-Year Dyspnea and Quality of Life After Mechanical Thrombectomy for Treatment of Pulmonary Embolism in Female Versus Male Patients: STRIKE-PE Interim Analysis



(Article No. 108400)

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Purpose: We report 1-year dyspnea and QoL outcomes comparing male and female patients treated with mechanical thrombectomy using computer-assisted vacuum thrombectomy (CAVT; Penumbra, Inc., Alameda, CA).

Materials and Methods: STRIKE-PE is a single-arm, prospective, international study enrolling 1500 patients with acute PE symptoms of ≤14 days and right-to-left ventricular (RV/LV) diameter ratio of ≥ 0.9. Borg dyspnea scale at rest and after 6MWT and two QoL measures were assessed through 1-year. Among 595 patients, 315 (53%) were male with an age of 61.4 ± 13.9 years and 280 (47%) were female with an age of 62.3 ± 16.1 years. 252 completed 1y follow-up. Data reported as mean ± SD or median [Q1-Q3].

Results: Both sexes presented with similar risk stratification and had a similar time from symptom to venous puncture. Thrombectomy time was also similar: 31 [21-44] min for males and 30 [21-40] min for females. Primary efficacy, RV/LV ratio reduction at 48h, was similar across sexes (both P < .001). Primary safety, composite major adverse events (MAE) rate, were lower in males

367.1.

	Females	Males	Difference between groups (95% CI)	P-value
EQ-5D-5L Index Value				
Baseline	.411 ± .452	.525 ± .399	.114 (.023, .204)	.014
90 d	.757 ± .248	.838 ± .222	.081 (.031, .131)	.002
1y	.799 ± .240	.869 ± .180	.071 (.008, .133)	.027
Change baseline to 90 d	0.346 ± 0.439	0.313 ± 0.408	-0.033 (-0.124, 0.058)	.475
Change baseline to 1 y	0.427 ± 0.472	0.376 ± 0.424	-0.051 (-0.182, 0.080)	.442
Total PEmb-QoL				
Baseline	47.6 ± 23.4	38.9 ± 22.0	-8.7 (-12.8, -4.7)	< .001
90 d	24.2 ± 21.5	17.9 ± 19.5	-6.4 (-10.0, -2.7)	< .001
1y	15.6 ± 16.6	12.3 ± 14.8	-3.3 (-7.4, 0.8)	.119
Change baseline to 90 d	-23.4 ± 26.2	-21.0 ± 24.1	2.4 (-2.1, 6.9)	.302
Change baseline to 1 y	-30.6 ± 26.3	-25.1 ± 24.0	5.5 (-1.2, 12.1)	.106

than females, due to major bleeding rates (0.3% vs 3.6%, respectively; $P=.003$). Borg scale at rest and post-6MWT were comparable and improved for both sexes from baseline to 90d and 1y (both $P<.001$). Females had lower EQ-5D-5L scores from baseline to 1y and higher PEmb-QoL score (worse) from baseline to 90d (353.1). QoL scores improved at the same rate for both sexes from baseline to 90d and 1y (all $P<.001$; 353.1).

Conclusion: In STRIKE-PE, CAVT rapidly improved RV dysfunction regardless of sex. CAVT was associated with improved dyspnea severity, also similar in both sexes. QoL improvement was significant and comparable between sexes despite baseline and postprocedural scores remaining different. MAEs were low in both groups with a higher major bleeding rate in females. This offers insight into sex-specific recovery in PE care.

Abstract No. 368

Comparative Outcomes of Catheter-Directed Thrombolysis and Mechanical Thrombectomy for Intermediate- and High-Risk Pulmonary Embolism: A National 6-Month Analysis



(Article No. 108401)

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Purpose: To compare catheter-directed thrombolysis (CDT) and endovascular mechanical thrombectomy (MT) for acute intermediate-risk and high-risk pulmonary embolism (PE) with respect to unplanned 6-month readmissions and in-hospital outcomes using a national database.

Materials and Methods: The NRD was queried from 2016 to 2022 for adult patients with acute nonseptic PE who received either CDT or MT. Inverse probability weighted regression adjustment was used to compare CDT and MT with regards to in-hospital mortality, unplanned 6-month readmissions, discharge other than home(DOTH), total cost as well as gastrointestinal bleeding(GIB), intracranial hemorrhage(ICH), blood transfusion at index admission and 6-month readmission. Results are depicted as average treatment effect (ATE).

Results: A total of 11,038 patients were identified; 9,914(90%) underwent CDT and 1,124(10%) underwent MT. There was a total of 1,461 patients with high risk PE(13.2%). Compared to CDT, the ATE of MT was higher with regards to in-hospital mortality(ATE: 0.007; $p=0.048$), DOTH(ATE: 0.031; $p<0.001$), ICH (ATE: 0.006; $p<0.001$), total cost at index admission(ATE: 0.118; $p<0.001$), GIB at 6 months (ATE: 0.004; $p=0.023$), blood transfusions at 6 months (ATE: 0.006; $p=0.017$) as well as death at final follow-up(ATE: 0.009; $p=0.025$). The ATE was similar between CDT and MT with regards to GIB($p=0.097$) at index admission as well as unplanned 6-month readmission($p=0.10$), ICH($p=0.11$), and recurrent PE($p=0.39$) at 6 months.

Conclusion: MT was associated with higher rates of mortality, DOTH, ICH, and total cost at index admission as well as GIB,

blood transfusions and mortality at 6 months. MT was associated with similar rates of GIB at index admission, as well as unplanned readmission, ICH, and recurrent PE at 6 months.

Abstract No. 369

Readmission Outcomes of IVUS Use in Lower Extremity Deep Vein Thrombosis Intervention in the United States



(Article No. 108402)

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Purpose: To compare intravascular ultrasound (IVUS) use in lower extremity deep venous thrombosis (DVT) interventions with respect to unplanned 3-month readmissions and in-hospital outcomes using a national database.

Materials and Methods: The NRD was queried from 2016 to 2022 for adult patients with acute or chronic DVT who underwent endovascular intervention. Patients were stratified based on the usage of intraoperative IVUS (ICD-10 codes: B54BZZ3, B54CZZ3, and B54DZZ3). Inverse probability weighted regression adjustment was used to assess the association of IVUS use with regards to 30-, 90-, and 180-day readmissions as well as 30-, 90-, and 180-day reintervention. Additional subgroup analysis was conducted for patients with iliofemoral DVT intervention.

Results: A total of 57,948 patients were included; 7,660 (13.2%) received an intervention that utilized IVUS. IVUS usage was associated with lower risk of 30-day unplanned readmission (Relative risk [RR]: 0.988, $p=0.031$; Number Needed to Treat [NNT]: 85). IVUS use had similar risk for all other outcomes (all $p>0.05$). Among the patients with iliofemoral DVT intervention, IVUS use was associated with lower risk of 30-day unplanned readmission (RR: 0.988; $p=0.028$; NNT: 81) and reintervention (RR: 0.99, $p=0.046$; NNT: 152). IVUS use had similar risk for all other outcomes compared to no IVUS use (all $p>0.05$).

Conclusion: IVUS use was associated with a reduction in 30-day unplanned readmissions, particularly among those with iliofemoral DVT, where IVUS was also associated with fewer early reinterventions. No statistical differences were observed for other in-hospital or long-term outcomes. These findings suggest that IVUS may provide incremental clinical benefit in complex DVT interventions, especially in the iliofemoral subset, though further prospective evaluation is warranted to clarify its role in optimizing patient outcomes.

Abstract No. 370

Recurrence After DVT Intervention: Comparing Aspiration, Coring, and Thrombolysis Approaches in a Single-Center Ultrasound Follow-Up Study



(Article No. 108403)

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Purpose: Deep venous thrombosis (DVT) treatment remains challenging. While catheter-directed thrombolysis (CDT) has been the traditional therapy, mechanical thrombectomy (MT) is increasingly employed. MT devices include aspiration-based systems (FlowTrier) and coring-based systems (ClotTrier). Concerns exist that mechanical devices, specifically coring devices, may damage valves and predispose to recurrence. This study evaluated ultrasound (US) follow-up after CDT and MT for recurrence, chronicity, and segmental distribution.

Materials and Methods: This single-center retrospective study included 63 patients treated for iliofemoral or more central DVT (2013–2018). Follow-up duplex US was available in 49 patients. MT was performed in 29 patients (ClotTrier n=17, FlowTrier n=8, AngioJet n=4) and CDT in 20 patients (EKOS, UniFuse, Cragg-McNamara). Recurrence, chronicity, and segmental involvement were classified from ultrasound findings. Chronicity was defined as acute, sub-acute, or chronic. Segments were grouped as iliofemoral or other (popliteal/below-knee). Comparisons were made between MT vs CDT, ClotTrier vs FlowTrier, and ClotTrier vs CDT using Fisher's exact test.

Results: Overall recurrence was observed in 26/49 patients (53.1%). Of these, 8 were acute (16.3%), 7 sub-acute (14.3%), and 13 chronic (26.5%). Recurrences were evenly distributed: iliofemoral 19/49 (38.8%), popliteal/below-knee 19/49 (38.8%). MT and CDT showed equivalent recurrence (52% vs 55%, p=0.69), chronicity, and segmental distribution. ClotTrier and CDT also demonstrated similar recurrence (65% vs 55%, p=0.74) and no differences in chronicity or segmental involvement. FlowTrier showed fewer recurrences than ClotTrier (25% vs 65%, p=0.097), though not statistically significant.

Conclusion: In this cohort, overall recurrence remained high, underscoring the aggressive nature of iliofemoral DVT. New mechanical thrombectomy devices demonstrated outcomes comparable to CDT, which has traditionally been considered a "gentler," pharmacologic approach. Importantly, the coring-based ClotTrier did not perform worse than CDT, providing no signal that its mechanism leads to higher recurrence or valvular injury. In contrast, the aspiration-based FlowTrier demonstrated lower recurrence than ClotTrier, though this did not reach statistical significance. Collectively, these findings suggest equivalence between MT and CDT, with no evidence of valvular damage from coring devices, and highlight aspiration-based MT as a promising approach for further study.

Abstract No. 371

Real-World Multicenter Experience with the CLEANER Vac Thrombectomy System: An Analysis of 110 Patients



(Article No. 108404)

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Purpose: To evaluate the real-world efficacy and safety of the CLEANER Vac Thrombectomy System in the treatment of symptomatic venous thrombosis.

Materials and Methods: This retrospective, multicenter analysis included 110 adults (≥ 18 years) with acute or subacute symptomatic venous thrombosis confirmed by duplex US, CT venography, or conventional venography. Vascular access was obtained via femoral, popliteal, or jugular veins. The CLEANER Vac was advanced under fluoroscopic guidance and aspiration thrombectomy performed. Completion venography assessed clearance; adjunctive therapy (angioplasty, rotational maceration) was used at physician discretion. Data collected included demographics, clot burden pre- and post-procedure, clearance rates, number of device passes, adjunctive therapy use, estimated blood loss (EBL), and complications.

Results: Mean patient age was 66.8 years (range 28–88); 26.7% were female. An average of 2 venous segments were treated per patient. Mean pre-treatment clot burden of 85.7% was reduced to 16.5% post-procedure, yielding 85.0% average clearance; 83 patients (75.5%) achieved $\geq 90\%$ clearance. Results compare favorably with published benchmarks (CLOUT: 88.9% patency, 99.4% single-session completion; PEERLESS: residual thrombus 16.2%, win ratio 5.01 favoring thrombectomy over CDT). Adjunctive therapy was used selectively, most often rotational maceration and balloon angioplasty. The mean number of passes was 2.8; mean EBL was 323 mL. No major device-related complications occurred. Minor access-site hematomas occurred in 2.4%. One death occurred secondary to stent-related rupture, adjudicated unrelated to the device. Active PE was present in 6.1%. Treated indications were primarily peripheral venous thrombosis of the extremities (70%).

Conclusion: The CLEANER Vac achieved high rates of clot clearance with manageable blood loss and a favorable safety profile, supporting its role as an effective thrombectomy option for venous thrombosis. Further prospective studies with larger cohorts and long-term follow-up are warranted to validate durability, refine patient selection, and optimize outcomes.

Abstract No. 372

Safety of Endovascular Therapy for Acute Pulmonary Embolism in the Geriatric Population: A Single-Center Retrospective Study



(Article No. 108405)

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Purpose: To evaluate the safety of catheter-directed thrombolysis (CDL) and large-bore aspiration thrombectomy (LBAT) used to treat acute pulmonary embolism (PE) in geriatric patients (≥ 65 years old).

Materials and Methods: A retrospective review of medical records was performed to find 154 consecutive patients ≥ 65 years old (age: 73.2 ± 6.4 years, 51.9% female) and who underwent CDL (37.7%), LBAT ($\geq 16F$, 59.1%), or both (3.2%) for acute PE in the years 2010–2025, after excluding patients with chronic PE (n=16), or who received systemic thrombolysis prior to intervention (11). Patients with intermediate-low (22.1%), intermediate-high (68.2%) and high (9.7%) risk PE were included. Sub analysis was performed for 26 patients ≥ 80 years old (83.9 ± 3.3 years, 69.2% female) who underwent CDL (23.1%) or LBAT (76.9%). Safety was assessed according to GUSTO classification for hemorrhagic

adverse events (AE). Society of Interventional Radiology (SIR) classification was used for all AE, and only AE that were caused by the procedure or if unknown if they were caused by the procedure were reported (categories 3 & 2).

Results: CDL was discontinued prematurely in 4/63 cases (6.3%) due to hemorrhagic AE. There were 7.2% minor, 5.2% moderate and 3.3% major hemorrhagic GUSTO complications. Blood was transfused in 7.2% of patients. There was a single case of intracranial hemorrhage (0.7%). SIR AE rates were mild 11.8%, moderate 6.5%, severe 2% and life-threatening 5.8%. There was a single event of hemoptysis (0.65%, that occurred in a patient older than 80 years, 1/26 [3.9%]). Hemodynamic decompensation during or after the procedure occurred in 5.9% of patients while pulmonary decompensation (requiring positive pressure ventilation) occurred in 2.6%. One-year all-cause mortality was 6.5% and procedure related mortality was 1.3%. In the ≥ 80 years old cohort CDL was not discontinued prematurely (0/6). There were 7.7% minor, 3.8% moderate and 7.7% major hemorrhagic GUSTO complications. Blood was transfused in 3.8% of patients. There were no intracranial hemorrhages. SIR AE rates were mild 15.4%, moderate 7.7%, severe 3.8%, and life-threatening 11.5%. Hemodynamic decompensation during or after the procedure occurred in 11.5% of patients while pulmonary decompensation occurred in 7.7%. One-year all-cause mortality was 3.8% with no procedure related mortalities.

Conclusion: Endovascular intervention in the geriatric population appears to have a higher AE rate than reported for all comers in the existing literature. Patients ≥ 80 years old had higher AE rates than the general geriatric population.

Abstract No. 373

Preprocedural Lower Extremity Inflow Status Correlates with Early Reocclusion After Thrombectomy for Deep Vein Thrombosis



(Article No. 108406)

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Medicine, Department of Interventional Radiology; ⁴Yale University

Purpose: To determine whether pre-procedural inflow status predicts outflow tract reocclusion after thrombectomy in iliofemoral or femoropopliteal deep vein thrombosis (DVT).

Materials and Methods: A single-center retrospective analysis of patients undergoing thrombectomy with multiple devices from 2018 to mid-2023 was conducted. First-time unilateral iliofemoral or femoropopliteal DVTs without evidence of extensive collateralization constituted the outflow conduit. Pre-procedural duplex within 72 hours was used to assess profunda femoris (PF) and tibioperoneal trunk (TPT) inflow, while follow-up duplex within 90 days evaluated reocclusion within the outflow conduit. Demographic and presenting characteristics were collected, excluding patients with underlying malignant obstruction or strictures and those for whom treatment was aimed at inflow vessels. Group differences were tested using chi-square tests, and the odds of reocclusion were analyzed using logistic regression.

Results: Among 64 patients without prior intervention, outflow patency at 90 days was achieved in 26 of 29 patients with an open PF. Similarly, 26 of 33 with an open TPT achieved outflow patency. Inflow status achieved significantly different outflow reocclusion rates, with 10% versus 54% reocclusions observed when the PF was respectively open versus occluded (χ^2 , $p = 0.0006$). Similar differences were observed for TPT status (χ^2 , $p = 0.043$). Single inflow vessel occlusion proved to have limited discrimination for short-term reocclusion, with half of the outflow vessels remaining patent at 90 days ($n=16/35$ for PF; $n=16/31$ for TPT). Composite inflow occlusion results in a stepwise increase in 90-day reocclusion rates: 6% when neither was occluded, 29% if one was occluded, and 68% if both were. Each additional occluded inflow vessel increased the odds of reocclusion by six times (OR 5.7, 95% CI 2.4–16.3, $p < 0.0001$). Limitations include the operator's dependency on ultrasound and the lack of formal assessment for confounders.

Conclusion: Irrespective of procedural details, pre-procedural inflow status correlated with short-term reocclusion in this lower extremity DVT thrombectomy cohort. Systematic assessment of inflow patency during the procedure is challenging in a retrospective manner, and whether the treatment of PF and TPT occlusion alters short- and long-term patency remains to be determined.

Traditional Poster Presentations

Monday, April 13, 2026
12:10–1:10 p.m.

Abstract No. 500

A Clinical Application Study on Biliary Stent-Based Comprehensive Interventional Therapy for Advanced Pancreatic Cancer with Obstructive Jaundice



(Article No. 108408)

H. Sun¹; ¹Zhongshan Hospital Affiliated of Fudan University

Purpose: This study aims to investigate the impact of iodine-125 intraluminal brachytherapy on SPT and OS in patients with advanced pancreatic cancer complicated by obstructive jaundice, which may provide evidence for optimizing multimodal interventional strategies for patients with pancreatic cancer.

Materials and Methods: This retrospective study enrolled 262 patients with advanced pancreatic cancer complicated by obstructive jaundice who had underwent metallic biliary stent placement. Patients were stratified into the I-125 group (n=97) and the control group (n=165). A 1:1 PSM was performed using a caliper width of 0.2 standard deviations of the propensity score. The primary end-points were SPT and OS. Survival curves were generated using the Kaplan-Meier method, with between-group differences assessed by log-rank test. Variables with $p < 0.05$ in univariate Cox regression were incorporated into multivariate Cox proportional hazards models to identify independent prognostic factors.

Results: At 1 month post biliary stent placement, significant reductions of serum bilirubin, transaminases, and CA19-9 levels compared to their pre-drainage values were observed in this study. The overall cohort demonstrated a median SPT of 7.63 months (95% CI 7.10-8.16), a stent restenosis rate of 36.2%, and a median OS of 9.40 months (95% CI 9.11-9.69). After 1:1 PSM (62 patients per group), the I-125 group showed a significantly longer median SPT (9.44 months vs. 6.21 months, $p < 0.001$) and lower restenosis rate (17.7% vs. 43.5%, $p = 0.002$) compared to the stent-alone group. However, no significant OS difference was observed between groups (10.59 months vs. 9.07 months, $p = 0.248$). Cox analysis suggested that intratumoral brachytherapy (HR 0.382, $p < 0.001$) was an independent protective factor for SPT; ECOG 2 score (HR 1.572, $p = 0.019$) was an independent risk factor for SPT. The independent risk factors for OS included ECOG 2 score (HR 1.469, $p = 0.042$) and post-stent CA19-9 ≥ 500 ku/L (HR 1.322, $p = 0.046$).

Conclusion: Biliary stent combined with iodine-125 intraluminal brachytherapy significantly prolonged stent patency time compared to stent-alone in patients with advanced pancreatic cancer complicated by obstructive jaundice, although it did not

significantly improve survival outcomes. Higher ECOG performance status at initial diagnosis and elevated CA19-9 levels after jaundice resolution were associated with poor prognosis.

Abstract No. 501

Comparison of Same-Day Discharge and Overnight Observation Outcomes Following Percutaneous Liver Ablation



(Article No. 108409)

A. Gunn¹, H. Terhaar¹; ¹University of Alabama at Birmingham

Purpose: The objective of this study is to evaluate whether the institutional transition from routine overnight observation to same-day discharge after percutaneous ablation (PA) of liver tumors is associated with a significant increase in major adverse events (AEs) and 30-day readmission rates.

Materials and Methods: This single-center retrospective study included 217 adult patients. Patients who underwent percutaneous ablation (PA) in 2018–2019 and were routinely admitted for overnight observation were designated as the control group (Group A). Patients treated in 2021–2022, following the implementation of a same-day discharge protocol, comprised the test group (Group B). Data collection included demographics, tumor characteristics and clinical outcomes. Categorical variables were analyzed using the chi-square test, while continuous variables were assessed with a two-sample t-test. Logistic regression analysis was performed to identify predictive factors for major adverse events (AEs) and 30-day readmission rates.

Results: Thirteen patients (5.9%) from the total cohort were re-admitted to the hospital within 30 days for any reason. Four patients (5.3%) and nine patients (6.3%) were re-admitted for any reason within 30 days in Group A and Group B, respectively, with no difference between the two groups ($p = 0.95$). Logistic regression analysis found no significant predictive variables for 30-day readmission rates. Nine patients (4.2%) from the cohort experienced major adverse events. Two patients in Group A (2.7%) and seven patients in Group B (4.9%) had major AEs following liver ablation, with no difference between the two groups ($p = 0.25$). Logistic regression analysis of the cohort found that tumor diameter was a significant predictive variable of major adverse events (OR 1.89, 95% CI 0.97-3.52, $p = 0.05$).

Conclusion: After the institutional transition to same-day discharge, there was no significant increase in major adverse events or 30-day readmission rates compared to the prior routine of overnight observation. These findings suggest that same-day discharge is a safe and effective protocol that can be maintained in institutional practice without increasing adverse clinical outcomes following PA. Continuation of this approach has the potential to reduce healthcare costs, decrease inpatient admission rates, and enhance patient outcomes by allowing individuals to recover in the comfort of their own homes. Additionally, tumor diameter was observed to be as an important factor for physicians to consider when stratifying the risk of adverse events and making discharge decisions.

Abstract No. 502**Preoperative Aneurysm Characteristics That Predict Need for Repeat Endoleak Procedure Following Type II Endoleak Embolization**

(Article No. 108410)

C. Dalzell¹, D. Sheeran¹, J. Angle¹, L. Wilkins¹; ¹University of Virginia

Purpose: Endoleaks are the most common complication following endovascular abdominal aortic aneurysm repair (EVAR). The purpose of this study was to evaluate the preoperative aneurysm characteristics associated with need for repeat endoleak procedure following type II endoleak embolization.

Materials and Methods: Single center retrospective review of 50 patients who underwent type II endoleak embolization procedures from August 5, 2011, to January 17, 2025. Clinical, preoperative imaging characteristics including suprarenal neck angle, coronal and sagittal aneurysm neck angles, maximum aneurysm diameter, and procedural data were recorded. True aortic neck and suprarenal angles were calculated from the sagittal and coronal 2D reconstructed images using the paired angle formula. Multivariate logistic regression analysis was performed after univariate analysis to determine independent predictors of need for repeat endoleak procedure.

Results: 50 patients underwent type II endoleak embolization procedures, 17 (34%) of which required repeat endovascular endoleak procedure. There was no difference in age ($p = 0.48$), gender ($p > 0.99$), embolization technique (transarterial vs. transcaval vs. translumbar, $p = 0.66$), maximum abdominal aortic aneurysm diameter (5.73 ± 1.01 vs. 5.70 ± 0.92 cm; $p = 0.91$), mean aneurysm neck diameter (2.38 ± 0.51 vs. 2.25 ± 0.34 cm; $p = 0.29$) or length (2.47 ± 1.31 vs. 2.54 ± 1.63 cm; $p = 0.88$) in patients who required a repeat endoleak procedure versus those who did not. Suprarenal neck angle and true aortic neck angle were significantly increased in patients who required a repeat endoleak procedure versus those who did not ($34.18^\circ \pm 13.30$ vs. $17.43^\circ \pm 11.20$; $p < 0.0001$ and $60.12^\circ \pm 23.79$ versus $43.90^\circ \pm 17.31$; $p = 0.008$, respectively). In multivariate logistic regression analysis, only suprarenal neck angle retained statistical significance (OR 1.1, 95% CI 1.04-1.18; $p = 0.004$). ROC curve analysis of suprarenal neck angle demonstrated an area under the curve (AUC) of 0.84 (95% CI 0.72-0.96; $p < 0.0001$). A suprarenal neck angle cutoff value of 23.3° was associated with a sensitivity of 82.4% and specificity of 81.8% in predicting need for repeat endoleak procedure.

Conclusion: True aortic neck and suprarenal neck angles are associated with need for repeat endoleak procedure following type II endoleak embolization. There may be a subset of patients with an imaging occult endoleak who continue to have sac growth following type II endoleak embolization procedures if their preoperative aneurysm neck has the characteristics described above.

Abstract No. 503**Prognostic Factors Following Embolization in Persistent Type II Endoleaks After Endovascular Aneurysm Repair (EVAR)**

(Article No. 108411)

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Purpose: Persistent type II endoleaks after endovascular aneurysm repair (EVAR) are commonly managed with embolization, but predictors of sac response and endoleak resolution remain poorly defined. Evaluation of arterial and venous volumetric and integral total flow within the sac may serve as prognostic factors following embolization.

Materials and Methods: We retrospectively reviewed 30 patients who underwent embolization for type II Endoleaks using the translumbar approach. Aneurysmal sac behavior was categorized as decreased, stable, or increased diameter on follow-up imaging 6 months post-embolization. Clinical variables, sac area, arterial and venous volumes, and arterial and venous integrals were collected using MIM v.6.9.4 (MIM Software, Cleveland, Ohio). Logistic regression and receiver operating characteristic (ROC) analysis were used to assess associations with endoleak resolution using R.

Results: The average age of our cohort was 71 years, with 20% female. 6 patients (20%) had undergone a prior embolization attempt. N-butyl cyanoacrylate glue was the most used embolic used (40%). ROC analysis demonstrated fair discrimination for aneurysmal sac enlargement (AUC 0.71-0.74), with optimal cut-offs of arterial volume >3.6 mL (sensitivity 88%, specificity 64%) and arterial integral total >400 HU·mL (sensitivity 75%, specificity 77%). Kruskal-Wallis testing confirmed a significant association for arterial integral total ($p = 0.041$), whereas venous parameters did not reach statistical significance. Other clinical parameters, including age, sex, hypertension, anticoagulant use, coronary artery disease, tobacco history, diabetes, and hyperlipidemia, were not significant predictors of aneurysmal sac behavior or resolution of the endoleak.

Conclusion: In this cohort, arterial volumetric parameters showed moderate ability to predict aneurysmal sac behavior after embolization of type II endoleaks. Patients with larger volume arterial flow in the aneurysm sac on CTA imaging may experience the best clinical results from a translumbar approach.

Abstract No. 504**Characterization of Glue Penetration with Balloon Occlusion Microcatheter Use During N-Butyl Cyanoacrylate Prostatic Artery Embolization**

(Article No. 108412)

C. Agudelo¹, M. Bader¹, B. Coffin¹, K. Poulton¹, R. Ayyagari²; ¹Boston University Medical Center; ²Boston Medical Center

Purpose: To use the extended Glue Penetration Index Score (eGPIS) to characterize n-butyl cyanoacrylate glue penetration in prostatic artery embolization (PAE) when performed using a balloon occlusion microcatheter.

Materials and Methods: Twenty-five consecutive patients who underwent PAE using n-butyl cyanoacrylate glue from December 2023 through July 2025 by a single experienced operator (13

years' experience) were retrospectively reviewed. Baseline patient age and prostate volume (PV) were recorded. Microcatheter choice, ratio of glue dilution with ethiodized oil, and total volume of glue injected were tabulated. Un-subtracted high-quality angiographic images were obtained in straight anterior-posterior views immediately after glue injection and microcatheter removal. Images were independently reviewed by two physicians (Observer A, 13 years' experience; Observer B, 2 years' experience) who each assigned a glue penetration score from 0 to 3.5 for each hemi-gland according to the eGPIS system proposed by von Stempel. Values were reported as means with standard deviations. Comparisons used Student's t-tests. Embolization-specific adverse events were tabulated using Clavien-Dindo classification.

Results: Patients who underwent PAE with glue using a balloon occlusion microcatheter (n=21) had mean age of 70.9 ± 6.5 years and PV of 126 ± 73 mL. All cases were technically successful. The dilution of cyanoacrylate to ethiodized oil was 1:10 in 16 cases and 1:8 in 5 cases. Mean total gland glue volume injected was 1.6 ± 0.6 mL. Observer A's mean hemi-gland eGPIS was 3.0 ± 0.7 and mean whole gland eGPIS was 6.0 ± 1.1 . Observer B's mean hemi-gland eGPIS was 3.2 ± 0.4 and mean whole gland eGPIS was 6.4 ± 0.8 . Interobserver differences in hemi- and whole gland eGPIS values were not significant ($p=0.15$ and 0.23 , respectively). Nontarget embolization adverse events were not observed. One grade 3 adverse event occurred with gland tissue sloughing requiring intervention.

Conclusion: PAE performed using cyanoacrylate glue with a balloon occlusion microcatheter achieved high levels of glue penetration into prostate tissue, as quantified by the eGPIS system. No reflux or nontarget embolization events occurred. The eGPIS values observed in this study were substantially higher than those reported elsewhere in procedures performed without a balloon occlusion microcatheter. However, validation of this observation with direct-comparison study is needed. Correlation of degree of glue penetration with clinical outcomes is likewise in need of further study.

Abstract No. 505

Curative Endovascular Treatment of Ear AVMs



(Article No. 108413)

W. Yakes¹; ¹The Yakes Vascular Malformation Center

Purpose: To determine the efficacy of Ethanol Endovascular Repair of Ear Arteriovenous Malformations (AVMs).

Materials and Methods: 14 patients (9 female, 5 males; age range 6-39 years; mean age: 22 years) with ear AVMs presented for therapy. 2 patients had failed prior embolizations (PVA/coils/nBCA/steroids) and 2 patients had other therapies (laser/excisions/grafting). All patients presented with a grossly enlarged painful ear, and 5 patients had intermittent bleeding. All patients underwent transcatheter and direct puncture ethanol treatments. (86 procedures).

Results: All 14 patients were cured of their AVM at long-term follow-up (mean follow-up: 52 months). 1 patient had transient partial VII nerve palsy. 2 patients had minor blisters and ear injuries that healed on the outer tragus. The longest arteriographic follow-up demonstrating cure is 12 years, and clinical cure is 32 years.

Conclusion: Ethanol endovascular repair of ear AVMs can achieve cures in this vexing lesion that previously was treated with resection of the ear with complex plastic surgical reconstructions and with recurrence rates. This series documents long-term cures of AVMs of the ear and scalp that were not treatable by endovascular approaches as previously documented in the world's literature. Permanent treatment of the auricular AVMs is documented and no recurrence occurred in any patient. Only one article is published (group from Shanghai, China) emulating this technique also with curative results.

Abstract No. 506

Ultrasonography-Guided Suture-Mediated Vascular Closure ("Pseu-close" Technique) for Iatrogenic Femoral Artery Pseudoaneurysms



(Article No. 108414)

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Purpose: Suture-mediated closure devices are widely used for managing large-bore arterial access sites. Their application to iatrogenic femoral artery pseudoaneurysms has been described, but most prior reports relied on angiography for lesion definition and wire guidance. This study evaluated the feasibility of performing the procedure solely under ultrasonography (US), particularly in situations where conventional options are limited or unsuitable.

Materials and Methods: Thirteen patients from three hospitals with iatrogenic femoral artery pseudoaneurysms were treated using suture-mediated closure devices (*Perclose ProGlide* or *ProStyle*; Abbott Vascular Devices) under real-time US. Doppler US characterized wall defects, neck morphology, and flow pattern. The procedure consisted of direct needle puncture/crossing of the pseudoaneurysm neck with a 21-G needle, followed by retrograde introduction of a microwire and micro-introducer, and subsequent advancement of a 0.035-inch guidewire into the proximal artery, all under US guidance. The closure device was deployed with real-time visualization of the footplate against the arterial wall and assurance that the suture was correctly positioned within the lumen. Immediate completion Doppler US verified cessation of the yin-yang sign and flow stagnation within the sac.

Results: Technical success was achieved in all cases. Etiologies included complications after transcatheter valve implantation, coronary interventions, embolization, cerebral angiography, angioplasty, and dialysis catheter mis-implantation. Multiple devices were required in three patients (two devices in two, three devices in one), while one device sufficed in the remaining cases. Follow-up Doppler US demonstrates resolution of abnormal arterial flow and thrombus formation in all pseudoaneurysms. No major complications occurred.

Conclusion: US-guided suture-mediated vascular closure (“Pseu-close”) is a feasible method for iatrogenic femoral artery pseudoaneurysms, particularly when contrast is undesirable, when transfer to an angiography suite is not feasible, or when wide or short neck morphology makes thrombin unsuitable. The technique highlights the direct needle-tip approach under real-time US, which enables reliable passage through the pseudoaneurysm neck and ensures safe closure.

AI Disclosure Statement: During the preparation of this work, the authors used ChatGPT (GPT-5, OpenAI, 2025) to improve grammar and readability. The authors reviewed and edited the content and take full responsibility for the abstract.

Abstract No. 507

Comparison of the Celt and Mynx Grip Arterial Closure Devices



(Article No. 108415)

A. Nguyen¹, V. Jindal¹, N. Patel¹, K. Chuah¹, D. Leung², C. Grilli¹, A. Graif²; ¹ChristianaCare; ²Christiana Care Health System

Purpose: To compare the effectiveness and safety of the Celt Arterial Closure Device (CACD, Vasorum Ltd., Dublin, Ireland) and the Mynx Grip (MG, Cordis, Miami Lakes, FL, USA) for closure of arterial access.

Materials and Methods: A retrospective review of patients who underwent closure of arterial access with either a 5F CACD (n=94 patients, 66.5±16.6 years, 37.2% females) or 5F MG (n=102, 64.8±18.6 years [p=.5], 44.1% female [p=.3]) between 2023-2024 in a single health care system. All CACD were performed under ultrasound guidance. There was no significant difference in demographics, including ASA scores, between the groups except for a higher rate of hypertension in the CACD group (73.4% vs. 57.8%, p=.025). Technical success was defined as successful deployment of closure device per instructions. Procedural success was defined as hemostasis achieved without need for a secondary intervention or manual compression beyond that required in the instructions. Adverse events (AE) were defined according to Society of Interventional Radiology classification. Adverse events that were considered to be related to, or unclear if related to, the closure device were included (category 2 or 3).

Results: Inpatients were more likely to undergo closure with CACD than with MG (77.7% vs 59.8%, p=.007). The most common etiology for intervention was embolization for acute hemorrhage in both groups with a significantly higher rate in the CACD group (68.1% vs. 53.9%, p=.002). The CACD was used in more cases that utilized general anesthesia (18.2% vs. 3%, p=.003). Closure with MG had a higher technical success rate (100% vs. 95.7%, p=.035) and higher procedural success (99% vs. 92.6%, p=.022). There was no significant difference in mild (1% vs. 3.2%, p=.35), moderate (2.9% vs. 0%, p=.25) and severe (0% vs. 1.1%, p=.48) AE between the MG and CACD groups, respectively. There was a single life-threatening AE in the MG group (1% vs. 0%, p=1) and a single procedure related mortality in the CACD group (1.1% vs. 0%, p=.48).

Conclusion: Both MG and CACD had high success rates although MG was significantly higher. There was no difference between the devices in adverse event rates.

Abstract No. 508

Safety and Clinical Outcomes of Ultrasound-Guided Bedside Antegrade SFA Sheath Placement for Limb Salvage in Critically Ill Patients with Peripheral Veno-Arterial Extracorporeal Membrane Oxygenated (ECMO) Cannulation



(Article No. 108416)

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Purpose: To assess complication rates, demographics, and clinical outcomes following bedside ultrasound (US)-guided antegrade superficial femoral artery (SFA) sheath placement for extracorporeal membrane oxygenation (ECMO) patients with existing retrograde common femoral artery (CFA) access. Despite increasing use of this technique, data on risks and outcomes remain limited.

Materials and Methods: A single-center retrospective chart review (2015-2025) identified patients on veno-arterial ECMO with retrograde CFA access who underwent antegrade SFA sheath placement. Demographics, procedural details, complications, and outcomes were collected via chart review in with HIPAA and institutional protection policies. Subgroup comparisons were made between bedside US-guided and angiographic (angio) suite US/fluoroscopic-guided placements. Categorical variables were summarized with frequencies and percentages; Fisher's exact test and Mann-Whitney U test were used for analysis.

Results: Fourteen patients were included, 8 at bedside with US-guidance and 6 in the angio suite with US and fluoroscopic guidance. Mean age was 52.5 and 57 years, respectively. Time from ECMO initiation to sheath placement differed significantly [14.8 hours bedside vs. 3.1 hours angio suite]. Technical success

508.1.			
Variables	Bedside (n = 8)	IR suite (n=6)	p value
Age (years)			
Median (IQR)	52.5 (25)	57.0 (24)	0.95
BMI			
Median (IQR)	29.5 (13.4)	36.1 (8.5)	0.14
Time to SFA Placement (hours)			
Median (IQR)	11.8 (20.9)	2.2 (6.0)	0.03
Sheath Size (F)			
Median (IQR)	6.0 (0.0)	7.0 (1.0)	0.02
Hospital length of stay (days)			
Median (IQR)	13.0 (39)	14.0 (23.0)	0.66
ICU length of stay (days)			
Median (IQR)	8.5 (28.0)	9.0 (16.0)	1.00
Complications, n (%)			
Yes (n=6)	3 (50.0)	3 (50.0)	1.00
No (n=8)	5 (62.5)	3 (37.5)	
Outcome, n (%)			
Survival (n=5)	3 (60.0)	2 (40.0)	1.00
Death (n=9)	5 (55.6)	4 (44.4)	

was achieved in 93% of cases. Sheath-related complications occurred in 50% of patients at bedside and 37.5% in the angio suite, most commonly bleeding and pseudoaneurysm formation; no dissections were noted. Hospital and ICU length of stay, complications, and mortality rate did not significantly differ between the two groups. No deaths were attributed to sheath placement, but rather patient factors.

Conclusion: Bedside US-guided antegrade SFA sheath placement in ECMO patients demonstrated high technical success; complication rates were comparable to angio suite placement. Despite sheath-related complications, clinical outcomes were similar, supporting bedside placement as a feasible alternative in selected patients.

Abstract No. 509

Radial Access for Interventional Oncologic Interventions: A Single-Center Experience of 307 Transradial Procedures



(Article No. 108417)

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Purpose: Radial access is gaining momentum for interventional oncologic intervention due to its several advantages over femoral access, including lower access site complication rates, reduced periprocedural pain and shorter recovery times. The purpose of this study is to evaluate a single institution's experience with radial access for interventional oncologic interventions.

Materials and Methods: This institutional review board--approved single-center retrospective study included 166 total patients (118 male, 48 female, age at procedure 68.9 ± 10) who underwent 295 interventions using transradial access between September 2014 and March 2024. The procedures included chemoembolization, chemoperfusion, radioembolization, bland embolization and diagnostic angiography. Medical records and imaging data were reviewed to evaluate procedural success, complications and radial artery diameter.

Results: A total of 313transarterial interventions were planned in these 166patients. Transradial access was attempted in 307of these cases. Out of 307attempts at interventions via transradial access, 295were successful (96%). Six of the patients were deemed to not be candidates for transradial access secondary to Barbeau D waveform in 4patients, occluded radial artery in 1patient, and presence of hemodialysis fistula in 1patient. Mean radial artery diameter was 2.52 ± 0.51 mm. During the successful 295procedures, 3 (1%) total complications occurred: 2subcutaneous wrist hematomas and 1subcutaneous fluid collection at the right mid-forearm. 8patients had a platelet count of less than 15,000/uL at the time of procedure (6.3 ± 4.1 /uL) with no associated bleeding complications. 26patients had a radial artery diameter < 2mm which is regarded as a contraindication for radial access. This subset of patients underwent a total of 35procedures with a technical success rate of 97% (34/35). 19patients underwent 4or more transradial procedures via the same radial artery. The median number of transradial access procedures performed in these patients was 8. Technical success rate was 100%.

Conclusion: Transradial access is a safe and effective method for performing interventional oncologic interventions. Even in

extreme conditions such as severe thrombocytopenia and radial artery diameter < 2 mm, it has a high technical success rate. Additionally, the same radial artery can be accessed multiple times with a high technical success rate.

Abstract No. 510

Large-Bore Mechanical Thrombectomy Versus Catheter-Directed Thrombolysis for Intermediate-Risk Pulmonary Embolism: A Single-Center Retrospective Analysis



(Article No. 108418)

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Purpose: To compare the effects and outcomes of large-bore mechanical thrombectomy (LBMT) and catheter-directed thrombolysis (CDT) in patients with intermediate-risk pulmonary embolism (PE), and to place these real-world findings in context with prior randomized trial data.

Materials and Methods: This institutional review board--approved retrospective study included consecutive patients with intermediate-risk PE treated with LBMT or CDT at a single tertiary center between January 2018 and December 2024. High-risk PE was excluded. Treatment strategy was determined at physician discretion. Baseline demographics, comorbidities, and Pulmonary Embolism Severity Index (PESI) scores were collected. Primary safety endpoints were all-cause in-hospital mortality, PE-associated mortality, and major bleeding (International Society on Thrombosis and Haemostasis [ISTH] criteria). Secondary outcomes included ICU stay, hospital stay, and 30-day readmission. Group comparisons were performed using Fisher's exact test for categorical variables and appropriate tests for continuous variables.

Results: A total of 170 patients met criteria for intermediate-risk PE (LBMT n=113; CDT n=57). Baseline characteristics, including PESI scores and right ventricular strain, were similar between groups. All-cause in-hospital mortality occurred in 9 of 113 patients (6.7%) treated with LBMT and 7 of 57 patients (12.3%) treated with CDT ($p=0.41$). PE-associated mortality was 5 patients (4.4%) in the LBMT group and 7 patients (12.3%) in the CDT group ($p=0.11$). Major bleeding, defined by ISTH criteria, occurred in 10 patients (8.8%) with LBMT and 6 patients (10.5%) with CDT ($p=0.78$). Mean ICU stay was 5.1 ± 7.7 days for LBMT and 4.3 ± 6.2 days for CDT ($p=0.53$), while mean total hospital stay was 9.5 ± 9.3 and 8.3 ± 6.8 days, respectively ($p=0.39$).

Thirty-day readmission occurred in 15 of 113 patients (13.3%) in the LBMT group compared with 5 of 57 patients (8.8%) in the CDT group ($p=0.46$).

Conclusion: In this single-center, real-world cohort of intermediate-risk PE, outcomes with LBMT and CDT were broadly similar, with no significant differences in all-cause mortality, PE-associated mortality, or major bleeding. While PEERLESS' superiority signal was driven by clinical deterioration and ICU admission—endpoints not captured in our dataset—PE-associated mortality and major bleeding were similar between LBMT and CDT in our cohort. These findings suggest comparable real-world outcomes across the two approaches and highlight the value of observational data in contextualizing RCT results.

Abstract No. 511

An Interpretable Exam-Level Score for Pulmonary Embolism Burden: Transparent, Reproducible Insights from CTA



(Article No. 108419)

N. Primiano¹, D. Shilo¹; ¹Mount Sinai

Purpose: Timely triage in acute PE demands rapid, reliable risk stratification. Automated CTA clot-burden assessment can accelerate mobilization and represents a step forward in the continued efforts to extract clinically predictive signals from diagnostic PE CTs. Using a publicly available dataset, we derive an interpretable exam-level score linked to central emboli and RV strain ($RV/LV \geq 1$). Because clot distribution and pulmonary vascular reserve may predict response to intra-arterial therapy, this score may help guide care.

Materials and Methods: Using the RSNA STR Pulmonary Embolism Detection dataset, we excluded studies with motion or flow artifacts, and trained a 2.5D per-slice classifier on mediastinal-window images (inputs: [slice-1, slice, slice+1]). A study-level test set was held out. The model produced per-slice probabilities. On a validation fold, we chose a slice-probability threshold t^* that maximized correlation between a density measure and RV strain, then fixed t^* for testing. To summarize clot burden, we combined extent (how many slices are positive) and strength (how convincing the positives are):

$$\text{density_t} = (\text{number of slices with probability} \geq t) / N$$

$$S = \text{density_t}^* \times \text{topk_mean}$$

where N is the number of slices per study and topk_mean is the mean of the top 3% of slice probabilities. Higher S indicates greater burden. We evaluated slice- and study-level detection, central emboli, and association with RV strain.

Results: On the test cohort, the per-slice classifier achieved AUC 0.988. Aggregated to the exam level using S , AUC was 0.894 (95% CI 0.861-0.927) with precision 0.839, recall 0.867, and F1 0.851 at t^* . S discriminated central emboli (AUC 0.921) and correlated with $RV/LV \geq 1$ (Spearman $r = 0.688$).

Conclusion: An interpretable exam-level score that combines extent and severity quantifies PE burden, aligns with central emboli and RV strain. Embedded in CTA workflows, S can provide rapid,

reproducible triage signals, and help identify patients who may benefit from escalation—including intra-arterial therapies.

Abstract No. 512

Ultrasound-Guided Sheath Reversal: A Novel and Simplified Technique for Dialysis Access Interventions



(Article No. 108420)

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Purpose: Many AV access interventions require bidirectional access to treat antegrade and retrograde segments, traditionally requiring two separate sheath insertions. Sheath reversal can minimize the need for multiple access points, reducing access-related challenges and risks. While fluoroscopy-guided reversal has been described, a purely US-guided technique has not. Our group has simplified this approach for broader adoption.

Materials and Methods: This retrospective, single-center study included AV access interventions performed between January 1, 2021, and May 31, 2025, in which a single-sheath US-guided reversal technique was used. Eligible cases were identified through the mPower search engine. Inclusion criteria were fistula or graft interventions using a singular access site and sheath reversal. Unidirectional interventions and those involving multiple access sites, including declots, were excluded. Initial needle access was obtained as vertically as possible under real-time US to minimize tissue tract length. A woggle purse-string suture was placed before sheath manipulation for hemostasis in case access was lost. After treating one direction, the sheath was pulled back under US guidance until the tip was 5–10 mm within the AV access lumen. The sheath was then flipped and redirected, and US was used on

512.1.

n		38
Patient Sex (%)	Female	14 (36.8)
	Male	24 (63.2)
Patient Age (mean (SD))		65.68 (16.90)
Ultrasound Guidance (%)	Yes	38 (100.0)
Successful (%)	Yes	38 (100.0)
Second Access (%)	No	38 (100.0)
Procedure Time (minutes) (mean (SD))		35.05 (19.63)
Fluoro Time (mean (SD))		4.62 (3.57)
Anesthesia Time (mean (SD))		33.63 (17.65)
Bleeding (%)	< 10 mL	21 (55.3)
	11-50 mL	16 (42.1)
	20 mL	1 (2.6)
Hematoma (%)	No	38 (100.0)
Access loss (%)	No	38 (100.0)
Fistula Type (%)	Brachial-basilic	4 (10.5)
	Brachial-cephalic	10 (26.3)
	Graft	10 (26.3)
	Radio-cephalic	13 (34.2)
	Brachio-brachial	1 (2.6)
Stent Used (%)	No	34 (89.5)
	Yes	4 (10.5)

the opposite side to confirm tip position before treating the second direction.

Results: A total of 38 procedures met inclusion criteria. Technical success was achieved in 100% of cases, and none required a second access. The mean procedure time was 35.1 ± 19.6 minutes, with an average fluoroscopy time of 4.6 ± 3.6 minutes and sedation time of 33.6 ± 17.7 minutes. No instances of access loss, hematoma, or major bleeding events. Stents were deployed in 10.5% of cases.

Conclusion: This US-guided sheath reversal technique is fast, safe, and effective, with no recorded instances of access loss or complications. The simplicity and reproducibility of this technique make it easy for broad adoption.

Abstract No. 513

Risk Factors for Pseudoaneurysm After Percutaneous AV Fistula Creation with 4-Fr WavelinQ: A Retrospective Study



(Article No. 108421)

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Purpose: Percutaneous arteriovenous fistula (pAVF) creation is a minimally invasive alternative to surgical AVF for hemodialysis access. This study aimed to evaluate the incidence of pseudoaneurysm formation in pAVFs created with two devices (WavelinQ and Ellipsys) and to identify risk factors for pseudoaneurysm formation, with a focus on the WavelinQ cohort.

Materials and Methods: We conducted a retrospective review of 33 patients who underwent pAVF creation between July 2021 and August 2025. Among them, 24 patients received a 4Fr WavelinQ endovascular AVF and 9 patients received an Ellipsys percutaneous AVF. Patient demographics (age, sex, diabetes mellitus, hypertension, atherosclerosis) and vascular measurements (anastomosis artery diameter, anastomosis vein diameter, perforator vein diameter, and preoperative superficial draining vein diameter) were collected from medical records. The occurrence of pseudoaneurysm at the AV anastomosis was documented. Logistic regression analysis was performed in the WavelinQ group to identify independent predictors of pseudoaneurysm formation. A p-value < 0.05 was considered statistically significant.

Results: Pseudoaneurysm formation was observed in 4 of 24 WavelinQ cases (16.7%) and in 0 of 9 Ellipsys cases (0%). All pseudoaneurysms occurred at the anastomosis site and were limited to the WavelinQ device group. Logistic regression analysis in the WavelinQ subgroup revealed that a smaller anastomosis vein size was associated with an increased risk of pseudoaneurysm formation, showing a trend toward statistical significance (odds ratio [OR] = 2.44, 95% confidence interval: 0.90–6.63, p = 0.07). No other assessed variables showed a significant association with pseudoaneurysm occurrence in the WavelinQ group (p > 0.05 for age, sex, diabetes, hypertension, atherosclerosis, anastomosis artery size, perforator vein size, and preoperative superficial vein size). The Ellipsys cohort experienced no pseudoaneurysm complications in our series.

Conclusion: While logistic regression analysis did not reach statistical significance, the findings suggest a potential trend toward increased pseudoaneurysm formation in patients with smaller

anastomosis vein size. This trend warrants further investigation with a larger sample size to confirm its clinical relevance. Identifying specific anatomical factors associated with pseudoaneurysm formation may assist in optimizing patient selection and procedural planning in pAVF creation using the 4Fr WavelinQ system.

Abstract No. 514

Comparative Analysis Between Percutaneous and Surgically Created Arteriovenous Fistulas for Hemodialysis



(Article No. 108422)

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Purpose: Arteriovenous fistulas (AVF) are the first-line sites for hemodialysis access in patients with end-stage renal disease (ESRD). Patient prognosis largely depends on the patency of these fistulas. Historically, AVFs were surgically created but were associated with increased risk of failure and distal AVF ischemia (steal syndrome). The advent of percutaneous devices has allowed for minimally invasive opportunities in creating AVFs, but there remains controversy regarding their efficacy.

Materials and Methods: TriNetX was used to evaluate patient electronic medical records between January 1, 2020, and September 1, 2024. Patients receiving a first time surgically (sAVF) or percutaneously (pAVF) created AVF and were diagnosed with ESRD were included in our study. Patients who received an AV graft were excluded from the study. Patients were split into two cohorts based on the type of AVF. Patients were 1-to-1 propensity matched with a history of diabetes, hypertension, and previous hemodialysis access. Final totals were 250 patients in each cohort. Primary outcome measured was rates of steal syndrome at 3, 6, 12, and 24 months. Primary and cumulative patency were measured at 12 and 24 months. Other secondary outcomes measured were rates of percutaneous and open surgical reinterventions at 3, 6, 12, and 24 months.

Results: pAVF was associated with greater rates of steal syndrome earlier on at 3 (RR = 2.308, 95% CI [1.233,4.319]) and 6months (RR = 1.682, 95% CI [1.022,2.766]), but no significant difference was found afterwards. sAVF was consistently associated with greater rates of open surgical revisions than pAVF across all timepoints, while pAVF was associated with greater rates of percutaneous interventions at 3, 6, and 12months. pAVF primary patency at 1and 2years was 68% and 65.6%, respectively, while sAVF primary patency at 1and 2years was 70.8% and 65.2%, respectively. No significant difference was found between 1and 2year primary patency (p = .496, p = .925). pAVF cumulative patency at 1and 2years was 80% and 78.8%, respectively, while sAVF primary patency at 1and 2years was 79.6% and 76.8%, respectively. No significant difference was found between 1and 2year cumulative patency (p = .911, p = .59).

Conclusion: pAVF achieves similar success in short and long-term patency when compared to sAVF with less risk of open surgical interventions and distal AVF ischemia. Further randomized-controlled studies are necessary in ascertaining pAVF's efficacy.

Abstract No. 515**Single-Center Comparison of Endovascular and Surgical Arteriovenous Fistula Creation for Hemodialysis Access**

(Article No. 108423)

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Purpose: This study compared clinical outcomes after endovascular arteriovenous fistula (endo AVF) creation versus surgically created AVF (surgical AVF) at a single institution.

Materials and Methods: In this retrospective, single-center study, electronic medical records were reviewed for consecutive patients referred for endo AVF and surgical AVF creation between January 2019 and November 2024. Data collected included patient demographics, endo AVF and surgical AVF technical outcomes, hemodialysis (HD) treatment outcomes, patency outcomes, and adverse events (AEs).

Results: The endo AVF cohort consisted of 57 patients (M:F=35/22, 61% men, 39% women; mean age 57 years) with end-stage renal disease (ESRD) (n=36, 63%) or chronic kidney disease (CKD) (n=21, 37%) who underwent technically successful endo AVF creation. In the surgical AVF cohort, there were 46 patients (M:F=20/26, 43% men, 57% women; mean age 60 years) with ESRD (n=35, 76%) or CKD (n=11, 24%). Time from referral to creation was shorter in the endo AVF cohort, but not statistically different (48 ± 33 vs. 75 ± 117 days, $P=0.111$). AE rate was similar (18/57, 32% vs. 11/46, 24%, $P=0.390$). Endo AVFs required a higher number of interventions to achieve maturation (0.9 ± 1.2 vs. 0.4 ± 0.8 , $P=0.012$) and frequently (40/57, 70%) required brachial vein embolization to mitigate competing outflow. A total of 36 endo AVFs and 21 surgical AVFs matured at 81 ± 66 and 112 ± 106 days, respectively; maturation time was not different ($P=0.121$). 48 endo AVF and 42 surgical AVF patients required HD initiation during the study period and more endo AVF patients were able to initiate dialysis via their fistula compared to surgical AVF patients (35/48, 73% vs. 20/42, 48%; $P=0.018$). A higher proportion of endo AVF subjects achieved HD catheter removal after fistula creation (29/46, 63% vs. 16/41, 39%; $P=0.025$). Median primary patency was longer in the endo AVF cohort but not statistically different (1.7 years, CI: 0.8-1.8 vs. 0.5 years, CI: 0.3-1.2 years; $P=0.276$).

Conclusion: Endo AVFs can be created with high technical success and readily allow for the initiation of HD. However, they may require more interventions for assisted maturation compared to surgical AVFs. For patients on catheter HD, endo AVF creation may facilitate earlier catheter removal.

Abstract No. 516**Senolytic Changes in Murine Arteriovenous Fistulas with Chronic Kidney Disease**

(Article No. 108424)

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Purpose: Hemodialysis therapy for end-stage kidney disease (ESKD) patients requires suitable vascular access which is most commonly the arteriovenous fistula (AVF). Approximately forty percent of AVFs fail within one year via unclear mechanisms and current therapies are wholly inadequate. Cellular senescence disproportionately affects ESKD patients and may be essential in AVF failure. ESKD itself may also be responsible for an increasing senescent burden and predisposition to deleterious vascular responses. Senescence follows AVF placement in mice and rats with normal kidney function, but the temporal changes and specific localization of senescent cells in uremic conditions remain unknown. Therefore, this study aims to characterize AVF changes in uremic mice over time and versus control vessels.

Materials and Methods: Six- to eight-week-old male C57BL/6J mice received a 5/6 nephrectomy. Twenty-eight days later an AVF was created via a cuff anastomosis connecting the right carotid artery to the right jugular vein. Transcriptomic analysis was performed on the AVF seven days post-AVF, and further samples were collected at fourteen and twenty-eight days post-AVF creation for histological analysis.

Results: Firstly, the morphometry of the AVF outflow vein was assessed and showed reduced neointimal cell density. A whole transcriptomic analysis of the outflow veins at seven days post-AVF placement revealed 1187 upregulated and 3256 downregulated genes as compared to control veins. The differentially expressed genes were significantly enriched in established senescent (SenMayo) and fibrotic (SenSig) gene sets. These were confirmed to also change histologically between 14 and 28 days in the AVF with markers such as p16, p21, and pp53 increasing.

Conclusion: These data support established biomarkers of AVF failure like matrix-metalloproteinases and monocyte chemokines and lend credence to potential novel modulators of AVF survival. In summary, this study reveals for the first time the chronological progression of senescence in the AVF of uremic mice.

Abstract No. 517**Using Photon-Counting CT and AI-Assisted Image Registration Techniques to Improve Embolization Guidance**

(Article No. 108425)

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Purpose: Prostate artery embolization (PAE) procedures remain challenging due to complex pelvic vasculature. Photon-counting-detector CT (PCD-CT) offers ultra-high resolution virtual monoenergetic images and material maps that can improve semi-automated vessel segmentation; however, pre-procedural CT data require accurate registration with intra-procedural imaging. The aim of this study is to develop an AI-assisted, non-rigid registration framework combining pre-procedural PCD-CT with intra-procedural cone-beam CT (CBCT) and digital subtraction angiography (DSA) to improve image registration and thus vessel guidance during PAE.

Materials and Methods: Patients scheduled for PAE underwent pre-procedural CT angiography with PCD-CT (NAEOTOM Alpha). During intervention, CBCT without contrast and multiple DSA sequences were acquired (AXIOM Artis Q). Intra-procedural guidance was assisted by semi-automatically identified vessel

traces on high resolution 50 keV PCD-CT data, rigidly registered and overlaid onto the live images (syngo Embolization Guidance). Subsequently and retrospectively, an AI-assisted, non-rigid registration algorithm was used to align the preprocedural Virtual-Non-Contrast (VNC) PCD-CT data to the procedural unenhanced CBCT. The transformation was then applied to the vessel tracings used for embolization guidance. These registered tracings were then forward-projected onto the 2D DSA plane for comparison with actual vessel positions. The difference between the projected traces and the DSA was used to iteratively inform the registration algorithm in the form of an additional loss function to update the model weights. The percent overlap between the projected traces and the vessels in the DSA views was used at each iteration to determine vessel registration accuracy.

Results: AI-assisted registration of VNC PCD-CT image reduced the residual 3D registration error by over 50% compared to rigid registration. The addition of 2D information from the DSA plane combined with the projected traces from 50keV PCD-CT improved the accuracy of the vessel registration from the initial 23% to 75%.

Conclusion: Leveraging the multi-energy property of high-resolution PCD-CT data paired with AI-assisted, non-rigid registration techniques provides more accurate vessel guidance for PAE procedures, particularly after incorporating 2D DSA data to focus the model's attention on the relevant vessels.

Abstract No. 518

Tract Embolization to Reduce Pneumothorax and Chest Tube Placement After CT-Guided Lung Biopsy: Systematic Review and Meta-Analysis of 10,000+ Patients



(Article No. 108426)

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Purpose: Pneumothorax is the most common complication of CT-guided percutaneous lung biopsy (PTLB). Tract embolization (TE) has been proposed to reduce this risk. We performed a systematic review and meta-analysis to evaluate the efficacy of TE in preventing pneumothorax and chest tube placement.

Materials and Methods: We conducted a systematic review and meta-analysis registered in PROSPERO (CRD420250616833). PubMed, Embase, Web of Science, and Cochrane were searched until November 2024. Randomized and observational studies reporting TE in PTLB were included. Pooled risk ratios (RR) with 95% confidence intervals (CI) were calculated using random-effects models. Number needed to treat (NNT) and exploratory cost analyses were performed.

Results: Twenty-six studies comprising 10,689 patients (5,066 with TE) were included. TE was associated with a lower risk of pneumothorax (RR 0.59; 95% CI 0.54–0.65; $p < 0.001$; $I^2 = 36.9\%$) compared with no TE, either with blood patch (RR 0.62; 95% CI 0.52–0.73; $p < 0.001$; $I^2 = 49.1\%$) or Gelfoam (RR 0.56; 95% CI 0.49–0.65; $p < 0.001$; $I^2 = 36.2\%$). TE also reduced

chest tube placement (RR 0.47; 95% CI 0.38–0.58; $p < 0.001$; $I^2 = 33.4\%$), consistent across blood patch (RR 0.46; 95% CI 0.34–0.64; $p < 0.001$; $I^2 = 30.2\%$) and Gelfoam (RR 0.46; 95% CI 0.31–0.68; $p < 0.001$; $I^2 = 47.3\%$).

Conclusion: Tract embolization after PTLB significantly reduces pneumothorax and chest tube placement, supporting its consideration for broader clinical adoption.

Abstract No. 519

Embolization of Head and Neck Hemorrhage in Cancer Patients: A Survival Analysis



(Article No. 108427)

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Purpose: To review the safety and efficacy of embolization of head and neck bleeding in cancer patients.

Materials and Methods: In this single-center retrospective study, 31 cancer patients who underwent a total of 41 embolizations between 2022 and 2025 were included. Clinical outcomes of interest included days from embolization to discharge, the need for repeat procedures, 30-day mortality, and overall survival. Survival analysis was performed using the Kaplan-Meier estimator to determine survival probabilities at various time points.

Results: Seven patients (23%) underwent multiple embolizations, while two patients (7%) required re-embolization within 7 days. The median time to discharge post-embolization was 3 days, with an interquartile range (IQR) of 1–9 days. The most frequently embolized arteries were the internal maxillary (22%), and facial arteries (17%). The thirty-day survival rate was 77%. Overall, 12 patients (39%) died within one year with a median time from the last embolization to death of 29.5 days (IQR: 17.5–80 days). Estimated survival showed a survival probability of 0.83 (95% CI: 0.67–0.91) at 1 month, 0.71 (95% CI: 0.54–0.82) at 3 months, 0.60 (95% CI: 0.43–0.73) at 6 months, and 0.54 (95% CI: 0.37–0.68) at 12 months.

Conclusion: Embolization of head and neck arteries in cancer patients appears to be a safe and effective intervention, associated with an encouraging survival profile.

Abstract No. 520

Safety and Efficacy of Selective Arterial Embolization for Recurrent Hemarthrosis After Total Knee Arthroplasty: A Systematic Review and Meta-Analysis



(Article No. 108428)

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Health Sciences for Women, Nawabshah, Pakistan; ⁶Allama Iqbal medical college; ⁷Department of medicine, Multan Medical And Dental College, Multan; ⁸Shalamar Medical and Dental College

Purpose: The aim of this study was to assess the available evidence on the efficacy and safety of selective arterial embolization (SAE) as a minimally invasive treatment for recurrent hemarthrosis (RH) following total knee arthroplasty (TKA) through a systematic review and meta-analysis.

Materials and Methods: A systematic search was conducted through PubMed, Embase, Google Scholar, Cochrane (CENTRAL), Scopus, and ClinicalTrials.gov using keywords to identify relevant studies. Case reports, commentaries, nonhuman research, duplicates, and studies lacking data on SAE for RH were excluded. Eligible studies included retrospective cohorts and case series reporting relevant clinical outcomes. Risk of bias was assessed using the ROBINS-I tool. The primary outcome was clinical success, defined as resolution or significant improvement of RH. Secondary outcomes included recurrence rate, number of vessels embolized, and complication rates (major and minor). A random-effects model was used to pool event data and calculate proportions with 95% confidence intervals (CIs). Heterogeneity was assessed using the I^2 statistic. Publication bias was evaluated using funnel plot analysis and Egger's test. All analyses were performed in R version 4.4.2, with statistical significance set at 0.05. This review was done in accordance with PRISMA guidelines.

Results: Fifteen studies involving 303 participants were included. The pooled clinical success rate for SAE was 0.76 (95% CI: 0.66–0.83), while the pooled hemarthrosis recurrence rate was 0.25 (95% CI: 0.19–0.30). Across six studies, the mean number of vessels embolized was 2.77 (95% CI, 2.28–3.26), with significant heterogeneity. The pooled major complication rate was 0.08 (95% CI, 0.04–0.14), and the pooled minor complication rate was 0.12 (95% CI, 0.07–0.19). Funnel plot asymmetry and Egger's test indicated the presence of publication bias.

Conclusion: SAE appears to be a safe and effective minimally invasive option for managing RH after TKA, with high clinical success and acceptable complication rates. However, the observed recurrence rate, heterogeneity among studies, and evidence of publication bias highlight the need for larger, prospective trials to better define the long-term efficacy and safety of SAE in this setting.

Abstract No. 521

Review of Hemorrhoid Artery Embolization for Symptomatic Internal Hemorrhoids



(Article No. 108429)

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Purpose: Hemorrhoid artery embolization (HAE) has emerged as a promising treatment for symptomatic internal hemorrhoids (IH).

Due to the novelty of this procedure, limited data exists on its efficacy and technical details. As such, this review aims to summarize the findings of recent clinical trials that have contributed to our understanding of the role of IR in the treatment of hemorrhoidal disease and provide an update of ongoing trials and future directions.

Materials and Methods: Trial search was conducted using PubMed. Main inclusion criteria included randomized clinical trials and evaluation of the embolic material, technical success, and adverse events of HAE.

Results: A total of three randomized clinical trials were included for review. One trial focused on comparing HAE to surgical hemorrhoidectomy while the other two trials evaluated specific properties of embolic materials (size and embolization agent). In comparison to surgical hemorrhoidectomy, embolization was technically successful in 100% of cases with no severe or life-threatening adverse events. Moreover, postoperative pain levels were significantly lower and bleeding symptoms improved in 83.3% of patients in the embolization group. When comparing various embolization agents, the results suggest that using calibrated microspheres may be more effective and as safe as coil embolization for treating hemorrhoids, while Onyx may be an unsafe embolic agent for this indication due to the risk of ischemic complications. In terms of embolic particle size, Tris-acryl microspheres were safe and effective, with results favoring the use of larger 900-1,200 μ m microspheres over smaller sizes to achieve better bleeding control with fewer ischemic complications. An angiographic study was also done to determine anatomic variations of superior rectal arteries to improve the effectiveness of HAE. Four patterns were seen, with 4 main branches (2 left and 2 right) being the most common variation.

Conclusion: Hemorrhoid artery embolization presents as a safe and effective treatment for symptomatic internal hemorrhoids, particularly for those who have not responded to other treatments. While the procedure shows promise, further research is necessary to enhance the understanding of HAE as a treatment option.

Abstract No. 522

Complications of Hepatic Angioembolization for Trauma: Laparotomy Rates and Predictive Clinical Factors



(Article No. 108430)

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Purpose: Hepatic artery embolization for hepatic trauma is well established part of non-operative management, which is utilized in >80% of cases and expected to increase with the 2018 AAST-OIS update. Post embolization necrosis and bile leak are known complications which occur in up to 42% and 20% of cases. This is the largest HAE study (n=300) to date. We examine outcomes linked to the new 2018 AAST-OIS classification, including rates of necrosis and biliary leak.

Materials and Methods: We retrospectively studied 300 patients who underwent hepatic angiography at a Level 1 trauma center from January 1, 2015, to August 1, 2025. Unstable defined as persistent hypotension < 90 mm Hg or ATLS Grade 3-4 hemorrhagic shock. Coagulopathy was defined as INR > 1.4 or hypothermia < 35 C. Primary endpoints were rates of complications—bleeding, bile leak, necrosis. Hypothesis testing performed using Student's t-test, chi-squared, and Fisher's Exact test.

Results: Of the 300 hepatic angiograms performed for trauma, 221 were embolized. Compared to the non-embolization group, they had more severe hepatic injury (AAST 3.9 vs. 3.6, $p=0.004$) and higher rates of frank extravasation on angiogram (43.4% vs. 0%, $p<0.001$). Embolization patients were categorically higher acuity. Likewise, patients who ended up with complications of HAE had worse hepatic injury (AAST 4.3 vs. 3.8, $p<0.001$), with higher rates of unstable vitals (90% vs. 58%, $p<0.001$) and coagulopathy (78% vs. 44%, $p<0.001$). Damage control laparotomy (DCL) was performed in 48% of patients who developed complications, compared to 26% of patients who did not ($p=0.002$). HAE is reported to be associated with development of hepatic necrosis in 42% and bile leak in 20%. However, this study demonstrates significant clinical differences between those who do and do not develop complications. Many reported complication rates of HAE did not control for laparotomy rates, with up to 97% of patients also undergoing laparotomy before developing complications. These outcomes cannot be solely attributed to HAE without prospective evidence to control for the confounding effect of laparotomy rates.

Conclusion: This study demonstrates a strong association between complications (necrosis and biliary leak) of HAE and degree of hepatic trauma by updated 2018 AAST classification. Patients who undergo HAE without such complications have significantly less severe trauma and are less likely to be unstable. It is premature to conclude these complications are due to HAE without prospective data.

Abstract No. 523

Transhepatic Access Closure for Islet Cell Transplant in Anticoagulated Patients: A Comparison of Microfibrillar Collagen Paste, Coils, and Coil Plus Gelfoam



(Article No. 108431)

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Purpose: To evaluate the safety and effectiveness of microfibrillar collagen paste (MCP), coils, and coils combined with gel foam for transhepatic access tract embolization following portal vein islet cell transplant.

Materials and Methods: A retrospective review was conducted at a single institution between January 2008 and October 2024, including 20, 28, and 21 consecutive islet cell transplant

procedures requiring transhepatic access embolization with MCP, coils, and coil plus gel foam, respectively. All procedures were performed via a right portal vein branch. MCP was performed using Avitene (BD). The average number of coils required in the coil plus gel foam and coil-only groups were 1.8 and 1.6 coils per procedure, respectively. All patients were placed on therapeutic anticoagulation during the procedure and for at least two weeks after transplant. Medical records were reviewed to compare laboratory results, portal venous pressures, post-procedure liver ultrasounds, and 30-day hemorrhagic events across the three groups.

Results: All procedures were technically successful. However, one instance of coil migration into a portal vein branch occurred in the coil plus gel foam group (1/28, 3.5%). Baseline hemoglobin, platelet counts, and partial thromboplastin time did not differ significantly between groups ($p>0.05$). A statistically significant lower international normalized ratio (INR) was observed in the MCP group compared to the gel foam and coil-only groups (1.0 vs. 1.1 vs. 1.1, $p=0.0036$ and 0.004). No statistically significant differences were found in hemoglobin changes, posttransplant portal venous pressures, or post-embolization hemorrhagic events ($p>0.05$). One patient in the coil plus gel foam group developed a large subcapsular hematoma (1/27, 3.7%), while another in the MCP group experienced a large right hemothorax (1/20, 5.0%).

Conclusion: MCP, coils, and coil plus gel foam are similarly effective for transhepatic access closure following islet cell transplant in anticoagulated patients. However, coil embolization may require multiple coils and carries a risk of migration.

Abstract No. 524

Primary Results from a Real-World Registry of the Concerto Detachable Coil System for the Treatment of Hemorrhage, Peripheral Aneurysms, and Pelvic Venous Disorders



(Article No. 108432)

V. Wu¹; ¹Massachusetts General Hospital

Purpose: Evaluate safety/effectiveness of Concerto coil system through 12 months in a real-world setting

Materials and Methods: The Product Surveillance Registry enrolled 130 patients at 13 sites embolized with Concerto coil system for indications including arteriovenous malformation, gastric varices, GI bleed, hemorrhoid, pelvic venous disorder/pelvic venous insufficiency (PVD/PVI), peripheral aneurysm, portal vein embolization, trauma bleed, type II endoleak, varicocele, and other. Patients were followed per routine care practice. Safety objectives were non-target tissue ischemia and non-target embolization at index procedure. Performance objectives were technical success, clinical success, target lesion occlusion at follow-up, secondary embolization of target lesion, recanalization, coil compaction, and device fracture.

Results: Indications with ≥ 10 patients were trauma bleed (30.0%), GI bleed (25.4%), peripheral aneurysm (13.1%), and PVD/PVI (10.8%). Overall 1.3 ± 0.6 lesions were treated per procedure with 3.8 ± 2.6 coils per lesion. Zero instances of non-target ischemia, non-target embolization, and device fracture were reported. Technical success was 97.8%, and clinical success was 97.0%. Target lesion occlusion was mostly maintained for

indications with follow-up visits without recanalization or coil compaction (524.1).

Conclusion: Embolization with the Concerto coil system was safe and effective across a wide variety of indications.

524.1. Performance objectives by follow-up visit				
	Month ⁶			
	1	3	6	12
Patients (N)	46	20	37	48
Lesions (N)	62	33	49	63
Devices (N)	181	116	135	169
All Indications with Follow-Up ⁵				
Occlusion of target lesion at follow-up at lesion level ^{1,3,4,5}	100.0% (38/38)	100.0% (25/25)	96.7% (29/30)	100.0% (35/35)
Recanalization rate at lesion level ^{1,3,5}	0.0% (0/62)	0.0% (0/33)	0.0% (0/49)	0.0% (0/63)
Coil compaction at device level ^{2,3,5}	0.0% (0/181)	0.0% (0/116)	0.0% (0/135)	0.0% (0/169)

¹Calculated per number of index procedure lesions

²Calculated per number of index procedure devices

³Collected at follow-up visits

⁴Lesion level information wasn't available to determine occlusion for some lesions due to missingness

⁵Follow-up visits at 1, 3, 6, 12 months: hemorrhoids, PVD/PVI, "other"; 1, 6, 12 months: peripheral aneurysms, arteriovenous malformations, type II endoleak; 1, 12 months: varicocele

⁶Lesions/devices are based on follow-up; some patients missed follow-up at 3 and 6 months, others did not have 3- or 6-month follow-up, so lesions/devices are higher at 12 months than 3 or 6 months

Abstract No. 525

Pressure-Enabled Drug Delivery (PEDD) During Delivery of Embolic Spheres Enhances Hepatic Tumor Penetration in an Oncopig Model



(Article No. 108433)

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¹TriSalus Life Sciences

Purpose: To evaluate whether localized intravascular pressure elevation using Pressure-Enabled Drug Delivery (PEDD) during and after embolic sphere infusion enhances distribution and concentration of therapeutics within solid hepatic tumors in the Oncopig model. Outcomes may guide workflow parameters to improve targeted delivery.

Materials and Methods: Transgenic Oncopigs (35–55 kg) underwent induction of hepatic tumors by ex vivo oncogene activation of biopsy tissue followed by reinjection into all four liver lobes. Embospheres (100–300 µm; Merit Medical, South Jordan, UT) were conjugated with Iridye 800CW NHS Ester (Li-Cor, Lincoln, NE) as described in Jaroch. Infusions were performed via an investigational 0.038" ID microvalve infusion catheter (TriSalus Life Sciences, Westminster, CO) paired with an Aeris pressure wire (St. Jude Medical, Plymouth, MN) for continuous distal pressure measurement. Selective infusions targeted ~50% of a lobe through 1.5–2.5 mm vessels and continued

until stasis, defined by the angiographic endpoints of Titano: intrahepatic collateral visualization, portal vein enhancement, or contrast seepage through the valve.

Treatment Groups:

- G1: Infusion to endpoint (n=17 tumors, n=12 animals)
- G2: Infusion to endpoint + post-embolization high-pressure (>200 mm Hg) contrast flush (n=11 tumors, n=10 animals)
- G3: Infusion interspersed with ≥2 high-pressure flushes until endpoint (n=15 tumors, n=8 animals)

Analysis: Lobes were serially sectioned (1 cm) and imaged with Near-IR (Pearl, Li-Cor). A custom Visiopharm deep learning algorithm quantified intratumoral vs. parenchymal sphere distribution.

Results: Real-time pressure monitoring allowed controlled adjustment of injection rate, reliably achieving >200 mm Hg distal pressure with manual injection. A single post-embolization high-pressure flush significantly increased intratumoral sphere concentration ($p \leq 0.05$) while decreasing off-target deposition ($p \leq 0.05$). Multiple high-pressure flushes did not provide further benefit. Pressurized infusion shifted microsphere distribution from peritumoral margins (< 1 cm) into tumor cores.

Conclusion: PEDD with intraprocedural pressure monitoring enabled controlled pressure elevation during embolization. Incorporating a single high-pressure flush improved intratumoral penetration and reduced normal liver exposure, supporting pressure-modulated infusion as a workflow strategy to enhance delivery of therapeutics into solid tumors.

Abstract No. 526

Selection of Embolic and Sclerosing Agents for Peripheral Arteriovenous Malformations: A Retrospective Analysis of Influence on Outcomes



(Article No. 108434)

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Purpose: Arteriovenous malformations (AVMs) are aberrant vascular connections. Management frequently involves the use of liquid embolic or sclerosing agents; however, comparative data regarding efficacy remain limited. This study evaluates clinical outcomes of different embolization and sclerotherapy approaches for peripheral AVMs.

Materials and Methods: A retrospective review was performed of peripheral AVMs treated at a tertiary pediatric and affiliated adult hospital between 2010 and 2025. Patients with intracranial AVMs or who underwent exclusive surgical management were excluded. Treatments utilized liquid embolic agents—n-butyl cyanoacrylate (NBCA), or ethylene vinyl alcohol copolymer (EVOH); sclerosing agents—sodium tetradecyl sulfate (STS) or ethanol; or a combination of these approaches. Efficacy was assessed angiographically—complete occlusion (>90% reduction in flow), partial occlusion (< 90% reduction in flow), and by clinical response defined as patient-reported pain reduction and improved function. Complications were classified according to the Society of Interventional Radiology Adverse Event Classification system.

Results: Forty-nine patients underwent 78 treatment sessions. AVM lesions involved the upper extremities (33.9%), lower extremities (28.3%), abdomen (20.3%), and chest wall (17.5%). At the end of the procedure, liquid embolic agents achieved comparable rates of complete (42.9%) and partial (42.9%) occlusion, with functional improvements in 14.3% of cases. Sclerosing agents most frequently resulted in partial occlusion (55.6%), whereas complete occlusion (22.2%) and functional recovery (22.2%) occurred less commonly. Cases treated with a mixed embolic-sclerosing therapy did not yield to complete occlusions; the outcome was evenly distributed between partial occlusion (50%) and functional recovery (50%). Extremity AVMs achieved higher favorable response rates of complete occlusion (upper limb, 72%; lower limb, 68%) than abdominal (45%) or chest wall (38%) AVMs. The overall complication rate was 3.8%, consisting of a grade B nerve deficit as the major complication in 1.3% (n=1) of sessions, and grade C skin purpura and grade A skin redness as minor adverse events in 2.6% (n=2) of sessions.

Conclusion: Liquid embolic-only therapy achieved higher complete occlusion rates compared with sclerosant-only or mixed therapy approaches, while sclerosants favored partial occlusion. Across strategies, treatment of peripheral AVMs demonstrated favorable clinical outcomes with a low major complication rate (1.3%).

Abstract No. 527

Diagnosis and Curative Endovascular Treatment of Intrahepatic Venous Malformations ("Liver Hemangiomas")



(Article No. 108435)

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Purpose: Determine the role of ethanol endovascular therapy in the management of "liver hemangioma" (venous malformation of the liver). Currently, only surgical lobectomy with its attendant severe morbidity and sequela is the only other treatment option. The terms "liver hemangioma" and "hepatic hemangioma" are misnomers in the world's literature and these lesions are venular "intrahepatic venous malformations."

Materials and Methods: Twenty-eight patients underwent 221 treatments by direct puncture into the venous malformation involving single and multiple lobes of the liver. 7 males and 21 females with age range of 24 years to 72 years, mean age, 55 years. Patients underwent arteriography and direct puncture repair of the malformations in the liver; all patients had follow-up performed by CT and MR imaging. Early in the series one patient developed a fever and was placed on antibiotics. Currently all patients are placed on Flagyl and Levaquin for 7 days and no further infections or any abscesses occurred. 21-g needles were used in all direct puncture embolizations.

Results: Reduction in the vein malformation within the liver was noted in all patients. More importantly, their pain symptoms resolved. 1 patient's intractable hiccups resolved. 1 patient developed a left foot drop due to pressure on the sciatic nerve because she was thin and laying on a hard angiographic table. This completely resolved. One patient developed a fever and was successfully treated with antibiotic therapy. Patients were followed-up by CT and MR imaging documenting the shrinkage of single and multiple lesions (follow-up range: 13–52 months;

mean: 37 months). Three of 28 patients had minor abdominal and right shoulder pain post-procedure lasting less than a day post-procedure.

Conclusion: Direct puncture ethanol endovascular therapy is routinely efficacious in the management of symptomatic liver venous malformations just as it is efficacious in venous malformations in other anatomic areas. We recommend covering patients with antibiotics (Flagyl and Levaquin, unless allergic) due to the potential of bacterial seeding of the malformation from the portal system. This procedure is well-tolerated by patients compared with current treatment by liver resections/lobectomy/bile leaks/bile strictures/death that are noted to occur with surgery.

Abstract No. 528

Comparative Short- and Midterm Performance of 200 µ Polyethylene Glycol Microspheres Versus Ethiodized Oil Emulsion for Genicular Artery Embolization in Symptomatic Knee Osteoarthritis



(Article No. 108436)

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Purpose: Comparative outcomes related to embolic selection for genicular artery embolization (GAE) remain poorly defined. This study investigated six-month outcomes of GAE for permanent microspheres vs temporary ethiodized oil emulsion in patients with medically refractory symptomatic knee osteoarthritis (KOA).

Materials and Methods: Sixty-seven consecutive patients (age: 65.2±15.1, BMI: 35.1±9.8, 57 females) underwent GAE from September 2021 to March 2025 using 200-micron microspheres (HydroPearl, n=42, 47.7%) or an emulsion of ethiodized oil and ioversol contrast in a 3:1 ratio (Geurbet, n=46, 52.3%). Clinical outcomes were assessed with the WOMAC Pain sub-score at baseline, one-, three-month, and six-months post-GAE visits. A 20% reduction in the WOMAC Pain score was considered clinically significant. Adverse events (AE) were reported by Society of Interventional Radiology technical standard reporting guidelines. Univariate analysis was performed for treatment outcomes and embolic selection using Fisher and t-tests.

Results: Eighty-eight knees treated with KOA severity: KL3: n=38 (43.2%) & KL4: n=33 (37.5%). Pain sub-scale score decreased by 34.3% (p<0.001*), 30.4% (p<0.001*), and 29.9% (p<0.001*) at 1-, 3-, and 6-months respectively. There was a 67.1% (57/85) one-, 58.7% (44/75) three-, and 60% (30/50) six-month categorical response rate. No association was observed between embolic selection and categorical response (P=0.171-0.816). All AEs were self-limiting at 20.5% (18/88). AEs included skin changes without ulceration (n=16, 18.2%), knee swelling requiring prednisone (n=5, 5.7%), and access site hematoma (n=2, 2.3%). A lower adverse event rate was observed with Lipiodol emulsion compared to microspheres (10.9% vs 31.0%, p=0.033*).

Conclusion: GAE shows positive short and mid-term outcomes up to six-months post treatment for KOA. Lipiodol emulsion may

offer better safety profile over microspheres.

528.1.		
Baseline Characteristics of 67 Patients		
Age (y.o.), mean±SD		65.2±15.1
Gender, n(%)	Male	10 (15)
	Female	57 (85)
BMI, mean±SD		35.1±9.8
Laterality of knees treated, n(%)	Right	46 (52)
	Left	42 (48)
KL grade, n (%)	Grade 2	14 (19)
	Grade 3	38 (43)
	Grade 4	33 (38)
# arteries embolized per GAE, mean ± SD		3.3±0.8
Embolic, n(%)	Microspheres	42 (48)
	Ethiodized oil+ioversol	46 (52)

528.2.		
Baseline and Post Treatment WOMAC		
Characteristic	Mean ± SD	p-value
Baseline Total WOMAC	61.9 ± 18.0	
1Month % reduction	27.5 ± 37.5	P < 0.001*
3Month % reduction	20.8 ± 47.1	P < 0.001*
6Month % reduction	22.6 ± 35.1	P < 0.001*
Baseline WOMAC Pain	12.6 ± 3.5	
1Month % reduction	32.9 ± 32.3	P < 0.001*
3Month % reduction	30.1 ± 32.8	P < 0.001*
6Month % reduction	29.9 ± 32.9	P < 0.001*

Abstract No. 529

Angioembolization Improves Survival After Damage Control Laparotomy and Resuscitative Thoracotomy for Hepatic Trauma



(Article No. 108437)

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Purpose: Hepatic angioembolization (HAE) is one of the only interventions associated with decreased mortality after damage control laparotomy (DCL) for hepatic trauma. This study is the largest to date, which examines outcomes of HAE after DCL and resuscitative thoracotomy (RT).

Materials and Methods: We retrospectively examined 96 patients who underwent DCL at a Level 1 trauma center from January 1, 2015, to August 1, 2025. Nine also required resuscitative thoracotomy for lost pulses. Unstable defined as persistent hypotension < 90 mm Hg or ATLS Grade 3-4 hemorrhagic shock. Coagulopathy was defined as INR > 1.4 or hypothermia < 35 C.

Primary endpoints include complications (bleeding, bile leak, necrosis) and mortality.

Results: DCL patients presented with severe trauma (mean AAST 4.2, ISS 40). The majority were unstable (86%) and coagulopathic (84%). Hepatic-related mortality was 1% (overall 19.5%). Morbidity rate was 32%, comprising bleeding (11%), bile leak (14%), abscess (7%), and necrosis (7%). DCL + RT patients were all unstable and coagulopathic (100%), with Grade V hepatic injury (100%) and extensive polytrauma (mean ISS 55). Survival rate was 22%. Overall mortality was 77%, with 11% from hepatic causes. Morbidity was 33% overall, and 100% for surviving patients. Operative hepatic trauma is associated with 51-65% mortality. With HAE mortality drops to 20-30% in small sub-group analysis and database studies. This study shows 19.5% mortality with DCL, reaffirming previous reports of survival benefit. Post-thoracotomy outcomes of hepatic trauma have a reported 100% mortality. If the patient survives to receive HAE, mortality decreases to 77% in this study. Mortality benefits in this study occurred despite more severe injury (mean ISS 40-55 vs. 33-37) than previous studies on DCL.

Conclusion: This study demonstrates increased survival with HAE after damage control laparotomy (DCL) and resuscitative thoracotomy (RT). Previously, this was only suggested by small sub-group analysis and database query studies.

Abstract No. 530

Endovascular Management of Intractable Oral Bleeding in the Malignant Oral Cavity Tumors: Evaluating the Technical Success, Safety, and Outcomes



(Article No. 108438)

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Purpose: About 10% of locally advanced cases undergoing chemoradiotherapy have tumoral hemorrhage and bleeding episodes. surgical management is difficult due to altered anatomy due to prior surgery induced adhesions, radiation induced fibrosis. Intra-arterial embolization is a safe and effective method to control acute bleeding episodes. This study is done in an apex cancer institute of north India where efficacy, safety and outcomes of the treatment by trans arterial embolization was evaluated for the patients with tumor bleed in oral cavity cancers.

Materials and Methods: In this retrospective study, total number of 100 cases who were admitted with clinically suspected tumoral bleeding were studied from the period of 2018 to 2024. All patients were evaluated in terms of tumor location, type of pre-embolization undergoing treatment, Nuclear medicine staging, angiographic findings, number and type of vessel embolized by various embolizing agents, duration of hospital stay, recurrence of bleeding, need for re embolization, technical and clinical outcomes.

Results: Technical success was achieved in 100% patients. Most commonly males were affected with mean age group 30-60 years. Most common tumor location was tongue. Tumor blush was the most common angiographic finding with lingual arteries being the most common artery involved. There was no immediate

recurrence of bleed within the same duration of stay in hospital. However, in few cases recurrence was noted in the follow up period with need for re embolization in some cases. No major complication was seen in any of the patients.

Conclusion: Intra-arterial embolization is a safe and effective means of treating acute bleeding episodes in the oral cavity tumors with 100% technical success and improved clinical outcomes.

Abstract No. 531

The Bottom Line on Hemorrhoid Artery Embolization Outcomes: A Tertiary Center Experience



(Article No. 108439)

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Purpose: To assess technical and clinical success and complication rates in patients treated with hemorrhoid artery embolization (HAE) for rectal bleeding, and factors associated with clinical success.

Materials and Methods: A retrospective review was performed on all patients undergoing HAE for rectal bleeding at a single tertiary center between 2020 and 2025 (n=55). Hemorrhoid severity was classified according to Goligher's criteria. Clinical success was defined as no recurrence of rectal bleeding during the follow-up period. Electronic health records were interrogated for demographics, pre- and post-procedural clinical status and outcomes. Data were summarized as mean $\pm$ SD. Univariate random effect logistic regression models were used to assess predictors of clinical success considering the effect of repeated observations (embolizations). Stata BE 18.0 was used for all analyses and significance level was set at 0.05.

Results: A total of 69 hemorrhoid artery embolizations were performed in 55 patients. The mean age was 66 ± 15 years and 47% were females. Hemorrhoid severity at presentation was grades 1-4 in 14%, 44%, 37% and 5% of the embolizations, respectively. 61% of the patients were on an anticoagulation regimen and 27% had liver cirrhosis. The mean Charlson comorbidity index was 4.4 ± 2.4 . The median follow-up duration was 3 months (range: 1 day-30.5 months). Technical and clinical success rates were 99% and 52%, respectively; 51% (28 of 55) achieved clinical success with one HAE procedure. Complications including post-embolization syndrome, failed closure device requiring surgical intervention and self-limited groin swelling were reported in 4/69 procedures (6%). In repeat embolizations, 61% achieved clinical success (8 out of 13). Additional surgical procedures were required in 14% of the patients, most commonly hemorrhoidectomy. On regression analysis, none of the evaluated factors were associated with clinical success.

Conclusion: HAE is a safe option for patients with rectal bleeding due to hemorrhoids, demonstrating a 52% clinical success rate. No factors could be identified to predict clinical success in this study.

Abstract No. 532

Midterm Clinical Outcomes of Genicular Artery Embolization for Osteoarthritis-Related Knee Pain in a Single-Center Outpatient Practice



(Article No. 108440)

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Purpose: Knee osteoarthritis (OA) is the most common form of arthritis worldwide, and conventional therapies often provide only short-term relief with high retreatment rates, particularly among obese and morbidly obese patients who are not candidates for total knee arthroplasty (TKA). Genicular artery embolization (GAE) has emerged as a minimally invasive alternative for patients with persistent symptoms despite conservative treatment. This study aimed to assess the effectiveness of GAE in improving knee pain and function at 1-, 3-, and 6-month post-procedure in a real-world cohort of predominantly obese and morbidly obese patients with moderate to severe OA, the majority presenting with severe disease.

Materials and Methods: This was a retrospective analysis of 158 patients who underwent 194 GAE procedures at a single outpatient center between March and December 2024. The cohort had a mean age of 60 ± 10.5 years and Kellgren-Lawrence (KL) scores ranged from 0 to 4, with 48.5% of patients at KL grade 4. BMI ranged from normal to obese, the largest proportion (70.2%) being obese, including 32.9% morbidly obese. Genicular arteries with angiographic hypervascularity were embolized using permanent microspheres or resorbable particles. WOMAC and VAS scores were collected at baseline and at 1-, 3-, and 6-months post-procedure. The Minimal Clinically Important Difference (MCID) was $\geq 20\%$ improvement, the Substantial Clinical Benefit (SCB) was $\geq 50\%$ improvement, and combined success was defined as achieving MCID or SCB in both WOMAC and VAS.

Results: Significant reductions were observed in WOMAC (45.8%, 41.1%, 45.9%; $p < 0.0001$) and VAS (52.7%, 42.3%, 42.8%; $p < 0.0001$) at 1-, 3-, and 6-months post-GAE. For WOMAC, MCID was achieved by 80.1%, 75.3%, and 71.6% of patients, while SCB was achieved by 46.6%, 38.1%, and 52.7%. For VAS, MCID was reached by 82.4%, 78.2%, and 76.2% of patients, while SCB was achieved by 67.1%, 67.3%, and 69.1%. Combined success was achieved by 88.1%, 80.2%, and 75.6% of patients for MCID, and 62.9%, 55.7%, and 61.5% for SCB.

Conclusion: In our cohort, composed mostly of morbidly obese patients refractory to conventional treatments and total knee arthroplasty (TKA), GAE produced substantial and sustained improvements in knee pain and function up to 6 months. These findings support GAE as an effective OA treatment option, with longer follow-up needed to assess durability and retreatment rates.

AI Disclosure Statement: The authors used ChatGPT (OpenAI, GPT-5) for grammar correction and readability improvements.

Abstract No. 533**Outcome of Combined Endovascular and Surgical Treatment of Vascular Malformations of the Lip**

(Article No. 108441)

L. Defreyne¹, N. Roche², P. Vanlangenhove¹, C. Sels³, W. Vanbuggenhout³, E. Dhondt¹, D. Desbuquoit⁴;¹Interventional Radiology, Ghent University Hospital;²Plastic Surgery, Ghent University Hospital; ³Ghent University; ⁴Interventional Radiology, Ghent University Hospital**Purpose:** To investigate the long-term outcome of vascular malformations of the lip treated by combined endovascular and plastic surgery.**Materials and Methods:** All patients treated between 2000 and 2023 for vascular malformation of the lip were included. Demographics, symptomatology, and type/extension of the vascular malformation were analyzed. Treatments were done by sclerotherapy/embolization and if required plastic surgical reconstruction. Treatment complications and physical/psychological outcome (by questionnaire) were analyzed.**Results:** Thirteen patients (10 females, mean age 27.5 (1-53) years) were included. Protrudent swelling in all, discoloration (N=10), heart synchrone pulsations N=5), pain N=2), bleeding (N=2) and saliva loss, were the referring reasons. Eight patients had a venous malformation treated by direct sclerotherapy with polidocanol, 5 from an arteriovenous malformation treated by direct or transarterial embolization with glue. Location was upper lid in five. Four patients (2 venous and 2 arteriovenous) underwent supplementary surgery with direct pre-operative glue embolization. No major post-operative complications. Long term outcome (in total 48 treatment in a mean time of 3.7 years), observation time (mean 5.1 year) of the physical aspect was a strong improvement, psychologically the impact clearly reduced and functionally also clear improvement.**Conclusion:** Vascular malformation of the lip can be treated successfully and safe by sclerotherapy/embolization Multiple treatment sessions, and in the event of severely deformation of the lip, a combination with reconstructive surgery after preoperative embolization is an excellent option.**Abstract No. 534****Analysis of Intervention Sequences Following Percutaneous Cholecystostomy for Acute Cholecystitis**

(Article No. 108442)

S. Sardesai¹, K. Yiu², N. Pandey³, B. Shin⁴; ¹Penn State College of Medicine; ²Memorial Sloan Kettering; ³Penn State Health Milton S. Hershey Medical Center;⁴Pennsylvania State College of Medicine**Purpose:** To assess frequency, time to treatment, and mortality for different intervention pathways following initial percutaneous cholecystostomy for acute cholecystitis.**Materials and Methods:** Using TriNetX US Collaborative Network data (2010–2025), we identified adult patients with no prior history of hepatopancreatobiliary malignancy who underwent percutaneous cholecystostomy (PC) for treatment of acute cholecystitis. Interventions analyzed included biliary drainage catheter exchange, biliary drainage catheter removal, laparoscopic cholecystectomy (LC), and open cholecystectomy (OC). Inclusion criteria, exclusion criteria, and interventions were determined by ICD-10 and CPT billing codes. Treatment pathway analyses were entirely completed within the TriNetX software platform, and workflow evaluation was conducted within the 365 days following initial PC placement. Kaplan-Meier analysis assessed mortality rate following intervention.**Results:** 14,964 patients met inclusion criteria for analysis. Mean age at PC placement was 65.6, and the cohort was 71.4% White, 13.4% Black, and 62.7% male. 15.3% of patients were deceased before an analyzed intervention. Of remaining patients, 46.2% received follow-up intervention at a Healthcare Organization (HCO) within TriNetX, allowing for intervention sequence analysis. Within 365days following initial PC, 46.7% of patients underwent continued exchange procedures without gallbladder excision, 29.2% underwent LC, 15.8% of patients underwent OC, and 4.3% of patients underwent cholecystostomy removal without surgical intervention. 18.1% of patients who underwent LC and 19.9% of patients who underwent OC received at least one exchange before resection. Of patients who progressed to LC or OC without any drainage catheter exchange, mean duration to surgery was 59.0and 61.2days, respectively. For patients who received LC or OC following an exchange, mean duration to surgery was 107.2and 127.9days, respectively.**Conclusion:** The variability in post-PC management underscores the need for standardized treatment pathways and better patient counseling regarding likely trajectories and timelines. Future work should focus on establishing consensus guidelines for downstream management.**Abstract No. 535****Image-Guided Percutaneous Creation of Pexied Roux Limb of Jejunum (Hutson Loop) for Biliary Interventions**

(Article No. 108443)

M. Cooper¹, A. Riaz²; ¹Northwestern Medicine; ²Northwestern University**Purpose:** Evaluate the feasibility, safety, and utility of image-guided percutaneous creation of pexied Roux limb of jejunum (Hutson loop) by interventional radiologists for subsequent percutaneous transjejunal biliary interventions performed under fluoroscopic and endoscopic guidance.**Materials and Methods:** Three patients at one academic medical center underwent image-guided percutaneous Hutson loop creation. These patients had prior Roux-en-Y hepaticojejunostomies and required long-term (> 6 months) percutaneous trans-hepatic biliary drainage for biliary strictures. The procedure involved using endoscopic and fluoroscopic guidance to advance 3 pexy T-fasteners into the lumen of the Roux limb to anchor the loop of small bowel to the anterior abdominal wall. The site was localized for subsequent interventions by placing two 2-mm × 2-cm S coils into the abdominal wall musculature under ultrasound

and fluoroscopic guidance. Patients were monitored with clinical follow-up for immediate and long-term complications.

Results: Pre-procedural CT following biliary drain placement demonstrated the Roux limb apposed to the anterior abdominal wall in all cases. The modified Hutson loop was created successfully in all cases. The patients tolerated the Hutson loop creation procedure well with no immediate or long-term complications. One patient underwent technically successful cholangiogram, cholangioscopy, and biliary drain removal via the Hutson loop 6 weeks after creation. Percutaneous biliary drains were removed in all cases, with the modified Hutson loop available for future biliary interventions if needed.

Conclusion: Fluoroscopic and endoscopic-guided creation of a Hutson loop with pexy T-fasteners in the Roux limb of a hepaticojejunostomy is feasible in patients where the Roux limb approximates the anterior abdominal wall. This procedure can be done safely and provides retrograde transjejunal access for a variety of biliary interventions without the subsequent need for biliary drains.

Abstract No. 536

Development and Preliminary Validation of a Radiomics and Deep Learning Model for Predicting Perioperative TIPS Portal Pressure Gradient (PPG)



(Article No. 108444)

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Purpose: Transjugular intrahepatic portosystemic shunt (TIPS) is an effective therapeutic procedure for portal hypertension, but its clinical application is limited by postoperative complications such as overt hepatic encephalopathy (OHE). The portal pressure gradient (PPG) is crucial for the efficacy and safety of TIPS. However, current PPG measurement can only be performed during invasive interventional procedures, and there is a lack of preoperative prediction methods. This study aims to develop a non-invasive tool integrating deep learning (DL) and radiomics for the PPG in the perioperative period of TIPS, including preoperative PPG (pre-PPG) and postoperative PPG (post-PPG). Meanwhile, it intends to establish a risk stratification for OHE after TIPS based on the predicted post-PPG.

Materials and Methods: A multicenter retrospective study enrolled 392 patients with portal hypertension (PH) who underwent TIPS. 306 patients were from Nanfang Hospital and randomly divided into training set and internal test set, while 86 patients were from other hospitals serving as the external test set. A semi-supervised model was used for automatic 3D dimensional segmentation of the portal vein on enhanced CT obtained before TIPS. Radiomics and deep learning features were extracted. After comparing multiple machine learning models, a MLP model was finally selected and constructed to predict the pre and post PPG of TIPS. Based on the results of predicted post-PPG, the Maximally Selected Log-rank Statistic was used to establish the p-PPG risk stratification (P-PPG-RS), and its performance was validated through K-M curves, Cox regression, and DCA. Eventually, a software was developed to facilitate its promotion and application in clinical practice.

Results: The semi-supervised segmentation model achieved a Dice Similarity Coefficient of 0.9436, with segmentation time reduced from 20 minutes to 2 seconds. The MLP model combining radiomics and deep learning features exhibited the optimal predictive performance in both pre and post-PPG prediction. A threshold of 9.0319 in the post-PPG effectively stratified patients into high and low OHE risk groups. Integration of P-PPG-RS improved the C-index of Cox models and showed higher net benefit than Child-Pugh and MELD scores in DCA.

Conclusion: The hybrid model integrating DL and radiomics features demonstrates high accuracy in predicting perioperative TIPS PPG. Additionally, the P-PPG-RS for OHE established in this study enables reliable identification of patients at high or low risk of post-TIPS OHE.

Abstract No. 537

Esophageal Stenting Redefined: Expanding Horizons with Interventional Radiology-Guided Approach



(Article No. 108445)

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Purpose: To evaluate the safety, feasibility, and clinical impact of interventional radiology-guided esophageal stenting in malignant esophageal obstruction, with emphasis on quality-of-life improvement and symptom relief.

Materials and Methods: Nineteen patients with malignant esophageal obstruction underwent IR-guided stenting. Data collected included demographics, obstruction site, fistula status, technical and clinical success, complications, stent size, and survival. WHOQOL-BREF scores (physical, psychological, social, environmental) and symptoms (reflux, cough, pain, dysphagia) were recorded before and after stenting. Group averages were compared.

Results: Middle-third disease predominated (52.6%), with gastroesophageal junction involvement in 15.8% and fistulas in 52.6%. Technical success was 94.7% and clinical success 78.9%. No re-obstruction was observed. Complications occurred in 30.8% of evaluable cases, all minor. Median survival was 30 days (mean 113, range 4–630). Quality-of-life improved across all domains: physical 32.1%→44.6% (+12.4), psychological 26.5%→41.3% (+14.7), social 42.1%→46.1% (+4.0), and environmental 35.9%→45.4% (+9.6). The overall QOL score increased from 34.2% to 44.3% (absolute gain +10.2, relative +29.8%). Symptom relief was significant: reflux-free patients rose from 36.8% to 73.7% (+36.9), cough-free from 26.3% to 52.6% (+26.3), mean dysphagia score decreased from 3.8 to 2.4 (−1.5), and pain score from 4.9 to 4.6 (−0.3).

Conclusion: IR-guided esophageal stenting is a safe, technically feasible, and effective palliative intervention. It provides high procedural success, consistent improvement in quality-of-life (notably in physical and psychological domains), and substantial relief of dysphagia, reflux, and cough, with minimal complications.

537.1. Average pre- and post-stenting outcomes (n=19)

Parameter	Pre	Post	Change
Overall QOL Score (%)	34.2	44.3	+10.2
Physical Health (%)	32.1	44.6	+12.4
Psychological Health (%)	26.5	41.3	+14.7
Social Relationship (%)	42.1	46.1	+4.0
Environmental Health (%)	35.9	45.4	+9.6
No Reflux (%)	36.8	73.7	+36.9
No Cough (%)	26.3	52.6	+26.3
Pain Score (mean)	4.9	4.6	-0.3
Dysphagia Score (mean)	3.8	2.4	-1.5

Abstract No. 538

How to Push Gastrostomy Tube: Over the Balloon or Through the Peel-Away? Which Method Leads to More Reinterventions? Single-Center Experience



(Article No. 108446)

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Purpose: Number of Gastrostomies placed in USA per year is estimated at 250 000. Interventional Gastrostomy tube placement is performed in patients requiring long-term enteral feeding. Indications for placement of push gastrostomies are malignancies and neurological disorders. Over-the-balloon (OtB) and peel-away (PA) techniques may be utilized for placement. Study was performed to assess reintervention rates of both placement methods.

Materials and Methods: Retrospective analysis was conducted on 63 patients in whom Push G tube placement was performed between 1.2024 and 8.2025. Only successful placements were included in the analysis. Patients included 26 females and 37 males. Mean age was 65, range from 27 to 93. Over the Balloon placement was used in 55 and through the PA method was used in 8 patients. Standard us/fluoroscopy guidance with air insufflation was utilized. Gastropexy sutures were used in both groups (Cope Gastrointestinal Suture Anchor set, Cook Medical, Bloomington IA or Avanos Gastropexy Set Avanos Medical, Alpharetta, GA). Dorado PTA 10- × 40-mm balloons (Bard, Tempe, AZ), Peel-Away Introducer Sets (Cook Medical, Bloomington, IA) and MIC G tubes (Avanos, Alpharetta, GA) were used. Majority of the tubes used in OtB group were 16F (mean 16.07F). In the PA group 18F and 20F tubes were used (mean 18.74F). Evaluated were complications (mechanical and hemorrhagic), reintervention within 30 days and radiation exposure (Fluoroscopy time- FT and Air Kerma-AK). Statistical analysis was performed using T test.

Results: There was 0% mortality associated with placements. In the OtB group there were 11/57 reinterventions. Complications included obstruction of the tube (4), pull outs (4) and 3 cases of bleeding (IMA, LGA and pancreatic branch of splenic artery). None of the 8 patients in PA group had reintervention. In OtB group average FT was 5.9 min, average AK was 82 mGy. In PA group average FT was 4.5 min, average AK was 53 mGy.

Conclusion: Both methods are safe and effective in obtaining feeding access. Mechanical complications in the OtB group were G tube size related. While comparison shows better durability of the G tubes in PA group, again it is most likely secondary to larger size of placed G Tube. Bleeding complications were not placement technique dependent. There were no significant differences in radiation times and exposure. Limitations of the study include short—30-day—window and a small number of cases in PA group. Additional evaluation of the other potential factors causing complications and increasing size of the sample is warranted.

Abstract No. 539

Retrieval-Augmented Language Models for Patient-Centered Periprocedural Anticoagulation in Interventional Radiology



(Article No. 108447)

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Purpose: Managing periprocedural anticoagulation (AC) in interventional radiology (IR) is a complex task that requires careful consideration of patient-specific factors. Current tools, such as the Society of Interventional Radiology (SIR) Guidelines App, offer static recommendations that lack individualization. In this study, we assess the ability of large language models (LLMs) enhanced with Retrieval-Augmented Generation (RAG) to produce patient-tailored, guideline-concordant AC recommendations. We further compare the performance of RAG-augmented models with their non-RAG counterparts.

Materials and Methods: IR procedure data were obtained from the MIMIC-IV database, resulting in 394 unique procedure–anti-coagulant pairs. Five state-of-the-art LLMs, Claude-3.5-Sonnet, GPT-4o, LLaMA-3.1, Mistral-Large-2411, and Qwen-2.5, were implemented within a RAG system built using LlamaIndex, which indexed the SIR guidelines as the external knowledge source. Claude was also evaluated without RAG integration (Base Claude). Each model was prompted with the procedure–AC pairs to generate recommendations on (1) whether to withhold anticoagulation, (2) withholding and reinitiation timeframes, and (3) platelet and International Normalized Ratio (INR) thresholds. Model outputs were evaluated by a human assessor for concordance with SIR guidelines using a 3-point scale (2 = complete concordance, 1 = partial concordance, 0 = no concordance).

Results: LLMs display high accuracy in generating patient-specific AC recommendations. Claude achieved the highest overall concordance (1.51/2). Claude, GPT-4o, and Mistral performed similarly in withholding decisions (1.88, 1.86, 1.88, respectively). Claude and GPT-4o were comparable in timeframe accuracy (withholding: 1.56, 1.55; reinitiation: 1.34, 1.37). Mistral outperformed on platelet thresholds (1.52), while Claude led INR guidance (1.37). LLaMA and Qwen underperformed, particularly for timeframes and INR. Significant differences ($p < 0.001$) separated top-performing models (Claude, GPT-4o, Mistral) from

lower-performing ones (LLaMA, Qwen). Claude outperformed Base Claude across all categories except platelet thresholds.

Conclusion: RAG-integrated LLMs, particularly Claude, GPT-4o, and Mistral, demonstrated strong potential in generating patient-specific, guideline-concordant anticoagulation recommendations for IR. These results underscore the promise of both proprietary and open-source models as safe, efficient, and adaptable decision-support tools for periprocedural anticoagulation management.

Abstract No. 540

Bringing X-ray Imaging to Space: A Radionuclide-Based Approach for Inflight Diagnostics and Interventional Radiology



(Article No. 108448)

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Purpose: Medical emergencies are a significant risk in commercial spaceflights and on long-duration missions. X-ray imaging, however, currently remains unused on missions due to size, weight, and electricity constraints on spacecrafts. We developed a lightweight, portable X-ray apparatus with a commercially available, low-dose radionuclide source. After showing that the apparatus was able to successfully capture images of tungsten foil and cooked pork meat without an electrical power source, it was selected for Low-Earth Orbit launch on September 10, 2024 with the SpaceX Polaris Dawn mission, becoming the first X-ray apparatus to leave Earth. Here, we present our apparatus design and our findings from imaging subjects that are closer to what we would see in a hypothetical image-guided procedure: simulated human tissue and 0.032" stainless steel wire.

Materials and Methods: Commercially available exempt-quantity radionuclides- Ba-133, Cs-137, Cd-109- were coupled with a digital camera using a phosphor screen to convert X-rays to visible photons. The experimental apparatus was built using commercially available lens tube parts connected to the camera. Image subjects included raw pork meat, pork bone, and phantom fingers made with Knox gelatin with or without an embedded chicken bone. A segment of 0.032" stainless steel wire, similar to those used in interventional procedures, was imaged alone as well as threaded through the simulated human tissue. Radionuclide sources and imaging conditions were examined.

Results: Images captured with each of the three radionuclides demonstrated varying levels of contrast, which correlated with the emission spectrum of each radionuclide source. Imaging parameters were adjusted to optimize exposure. It was difficult to appreciate the granularity in the raw pork tissue and the Knox gelatin finger, but their boundaries were distinct. Bone and steel wire were very clearly visualized, demonstrating clear contrast whether embedded in simulated human tissue or imaged alone.

Conclusion: The study demonstrated that it is possible to create a compact, lightweight, low-power radionuclide-based X-ray imaging system. Further work is required to optimize the images, such as uniformity correction due to the low photon flux levels. While the images obtained are not of clinical diagnostic quality, they are radiographs and demonstrate a feasible path to a device for long-

duration spaceflight. In addition to diagnostic radiology, inflight X-ray imaging is expected to enable minimally invasive procedures and eventually cross-sectional imaging of humans in space.

Abstract No. 541

Early Venous Enhancement on CT Angiography in Lower-Extremity Trauma: Associations with Tourniquet Use and Vascular Injury



(Article No. 108449)

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Purpose: Lower-extremity vascular trauma carries high morbidity, including risk of limb loss. Computed tomography angiography (CTA) is the preferred initial imaging modality, enabling rapid evaluation of arterial integrity. Occasionally, arterial-phase CTA reveals early venous enhancement (EVE), a finding linked to arteriovenous fistula (AVF) in some cases. However, in the absence of a visible AVF, the clinical significance of EVE remains uncertain. We aimed to evaluate the clinical significance of EVE on arterial-phase CTA in patients with acute lower-extremity trauma.

Materials and Methods: This retrospective study included adult patients with lower-extremity trauma who underwent CTA within 24 hours of injury between January 2020 and January 2025 at a level I trauma center. EVE was defined as asymmetric enhancement of deep veins on arterial-phase imaging relative to the contralateral limb. Patient demographics, injury characteristics, tourniquet use, vascular injuries, and complications were recorded. Multivariable logistic regression was used to identify factors independently associated with EVE.

Results: Among 101 patients (154 injured limbs), EVE was present in 27 limbs (17.5%). Tourniquet was applied in 72/154 limbs (46.8%) and was independently associated with EVE (aOR 5.95, 95% CI 1.77–20.00, p=.004). Visible vascular injury on CTA was not independently associated with EVE (aOR 0.43, 95% CI 0.14–1.27, p=.126). EVE showed no association with major complication (OR 2.31, p=.124) or persistent vascular injury at follow-up (OR 2.13, p=.383). Interobserver agreement for EVE was almost perfect ($\kappa=0.913$, $p<.001$).

Conclusion: EVE on arterial-phase CTA is significantly associated with prior tourniquet use but is not independently associated with acute vascular injury.

Abstract No. 542

CT Guidance for Intravascular Procedures at 200× Lower Dose via Pulsed X-ray Sparse Acquisition



(Article No. 108450)

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Purpose: 2D fluoroscopy remains the clinical standard for intravascular guidance, but its limited spatial resolution and inability to capture 3D anatomy hinder accuracy. Hybrid CT-fluoroscopy systems have been explored, but patient motion, tool artifacts, and radiation concerns limit their utility. We propose a real-time, dose-efficient 3D CT guidance approach using a novel pulsed X-ray tube and a prior-based reconstruction method. We combined ultra-fast pulsed X-ray acquisition with a reconstruction of difference (RoD) algorithm. RoD uses a high-quality reference scan to directly reconstruct anatomical or device-related changes from sparse follow-up scans, allowing for high temporal resolution at ultra-low dose. This is particularly suited for detecting contrast changes and tracking interventional tools. Traditional X-ray tubes are constrained by thermionic emission delays. The Quantix160 gridded cathode tube (GE HealthCare) enables microsecond-level beam control, operating $\sim 2000\times$ faster than analog CT tubes. This allows for sparse-view acquisition with precise timing, ideal for dynamic guidance.

Materials and Methods: A 3D-printed abdominal aorta model was placed in a human pelvis phantom. A 3Fr microcatheter and 0.018" guidewire were positioned using a robotic steering system. Axial CT scans (16 cm coverage) were acquired with full (1284) and sparse projections (24, 12, 6), simulating $50\times$, $100\times$, and $200\times$ dose reductions. Images were reconstructed using filtered back projection (FBP) and RoD. A no-guidewire scan served as the reference for RoD.

Results: FBP reconstructions had artifacts under sparse sampling. In contrast, RoD consistently visualized the guidewire and catheter in 3D, even at $200\times$ dose reduction.

Conclusion: Pulsed X-ray CT combined with RoD reconstruction enables substantial radiation dose reduction while preserving device visibility. This approach supports accurate 3D guidance for endovascular interventions, potentially replacing 2D fluoroscopy in select applications. This method provides a path toward real-time, low-dose 3D CT guidance for vascular procedures, improving localization accuracy while drastically reducing radiation exposure to both patients and providers.

Abstract No. 543

Improving Adrenal Vein Sampling: Utilizing the Combined Angio-CT Hybrid Suite



(Article No. 108451)

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Purpose: To evaluate the impact of combined Angio-CT hybrid suite on adrenal vein sampling (AVS) procedures compared with fluoroscopy-only procedures.

Materials and Methods: Retrospective, single-center review of all patients who underwent AVS from 2017 to 2025 at our academic institution in Chicago, IL, USA. With the acquisition of a hybrid Angio-CT procedure suite (Alphenix 4D CT, Canon Medical Systems USA, Tustin, CA), our AVS technique transitioned to adapt intra-procedural multidetector CT (MDCT) capabilities for confirmation of adrenal vein cannulation. We

hypothesized that the use of MDCT for confirmation of adrenal cannulation would decrease procedure duration and radiation dose, while improving technical and diagnostic success. Patients were separated based on AVS procedures with or without hybrid Angio-CT use. Analyzed data included procedure duration, fluoroscopy and radiation exposure, technical success defined as bilateral adrenal vein cannulation on imaging, and laboratory success defined as successful adrenal vein cannulation confirmed by cortisol and aldosterone chemical testing.

Results: There were 47 patients who underwent AVS during the study period, 24 (51.1%) male and 23 female (48.9%) with a mean age of 42 years. A total of 27 (57.4%) patients underwent AVS with combined Angio-CT, and 20 (42.6%) patients underwent AVS without Angio-CT. Four (20%) patients in the cohort without Angio-CT and no (0%) patients in the cohort with Angio-CT underwent repeat procedures; 2/4 (50%) repeat procedures were technically unsuccessful. For patients with combined Angio-CT, technical success was 25/27 (92.6%) compared with 13/20 (65%) in fluoroscopy-only patients, resulting in statistically significant improved success with the use of Angio-CT compared to fluoroscopy-only ($p=0.026$). Technical success was consistent with laboratory success in all cases. Procedure duration also significantly decreased ($p=0.00008$) for Angio-CT cases with a mean procedure time of 119.59 ± 52.59 minutes compared with a fluoroscopy-only mean procedure time of 214.50 ± 107.17 minutes. There was no statistically significant change in fluoroscopy time ($p=0.47$) or radiation dose from fluoroscopy ($p=0.48$). There were no (0%) immediate procedural complications in either cohort.

Conclusion: Use of a hybrid Angio-CT suite and adapted AVS technique results in significantly decreased procedure duration and improved procedural success.

Abstract No. 544

National Utilization Trends of Transcatheter Biopsies in Medicare Part B Beneficiaries from 2000 to 2023



(Article No. 108452)

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Purpose: The purpose of this study was to evaluate national utilization trends of transcatheter biopsies among Medicare Part B beneficiaries using the publicly available Centers for Medicare & Medicaid Services (CMS) data.

Materials and Methods: CMS Part B national summary data files from 2000 to 2023 were analyzed. Transcatheter biopsy procedures were identified using Current Procedural Terminology (CPT) code 37200. Annual counts of beneficiaries were extracted and standardized as procedures per 1,000,000 Medicare Part B beneficiaries, with denominator data obtained from the Harvey L. Neiman Health Policy Institute. This was done in order to make the counts comparable across different years. Joinpoint regression was used to identify inflection points in utilization and calculate annual percent changes (APCs) with 95% confidence intervals.

Results: The highest gross number of beneficiaries was observed in 2017 ($n = 4,403$) and the lowest in 2000 ($n = 1,439$). Standardized utilization peaked in 2014 (131.40per 1,000,000) and reached its nadir in 2000 (47.21per 1,000,000). Joinpoint regression identified two inflection points. From 2000–2003, utilization increased rapidly (APC, +17.21%; $P < 0.001$), followed by steady growth from 2003–2014 (APC, +5.18%; $P < 0.001$). Utilization then declined modestly from 2014–2023 (APC, –2.38%; $P < 0.001$).

Conclusion: Transcatheter biopsy utilization among Medicare Part B beneficiaries grew substantially between 2000 and 2014, followed by a gradual decline through 2023. The initial expansion likely reflects broader procedural adoption, increased access, and expanded indications, while the later decline may indicate market saturation, evolving clinical practice, reimbursement changes, or competition from alternative diagnostic technologies.

Abstract No. 545

Downstream Revenue Generated by Hereditary Hemorrhagic Telangiectasia Screening at a Multidisciplinary Center of Excellence



(Article No. 108453)

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Purpose: To assess the financial contribution generated by downstream screening and subsequent referrals and/or interventions including IR treatments of patients with Hereditary Hemorrhagic Telangiectasia (HHT) at a designated HHT Center of Excellence (CoE).

Materials and Methods: This retrospective cohort study used clinical and billing data from 325 patients seen at the Johns Hopkins HHT CoE from January 2021 to July 2025 with a minimum of one month of follow-up between consult and time of data collection. Adult and pediatric patients with confirmed or suspected HHT underwent initial and/or repeat protocolized testing were included. Screening, referrals and interventions followed Cure HHT guidelines. Downstream revenue was defined as any billable service after initial consult by specialty providers in the CoE. All imaging studies were recorded and included diagnostic imaging and IR procedures. Current Procedural Terminology (CPT) codes were extracted from electronic medical records and converted into Work Relative Value Units (wRVUs) per Centers of Medicare and Medicaid Services guidelines. Laboratory test CPT codes were converted to revenue dollars using the Clinical Laboratory Fee Schedule.

Results: Preliminary analysis demonstrated that screening for HHT at the CoE generated 876.99 wRVUs from referrals, 170.68 wRVUs from imaging services, and \$6790.31 in lab testing revenue from January 2021 to July 2025. Screening generated 6.63 ± 5.56 total wRVUs and $\$107.78 \pm 44.93$ from lab testing per patient. Pediatric patients ($n=22$) accounted for 7.4% of referral wRVUs, 20.0% of imaging wRVUs, and 3.9% of lab testing revenue. These may represent a conservative estimate of

revenue and do not include wRVUs generated by inpatient admissions.

Conclusion: Protocolized screening of HHT patients at a CoE generates measurable institutional value through wRVUs while supporting the specialized care of patients with a rare disease, of which IR has a central role. As HHT is underfunded, identifying sustainable financial models is essential to preserve comprehensive care programs. Future analyses will assess cost avoidance tied to early detection of complications from HHT such as stroke and anemia.

Abstract No. 546

Reducing Dwell Time: The Role of Guideline-Driven Interventional Rounds in Improving Drain Management Efficiency



(Article No. 108454)

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Purpose: Percutaneous drainage catheter placement (PDCP) with concomitant antimicrobial therapy (AT) is the first-line treatment for symptomatic fluid collections throughout the body. Compared to surgical management or AT alone, PDCP is associated with lower morbidity, mortality and shorter hospital stays. PDCP often are mismanaged, leading to delayed drain removal and avoidable complications such as superimposed infection, malposition, fistulization and poor healing of the insertion site. The primary objective of this study is to retrospectively review drain retention time following the introduction of a structured drain service line (SL).

Materials and Methods: A drain management protocol was created based on peer-reviewed, evidence-based practices and consensus recommendations and includes departmental guidelines with recommendations on drain maintenance, interval imaging and interval removal algorithm. Percutaneous drains placed into visceral organs and pleural space were excluded from these guidelines due to the complex and specific management they require. Additional exclusion criteria included no record of drain being placed/removed by IR or admission to surgical service. The SL was implemented in January 2025 with formal rounding on post procedure day 1, as well as every Tuesday and Thursday until drain removal for those admitted to non-surgical services. Following institutional review board approval, a retrospective review of all PDCP from January 2025 to June 2025 was performed and compared to cases prior to SL implementation. Non-parametric data was analyzed using Mann-Whitney test. Post-hoc analysis was performed based upon the location of drain placement (abdominal, pelvic, superficial).

Results: A total of 101 cases were reviewed, and 61 (60.4%) were included in the analysis (29 pre and 32 post SL implementation). The mean drain retention time before and after intervention was 16.9 ± 12.4 days (d) and 10.9 ± 8.1 d, respectively ($p=0.048$). When reviewed by location, retention time decreased following SL implementation for both abdominal drains (16.1 ± 13.8 d to 10.1 ± 7.3 d) and pelvic drains (13.3 ± 7.6 d to 1.6 ± 9.3 d), but did not reach statistical significance ($p=0.41$ and 0.42).

respectively). Superficial drain retention time did not change significantly following SL implementation ($p=0.755$).

Conclusion: Development and implementation of a drain management protocol and SL implementation led to a reduction in drain retention time with trends toward significance with drains in deep collections within the abdomen and pelvis over superficial drains.

Abstract No. 547

Data Submitted for IR Devices Seeking FDA 510(k) Approval: Quality and Implications for Patient Safety



(Article No. 108455)

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Purpose: To evaluate the data submitted for the FDA 510(k) approval of IR devices.

Materials and Methods: A dataset consisting of 112 representative IR devices (central and peripheral vasculature, brain vasculature, and tissue) was generated from the FDA Breakthrough Pathway and FDA 510(k) database between January 2020 and July 2025. For each device, we categorized the level of evidence of the data submitted (Bench only, Bench+Animal, Bench+Human, or Full Clinical Trial), peer reviewed publications pre/post approval, and adverse events (deaths, injuries, and device malfunctions) reported in MAUDE within 12 months following FDA approval. Devices were classified by pathway (Breakthrough vs. Traditional 510(k)). Comparative statistics were used to evaluate differences between pathways.

Results: 547.1 illustrates the level of evidence of data submitted by pathway. Preclinical data alone accounted for 80.6% (79/98) of approvals in the traditional pathways. Among the 112 approved IR devices, 45 (40.2%) had no peer-reviewed publication either before or after approval. 78.6% (11/14) of the data submitted for devices in the breakthrough category were clinical trials compared to 16.3% (16/98) in the traditional category ($p < 0.0001$). All 14 devices in the breakthrough category had peer-reviewed publications compared to 54.1% (53/98) of devices in the traditional category ($p = 0.001$). Adverse events reported to MAUDE differed between the two pathways. Breakthrough devices accounted for 47 malfunctions ($n=5/14$), 58 injuries ($n=5/14$) and 9 deaths ($n=3/14$). Traditional devices accounted for 133 malfunctions ($n=16/98$), 40 injuries ($n=13/98$) and 16 deaths ($n=5/98$). The difference in injury reports between the two pathways was statistically significant ($p < 0.0001$). In the traditional group, most adverse events occurred in devices approved with only preclinical testing 97.7% (130/133) of malfunctions, 90% (36/40) of injuries, and 50% (8/16) of deaths).

Conclusion: This random evaluation of 112 FDA-approved IR devices demonstrated that the majority of FDA 510(k) approvals in the traditional category are issued with only pre-clinical supporting data. Furthermore, up to 40% of approved devices in the traditional category enter the market and are used in patient care without pre- or post- FDA approval peer reviewed publication.

547.1.

	Breakthrough Devices	Traditional Devices
Number of Devices (N)	14	98
Level of Evidence		
Bench Only	0	51
Bench+Animal	2	28
Bench+Human	1	0
Full Clinical Trial	11	16
Not Accessible	0	3
Pre-Approval Publications (Y/N)/ Post-Approval Publications (Y/N)		
Y/Y	4	16
Y/N	6	10
N/Y	4	27
N/N	0	45

Abstract No. 548

Identifying Social Barriers to Pulmonary Arteriovenous Malformation Care: Single-Center Analysis of Procedural Utilization



(Article No. 108456)

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Purpose: To determine the effects of social determinants of health (SDoH) on access to care in patients screened for Hereditary Hemorrhagic Telangiectasia (HHT) referred for endovascular management of pulmonary arteriovenous malformations (pAVMs) at an HHT Center of Excellence (CoE).

Materials and Methods: A retrospective analysis of patients with a documented history of pAVMs presenting for initial screening at the CoE between January 1, 2017, and July 1, 2024 was conducted. Demographics, including age, sex, insurance status, smoking history, and CDC Social Vulnerability Index (SVI) from 5-digit home ZIP code were collected. All patients underwent >1 year of follow-up from initial screening. The primary outcome was the presence of ≥ 1 cancelled endovascular interventions (pulmonary arteriography and/or pAVM embolization) documented within one year of screening, and the secondary outcome was time from screening to first performed intervention (time-to-treatment) at the CoE. Exploratory, univariate regression and Cox proportional hazards were performed in RStudio (Posit, Boston, MA).

Results: 310 patients underwent screening, and 277/310 (89.4%) had suspected/confirmed HHT, defined as ≥ 2 Curacao criteria. Of these, 108/277 (39.0%) had pAVMs, of which 62/108 (57.4%) were referred for intervention. Eleven patients with a prior pAVM embolization at the CoE and three pediatric patients (age < 18 years at screening) were excluded from subsequent analyses, leaving 48 patients (median age 49.0 years [IQR 33.8-60.5]) in the final cohort. Twelve patients (25%) had ≥ 1 cancellation within 1

year of follow-up (median age 52.5 years [IQR 42.5-61]; 75% female). The first intervention resulted in 40/42 (95.2%) technically successful embolization sessions, 4 diagnostic arteriograms, and two patients with cancellation only. No baseline variables, including SVI (median 0.451 [IQR 0.342-0.656]), were significant predictors of cancellation ($p > 0.05$). Likewise, SVI was not a significant predictor of time-to-treatment on univariate Cox proportional hazards model (median time 121 days [IQR 65.5-194.5]; $p = 0.61$, HR 1.50 [95% CI 0.31-7.30]).

Conclusion: Preliminary findings demonstrate a complex relationship between SDoH and access to care for patients treated for pAVMs. SVI was not associated with cancellations or time-to-treatment, though further investigation is warranted, especially given that HHT remains underdiagnosed and undertreated in marginalized populations. Future studies should identify roles of area-level SDoH on quality of life and long-term clinical outcomes following embolization.

Abstract No. 549

Racial Subgroup Analysis in Endovascular Intervention and In-Hospital Mortality Outcomes Among Patients with Acute Pulmonary Embolism



(Article No. 108457)

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Purpose: We aimed to determine if the race of patients treated for acute pulmonary embolism (PE) was associated with differential rates of intervention and in-hospital clinical outcomes.

Materials and Methods: This retrospective, single-center study included 538 intermediate-high and high-risk PE patients who received PERT consultation during a 4-year period from 2021-2025. Racial and demographic and hospital course information were obtained from the electronic medical record. For analysis, only Black and white patients were included because the numbers of Asian ($n = 1$) and Indigenous American ($n = 1$) patients were too small to allow meaningful statistical comparison. Outcomes included PE-associated mortality, discharge location, and need for oxygen at discharge. Hospital course variables include cardiac arrests, bleeds, transfusions, and length of total and ICU stay. Further subgroup analysis of intervention patients was completed. Intervention included both mechanical thrombectomy and catheter-directed thrombolysis.

Results: The study population included 303 (56.32%) white patients and 235 (43.68%) Black patients. 63 (11.71%) and 37 (6.88%) White and Black patients received intervention, respectively. Race was an independent predictor of mortality, with Black patients showing higher odds of mortality after adjustment for demographic variables, clinical history, risk stratification, and time to PERT activation/anticoagulation (OR: 1.87, 95% CI [1.06-3.35], $p = 0.03$). Intervention appeared to be significantly associated with lower mortality risk in Black patients and not white patients (OR: 0.11, 95% CI [0.01-0.66], $p = 0.03$). However, the difference in effect between subgroups did not reach statistical significance ($p = 0.07$). No differences in time to PERT activation or to initial anticoagulation were observed; however, Black patients were significantly less likely to receive intervention compared to white

patients after adjusting for comorbidities and PE severity at presentation (OR: 0.58, 95% CI [0.34-0.95], $p = 0.03$). Although there were no differences observed in hospital course, discharge information, and complications within 30 days, Black patients had higher in-hospital mortality rates specifically related to PE ($p = 0.03$).

Conclusion: Our study demonstrated that Black PE patients are more likely to die in the hospital and are less likely to receive intervention when compared to white PE patients.

Abstract No. 550

Cutting Two Hours of Room Turnover: Efficiency Gains with IR-Led Ketamine Sedation Versus Anesthesiology for Biliary Drainage



(Article No. 108458)

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Purpose: Biliary drainage causes significant discomfort, with fentanyl/midazolam sedation often insufficient, prompting anesthesiology involvement. Ketamine/midazolam sedation administered by interventional radiologists (IRs) provides deeper sedation. The purpose was to assess how use of procedural sedation versus anesthesiology impacted room turnover time for primary biliary drainages, and whether ketamine use affected post-operative narcotic requirements.

Materials and Methods: All primary biliary drainages at one academic institution performed by an IR (11 years of experience) were identified by searching the Picture Archiving and Communication System (PACS). Procedure details and sedation/anesthetic/pain medications were abstracted from charts. All post-procedure day 1 narcotics were converted to oral morphine milligram equivalents (MME). Pre-procedure turnover was defined as the interval from the last image of the prior case to the first image of the drainage; case duration from the first to last image of the drainage; and post-procedure turnover from the last image of the drainage to the first image of the next case. Data are presented mean $\pm$ standard deviation or median with interquartile range. Turnover times, case durations, and post-procedure day 1 MME were compared with Mann-Whitney U tests.

Results: Seventy-two biliary drainages (40 internal-external, 8 external, 24 primary stents) were performed in 63 patients (23 women, 40 men; mean age 66 ± 14 years; weight 83 ± 26 kg). Thirty patients received procedural sedation, including 19 with ketamine (mean dose 65 mg, range 30-140 mg), and 33 received anesthesia (31 general, 2 monitored anesthesia care). Compared with procedural sedation, anesthesia was associated with longer pre- (65.0 IQR: 26.0 vs 116.0 IQR: 51.0 min, $p < 0.01$) and post-procedure (57.0 IQR: 15.5 vs 97.5 IQR: 44.3 min, $p < 0.01$) turnover times, adding roughly an hour on either end of the case. Case duration was similar (36.0 IQR: 27.5 vs 44.0 IQR: 36.5 min, $p = 0.18$). Post-procedure day 1 MME was higher in patients who did not receive ketamine sedation (7.5 IQR: 13.0 vs 5.0 IQR: 30.0 mg; $p = 0.22$), though the study was underpowered to detect a difference (76 per group required for 80% power at $\alpha = 0.05$).

Conclusion: Using anesthesiology services for primary biliary drainage was associated with substantially longer pre- and post-procedure room turnover times compared to IR-led sedation,

adding two hours of non-procedural time to every case. Incorporating ketamine into IR sedation programs may increase efficiency by enabling deeper sedation independent of anesthesiology.

Abstract No. 551

Large-Bore Mechanical Thrombectomy Versus Intravenous Thrombolysis for Intermediate-High-Risk Pulmonary Embolism: A 5-Year Retrospective Analysis



(Article No. 108459)

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Purpose: To compare safety and efficacy of large-bore mechanical thrombectomy (LBMT) with intravenous thrombolysis (IVT) in the treatment of intermediate-high risk pulmonary embolism (PE).

Materials and Methods: An institutional review board-approved, retrospective search for patients treated with LBMT or IVT for PE at a single institution from October 2020-June 2025 was performed. Inclusion criteria were intermediate-high risk PE determined by the Pulmonary Embolism Response Team (PERT) and intervention with LBMT and/or IVT. Exclusion criteria were contraindication for LBMT or IVT and hemodynamic instability. LBMT was performed with the FlowTrieve System (Inari Medical, Irvine, CA) and anticoagulation. For IVT, 50 mg of tissue plasminogen activator (tPA) was administered under protocol with anticoagulation. Demographics, clinical data, imaging and outcomes were collected. Continuous variables were summarized as mean $\pm$ SD or median, and categorical variables as counts and percentages. Binary outcomes were compared with Fisher's exact test, continuous variables with the Wilcoxon rank-sum test, and outcomes by change scores (post-pre) using the same test.

Results: 119 patients were included. 65 (54.6%, 31M/34F) received LBMT and 54 (45.4%, 29M/25F) received IVT. The average age of LBMT patients was 68.9 ($\pm$ 12.5 years) and of IVT patients was 55.8 ($\pm$ 17.3 years) ($p < 0.05$). Five IVT patients did not improve and required LBMT. Major bleeding complications occurred in five patients (4.2%), four in the IVT and one in the LBMT cohorts ($p > 0.05$). One patient died within 30 days and a single readmission occurred within six months, neither was statistically significant ($p > 0.05$). Mean ICU stay was 1.44 and 1.21 days for LBMT and IVT, respectively. Median ICU stay was one day for both groups. Hospital length of stay had a median of 3 days for both groups, LBMT patients had a tighter IQR with fewer prolonged stays, while IVT patients had a wider spread and more extended hospitalizations ($p < 0.05$). Echocardiography pre and post treatment revealed that right ventricular (RV) dilation and systolic function improved significantly more in LBMT patients compared with IVT patients ($p < 0.05$).

Conclusion: LBMT had significantly shorter hospital stays and greater improvement in RV dilation and systolic function compared with IVT, despite LBMT patients being significantly older.

Abstract No. 552

Percutaneous Radiofrequency Ablation of Perivascular Versus Nonperivascular Hepatocellular Carcinomas ≤ 3 Cm: An Inverse Probability of Treatment Weighting Analysis



(Article No. 108460)

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Purpose: To compare long-term outcomes of percutaneous radiofrequency ablation (RFA) between perivascular and non-perivascular hepatocellular carcinomas (HCCs) ≤ 3 cm using inverse probability of treatment weighting (IPTW).

Materials and Methods: This retrospective study included 650 treatment-naïve patients with a single small (≤ 3 cm) HCC treated with RFA between January 2005 and December 2020. Tumors were categorized as perivascular or nonperivascular based on proximity to large vessels. IPTW based on propensity scores was applied to balance baseline covariates between the groups. Local tumor progression (LTP) was evaluated using competing risks regression and Fine-Gray models. Overall survival (OS) was assessed using IPTW-adjusted Cox proportional hazards models.

Results: After IPTW adjustment, both groups showed balanced baseline characteristics. The 5-year LTP rate was significantly higher in the perivascular group (28.6%) compared with the nonperivascular group (12.9%) ($p < .001$). The 15-year OS rate was lower in the perivascular group (35.0%) than in the non-perivascular group (51.8%) ($p = .011$). Major adverse events occurred infrequently and were not significantly different between the groups (1.6% vs. 0.9%, $p = .328$).

Conclusion: Perivascular tumor location is associated with higher recurrence and lower survival following RFA for small HCCs compared to nonperivascular tumors. These findings underscore the need for careful treatment planning and consideration of adjunctive strategies in patients with perivascular HCC

Abstract No. 553

Retrospective Review of Complications Following Hepatic Histotripsy in Patients Receiving Uninterrupted Anticoagulation and Antiplatelet Therapies



(Article No. 108461)

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Purpose: Peri-procedural hold of anticoagulation or antiplatelet (AC/AP) therapy is recommended for patients undergoing ablative

therapies to the liver, but can increase the risk of thromboembolic events and create logistical challenges for patients and providers. Given the unique treatment properties of histotripsy it is hypothesized that histotripsy in anticoagulated subjects does not increase bleeding risk. The purpose of this study was to retrospectively evaluate the bleeding risk and complications after histotripsy in an early cohort of patients with ongoing AC/AP therapy during treatment.

Materials and Methods: Single center, retrospective review of all hepatic histotripsy patients (n=30) to identify patients on concurrent AC/AP therapy. A total of 11 patients (8 male, 3 female, mean age 62.9 ± 9.6 years) were identified and underwent 12 treatment sessions for the treatment of 16 liver tumors. Medical records were reviewed for data on AC/AP type and dosing, INR, platelet count, and all complications for 30 post-treatment. Immediate post-procedure and 1-month follow-up images were reviewed for bleeding complications, portal vein thrombus (PVT), and blood vessel injury. Complications were graded according to the Society of Interventional Radiology Adverse Event Classification.

Results: Patients received aspirin 81mg (3/12), aspirin 325mg (1/12), clopidogrel (1/12), apixaban (3/12), or pre-treatment intraprocedural heparin only (4/12). The mean INR at the time of treatment was 1.1 ± 0.1 , and the mean platelet count was 199 ± 72 (1,000cells/mm³). No bleeding-related complications occurred (0/12). Adverse events included one moderate (PVT occurring immediately post-procedure, treated with IV heparin and oral AC, fully resolved) and three mild events (no treatment required). No blood vessel injury was observed on post-procedure or follow-up imaging.

Conclusion: Hepatic histotripsy appears to be safe for patients on AC/AP therapy. Larger studies are warranted to fully define safety outcomes and anti-coagulant regimens in the setting of histotripsy.

Abstract No. 554

Outcomes of Lung Ablation in Patients with Soft Tissue Sarcoma with Pulmonary Metastasis



(Article No. 108462)

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Purpose: The purpose of this study is to evaluate the outcomes of lung cryoablation for metastatic sarcoma, focusing on technical success, overall survival, and local tumor recurrence in patients with varying numbers of pulmonary metastases treated between November 2020 and August 2025.

Materials and Methods: Between November 2020 and August 2025, 23 patients were treated for metastatic sarcoma. No extra-pulmonary metastasis were noted for 15 patients. 9 patient had 1 metastasis, 6 patients had 2 metastasis, 4 had 3 metastasis, 2 patients had 4 metastasis, 1 each had 5 and 6 pulmonary metastasis respectively. The endpoints were technical success (assessed by CT images during and after the procedure), overall survival and local tumor recurrence.

Results: A total of 38 metastasis in 23 patients underwent cryoablation. The median tumor diameter was 20 mm (range 8-42). Lung cryoablation was performed under general anesthesia with CT guidance. Median follow-up time was 25 months. Technical success was achieved in 35 cases of tumor ablation (92.1%). The 1

and 3-year OS rates were 91.3% and 65.2% A total of 7 recurrence were noted on cryoablation sites.

Conclusion: Cryoablation is safe and effective in the treatment of pulmonary metastases arising from soft tissue sarcoma.

Abstract No. 555

Promoter Hypermethylation as a Novel Regulator of Galectin-1 Mediated Progression After Thermal Ablation in Early-Stage Hepatocellular Carcinoma



(Article No. 108463)

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Purpose: To investigate the epigenetic regulation of Galectin-1 (Gal-1) expression, highlighting its role in promoting metastatic potential and post-ablation response in hepatocellular carcinoma (HCC) **Materials and Methods:** Gal-1 expression was analyzed by RT-qPCR, Western blotting in heat-resistant SNU423 and SNU449 cells. To assess the role of promoter CpG methylation, cells were treated with the DNA methyltransferase inhibitor 5-aza-2'-deoxycytidine (5-Aza-CdR). DNA methylation status and patterns were examined using methylation specific PCR (MSP) and bisulfite sequencing. Cell motility and invasion assay were performed in SNU423 and SNU449 cells with or without 5-Aza-CdR treatment. The metastasis-related gene expression levels were evaluated by RT-qPCR in Gal-1 knockdown SNU423 with or without 5-Aza-CdR treatment. An in vivo xenograft model was established to evaluate the metastatic potential of HCC cells.

Results: Gal-1 was minimally expressed in SNU423 but overexpressed in SNU449 cells (SNU423: 1.00 ± 0.06 versus SNU449: 64.87 ± 1.70 , $p = 0.001$). The treatment of SNU423 and SNU449 cells with 5-Aza-CdR potentiated Gal-1 expression. Consistent with this notion, hypermethylation was detected at the CpG island of Gal-1 promoter region in SNU423 cells by MSP, and 5-Aza-CdR treatment resulted in a drastic demethylation at promoter CpG methylation sites. Upon 5-Aza-CdR treatment, metastatic indexes, such as cell motility, invasion, and metastasis-related gene expression, were significantly altered in SNU423 cells. These 5-Aza-CdR-induced metastatic hallmarks were, however, almost completely silenced by stable knockdown of Gal-1.

Conclusion: Collectively, our results help elucidate the critical role of Gal-1 expression in HCC in post-ablation progression, which is epigenetically modulated by promoter CpG methylation.

Abstract No. 556

Combined Intra-operative Percutaneous Microwave Liver Ablation with Robotic Ultrasound Image Guidance for Metastatic Neuroendocrine Tumor



(Article No. 108464)

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Purpose: Minimally invasive robotic surgery for resection of enteropancreatic neuroendocrine tumors decreases the post-operative recovery period and pain. However, liver metastases are often present at time of diagnosis which then require additional loco-regional therapies if resection is contraindicated. The purpose of this study is to assess the safety of combined intra-operative percutaneous liver ablation under robotic image guidance in secondary tumors.

Materials and Methods: In this retrospective study, 16 tumors in 5 patients who underwent combined intra-operative percutaneous liver ablation under robotic ultrasound guidance from July 2019 to July 2025 were evaluated. Data collected included demographic, tumor characteristic, and procedural characteristics. Adverse events were categorized using the Society of Interventional Radiology adverse events classification.

Results: Total of 5 intra-operative percutaneous liver ablation sessions for 16 metastatic multifocal cancers in 5 patients were included. The mean patient age was 61.2 (51–71) years and 5/5 (100%) were male. The mean tumor size was 1.39 (0.5–3.2) cm. Metastases consisted of pancreatic and small bowel neuroendocrine tumors. Microwave ablation was delivered at 65 watts using the Neuwave PR20XT probe (Johnson & Johnson Medtech) with a mean ablation length of 5.4 minutes. One patient developed a peri-pancreatic fluid collection post-operatively from a concurrent robotic pancreatotomy. No adverse events were noted related to the microwave ablation procedure.

Conclusion: Combined intra-operative percutaneous liver ablation with robotic image guidance appears to be a feasible option for the treatment of hepatic metastatic neuroendocrine tumor when performed concurrently with robotic pancreatoduodenectomy or robotic mesocolic excision to prevent conversion to open surgery or subsequent traditional percutaneous liver ablation.

Abstract No. 557

Selective Intra Arterial Lipiodol Staining Enhances CT-Guided Thermal Ablation of Poorly Visualized Malignant Liver Tumors: A Prospective Single-Arm Study



(Article No. 108465)

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Purpose: A prospective single-arm study evaluated whether selective intra-arterial delivery of Lipiodol can improve visualization and technical success during CT-guided thermal ablation of malignant liver tumors.

Materials and Methods: Electronic medical records from 2024 to 2025 were retrospectively reviewed for patients with hepatocellular carcinoma or metastatic liver tumors who underwent image-guided thermal ablation (TA). Patients were included if they had previously unsuccessful TA, tumors that were difficult to visualize on unenhanced computed tomography (CT) or ultrasound, or lesions that were technically challenging to access percutaneously because of size or location. Pre-ablation selective

hepatic arteriogram was performed during the same treatment session and intra-arterial Lipiodol was delivered into the selected hepatic artery to stain target lesions before ablation. Subsequently, tumor ablation was performed under CT guidance.

Results: We identified 34 patients (mean age 64.5 ± 12.9 years; 26 men) with 43 malignant liver tumors (mean tumor size 2 ± 1 cm; range 0.5 to 5.5 cm) treated by TA (42 with microwave ablation and one with cryoablation). Mean follow-up was 21.7 ± 16.6 weeks. Three patients (4 tumors) lacked adequate post-procedure follow-up, leaving 31 patients and 39 tumors for final analysis. Primary technique efficacy, defined as complete ablation after the initial session, was achieved in 90 % of tumors (35/39). One patient required a second ablation session, resulting in a secondary technique efficacy of 92 % (36/39). Lipiodol staining enabled microwave ablation in two patients whose tumors had not been visible during prior attempts. One patient developed a small self-limited pneumothorax that did not require chest tube placement. No major adverse events were observed (557.1).

Conclusion: Pre-ablation selective intra-arterial Lipiodol staining is a safe and effective method to enhance lesion visualization and improve technical success when performing thermal ablation of malignant liver tumors that are poorly visualized on unenhanced CT.

557.1.

Characteristic	No.	Mean ± SD
Clinical follow-up (weeks)		21.7 ± 16.6
Age (years)		64.5 ± 12.9
Female/male sex	8/26	
Tumor Histopathology	Patients	Tumors
Hepatocellular carcinoma	26	34
Colorectal adenocarcinoma	3	3
Renal cell carcinoma	1	1
Cholangiocarcinoma	1	1
Urothelial carcinoma	1	1
Breast carcinoma	1	1
Pancreatic adenocarcinoma	1	1
Total	34	43
Insufficient follow-up	3	4
Analyzed Cohort	31	39
Primary technique efficacy		35 (90%)
Secondary technique efficacy		36 (92%)
Major adverse event	0 (0%)	
Minor adverse event	1 (3%)	

Abstract No. 558

Comparing Local Recurrence After Microwave Ablation and Partial Nephrectomy for Biopsy Proven cT1a Renal Cell Carcinoma with at Least 3-Year Follow Up



(Article No. 108466)

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Purpose: Microwave ablation (MWA) is an ablation technology that has advantages compared to other thermal techniques, including decreased ablation time and heat sink effect. Management of small renal masses with ablation is becoming increasingly popular due to benefits such as the minimally invasive approach, same day discharge, and shorter recovery. In this study, we compare local recurrence rates of biopsy-proven cT1a renal cell carcinoma (RCC) patients treated with CT-guided MWA vs partial nephrectomy (PN).

Materials and Methods: In this single-institution retrospective study, inclusion criteria consisted of patients with cT1a lesions from October 2015 to December 2022 managed surgically (n=200) or with MWA (n=272). Exclusion criteria were patients who underwent radical nephrectomy or with multifocal tumors, dialysis patients, prior surgical or ablative therapy, or less than 3 years of follow-up. Clinical, pathologic, radiologic, and oncologic data was obtained. The primary outcome was defined as radiologic evidence of local recurrence on imaging after treatment. Secondary outcomes were secondary technique effectiveness (successful re-ablation) and renal function.

Results: A total of 120 MWA patients and 73 PN patients met the above criteria for analysis. Patients who underwent MWA were older (69 vs 64 years, $p < 0.001$), had higher Charlson comorbidity scores (5 vs 3, $p < 0.001$), had smaller tumors on pre-procedure imaging (2.1 vs 2.5, $p=0.001$), and worse renal function (serum creatinine 1.05 vs 0.91, $p < 0.001$). At 3 years, local recurrence rates of MWA and PN statistically similar (3.3% vs 2.7%, $p=0.82$). Of 4 MWA patients with local recurrence, all 4 were treated successfully with re-MWA resulting in a total secondary technique effectiveness of 100%. Post-procedurally, the differences in renal function were persistent within six and fifteen months with median creatinine of 1.15 vs 0.99 ($p < 0.001$) and 1.15 vs 1.01 ($p=0.006$), respectively.

Conclusion: Patients undergoing MWA were older with more co-morbidities and lower renal function, compared to those who received PN. In patients with cT1a renal masses, MWA demonstrates comparable clinical outcomes to PN, while additionally conferring the benefits of a minimally invasive procedure.

Abstract No. 559

MR-Guided Cryoablation in the Treatment of Recurrent Prostate Cancer in the Prostate Bed: A 13-Year Prospective Study



(Article No. 108467)

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Purpose: To assess the efficacy, safety, and functional outcomes of MR-guided cryoablation for treating prostate bed recurrent prostate cancer.

Materials and Methods: In this institutional review board--approved study, 94 patients with recurrent prostate cancer, previously treated with radiotherapy or prostatectomy, underwent MR-guided cryoablation between September 2011 and September 2024. The mean patient age was 73 years (range: 60–89). Procedures typically used four cryoneedles (range: 3–6) with three freeze/thaw cycles, along with a urethral warmer for protection. T2-weighted MRI sequences (~20 sec) were used to monitor iceball formation and target coverage. PSA levels were recorded pre-ablation and at 6 and 12 months post-procedure. Follow-up included PSA testing and imaging (PET PSMA, PET 11-C Choline, or MRI) every 3 ± 1 months for 24 months. Functional outcomes were evaluated using validated questionnaires (AUASS, SHIM, and EPIC) at baseline and follow-up.

Results: Mean pre-ablation PSA was 3.57 ± 4.38 , decreasing to 1.41 ± 3.70 at 6 months and 1.52 ± 4.88 at 12 months, representing PSA reductions of 60.5% ($p < 0.001$) and 57.5% ($p < 0.001$), respectively. In-field recurrence occurred in 12 patients (12.7%) after an average of 2.1 years, while 23 patients (24.4%) developed new lesions outside the treatment field. Overall, 35 patients (37.2%) experienced recurrence (in-field or out-of-field), with a mean recurrence-free period of 2.6 years (range: 1–11). Functional outcomes were available in 58 patients. Urinary function remained stable, with no significant change in AUASS (9.9 ± 7.1 vs. 9.7 ± 7.9 , $p=0.84$), pad use, or EPIC urinary bother scores. However, sexual function declined significantly, with SHIM decreasing from 8.1 ± 8.0 at baseline to 4.5 ± 6.4 post-ablation ($p=0.002$), accompanied by a rise in EPIC sexual bother scores (1.8 ± 1.6 to 2.5 ± 1.6 , $p=0.01$).

Conclusion: MRI-guided focal cryoablation is an effective and safe treatment for recurrent prostate cancer, providing significant and sustained PSA reductions and prolonged recurrence-free intervals. The procedure preserved urinary function and continence but was associated with a measurable decline in sexual function, consistent with salvage settings. MRI guidance allows precise targeting and monitoring, supporting its role as a valuable salvage therapy option.

Abstract No. 560

Longer-term Outcomes Post Histotripsy of Liver Tumors: Lessons Learned and Next Steps



(Article No. 108468)

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Purpose: Histotripsy is a rapidly expanding minimally invasive treatment option for nonresectable liver tumors sought after by patients. The Theresa trial was the first in-human trial looking at immediate post-operative technical success and safety profile at 2 months post-procedure. The subsequent #HOPE4LIVER trial looked at outcomes in 44 patients, but only up to 30 days

post-procedure. The purpose of our study is to analyze the long-term efficacy and safety of histotripsy in the treatment of various liver tumor histologies.

Materials and Methods: This is a single-institution retrospective analysis of patients who underwent image-guided histotripsy of nonresectable liver tumors between September 2024 and March 2025. Patients who underwent partial treatment or were lost to follow-up were excluded. Patients treated less than 3 months from the time of data analysis were not included to ensure adequate follow-up. Patients underwent imaging and clinical evaluation immediately post-procedure, at 1 month and every 2-3 months thereafter. Primary clinical endpoint was local tumor control. The safety endpoint included any procedure-related adverse events (AEs) in the study time-period.

Results: A total of 23 patients underwent treatment of 41 non-resectable liver tumors. Average age was 68 years old (48% male, 52% female). Average treated tumor size was 2.6 with an average treatment/cavitation diameter of 4.6 cm. Combined local tumor control at 1 month, 3 month, and 6 month was 79%, 17%, and 0% respectively. Stratified 3-month local control per primary tumor histology was 67% for colorectal adenocarcinomas, 33% for cholangiocarcinomas, 13% for pancreatic ductal adenocarcinomas, and 0% for both hepatocellular carcinomas and neuroendocrine tumors. During the 3 months post-procedure, 100% of successfully treated patients were still alive with a 3.5-month overall survival of 85%, thus far. Three clinically significant AEs occurred. One patient was re-hospitalized for sepsis related to treatment (Society of Interventional Radiology [SIR] moderate AE). A second patient developed hepatic vein thrombus immediately post-procedure (SIR moderate AE). A third patient developed severe post-procedure liver hemorrhage resulting in ICU level of care and two emergent embolization interventions (SIR life-threatening AE).

Conclusion: Ongoing monitoring of long-term outcomes of histotripsy is essential for optimization of treatments and patient selection. As seen in this study, new life-threatening AE have occurred reinforcing the importance of continued monitoring and reporting of adverse events.

Abstract No. 561

RCC Tumor Morphology and Recurrence in Tumors Greater Than 3.1 Cm



(Article No. 108469)

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Purpose: Improving performance of cryoablation for larger renal cell carcinoma (RCC) tumors is an area of active research. However, the relationship between tumor features, particularly for tumors larger than 4 cm, and recurrence is not fully understood. The goal of this study was to explore the relationship between exophytic tumor morphology and recurrence in larger tumors.

Materials and Methods: This study was conducted under an institutional review board approved by our institution. All patients who underwent cryoablation from January 1, 2015, to January 30, 2021, for tumors greater than 3.1 cm in maximum diameter were

identified using an internal search engine ($n = 39$). Patients were excluded based on a lack of curative intent ($n=4$), no imaging or follow up data ($n=7$), or aborted procedure due to intra-operative complication ($n=1$). Predominantly exophytic (greater than 50%) tumors were identified by radiology report if available or by image interpretation. For tumors greater than 4 cm ($n=11$), exophytic volume and total volume were estimated by manual segmentation. Recurrence was the primary end point and was defined as any definitive evidence of recurrence per the reporting radiologist. Fisher's exact test was used for categorical analysis of ablations and Student's t-test was used for volumetric analysis.

Results: Out of a total of 27 tumors, 17 were predominantly exophytic. The median time to follow up was 43 months (IQR: 27.5–57.0). There were $n=8$ instances of recurrence (33.3%), of which 2 (7.4%) were in predominantly exophytic tumors and 5 (18.5%) were in tumors greater than 4 cm. For all tumors, there was a higher rate of recurrence in non-exophytic morphology (60.0% vs 11.8%, $p = 0.025$) with a relative risk of 5.1 (95% CI: 1.3–20.6). When comparing tumors greater than 4 cm with and without recurrence, there was no significant difference in mean tumor volume (45 mL vs 37 mL, $p = 0.44$) however, tumors with recurrence had a lower component of exophytic volume (9 mL vs 27 mL, $p = 0.03$). The only recurrence in a predominantly exophytic tumor larger than 4 cm occurred 8 years after ablation.

Conclusion: Non-exophytic morphology had a higher risk of recurrence in RCC greater than 3.1 cm with this effect predominantly driven by tumors greater than 4 cm. For tumors greater than 4 cm, recurrence was associated with lower exophytic volume however, the overall volume was similar in tumors with and without recurrence. Larger sample sizes are needed, and further research is warranted to determine if this difference is due to technical challenges with ablation, patient characteristics, or underlying tumor biology.

Abstract No. 562

Impact of Etiology, Age, and Race/Ethnicity on Outcomes Following Transarterial Locoregional Therapy for Hepatocellular Carcinoma: A Multi-institutional Cohort Study



(Article No. 108470)

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Purpose: To evaluate real-world outcomes of first-line transarterial therapy in hepatocellular carcinoma (HCC) and determine whether progression and curative therapy rates differ across patient subgroups defined by liver disease etiology, age, and race/ethnicity.

Materials and Methods: We conducted a retrospective cohort study using the TriNetX database, identifying adults with HCC who received bland embolization (TAE), chemoembolization (TACE), or radioembolization (TARE) as first-line treatment between 2000–2023. Patients with prior liver-directed or systemic therapies or those with extrahepatic spread at baseline were excluded. Subgroups were stratified by etiology (hepatitis C virus

[HCV], metabolic-associated steatotic liver disease [MASLD], alcohol-related liver disease [ALD]), age (< 65 vs ≥65 years), and race/ethnicity (white, Black, Hispanic). Propensity-score matching balanced baseline characteristics between subgroups. The primary outcome was progression, a composite of death, additional therapy, or extrahepatic metastases. The secondary outcome was receipt of curative therapy (resection or liver transplantation [LT]). Risk ratios (RR) assessed outcome incidence; Kaplan-Meier analysis was used for progression-free survival (PFS) and time to curative therapy (TTC).

Results: Among 5,060 patients (mean age 65 years; 76.1% male) who received first-line transarterial therapy, 46.1% experienced HCC progression by 24 months, including 22.6% who required additional therapy and 10.2% who developed extrahepatic metastases. Curative therapy was achieved in 11.9% of patients, most commonly LT (10.1%). Median PFS was 540 days, with survival rates of 71%, 57%, and 45% at 6, 12, and 24 months, respectively. After matching, older adults had prolonged TTC ($p < 0.001$) while younger patients more often received additional treatment (RR: 1.14, $p = 0.035$). Hispanic patients exhibited better PFS ($p = 0.005$) and lower rates of retreatment (RR: 0.70, $p = 0.003$), but they experienced prolonged TTC ($p < 0.001$) compared with White patients. Black and White patients had comparable outcomes.

Conclusion: First-line transarterial therapy for HCC achieved a median PFS of 18 months, with curative therapy attained in 12% of patients. Outcomes were consistent across etiologies but varied by age and race/ethnicity, underscoring the need for personalized surveillance and treatment strategies while supporting the broad utility of transarterial therapy in diverse HCC populations.

Abstract No. 563

Trends in the Utilization of Transarterial Radioembolization in Medicare Part B Beneficiaries from 2007 to 2023



(Article No. 108471)

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Purpose: The aim of this study was to identify national utilization trends of transarterial radioembolization (TARE) among Medicare Part B beneficiaries over a 17-year period from 2007–2023.

Materials and Methods: Publicly available Centers for Medicare & Medicaid Services (CMS) Part B national summary data files from 2007 to 2023 were analyzed. Beneficiaries undergoing TARE were identified using the Current Procedural Terminology (CPT) code 79445. To standardize utilization, the annual number of TARE beneficiaries was expressed per 1,000,000 Medicare Part B beneficiaries, with denominator data obtained from the Harvey L. Neiman Health Policy Institute. Gross and adjusted Medicare payments were recorded, and adjusted per-beneficiary costs were calculated. Trends in utilization were evaluated using Joinpoint regression, with annual percent change (APC) and 95% confidence intervals (CIs) reported.

Results: A total of 466 beneficiaries were recorded in 2008 compared with 4629 in 2021, representing the lowest and

highest annual counts, respectively. Standardized rates ranged from 14.55 beneficiaries per 1,000,000 in 2008 to 159.30 per 1,000,000 in 2023. Joinpoint regression identified two significant inflection points, in 2011 and 2016. From 2007 to 2011, the APC was 5.32 ($p = 0.090$). Between 2011–2016, utilization increased sharply (APC: 46.88, $p < 0.001$), followed by slower but sustained growth from 2016–2023 (APC: 3.97, $p = 0.022$).

Conclusion: Utilization of TARE among Medicare Part B beneficiaries increased substantially between 2007 and 2023, with the steepest growth occurring from 2011 to 2016, followed by more gradual expansion. These findings reflect broader clinical adoption, increasing evidence supporting efficacy in liver malignancies, and growing provider familiarity. The inflection point in 2011 may correspond to the accumulation of key clinical data that helped establish TARE as a robust locoregional therapy.

Abstract No. 564

Porcine-Based Platform for Image-Guided Delivery of Allogeneic Natural Killer Cell Immunotherapy



(Article No. 108472)

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Purpose: Murine models are widely used in cancer immunology, but their small size and dissimilar immune limit clinical relevance for catheter-based cell therapies. In contrast, pigs have similar body size, liver structure, vascular anatomy, and immune system compared to humans, making them suitable for image-guided adoptive cell research. This study develops a clinically relevant image-guided pig allogeneic natural killer (NK) cell immunotherapy delivery platform by combining pig NK cell isolation and activation, a PD-L1 checkpoint assay, and hepatic arterial delivery in an Oncopig liver tumor model.

Materials and Methods: Peripheral blood from wild-type pigs was processed via Ficoll, magnetic negative selection (Triple negative (TN): CD21⁺SWC3⁺CD3⁺), and FACS to isolate CD3⁺CD8α⁺±CD16⁺ NK cells. NK cells were activated with IL-2 and assessed for cytotoxicity against an Oncopig liver tumor cell line (272, with/without PD-L1 overexpression). PD-L1 blockade assay was used to evaluate checkpoint effects on NK cell cytotoxicity. Allogeneic IL-2 activated TN NK cells (3×10^6) were infused intra-arterially into liver tumors via hepatic arteries of Oncopigs ($n = 2$) under CT guidance, followed by serial imaging to monitor tumors. Statistical analysis used unpaired t-tests and two-way ANOVA with Tukey correction ($p = 0.05$).

Results: IL-2 activated CD3⁺CD8α⁺ NK cells showed significantly faster killing than bulk TN cells (KT20: 3.1 ± 0.1 vs 43.8 ± 6.2 h, $p = 0.008$). CD8α⁺CD16⁺ cells mediated the greatest cytotoxicity, followed by CD8α⁺CD16⁺ and then CD8α⁺CD16⁺ subsets. PD-L1 overexpression on 272 cells reduced CD3⁺CD8α⁺CD16⁺ NK cell cytotoxicity (WT: $97.3 \pm 2.5\%$ vs PDL1: $70.4 \pm 2.4\%$, $p < 0.0001$). Anti PD-L1 partially restored NK cytotoxicity

(rescue trend present but not found to be statistically significant). In vivo intra-arterial NK infusion was feasible and safe. CT scans showed rapid tumor reduction (week 1: 68.0%, week 2: 90.5%, week 3: 100%) in treated animals compared with historical tumor alone controls (n=11); however, this study was not powered for efficacy.

Conclusion: This feasibility study shows that pig NK cell immunotherapy can be evaluated using in vitro benchmarking and checkpoint modulation and delivered via catheter-directed approaches. In vivo results showed the safety of allogeneic arterial NK cell infusion in Oncopig liver tumors, highlighting the potency and cross-talk between the PD-1/PD-L1 axis of porcine NK cells. This platform can potentially be used for image-guided studies on cell-based immunotherapy delivery in an immunocompetent large animal tumor model.

Abstract No. 565

Spectral Cone-Beam CT as a Tool for Thermal Ablation Guidance and Confirmation



(Article No. 108473)

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Purpose: To investigate the potential utility of dual-energy cone-beam CT (CBCT) technologies in hepatic imaging and assessment of thermal ablation zones.

Materials and Methods: Under Institutional ACUC approval, 3 healthy swine underwent dual-energy CBCT imaging (Azurion, Philips) at 90kVp and 125kVp and dual-layer Spectral CT (IQon, Philips), with breath holds post liver MWA, without and with contrast. CBCTs were processed with elastic registration and virtual mono-energetic (VMI), virtual non-contrast (VNC), and iodine no-water images were generated. Metal artifact reduction (MAR) algorithms were applied in the presence of the probe. Conspicuity of the MWA zone vs. surrounding liver tissue was quantified with contrast-to-noise ratio (CNR), image quality using signal-to-noise (SNR), and iodine density maps. CBCT results were compared to dual-layer spectral CT images.

Results: VMIs, VNC images, and iodine density maps were successfully generated from spectral CBCT following MWA.

Elastic registration, and noise and metal artifact reduction algorithms were required to improve image quality. With the probe in, liver image quality was best using 200keV VMIs with MAR, reflected by a SNR of 3.0 ± 3.6 . Without contrast, MWA visualization was best using low-energy scans with a CNR of 2.3 ± 3.0 . Image quality of the MWA zone was higher with contrast using low-energy scans with a CNR of 5.4 ± 2.9 . Both without and with contrast, 40keV VMIs had the greatest lesion conspicuity with attenuation differences between the ablated and healthy liver tissue of 54.7 ± 59.9 HU and 128.7 ± 114.7 HU, respectively. Compared to standard CBCT images, image quality and conspicuity was worse with a CNR of 1.3 ± 1.2 and attenuation difference of 28.6 ± 28.0 HU. Renal iodine concentration after contrast was calculated as 8.5 ± 2.0 mg/mL.

Conclusion: Spectral CBCT imaging could prove a useful tool for ablation monitoring or ablation zone confirmation. Image quality and MWA zone conspicuity was improved MAR algorithms and spectral VMIs. Spectral CBCT holds promise as a tool for ablation, enabling CBCT to function as a hybrid modality for angiography and ablation guidance requisite for combination needle and catheter therapies.

Abstract No. 566

Interventional Radiology in Multidisciplinary Liver Oncology Clinics: Evaluating Growth and Specialist Involvement



(Article No. 108474)

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Purpose: The aim of this study is to evaluate the role of interventional radiology (IR) in a multidisciplinary liver oncology clinic, focusing on growth, specialist involvement, and opportunities for care coordination as part of a quality improvement initiative.

Materials and Methods: With institutional review board approval, a retrospective analysis of a prospectively maintained database was performed for all patients seen in a dedicated liver oncology clinic from its inception in September 2021 through August 2025 and analyzed in consecutive 12-month periods. The

565.1.

	Needle in		MWA zone without contrast				MWA zone with contrast			
	SNR (MAR)	Standard Deviation	CNR	Standard Deviation	HU diff	Standard Deviation	CNR	Standard Deviation	HU diff	Standard Deviation
Prop HE -5	2.4	2.8	1.3	1.2	28.6	28.0	3.8	0.2	74.6	7.1
Prop LE -5	0.9	0.4	2.3	3.0	29.1	41.0	5.4	2.9	80.2	38.4
MonoE40	1.7	2.5	0.8	0.7	54.7	59.9	2.2	2.2	128.7	114.7
MonoE200	3.0	3.6	0.7	0.4	29.0	19.0	1.7	1.2	68.7	52.4

clinic team comprised hepatology, surgery, medical oncology, and IR specialists. Primary outcomes included demographics, annual visit volumes, and specialist involvement. Initial visits were each patient's first encounter; subsequent visits were follow-ups. Same-day visits with multiple providers were consolidated. Data analysis included descriptive statistics and chi-square tests.

Results: A total of 695 patients were seen, accounting for 1519 clinic visits over the study period. Patient demographics included 63.7% (443/695) male patients with a median age of 69 years (IQR: 60–75). Annual visit volume increased from 223 (2021–2022) to 429 (2022–2023, 92.4% growth) and 446 (2023–2024), before slightly declining to 421 (2024–2025), representing 88.8% overall growth and a compound annual growth rate of 23.6%. Initial visits comprised 45.8% (695/1519) of encounters, while 54.2% (824/1519) were follow-up visits. The frequency of patient visits demonstrated that the median number of visits per patient was 1 (IQR: 1–3); 53.7% (373/695) had a single visit, while 25.3% (176/695) had ≥ 3 visits, reflecting variability in longitudinal follow-up. Specialty utilization included hepatology 42.3% (643/1519), IR 33.2% (504/1519), medical oncology 30.6% (465/1519), and surgery 2.6% (40/1519), with 13.0% (198/1519) visits lacking specialty assignment. Multidisciplinary care was more frequent at initial visits, occurring in 28.8% (155/539) of encounters compared with 15.9% (124/782) of follow-up visits ($p < 0.001$). Across all visits with available data, same-day multidisciplinary involvement was documented in 21.1% (279/1321) visits.

Conclusion: IR was integral to the rapid growth and multidisciplinary utilization of a liver oncology clinic, accounting for one-third of visits and frequently contributing to same-day collaborative care. This model demonstrates how IR-driven multidisciplinary clinics can scale rapidly and highlights opportunities for quality improvement in patient retention and care coordination.

Abstract No. 567

Factors Associated with Overall Survival of Leiomyosarcoma Patients with Metastases to the Liver Undergoing Hepatic Transarterial Embolization



(Article No. 108475)

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Purpose: Patients with leiomyosarcoma present with diverse features when being considered for locoregional, liver-directed IR therapies. This study evaluated factors influencing overall survival in leiomyosarcoma patients undergoing hepatic transarterial embolization (TAE).

Materials and Methods: After institutional review board approval, we retrospectively reviewed patients treated between 2010–2024 with leiomyosarcoma and liver metastases who underwent hepatic TAE. Patients who received ablation or other locoregional IR therapies prior to TAE were excluded. Data collected included demographics, tumor number, largest tumor diameter, and liver tumor burden ($< 25\%$, $25\text{--}50\%$, $50\text{--}75\%$, $> 75\%$). Pre-procedure labs (albumin, bilirubin, platelet count) were used to calculate ALBI and pALBI grades. Survival was

analyzed using Kaplan-Meier methods, log-rank testing, and Cox proportional hazards modeling.

Results: Seventy-nine patients were included, with a median follow-up of 12.6 months. The cohort was 75% female, with a mean age of 60 ± 13 years. Bilobar disease was present in 62%, and 81% had extrahepatic disease. Most patients underwent one TAE (53%), while 26% had two and 19% had three or more. The median overall survival of patients with leiomyosarcoma metastatic to the liver who underwent TAE was 17 months. Significant predictors of survival included bilobar disease, extrahepatic disease, number of TAEs, tumor number, largest tumor size, and tumor burden. Patients with $< 25\%$ liver tumor burden had significantly longer survival compared with those with greater ($25\text{--}50\%$, $50\text{--}75\%$, $> 75\%$) tumor burden (31 vs 17 vs 9 vs 4 months, $p < 0.001$). ALBI and pALBI grade were not significantly associated with survival. On multivariate analysis, unilobar disease (HR 0.39, 95% CI 0.19–0.78, $p = 0.008$) and a higher number of TAEs (HR 0.64, 95% CI 0.47–0.87, $p = 0.004$) were positive predictors of survival, while liver tumor burden of $50\text{--}75\%$ (HR 6.7, 95% CI 1.3–33, $p = 0.008$) and $> 75\%$ (HR 8.4, 95% CI 1.2–60, $p = 0.03$) were negative predictors.

Conclusion: For leiomyosarcoma patients undergoing hepatic transarterial embolization, pre-procedure liver tumor burden is a strong predictor of overall survival. Tumor burden $> 50\%$ is associated with the poorest outcomes.

AI Disclosure Statement: During the preparation of this work, the author(s) used ChatGPT GPT5 in order to improve grammar, spelling, and readability of submission.

Abstract No. 568

Quantifying the Role of Interventional Radiology in Managing Patients with Hepatobiliary Cancers



(Article No. 108476)

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Purpose: To quantify the growing role of Interventional Radiology (IR) in the management of primary and secondary hepatobiliary cancers.

Materials and Methods: This retrospective study utilized administrative data provided by the Centers for Medicare and Medicaid Services (CMS), using all final action claims for services provided to Medicare Fee-For-Service participants from 2016 to 2021. Patients aged ≥ 65 years with primary or metastatic hepatobiliary cancer were identified using ICD-10 codes. CMS physician specialty codes were used to identify services and their associated work Relative Work Units (wRVUs) provided by IR and compared to those provided by Oncology and Radiation Oncology, for each calendar year. IR procedures were stratified as therapeutic (ablation and transarterial therapies) and supportive services.

Results: From 2016–2021, the Medicare hepatobiliary cancer cohort included 108,317–111,761 patients annually (mean age 75 years, 53% male). IRs treated 51% of patients, oncologists 71% and radiation oncologist 13%. Physician service volumes and wRVU shares remained stable, with oncologists providing the

largest share (26.8% of services, 13.7% of wRVUs), followed by IRs (8.6%, 11.7%) and radiation oncologists (3.2%, 4.5%). IRs performed 75,785 therapeutic procedures; pre-pandemic, IR volumes increased 57%, driven by liver ablations (+25%) and supportive services (+63%), while transarterial therapies declined slightly (-6%), with volumes dropping modestly during the pandemic. Total physician payments rose 35.1% over the study period, with increases of 72.1% for oncologists and 17.7% for IRs.

Conclusion: IRs provide a substantial share of services for Medicare patients with hepatobiliary cancers, with rising use of therapeutic and supportive services, underscoring its role in cancer care alongside oncology and radiation oncology.

Abstract No. 569

Evaluating Eligibility and Access to Hepatocellular Carcinoma Treatment at a National Referral Hospital in Tanzania



(Article No. 108477)

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Purpose: Hepatocellular carcinoma (HCC) is the third leading cause of cancer-related mortality worldwide, with 85% of cases in low- and middle-income countries. In sub-Saharan Africa, most HCC cases present at late stages with survival < 16 weeks, but data from Tanzania remain scarce, and little is known about patient characteristics, treatment eligibility, or treatment adherence. This study describes HCC patients at Muhimbili National Hospital (MNH) in Dar es Salaam, TZ, and compares treatment eligibility per the Barcelona Clinic Liver Cancer (BCLC) system with treatment delivery.

Materials and Methods: A retrospective chart analysis was completed from June-August 2025, including 121 patients with CT- or histopathology-confirmed HCC seen by interventional radiology, oncology, or surgery at MNH from April 2019-August 2024 (mean age 45.2 years; 18.2% female). Records were reviewed for demographics, medical history, treatment, and outcomes. Tumor burden on CT was assessed using Liver Imaging Reporting and Data System (LI-RADS). Eastern Cooperative Oncology Group (ECOG) scoring was documented and Child-Pugh class calculated; for patients with missing hepatic encephalopathy information, 3 ranges were imputed. Patients were staged per BCLC guidelines.

Results: Of 121 patients, most were hepatitis B positive (77.3%) with frequent ascites (62.5%) and bilobar disease (50.4%). Only 38% received documented therapy: transarterial chemo-embolization (TACE) (6.6%, 8/121), sorafenib (18.2%), or supportive care (13.2%). BCLC staging was estimated for 84 patients. No patients were eligible for resection; 2.4% (2/84) qualified for transplant or ablation (mostly Child-Pugh A, single nodule); ≤14.3% for TACE (Child-Pugh B, multinodular disease); ≤69% for sorafenib (Child-Pugh C, portal invasion); with the remainder for supportive care. At last review, 19% (23/121) of patients were alive, 53.7% deceased, and 27.3% lost to follow-up.

Conclusion: Despite eligibility for life-prolonging therapy in >80% of patients, few received curative or palliative treatments,

highlighting a significant gap between therapeutic eligibility and delivery. Incomplete records limited staging accuracy; ongoing work includes reassessment of CT imaging for cirrhosis, nodule size, and portal invasion. Future studies should examine treatment in the context of resource limitations, access, and late presentation.

AI Disclosure Statement: During the preparation of this work, the authors used ChatGPT-5 for grammar and reviewed the work afterwards. The authors take full responsibility for this abstract's content.

Abstract No. 570

Safety and Effectiveness of a Combined Simultaneous Approach Using Embolization, Gelfoam Alcohol Sclerosis, and Vertebroplasty to Treat Aggressive Vertebral Hemangioma: Technique and Preliminary Results



(Article No. 108478)

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Purpose: The aim was to evaluate technical success, safety and effectiveness of a non-surgical protocol treatment combining transarterial embolization and percutaneous radiopaque gelfoam ethanol (RGE) sclerotherapy in a first procedure, followed by vertebroplasty in a second procedure, to treat patients with aggressive vertebral hemangioma (AVH).

Materials and Methods: This retrospective study included a total of 10 patients treated for hemangiomas between September 2022 and March 2024. The 11 hemangiomas were located in the cervical (n=1), thoracic (n=5), lumbar (n=4) or sacrum (n=1). Follow-up included MRIs and medical consultations one year after the final procedure. In all cases, the procedure was technically feasible.

Results: The procedure was safe; one fracture occurred between sclerosis and cementoplasty, probably partly related to the AVH. This procedure proved to be effective, as in all patients, the epiduritis partially regressed on follow-up MRI. 90% of patients noted a reduction or disappearance of pain.

Conclusion: The combination of transarterial embolization and percutaneous sclerotherapy with RGE followed by a second procedure vertebroplasty appears to be technically feasible, safe and early effective. These results need to be confirmed by long-term prospective studies.

Abstract No. 571

Can Hospital Volume of TARE Affect Survival in Early-Stage HCC?



(Article No. 108479)

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Purpose: Procedural volume is an independent predictor of outcomes in surgical procedures. However, the effect of Y-90 trans arterial radioembolization (TARE) procedural volume as a predictor of mortality in patients with hepatocellular carcinoma (HCC) is yet unexplored.

Materials and Methods: The National Cancer Database was queried for the years 2018–2024 to identify patients who underwent TARE as primary/first treatment for HCC (C22.0). Only patients with American Joint Committee on Cancer (AJCC) Stage I disease were included. The primary outcome was overall survival. Propensity score matched cohorts were created to assess the effect of facility volume on overall survival. Nearest neighbor matching was used in a 1:1 ratio with a caliper of 0.2. Matching was performed using the following covariates: age, sex, AFP level, INR, creatinine, fibrosis score, race, insurance status, bilirubin, household income, and Charlson–Deyo comorbidity score. Hospitals were categorized at the 95% percentile cutoff point into low-volume (< 11 TARE procedures/year) or high-volume (≥11 TARE procedures/year).

Results: A total of 2,337 patients met inclusion criteria and were treated with TARE. The mean age was 69 years (SD 9), and 72% were male. Among them, 1,345 patients were treated at high-volume centers (≥11 cases/year) and 984 at low-volume centers (< 11 cases/year). After 1:1 propensity score matching (PSM), 1,434 patients remained (717 per group). Median survival for the entire cohort was 37 months (95% CI: 36–38). After matching, treatment at high-volume centers was independently associated with improved overall survival compared with low-volume centers (HR 0.85, 95% CI 0.73–0.97, $p=0.019$). Median overall survival was 34.8 months (95% CI: 32.4–38.2) at low-volume centers versus 38.9 months (95% CI: 37.1–41.3) at high-volume centers. Kaplan–Meier analysis demonstrated significantly improved survival for patients treated at high-volume centers ($p=0.013$).

Conclusion: In patients with early-stage hepatocellular carcinoma undergoing trans arterial radioembolization, treatment at high-volume centers (≥11 procedures/year) is independently associated with improved overall survival compared with low-volume centers.

Abstract No. 572

Splenic Radioembolization: A Novel Therapeutic Approach for Extreme Splenomegaly in Hematologic Malignancies



(Article No. 108480)

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Purpose: Patients with extreme splenomegaly frequently experience compressive symptoms and cytopenias, yet therapeutic options are limited. Splenectomy in this population carries a perioperative mortality rate as high as 20%. Partial splenic bland embolization can be performed but often requires multiple sessions to achieve meaningful volume reduction with acceptable morbidity. This study assessed the safety and efficacy of splenic radioembolization in patients with hematologic malignancies and extreme splenomegaly, defined as spleen volume at least five times greater than the predicted normal size for sex and height.

Materials and Methods: Between June 2023 and September 2025, 24 patients underwent splenic radioembolization with Y90-labeled resin microspheres. Of these, 20 patients (16 men, 4 women; mean age 64.2±9.2 years) with hematologic malignancies (18 myelofibrosis, 1 chronic lymphocytic leukemia, 1 hairy cell leukemia) and extreme splenomegaly formed the study cohort. Target dose was 70 Gy to the treatment volume, calculated with MIRD methodology. All patients had pre- and post-treatment dosimetry with SPECT-CT. Demographic, laboratory, and imaging data were prospectively recorded.

Results: Complete splenic radioembolization was achieved in 14 patients, and partial treatment (61–90% of volume) in 6 patients. Median follow-up was 8 months. Technical success was 100%. Delivered dose to the treated spleen was 67.7±12.4 Gy, measured on post-Y90 Bremsstrahlung SPECT-CT. Mean liver and lung shunts were 1.3±0.9% and 1.6±0.8%, respectively. The liver and lung doses were 2.7±1.2 Gy and 3.2±2.7 Gy. Baseline spleen volume was 2628±1717 mL (15.5±9.9× normal). Volume reductions at 1, 3, 6, 12, and 18 months were 35±22%, 56.1±17.1%, 65.9±13.4%, 73.6±7.8%, and 83.5±8.5%, respectively. No major complications occurred; minor events included fatigue and low-grade fever. Fifteen patients with myelofibrosis proceeded to successful allogeneic stem cell transplantation after radioembolization.

Conclusion: Splenic radioembolization is a safe and effective therapy for extreme splenomegaly, achieving substantial volume reduction within months and avoiding the morbidity and mortality associated with splenectomy. This minimally invasive approach may represent a paradigm shift in the management of patients with extreme splenomegaly.

Abstract No. 573

Yttrium-90 Radioembolization for Hepatic Adenomas: A Single-Institution Retrospective Experience



(Article No. 108481)

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Purpose: Yttrium-90 transarterial radioembolization (Y90) is established for hepatocellular carcinoma, but its role in hepatic adenomas is undefined. This case series evaluates the safety and efficacy of Y90 in hepatic adenomas.

Materials and Methods: We retrospectively reviewed all patients treated with Y90 for hepatic adenomas at a tertiary center from 2010–2024. Clinical, laboratory, imaging, and safety follow-up data were collected. Primary outcomes were CTCAE adverse events (AE) and long-term safety; secondary outcome was overall radiologic response.

Results: 5 patients (mean age 39.2 years, range [13.6–61.5]) with 9 unresectable lesions (mean 1.8 per patient [1–4]) were treated. 8/9 lesions were diagnosed via biopsy, 1/9 by imaging. Indications for Y90 included lesion size >5 cm in all female patients of child-bearing age at risk of hemorrhage (3/5) and higher risk of malignant transformation in male patients (2/5). Mean lesion size was 6.0 cm [2.5–9.5]. All treatments were performed as radiation segmentectomies with targeted absorbed dose >205 Gy. Grade 1 AEs (nausea, fatigue, anorexia, diarrhea) occurred in 3/5 patients; no grade 2 or greater AEs occurred. 3/5 patients had follow-up laboratory values, none of whom had evidence of liver dysfunction on labs measured by ALT or AST > 2× upper limit of normal (ULN), ALP > 2× ULN, or total bilirubin > 2 mg/dL. No patients developed evidence of liver cirrhosis, fibrosis, or portal hypertension on latest MRI. mRECIST Objective response rate (ORR) was 100% (complete response [CR]: 6/9 [67%], partial response [PR]: 3/9 [33%]). Mean time from Y-90 to follow-up MRI was 7.1 weeks [6.1–25.7], to latest labs was 14.5 months [4.4–22.3], and to latest MRI was 12.5 months [1.6–21.9]. One patient underwent surgical resection post Y-90. No lesions recurred.

Conclusion: This single-institution series shows Y90 radioembolization can be performed safely for hepatic adenomas with high objective response rates.

Abstract No. 574

Efficacy of Radiation Segmentectomy for Treatment of Breast Cancer Liver Metastases



(Article No. 108482)

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Purpose: Breast cancer remains the second most common cancer globally and the leading cause of cancer-related death among females worldwide. Treatment options for patients with liver metastases from breast cancer are limited and prognosis remains poor. Radioembolization is a promising treatment for patients; however, there is a lack of ideal dosimetry techniques specific for breast cancer. The benefit of targeted high dose selective internal radiation therapy has been established for treatment in hepatocellular cancer and other malignancies; however, there is limited information on use in breast cancer. This study examines the clinical outcomes of patients with oligometastatic liver metastases following treatment with radiation segmentectomy.

Materials and Methods: This is an institutional review board–approved retrospective review. From March 2021 to July 2024, a total of 30 patients with breast cancer with oligometastatic liver disease underwent radiation segmentectomy. Demographic information, cancer status, receptor status, and number of lines of prior chemotherapy were assessed. Treatment consisted of 1–2 sessions of selective administration of yttrium-90 glass microspheres with a minimum prescribed target dose of 200Gy using

MIRD or personalized dosimetry models. Clinical efficacy was evaluated using RECIST and PERCIST criteria at 3 months, 6 months and 1 year following initial treatment. Safety parameters evaluated were pre and post procedure liver chemistry, MELD and ALBI scores. Adverse events were monitored. The achieved doses were assessed using retrospective voxel analysis of post treatment SPECT/CT.

Results: Procedure was technically successful in 100% of patients. 0 serious adverse events were encountered. 6 of 30 patients encountered a transient increase in total bilirubin. Objective response was seen in 28 of 30 (93.3%) patients. 100% of patients that achieved a target dose of 200 Gy experienced objective response. 10 of 30 (33%) patients had a complete response of the target lesion. 12 of 30 (40%) patients had progression of disease in non-targeted area of the liver at 12 months. The 1 year overall survival was 27 of 30 (90%). Lesions less than 6 cm were significantly more likely to have an objective response $p < 0.01$ or complete response $p < 0.001$. Achieved target dose was associated with higher ORR and CR.

Conclusion: Radiation segmentectomy for treatment of breast cancer liver metastases is safe and effective at a minimum target tumor dose of 200 Gy.

Abstract No. 575

State-Level Trends and Disparities in Transarterial Radioembolization Utilization by Medicare Part B Beneficiaries from 2013 to 2023



(Article No. 108483)

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Purpose: This study aimed to examine state-level disparities in transarterial radioembolization (TARE) utilization among Medicare Part B beneficiaries in the United States from 2013 to 2023.

Materials and Methods: The CMS “Medicare Physician & Other Practitioners–by Provider” dataset (2013–2023) was queried. TARE procedures were identified using the CPT code 79445 and total number of distinct services were recorded (facility and non-facility combined). Counts were standardized as services per 1,000,000 residents aged ≥65 years using population data from the Annie E. Casey Foundation. Annual and median values across years were calculated, and state-level trends were visualized to identify top and bottom utilizers.

Results: By median gross number of distinct services, the highest-utilization states were California (396.0), Florida (322.5), Illinois (267.0), Texas (226.0), and New York (212.5), while the lowest were Iowa (13.5), Vermont (14.0), Montana (15.0), Rhode Island (15.0), and New Hampshire (16.5). When adjusted per 1,000,000 residents aged 65 or older, the highest medians were observed in the District of Columbia (362.62), South Dakota (132.43), Washington (128.13), Illinois (127.63), and Delaware (122.51). The lowest were Iowa (24.11), Connecticut (30.03), Kentucky (34.28), Minnesota (48.32), and New Jersey (49.36). Across states, adjusted service rates generally ranged from 11.39–

255.62, except for the District of Columbia, which consistently demonstrated outlier values (range: 166.85–668.60) and the highest utilization throughout the study period. Utilization rates increased steadily across most states until 2020, except Iowa, where rates remained largely unchanged.

Conclusion: State-level analysis revealed substantial disparities in TARE utilization among Medicare Part B beneficiaries. Most states showed rising rates through 2020, while Iowa remained stable. The District of Columbia consistently exhibited the highest standardized rates. These findings highlight geographic heterogeneity in TARE access and use, likely reflecting differences in cancer epidemiology, provider availability, or referral patterns, warranting further investigation.

References: 1. Centers for Medicare & Medicaid Services. Medicare Physician & Other Practitioners by Geography and Service. <https://data.cms.gov/provider-summary-by-type-of-service/medicare-physician-other-practitioners/medicare-physician-other-practitioners-by-geography-and-service>.

2. The Annie E. Casey Foundation. Population Data by Location. <https://datacenter.aecf.org/locations>.

Abstract No. 576

Radiomics-Based Imaging Biomarkers for Predicting Response to TARE: A Systematic Review and Meta-Analysis



(Article No. 108484)

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Purpose: Radiomics offers a noninvasive means to predict outcomes after transarterial radioembolization (TARE), yet its reproducibility and performance remain unclear. This systematic review and meta-analysis assesses predictive accuracy, imaging modalities, and modeling strategies, providing tumor type and modality pooled metrics.

Materials and Methods: Following PRISMA guidelines, PubMed, Embase, Scopus, and Web of Science were searched through April 2024. Studies using radiomics to predict treatment response or survival after TARE were included. Quality was assessed via QUADAS-2 and Radiomics Quality Score (RQS). Data on tumor type, imaging modality, model type, validation, and performance metrics were extracted. Meta-analysis of 11 externally validated studies was performed using a random-effects model to estimate pooled sensitivity, specificity, and AUC, with subgroup analyses by imaging type and tumor origin.

Results: Out of 608 screened articles, 14 studies (1423 patients) were included. Tumors studied included HCC (n=9), iCC (n=2), and mCRC (n=3). Imaging sources included CT (n=3), MRI (n=6), and PET (n=2), with some using hybrid or multiparametric inputs. Meta-analysis of 11 studies with quantitative outcomes revealed a pooled AUC of 0.82 (95% CI: 0.78–0.86), sensitivity of 79% (95% CI: 72–85%), and specificity of 75% (95% CI: 67–82%), with moderate heterogeneity ($I^2 = 52\%$). Subgroup analysis demonstrated superior performance in PET-derived models (AUC = 0.87) compared to CT (0.81) and MRI (0.78). Studies

integrating radiomics with clinical features (e.g., AFP, tumor burden) achieved higher AUCs (0.85) than radiomics-only models (0.76). Meta-regression showed that studies using external validation and those with higher RQS (>12) had significantly better model robustness ($p < 0.01$). Temporal resolution (e.g., baseline vs. follow-up imaging), feature reduction strategies (e.g., LASSO vs. PCA), and inclusion of shape descriptors were key moderators of model performance. Notably, studies using 3D radiomics and those focusing on texture heterogeneity features (e.g., entropy, GLCM contrast) had better predictive metrics across tumor types. Predicting complete or partial response was more accurate than predicting stable/progressive disease.

Conclusion: Radiomics models effectively predict treatment response after TARE, particularly when combined with clinical data and PET imaging. However, methodological variability and reporting gaps underscore the need for standardization and prospective validation.

Abstract No. 577

High Specific Activity Ho-166 Microspheres for Transarterial Radioembolization (TARE)



(Article No. 108485)

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Purpose: The objective of this work was to assess the post-activation stability of a new class of TARE microspheres that use holmium-166 (Ho-166) as the therapeutic radionuclide.

Materials and Methods: Aluminosilicate-holmium oxide glass microspheres (ID SS02, 0.9956 g, MoSci LLC, Rolla MO) were weighed into a quartz tube (8 mm × 6 cm), capped, and sealed into an aluminum capsule. The capsule was placed in a neutron flux in the McMaster Nuclear Reactor (Hamilton, Canada) for neutron bombardment ($t = 48$ h). The capsule was decay-stored underwater ($t = 13$ d) prior to quantification of the Ho-166 in a dose calibrator (Atomlab 500, Biodex). The microspheres were suspended in phosphate buffered saline (3.000 mL); leaching of trace metals was monitored for 25 d by gamma spectroscopy (ORTEC HPGe detector, Gamma Vision & Aptec MCA software) and ICP-OES (Agilent 5800 VDV). The radionuclides in the microspheres were quantified by gamma spectroscopy using a NIST-traceable calibration curve. Optical images were acquired with a Zeiss microscope fitted with a digital camera (AxioCam, ZEN software); Scanning Electron Microscopy images were acquired with a FEI Versa Dual Beam Scattering Electron Microscope instrument.

Results: The microspheres attained an End of Bombardment (EoB) activity of 2.57 TBq/g Ho-166. Assuming a delay-to-administration period of 72 h to permit processing, QC, and transportation, this would enable clinical delivery of microspheres at 400 GBq/g—a significantly higher specific activity than currently available TARE devices. No substantial damage to the microspheres was detected either by chemical testing or microscopy, which showed smooth, spherical particles with no evidence of cracking or breaking indicating the spheres are highly radiation resistant. The radionuclidic purity of the Ho-166 was excellent (> 99.99% at EoB + 72 h) despite the presence of eight minor radioactive impurities. The Ho-166 was the only major contributor

to the lifetime dose imparted by the device (>99.88% of total dose), which surpasses the recommended value of >95%.

Conclusion: These results suggest that aluminosilicate-holmium oxide glasses are a viable class of materials for TARE microspheres. The specific activity achieved was limited by the neutron flux available: activation to >10 TBq/g can theoretically be achieved in a higher-power facility. Future work will focus on optimizing the chemical composition of the glass microspheres, assaying the biocompatibility of the glasses, and developing clinically representative imaging protocols to assess the possibility of CBCT-guided dosimetry.

Abstract No. 578

Refining Y90-SIRT Treatment Planning Through More Rational Use of Lung Shunt Fraction



(Article No. 108486)

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Purpose: Lung shunt fraction (LSF) and lung dose estimates are primary aspects of treatment planning in ⁹⁰Y-SIRT. The objective in this work was to identify when a patient-specific LSF actively influences treatment planning and decision-making. The impacts of a more rational usage of parameters such as liver volume, lung mass, and LSF on achievable target and non-target dosimetry were analyzed.

Materials and Methods: Both planar (LSF_{planar}) and MAA-SPECT/CT (LSF_{SPECT}) clinical data were analyzed retrospectively in 354 glass ⁹⁰Y-SIRT cases. LSF_{min} was defined as the minimum LSF value where the maximum achievable perfused volume (PV) dose becomes determined by a selected lung dose threshold (LMD_{max}) instead of a designated whole-liver dose threshold (Liver_{max}). LSF_{min} values computed using both clinical and simulated treatment planning parameters were compared to clinical LSF. Probability density functions for LSF were estimated from clinical data using five tumor categories: 1) HCC < 3 cm, 2) HCC 3-8 cm, 3) HCC >8 cm, 4) any case with TIPS or macrovascular invasion (MVI), 5) non-HCC.

Results: LSF_{min} depends only on liver volume, lung mass, Liver_{max}, and LMD_{max}, while PV size plays no role. Using 120 Gy Liver_{max} and 30 Gy LMD_{max}, 29 (10%) treated cases had clinical LSF_{planar} > LSF_{min}. Even at a lower LMD_{max} of 20 Gy, only 7 (2%) treated cases had clinical LSF_{SPECT} > LSF_{min}. Based on observed clinical LSF distributions, cases with HCC tumors ≤8 cm maintained a median (max) probability of 0% (5%) for LSF_{SPECT} to exceed LSF_{min}.

Conclusion: In a great majority of cases it is Liver_{max} that limits the achievable PV dose, with LSF and LMD_{max} playing no relevant role. Cases amenable to single-compartment treatment planning, with small to medium HCC or non-HCC tumors (< 8 cm), and without confounding factors like TIPS or MVI are highly unlikely to benefit from a patient-specific LSF using MAA. It may therefore be plausible to extend “no-MAA” ⁹⁰Y-SIRT workflows to a larger patient population.

Abstract No. 579

Transarterial Radioembolization Versus Transarterial Chemoembolization for Unresectable Hepatocellular Carcinoma: A Systematic Review and Meta-Analysis



(Article No. 108487)

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Purpose: To evaluate and compare the safety and efficacy of transarterial radioembolization (TARE) and transarterial chemoembolization (TACE) in the treatment of patients with unresectable hepatocellular carcinoma (HCC).

Materials and Methods: A systematic search of MEDLINE/PubMed, EMBASE, and the Cochrane Library identified studies comparing TARE and TACE for unresectable HCC. Meta-analyses were conducted to evaluate hazard ratios (HRs) for overall survival (OS), progression-free survival (PFS), and time to progression (TTP); risk ratios (RRs) for treatment response, post-procedural pain, major complications, and mortality; and mean difference (MD) in hospital stay. Subgroup and meta-regression analyses were performed for OS.

Results: Twenty-one studies were included. TARE was associated with a significantly higher complete response (CR) rate

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	HCC < 3 cm	HCC 3-8 cm	HCC >8 cm	TIPS/MVI	Non-HCC
	Median (Range)				
Clinical LSF (%)					
Planar	5.8 (1.6–16.9)	7.3 (0.3–27.3)	8.8 (1.0–20.7)	9.3 (3.0–45.3)	5.6 (1.6–28.4)
SPECT	1.2 (0.1–4.7)	1.5 (0.2–12.1)	2.6 (0.2–7.6)	2.8 (0.2–26.2)	1.1 (0.1–14.7)
LSF _{min} (%)					
Planar	21.4 (7.7–36.0)	17.3 (9.5–38.5)	11.1 (6.3–22.9)	20.9 (7.3–31.0)	18.0 (7.9–33.1)
SPECT	15.3 (5.3–27.2)	12.3 (6.6–29.4)	7.7 (4.3–16.6)	15.0 (5.0–22.3)	12.8 (5.4–24.8)
	Probability: Median (Range)				
LSF _{planar} > LSF _{min}	0 (0–0.27)	0.04 (0–0.26)	0.38 (0.02–0.68)	0.17 (0.12–0.69)	0.03 (0–0.32)
LSF _{SPECT} > LSF _{min}	0 (0–0)	0 (0–0.05)	0.05 (0–0.30)	0.14 (0.08–0.26)	0.02 (0–0.05)

compared to TACE (RR = 1.23; 95% CI, 1.01–1.51; $p = 0.045$). The pooled HR for OS was 0.93 (95% CI, 0.76–1.13; $p = 0.443$), indicating comparable efficacy between TARE and TACE in terms of OS. The pooled HR for PFS was 0.68 (95% CI: 0.45–1.01; $p = 0.055$), indicating a trend toward improved efficacy of TARE compared to TACE in terms of PFS. TARE was associated with significantly less post-procedural pain (RR = 0.48; 95% CI, 0.27–0.83; $p = 0.014$) and a shorter hospital stay (MD = –2.77 days; 95% CI, –4.33 to –1.22; $p = 0.006$). No significant differences were observed in major complications or mortality.

Conclusion: TARE showed comparable OS to TACE, with a higher CR rate and a trend toward improved PFS. Moreover, TARE was associated with less post-procedural pain and a shorter hospital stay, indicating a more favorable tolerability profile.

Abstract No. 580

Outcomes of Embolization for Hepatocellular Carcinoma with Portal Vein Tumor Thrombus: A Single-Institution Experience



(Article No. 108488)

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Purpose: To evaluate outcomes of liver-directed therapy with embolization in patients with hepatocellular carcinoma (HCC) and tumor extension into the portal veins (tumor thrombus), an institutional experience.

Materials and Methods: A single-institution retrospective review was performed from January 2013 to January 2024 including patients with HCC and portal vein tumor thrombus who underwent endovascular liver-directed therapies with TARE, TACE or Bland embolization. Patients with bland portal vein thrombus or tumor thrombus involving hepatic veins were excluded. 24 patients met inclusion criteria. 19 were male (79%) and 5 were female (21%) with a mean age of 67.2 yrs. 17 patients were Child-Pugh class A (70.1%) and 7 were class B. 9 patients had tumor thrombus involving the extrahepatic portal vein (ePVTT) (37.5%) and 15 had tumor thrombus in the intrahepatic portal veins (iPVTT) (62.5%). 9 patients (37.5%) received systemic therapy (2 received neoadjuvant while 7 received adjuvant therapy) while 15 did not (62.5%). Overall survival (OS) was determined from the date of the procedure. Survival sub analyses of patients with ePVTT vs iPVTT, Child-Pugh A vs. B, and systemic treatments vs no systemic treatments. Serious adverse events were recorded.

Results: OS for the 24 patients at 1 year was (45.8%), 2 year was (29.1%) and 3 year was (20.8%). OS in patients with iPVTT only (n=15) vs. ePVTT (n=9) at 1, 2 and 3 yrs was 60% vs. 22.2% ($p=0.19$), 40% vs. 11.1% ($p=0.19$) and 26.6% vs. 11.1% ($p=0.61$), respectively. OS in patients treated with adjuvant/neoadjuvant systemic therapy (n=9) vs no systemic therapy (n=15) at 1, 2 and 3 yrs was 66.6% vs 33.3% ($p=0.23$), 33.3% vs 26.6% ($p=0.74$) and 11.1% vs 20.0% ($p=0.65$), respectively. OS in Child-Pugh Class A vs. Class B at 1, 2 and 3 years was 58.8% vs. 14.3% ($p=0.07$), 29.4% vs. 14.3% ($p=0.63$), and 17.6% vs 14.3% ($p=1.0$), respectively. Serious adverse events occurred in 22.2% of patients with ePVTT and in none of the patients with iPVTT.

Conclusion: Liver-directed endovascular treatments give acceptable survival rates with few complications. Overall survival, although not statistically significant, showed a positive trend towards patients with iPVTT, Child-Pugh A, and those eligible for systemic treatment particularly at 1 year. Serious adverse events are more common in patients with ePVTT.

AI Disclosure Statement: During the preparation of this work, the author(s) used [ChatGPT version 5] to help with statistical analyses.

Abstract No. 581

Prostate Artery Embolization in Older Patients: Clinical Outcomes, Safety, and Durability



(Article No. 108489)

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Purpose: Benign prostatic hyperplasia (BPH) is common in older men, with prevalence exceeding 80% by age 80. Surgical therapies such as transurethral resection of the prostate (TURP) or open prostatectomy are often contraindicated in this patient population due to comorbidities and perioperative risks. Prostate artery embolization (PAE) has emerged as a minimally invasive alternative, offering significant symptom relief with lower morbidity. This study was done to evaluate the safety, efficacy, and durability of PAE in patients ≥ 80 years old at a single institution.

Materials and Methods: The authors of this study retrospectively evaluated 34 consecutive patients (mean age 84.7 ± 3.9 years, range 80-94) who underwent PAE between 2015-2024 for lower urinary tract symptoms (LUTS, n=20), urinary retention (n=9), or hematuria of prostatic origin (n=5). Baseline and follow-up variables included International Prostate Symptom Score (IPSS), technical success (successful bilateral prostate artery embolization), adverse events (graded by Society of Interventional Radiology classification), clinical success (technical success with resolution of symptoms), catheter independence, and reintervention rates. Follow-up was performed at 1, 3, 6, and 12 months.

Results: Technical success was achieved in 32/34 patients (94.1%). In 2 patients, only unilateral prostate artery embolization was possible due to artery stenosis/calcification. Of 9 catheterized patients, 6 (66.7%) achieved catheter independence within 3 months post-PAE. Hematuria resolved in 4/5 (80%) patients. Mean IPSS improved from 26.8 ± 5.9 at baseline to 11.2 ± 4.3 at 12 months ($p < 0.001$). Clinical success was achieved in 28/34 (82.4%) patients. The overall adverse event rate was 23.5% (8/34), all graded as mild AE (transient dysuria, post-embolization syndrome requiring additional medications). No major adverse events or procedure-related mortality occurred. At median follow-up of 26 months (IQR: 18-41), 3 patients (8.8%) required reintervention (2 repeat PAE, 1 TURP for recurrent LUTS). Medication discontinuation was achieved in 17/24 (70.8%) patients previously on BPH therapy.

Conclusion: In older patients with symptomatic BPH, urinary retention, or hematuria, PAE is a safe, well-tolerated, and effective alternative to surgery. It provides durable symptom relief, catheter independence in most retention patients, and a favorable safety profile, supporting its role as a front-line therapy for high-risk older adult populations.

Abstract No. 582**Assessment of Pre-procedure MR Angiography Compared to Iliac Artery Cone-Beam CT for the Detection of Prostatic Arteries and Pelvic Collateral Vasculature**

(Article No. 108490)

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Purpose: Effective and safe prostatic artery embolization (PAE) requires a detailed understanding of pelvic arterial anatomy. Prior studies demonstrated that MR angiography (MRA) can successfully identify the prostatic arteries (PAs) and reduce the procedure time. However, a direct comparison of pre-procedure MRA to PAE using intra-procedure internal iliac artery (IIA) cone-beam CT (CBCT) has not been previously reported. This evaluation is important to determine if pre-procedure MRA is warranted before PAE.

Materials and Methods: A retrospective cohort of 35 patients underwent PAE between April 2023 and February 2024 utilizing both pre-procedure MRA and IIA CBCT. Images were reviewed by two board-certified interventional radiologists in a blinded manner. For each imaging modality, the number and origins of the prostatic arteries (PA) on each side and the presence of penile and rectal collateral pathways were recorded. Additional qualitative parameters (e.g., image quality and confidence in identifying PAs) were scored on a Likert scale. A McNemar test was used to compare the detectability of the PAs origins and collaterals between MRA and CBCT. Qualitative parameters were compared across imaging modalities using a Wilcoxon signed-rank test.

Results: Mean patient age was 77.5 years (std dev: 6.9), and the mean prostate size of 82.9 mL (std dev: 34.2). Of the 99 PA origins identified using CBCT, 87 were recognized on MRA (sensitivity 87.9%, $p > 0.5$). Of the 52 collateral vessels identified on CBCT, only 18 were recognized on MRA (sensitivity 34.6%, $p < 0.00001$). A few additional PA origins and collaterals were identified on MRA that were not seen on CBCT, but these were often not recapitulated on DSA (3/11 for PA origins and 3/5 for collaterals). Image quality and confidence in identifying all feeding vessels were significantly lower in the MRA data set compared to the CBCT data set ($p < 0.00001$ and $p = 0.015$ respectively).

Conclusion: IIA CBCT performed at the time of PAE demonstrated improved image quality with higher sensitivity for identifying PA origins and important collateral vasculature when compared to MRA. The additional time, cost, and expertise needed for the acquisition and interpretation of pre-procedure MRA may not be justified to evaluate pelvic arterial anatomy for procedure planning.

Abstract No. 583**Prostate Artery Embolization Outcomes in Small (< 51 g) Versus Large (> 51 g) Prostates: A Single-Center Retrospective Analysis**

(Article No. 108491)

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Purpose: To compare the efficacy and safety of prostate artery embolization (PAE) in patients with prostate volumes < 51g versus ≥ 51 g, evaluating technical success, bilateral embolization, clinical success, International Prostate Symptom Score (IPSS) reduction, prostate volume reduction, procedural characteristics, and adverse events.

Materials and Methods: A retrospective analysis of 211 PAE patients for benign prostatic hyperplasia (BPH), lower urinary tract symptoms (LUTS), hematuria, or urinary retention (UR) was conducted. Patients were stratified into small (< 51g, n=34) and large (≥ 51 g, n=177) prostate groups. Clinical success was defined as post-treatment IPSS < 15, >50% IPSS reduction, Foley catheter removal, or hematuria cessation. Outcomes included technical success rate, bilateral embolization rate, mean IPSS reduction (with 95% CI), prostate volume reduction, fluoroscopy time, radiation dose, and adverse events (pain, hematoma, ecchymosis, AUR, hematuria, dysuria, post-embolization syndrome, UTI). Two-proportion z-tests compared success and embolization rates, two-sample t-tests compared continuous variables, and Fisher's exact tests compared adverse events ($p < 0.05$ for significance).

Results: Technical success rates were 97.06% (< 51g, 33/34) versus 94.92% (≥ 51 g, 168/177) ($p = 0.611$). Bilateral embolization rates were 85.29% (< 51g, 29/34) versus 90.96% (≥ 51 g, 160/177) ($p = 0.296$). Clinical success rates were 92.86% (< 51g) versus 93.65% (≥ 51 g) ($p = 0.879$). Mean IPSS reduction was 17.11 points (95% CI: 13.83–20.39, n=28) for < 51g versus 15.86 points (95% CI: 14.22–17.50, n=173) for ≥ 51 g ($p = 0.551$). Prostate volume reduction was 32.09% (n=16) versus 31.92% (n=76) ($p = 0.965$). Fluoroscopy time averaged 47.79 min (< 51g) versus 44.58 min (≥ 51 g) ($p = 0.393$); radiation dose was 2887.65 mGy (< 51g) versus 3317.92 mGy (≥ 51 g) ($p = 0.383$). Adverse events showed no significant differences (all $p > 0.05$), with pain (2.94% vs. 0.56%), hematoma (2.94% vs. 0%), and ecchymosis (2.94% vs. 0%) slightly higher in < 51g, and AUR (0% vs. 2.26%) and post-embolization syndrome (0% vs. 1.13%) higher in ≥ 51 g.

Conclusion: PAE is equally effective and safe for small (< 51g) and large (≥ 51 g) prostates, with no significant differences in technical success, bilateral embolization, clinical success, IPSS reduction, prostate volume reduction, fluoroscopy time, radiation dose, or adverse events. These results support PAE's broad applicability across prostate sizes, though the smaller < 51g cohort size may limit statistical power.

Abstract No. 584**Radiation Dose Decreases Following Adoption of a Novel Prostate Artery Embolization Technique**

(Article No. 108492)

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Purpose: Prostate artery embolization (PAE) is an emerging treatment for patients with benign prostate hypertrophy (BPH). We

sought to describe a novel PAE technique and the effects on procedure time and radiation dose.

Materials and Methods: Cases of elective PAE performed by a single operator were included in this study (N=36). The technique adopted during the study consists of (1) obtaining a CT Angiogram of the pelvis during routine workup of PAE patients, (2) postprocessing of the scan using a Siemens workstation to create roadmaps of the vasculature pre-procedure, and (3) use of the preplanned anatomy uploaded to the fluoroscopy suite. All cases pre- and post-adoption utilized NBCA glue as an embolic agent. Technical success was defined as successful embolization of bilateral prostatic arteries. Data were compared between pre- and post-adoption cases using the Mann-Whitney U test. To control for potential confounding variables, we generated multivariate linear regression models including BMI, patient complexity (Charlson comorbidity index), and pre/post adoption status.

Results: Technical success rate was 100% in pre- and post-adoption cases. Post-adoption cases demonstrated significant reductions in median radiation dose (676 mGy vs 4104 mGy, $p = 0.002$) and median procedure time (104 min vs 208 min, $p = 0.003$). In the multivariate models, post-procedure cases were independent factors for lower radiation dose ($p=0.003$) and procedure time ($p=0.03$).

Conclusion: Radiation dose and procedure time were significantly reduced following this technique and remained significant when controlling for potential confounding variables. The decrease in fluoroscopy time was not statistically significant, which may be due to low sample size or unrelated procedural improvements such as reduced reliance on digital subtraction angiography or cone-beam CT (high-dose, low fluoroscopy time tools).

Abstract No. 585

Intraoperative Factors Associated with Clinical Nonresponse to Prostate Artery Embolization



(Article No. 108493)

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Purpose: Prostate artery embolization (PAE) is an established minimally invasive treatment for lower urinary tract symptoms (LUTS) secondary to benign prostatic hyperplasia. Despite high overall success rates, a subset of patients fails to achieve meaningful symptom improvement. We evaluated intraoperative technical factors among clinical nonresponders to identify features that may contribute to treatment failure.

Materials and Methods: From a cohort of 103 PAE patients, 27 (26%) were identified as clinical nonresponders, defined by < 5 -point reduction in International Prostate Symptom Score at follow-up. Intra-operative records were retrospectively reviewed for embolization laterality, iliac artery tortuosity, origin of the prostatic artery, embolic penetration grade (1–3), number of prostatic arterial feeders, and presence of collateral supply. Descriptive

statistics were performed, with exploratory correlations between these factors and angiographic penetration grade.

Results: Bilateral embolization was achieved in 100% of non-responders. Iliac tortuosity was mild in 30%, moderate in 44%, and severe in 26%. Prostatic artery origin was heterogeneous with 35% arising from a common trunk with the superior vesical artery (Type 1) and 28% from the internal pudendal artery (Type 4). Embolic penetration was predominantly Grade 2 (44%) or Grade 3 (44%), though 11% demonstrated only proximal penetration (Grade 1). The mean number of feeders was 2.4 ± 0.6 , with collateral supply identified in approximately one-third of cases. Exploratory analyses revealed no statistically significant correlations between tortuosity, vessel number, collaterals, or laterality and embolic penetration grade (all $p > 0.2$).

Conclusion: Clinical nonresponse to PAE occurred despite technical success in most cases. Complex vascular anatomy including multiple feeders, variant origins, and collaterals was frequently encountered. These patterns highlight technical challenges that may limit procedural efficacy and underscore the need for larger prospective studies.

Abstract No. 586

A Cohort of Inventors and Their Medical Patent Filings and Patent Abandonment: A Cause for Concern



(Article No. 108494)

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Purpose: To evaluate the prevalence of medical patent filings, issuances and abandonment by inventor members of the Society Interventional Radiology (SIR).

Materials and Methods: A cohort of 3892 members were identified from the 2019 membership registry of the SIR. Espacenet a web-based searchable patent database with entries from worldwide patent granting authorities, was searched for medical patent filings from SIR members. Information on patent filing registrations for 349 members was unable to be identified from the database resulting in a study cohort of 3543 members. Patent filings on inventions registered for multiple geographic locations were counted as one filing and the total number of patent filings and patents issued were counted. The number of SIR inventors having one or more filings and one or more patents were also counted. The reasons that patents were not issued were reported where information was available. Follow-up information on the active status of patents issued to SIR's international inventor members ($n=28$) was unavailable. The active status of 172 patents issued to US inventors and the reasons for inactivity or abandonment were reported.

Results: At the time of the review, 535 patent filings were registered by 157 inventors (4.4%) of the study cohort. Of the 535 filings, 200 patents (37.4%) were issued involving 39.5% (62/157) of the inventors. Patents were not granted to 335 filings from 95 members. Examinations were underway for 32 filings docketed as new cases and awaiting a final decision by examiners. Patent

filings were also subjected to requests for further information (n=9) or referred to substantive examination by examiners (n=4) resulting in further delays and administrative burden. The main reason that patents were not granted to inventors was a failure to respond to granting office action in follow-up after their filing (n=87). Of the 172 patents issued to 55 US member inventors, 54 patents (31.4%) were inactive or abandoned. A common reason (n=44) for patent abandonment by holders was a failure to pay maintenance fees during the scheduled maintenance cycle. One patent was reported to have died beyond the 20-year patent enforcement period.

Conclusion: Inventors among the SIR membership are a small group who experienced low rates of patent issuance for their filings and difficulties maintaining their issued patents. Support and assistance for inventive members is needed to reduce the loss of medical invention patents that could potentially improve interventional practice, patient healthcare and member initiative and well-being.

Abstract No. 587

3D Cerebrovascular Reconstruction from Biplane Projections: A CT Angiography-Based Deep Learning Simulation



(Article No. 108495)

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Purpose: To reconstruct 3D cerebrovascular anatomy from biplane (anteroposterior and lateral) projection images using a deep learning back-projection algorithm and to evaluate reconstruction accuracy.

Materials and Methods: Sixteen CT angiography (CTA) datasets were divided into training (n=10), validation (n=3), and test (n=3) groups, with three cross-validation configurations. CTA-derived biplane projections served as DSA-like inputs. Different projection stack sizes were evaluated to assess reconstruction accuracy for the cerebral arteries, quantified by the Dice coefficient (DC) and intersection over union (IoU). Region-of-interest (ROI) magnified reconstructions of the left and right cerebral arteries were compared with non-magnified cropped images using DC, IoU, peak signal-to-noise ratio (PSNR), and structural similarity index (SSIM). The Wilcoxon signed-rank test was applied for statistical comparisons.

Results: For whole-brain cerebral arterial reconstructions, higher DC and IoU values were observed at stack sizes of 9, 11, and 13 with only marginal differences. Accordingly, a stack size of 9 was selected for subsequent evaluations, yielding a DC of 0.509 and an IoU of 0.344. In ROI-magnified reconstructions, DC (right/left: 0.783/0.765) and IoU (0.644/0.622) were higher than in non-magnified cropped images (0.566/0.554, 0.402/0.392), demonstrating improved accuracy in focal areas. PSNR improved from 26.6 dB/26.9 dB to 30.2 dB/30.2 dB, and SSIM from 0.682/0.680 to 0.892/0.883. Magnified reconstruction showed statistically significant improvement in all parameters ($p < 0.01$).

Conclusion: This proof-of-concept demonstrates the feasibility of 3D cerebrovascular reconstruction from biplane angiography-like input using deep learning. This approach may reduce radiation

exposure and contrast load, and warrants validation in studies using actual high-resolution angiographic data with higher resolution.

Abstract No. 588

Semi-supervised Learning Achieves Fully Supervised Performance for Infarct Segmentation Using 50% Fewer Annotations



(Article No. 108496)

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Purpose: Expert annotation limits deployment of AI stroke segmentation. We evaluated whether semi-supervised learning (SSL) can maintain accuracy with half the labeled data and report patient-level volume agreement.

Materials and Methods: We implemented a Mean-Teacher nnU-Net on ISLES2022 MRI (FLAIR/DWI/ADC; 250 cases, 3 centers, 5 scanners). Models using 25%, 50%, or 100% labels were compared with a fully supervised nnU-Net. Data were split 200 train/50 held-out validation, registered to MNI-152 with standard augmentations. Primary outcome was Dice on the validation set; paired Wilcoxon tests compared models. We also performed Bland-Altman analysis of predicted vs ground-truth core volume.

Results: With 50% labels, SSL achieved Dice 0.644 ± 0.243 vs 0.640 ± 0.258 for full supervision (Wilcoxon $p=0.664$; no significant difference). At the same 50% label fraction, SSL outperformed supervised learning (0.644 vs 0.539 ; $p < 0.01$). With 25% labels, SSL (0.612 ± 0.239) exceeded supervised learning with 50% labels ($p < 0.01$). Bland-Altman on the 50-case validation set showed a small positive bias of +4.1 mL (95% CI -1.1 to +9.4 mL) with 95% limits of agreement -32.3 to +40.5 mL (each LoA 95% CI ± 9.1 mL); dispersion increased for very large cores.

Conclusion: SSL maintained segmentation performance while halving labeled data. Volume agreement demonstrates minimal average bias, with wider errors mainly in very large cores suggesting limited impact on triage thresholds except for outliers. Halving labels in our 200-case training set eliminates ~100 manual segmentations saving an estimated 17-32 annotator hours (assuming 10-19 min/case) and \$2800-\$5400 (mean US Radiologist wages), reducing burden without degrading accuracy. Next steps include 5-fold cross-validation, an external/site-held-out test, and formal equivalence testing (TOST).

Abstract No. 589

Predictors of Recovery in Treated Aneurysmal Subarachnoid Hemorrhage: A Quantitative Assessment of Early Presentation Grading Scales



(Article No. 108497)

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Purpose: Aneurysmal subarachnoid hemorrhage (aSAH) remains highly morbid despite advances in clipping and coiling. Most prognostic studies pool treated and untreated patients, confounding interpretation of admission variables. We aimed to identify predictors of functional outcome and complications in a uniformly treated cohort.

Materials and Methods: We retrospectively analyzed 129 consecutive aSAH patients who underwent surgical or endovascular treatment at a single academic center (2020–2023). Data included demographics, comorbidities, aneurysm features, Hunt–Hess (HH), WFNS, and Modified Fisher (mFisher) grades. Outcomes were modified Rankin Scale (mRS) at discharge, 3 months, and 12 months, and discharge disposition. Logistic regression identified predictors of favorable outcome (mRS 0–2), vasospasm, and discharge home.

Results: Mean age was 53.3 ± 13.0 years; 72.9% were female. Hypertension (36.4%) and obesity (35.7%) were most common. Most aneurysms were anterior circulation (62.8%), mean dome size 5.5 ± 3.3 mm. Mean HH was 2.4 ± 1.2 , WFNS 3.1 ± 0.9 , and mFisher 2.8 ± 0.9 . Radiographic vasospasm occurred in 50.4% and symptomatic vasospasm in 24.0%. Vasospasm correlated with higher HH (2.7 vs 2.4, $p=0.0430$), mFisher (3.1 vs 2.6, $p=0.0125$) and with longer hospital stay (20.6 vs 17.0 days, $p=0.0169$). At discharge, 51.2% achieved mRS 0–2 and 63.6% were discharged home; favorable mRS rose to 73.6% at 3 months and 77.5% at 12 months. Favorable outcomes were associated with younger age (49.3 vs 57.5 years, $p=0.0003$), shorter hospitalization (12.7 vs 21.5 days, $p<0.0001$), absence of preoperative altered mental status (10.6% vs 57.1%, $p<0.0001$), and lower HH and mFisher grades ($p<0.01$). However, on multivariable regression only WFNS independently predicted favorable mRS at discharge (OR 0.34 per grade, $p<0.0001$), 3 months, and 12 months. Aneurysm size, number, and mFisher did not retain significance.

Conclusion: In this large treated-only aSAH cohort, WFNS grade at presentation was the sole independent predictor of functional recovery through 12 months. While vasospasm was frequent and associated with higher mFisher grade, it did not independently affect disability. With a high morbidity and mortality, aSAH remains a difficult disease to manage, but understanding clinical grading scales such as WFNS can serve to better guide conversations with patients and family about long-term prognosis and functional outcome.

Abstract No. 590

Development of a Novel Dual-Lumen Catheter and Artificially Intelligent Pump System for Complex Fluid Drainage



(Article No. 108498)

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Purpose: To compare the performance of a novel abscess drainage catheter system with conventional devices, utilizing in silico, in vitro, and ex vivo experimental assays.

Materials and Methods: In silico: computational fluid dynamics modeling guided the design of a novel catheter with dedicated aspiration and flush lumens uniquely engineered to optimize clearance of occlusive debris and preserve patency compared to single lumen catheters. In vitro: a custom 3D-printed

test bed, along with abscess fluid analogues of tunable viscosity (glycerol-water solutions of 0–80% w/v) and particulate density (bulgur wheat #1 of 0–16 g/100 mL), were used for head-to-head challenges of the 12-Fr dual-lumen prototype catheter vs. 10 and 12-Fr commercially available catheters attached to bulb suction. The primary endpoint was time to complete fluid evacuation. Ex vivo: a biomimetic abscess model was developed using the fresh, unfixed human cadaveric bladder as a surrogate cavity, distended with abscess analogue fluid via transurethral Foley catheter, and subsequently drained via suprapubic cystostomy catheter. Fluid transfer was measured via real-time digital weight scales. The pump-driven drainage system was compared to a 12-Fr commercially available catheter attached to bulb suction. Performance metrics included mass transfer and post-processed CT image parameters (bladder cross-sectional area, volume, and average fluid density) over time.

Results: In silico: the dual-lumen catheter model with the highest simulated flushing velocity and drainage flow rate was characterized by an 80:20 drain/flush luminal ratio, septal holes of distally increasing diameters (1–3 mm), and proximal offset of each septal hole by 1 mm relative to its corresponding side hole. In vitro: across viscosities and particulate burden, the novel drainage system significantly reduced time to complete fluid evacuation vs. 10- and 12-Fr comparators. Ex vivo: The novel drainage system without or with pump-driven flushing demonstrated greater and more continuous reductions in cavity volume and fluid density on serial CT imaging vs. a 12-Fr standard catheter attached to bulb suction.

Conclusion: A novel abscess drainage system composed of a unique dual-lumen catheter and programmable aspiration/flush pumps maintained patency and outperformed conventional drainage techniques in bench-top and cadaveric models, particularly for viscous, particulate-rich collections. Such technology has the potential to accelerate abscess resolution, shorten catheter dwell times, and reduce the need for drain check/exchange/upsized procedures.

Abstract No. 591

Fabrication of Gelatin-Based 3D-Printed Tissue Phantoms for Catheter Device Validation



(Article No. 108499)

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Purpose: Demonstrate design, fabrication, and characterization of cost-effective, gelatin-based tissue phantoms for interventional radiology device testing, with a case study of catheter anti-dislodgement device testing, emphasizing control of mechanical and ultrasound properties through formulation parameters.

Materials and Methods: Anatomical geometries from the National Institutes of Health 3D portal were converted to hollow, two-part molds in Fusion 360 and printed in PLA. Type A gelatin (250 Bloom) was bloomed for 120 minutes at 24°C, then dissolved in 60°C water at a 1:6 (w/w) ratio. Formulation included 5% (v/v) glycerol to modulate elasticity and 1% (w/v) graphite for ultrasound backscatter. Oil-coated molds were filled, refrigerated for 12 hours, and phantoms stored in saline at 4°C. A porcine skin layer

was adhered with cyanoacrylate and the assembly secured to a wooden base with rope. Characterization comprised unconfined compression testing (Young's modulus) and B-mode ultrasound to estimate attenuation and visualize organ models. Hands-on time and material costs were recorded.

Results: Phantoms demonstrated soft-tissue-like stiffness (Young's modulus 22.8 kPa) and acoustic behavior (attenuation ≈ 0.4 dB/cm/MHz). Ultrasound showed crisp artificial kidney boundaries and reliable needle/catheter tip visualization without obscuring artifacts, enabling guided access and tract creation. Adjusting glycerol and graphite provided predictable tuning of elasticity and backscatter for target property matching. CAD-to-print molds yielded anatomically faithful geometries with smooth internal lumens compatible with standard guidewires and catheters. Assemblies tolerated repeated puncture, dilation, and catheter exchanges within single bench sessions without porcine-skin delamination or gel fracture, and remained hydrated and mechanically stable during testing when stored in saline. Total hands-on fabrication time was ~ 3 h, and material costs were $< \$30$ per phantom.

Conclusion: A simple CAD-guided casting workflow yields anatomically faithful, tunable, and inexpensive gelatin phantoms that reproduce the tactile resistance and ultrasound appearance of soft tissues. This approach lowers cost barriers and provides scalable support for training, device development, and catheter validation.

Abstract No. 592

Diabetes and Long-Term Complications After Vertebroplasty and Kyphoplasty: A Propensity Score-Matched Analysis



(Article No. 108500)

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Purpose: Percutaneous vertebroplasty and kyphoplasty are recognized treatment options for osteoporotic vertebral compression fractures. Current Society of Interventional Radiology (SIR) guidelines outline procedural risks but do not address diabetes as a potential modifier. Considering the strong association between diabetes, increased risk of infection and impaired bone healing, this study assessed whether diabetic status contributes to higher complication rates following vertebral augmentation.

Materials and Methods: A retrospective cohort study was performed using the TriNetX research network, covering the period from January 1, 2015, to September 1, 2025. Adults aged ≥ 18 years who underwent vertebroplasty or kyphoplasty were identified using relevant CPT and ICD-10 procedure codes, with exclusions for malignancy, traumatic fractures, and prior augmentation within 12 months. Diabetic and non-diabetic cohorts were propensity score-matched ($n=6,565$ each) to balance baseline demographics and comorbidities. Outcomes at 90 days, 6 months, 1 year, 3 years, and 5 years included infectious, spine-related structural, and healthcare utilization complications. Risk ratios (RR), 95% confidence intervals (CI), and p-values were calculated to determine significance.

Results: In matched cohorts, diabetes was associated with higher spinal stenosis rates at 90 days (8.6% vs 7.4%, RR 1.16, $p=0.013$) and persisting through 5 years (24.5% vs 22.4%, RR 1.09, $p=0.005$). Spinal fusion was also increased at 3 years (1.6% vs 1.1%, RR 1.39, $p=0.029$) and 5 years (1.7% vs 1.2%, RR 1.37, $p=0.030$). Sepsis was consistently elevated, including 1 year (7.7% vs 5.9%, RR 1.30, $p<0.001$) and 5 years (15.5% vs 12.6%, RR 1.23, $p<0.001$). Emergency department utilization was higher across all timepoints, reaching 44.8% vs 41.6% at 5 years (RR 1.08, $p<0.001$). Thromboembolic complications were not different early but became modestly elevated by 5 years (10.2% vs 8.9%, RR 1.14, $p=0.013$). Chronic pain, repeat procedures, and mortality were not significantly different.

Conclusion: Diabetic status was associated with higher rates of spinal stenosis, sepsis, emergency department utilization, and spinal fusion over mid- to long-term follow-up, while repeat procedures, chronic pain, and mortality did not differ. Thromboembolic complications were not significantly different early and showed only modest increases at longer follow-up. These findings highlight the need for risk stratification, closer monitoring, and recognition of diabetes as a potential risk-modifying factor in vertebral augmentation.

Abstract No. 593

Trends in the Utilization of Percutaneous Vertebroplasty and Kyphoplasty Among Medicare Part B Beneficiaries from 2001 to 2022



(Article No. 108501)

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Purpose: To find and explain the trends in the utilization of percutaneous vertebroplasty and percutaneous kyphoplasty among Medicare Part B beneficiaries.

Materials and Methods: Publicly available Centers for Medicare & Medicaid (CMS) Part B national summary data files from 2001 to 2022 were used for this study. For the 2001 to 2014 summary files, Current Procedural Terminology (CPT) codes 22520 and 22521 were used to identify vertebroplasty data. Codes 22510 and 22511 were used for the summary files from 2015 to 2022. CPT codes 22523 and 22524 were used to identify kyphoplasty data in the summary files from 2006 to 2014. Codes 22513 and 22514 were used for the summary files from 2015 to 2022. The annual count of the total Medicare Part B beneficiaries for these codes were extracted from the summary files. The total counts were converted to count per 10,000,000 of the total Medicare Part B beneficiaries for the respective year. This was done in order to make the counts comparable across different years. The data for the annual number of total Medicare Part B beneficiaries used for this conversion was obtained from the Harvey L. Neiman Health Policy Institute website. Joinpoint regression was used to identify the inflection points in the utilization of the two

procedures. Significance level for the Annual Percent Changes (APCs) to be significantly different from 0 was set at 0.05.

Results: The highest annual number of vertebroplasty beneficiaries per 10,000,000 were in 2008 (9512.45) and the lowest in 2022 (1664.80). For kyphoplasty, this value was the highest in 2009 (15897.62) and the lowest in 2006 (13016.90). Jointpoint regression identified three jointpoints at 2003, 2009 and 2012 for the vertebroplasty beneficiaries per 10,000,000 from 2001 to 2022. APCs obtained for 2001-2003, 2003-2009, 2009-2012 and 2012-2022 were 31.17 ($P = 0.01$), 3.80 ($P = 0.08$), -21.46 ($P = 0.01$) and -10.27 ($P > 0.001$), respectively. No jointpoint was identified for the kyphoplasty beneficiaries per 10,000,000 from 2006 to 2022 (APC = -0.18, $P = 0.62$).

Conclusion: Vertebroplasty beneficiaries peaked in 2008, with a notable inflection point in 2009 and significant decline afterward. This was probably due to the publication of randomized controlled trials in 2009 that questioned vertebroplasty's efficacy and the subsequent 2010 American Academy of Orthopedic Surgeons (AAOS) guidelines advising against its routine use. In contrast, kyphoplasty utilization remained relatively stable, with only a modest decline during the COVID-19 pandemic years.

Abstract No. 594

Splanchnic Cryoneurolysis: Efficacy and Complications



(Article No. 108502)

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Purpose: Abdominal pain is a prevalent issue in the United States and one of the emerging treatment options is cryoneurolysis. The Splanchnic nerve is a common target for treatment in abdominal pain and several studies have reported on blocking and chemically ablating it for pain relief. However, relatively little data is available for cryoneurolysis of this peripheral nerve. Given the fundamentally different mechanism and level of injury more data is warranted. The authors report the outcomes of a single-institution review of splanchnic nerve cryoneurolysis.

Materials and Methods: Consecutive patients who underwent splanchnic cryoneurolysis at a single center were retrospectively reviewed. Patients' pain was evaluated using the visual analog pain scale (VAS), morphine equivalents were evaluated, and Eastern Cooperative Oncology Group performance status (ECOG) was recorded. Patients' demographic, procedural and complication data was also reviewed.

Results: In total 53 patients were evaluated, 4 were excluded as they underwent blocks without cryoneurolysis. Of the 49 patients included 24 (24/49, 49%) were men and 34 (34/49, 69.4%) had pain secondary to malignancy. When comparing pretreatment VAS scores to 1 week post treatment (8.4 ± 1.5 vs 4.1 ± 2.8 , $p < 0.001$), 1 month post treatment (8.4 ± 1.5 vs 3.6 ± 2.9 , $p < 0.001$), 3 months post treatment (8.4 ± 1.5 vs 5.1 ± 3.3 , $p < 0.001$) and 6 months post treatment (8.4 ± 1.5 vs 6.7 ± 1.3 , $p < 0.001$) there was a significant improvement in pain at all post treatment time points. However, there was no significant difference between morphine equivalents when comparing pretreatment use to 1 week (45 (range:0-405) vs 30 (range 0-405), $p=0.097$), 1 month (45 (range:0-405) vs 30 (range 0-405), $p=0.39$), 3 months (45

(range:0-405) vs 17.5 (range:0-405), $p=0.928$) or 6 months (45 (range:0-405) vs 30 (range:0-90), $p=0.516$) post treatment usage. There was also no significant change in ECOG when comparing pretreatment to 1 week (1 (range:0-3) vs 1 (range:0-3), $p=0.562$), 1 month (1 (range:0-3) vs 1 (range:0-3), $p=0.412$), 3 months (1 (range:0-3) vs 1 (range:0-3), $p=0.728$) or 6 months (1 (range:0-3) vs 1 (range:0-3), $p=0.976$) post treatment time points. No adverse events were reported; however, 6 (6/49, 12.2%) developed postural hypotension and 2 (2/49, 4.1%) developed diarrhea.

Conclusion: Splanchnic cryoneurolysis appears to provide significant pain relief for patients with upper abdominal pain and is associated with low morbidity.

Abstract No. 595

Correlation of Radiopaque Markers with Embolic Delivery Targets in Genicular Artery Embolization: A Large Academic Multicenter Analysis



(Article No. 108503)

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Purpose: To evaluate the utility of placing radiopaque BB skin markers at patients' areas of maximal knee pain in order to correlate intraprocedurally with genicular artery angiographic findings during Genicular Artery Embolization (GAE) for symptomatic knee osteoarthritis.

Materials and Methods: This retrospective multicenter study from June 1, 2022, to August 19, 2025, includes 34 patients and 39 knees which underwent GAEs for symptomatic knee osteoarthritis. Demographic and technical data was collected including age, sex, BB marker location (medial/lateral and cranial or caudal), genicular artery branches embolized, and amount of embolic used for each branch. GAE embolization was performed by operators with over 10 years of experience who embolized in the setting of synovial hyperemia. Data was analyzed utilizing IBM SPSS Statistics version 29.0.0.0 (IBM, Armonk, New York). A paired sample t-test was performed comparing the amount of embolic that corresponded to BB marker placement versus the amount used in other areas of the knee when dividing the knee medially/laterally and cranially/caudally.

Results: 69% of the cohort was female, with a median age of 65 years, and the site of pain was most often medial (58%) and cranial 44% (595.1). For BB markers placed on the medial or lateral aspect of the knee, the area of the BB marker received an average of 1.1 mL of particle embolic material vs 0.46 mL embolic material in the unmarked laterality $p=0.017$. For BB markers placed on the cranial or caudal aspect of the knee, the area of the marker received 1.1 mL of embolic material vs 0.46 mL of embolic in the unmarked laterality $p=0.022$.

Conclusion: BB markers correspond well to the location and amount of embolic administered, indicating that the neovascular blush traditionally targeted during GAE correlates well with our patients' point of maximal pain. As institutional protocols are developed nationwide, intra-operative pain point identification may prove to be an important tool in the selection of vascular territories for embolization during GAE.

595.1.	
Demographics	
Gender	Male 12/39 (31%) Female 27/39 (69%)
Age	Mean 67.7 years Median 65 years
BB marker site	Medial 23 (58%) Lateral 8 (21%) Both 8 (21%)
BB marker site	Cranial 17 (44%) Caudal 13 (33%) Both 4 (10%)

Abstract No. 596

Cryoneurolysis in Malignant and Nonmalignant Pain: A Comparison of Outcomes



(Article No. 108504)

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Purpose: Cryoneurolysis is an emerging technique for the treatment of refractory pain in several anatomic regions. While early reports have been promising the cause of pain can vary widely and prior studies have reported primarily on cancer related pain patients. Here in the authors evaluate if outcomes differ in patients with malignant or nonmalignant related pain when being treated with cryoneurolysis.

Materials and Methods: Consecutive patients who underwent cryoneurolysis of the impar ganglion, pudendal, splanchnic or celiac nerves were retrospectively reviewed. Visual analog scale (VAS) pain scores were recorded prior to and after the procedure. Numeric improvement (NI) in VAS was calculated by the following formula: (VAS pretreatment) – (VAS post treatment). While percent improvement (PI) was calculated with this formula: (NI VAS)/(VAS post treatment). Demographic variables and adverse events were also recorded.

Results: In total 92 patients were included, of which 70 (70/92, 76.1%) had malignant pain and 22 (22/92, 33.9%) had nonmalignant pain. In the entire cohort the VAS significantly improved when pretreatment (8.5 ± 1.6) scores were compared to 1 week (4.2 ± 2.5), 1 month (4.1 ± 2.8), 3 months (4.9 ± 3.1) and 6 months (6.4 ± 2.6) post treatment scores ($p < 0.05$, for all). Similarly, when the malignant pretreatment VAS scores (8.4 ± 2.5) were compared to the 1 week (4.4 ± 2.5), 1 month (4.2 ± 2.8), 3 months (4.5 ± 3.1) and 6 months (6.8 ± 2.8) scores there was significant improvement ($p < 0.05$, for all). The nonmalignant VASs also demonstrated significant improvement when comparing pretreatment (8.7 ± 1.4) to 1 week (3.6 ± 2.5), 1 month (3.9 ± 2.8), 3 months (5.8 ± 3), and 6 months (5.6 ± 2.2) time points ($p < 0.05$, for all). Comparisons between NI and PI of malignant and nonmalignant patients can be found in table 1, however, no significant difference was found between either of these measures at any time point.

Conclusion: Cryoneurolysis appears to be a promising method for treatment of both malignant and nonmalignant pain.

596.1.			
Variable	Malignant	Non-Malignant	p value
NI 1 week Post	4.3 ± 2.6	4.9 ± 2.8	0.217
NI 1 month Post	4.6 ± 2.8	4.6 ± 2.8	0.493
NI 3 months Post	4.4 ± 3.2	3.1 ± 3.5	0.111
NI 6 months Post	2.5 ± 3.5	3.1 ± 3.5	0.328
PI 1 week Post	$50\% \pm 33.2\%$	$55.1\% \pm 32.3\%$	0.269
PI 1 month Post	$53.8\% \pm 30.6\%$	$51.3\% \pm 32.8\%$	0.322
PI 3 months post	$49.9\% \pm 35\%$	$33.4\% \pm 35.8\%$	0.07
PI 6 months post	$26.7\% \pm 41.3\%$	$32.5\% \pm 34.7\%$	0.36

NI=numeric improvement in VAS, PI= percent improvement in VAS

Abstract No. 597

Trends in the State-Level Utilization of Percutaneous Kyphoplasty Among Medicare Part B Beneficiaries from 2015 to 2023



(Article No. 108505)

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Purpose: Percutaneous kyphoplasty is widely used to manage vertebral compression fractures, yet little is known about its state-level utilization patterns. This study aimed to evaluate state-level utilization trends of percutaneous kyphoplasty among Medicare Part B beneficiaries from 2015 to 2023.

Materials and Methods: The CMS “Medicare Physician & Other Practitioners–by Geography and Service” dataset (2015–2023) was queried. Percutaneous kyphoplasty procedures were identified using Current Procedural Terminology (CPT) codes 22513 and 22514. The variable *Tot_Bene_Day_Srvcs* was used to quantify the number of distinct services, combining facility and non-facility counts where applicable. Counts were standardized as services per 1,000,000 residents aged ≥ 65 years in each state, using state-level population data obtained from the Annie E. Casey Foundation. Median values across the study period were calculated, and state-level trends were analyzed to identify highest- and lowest-utilization states.

Results: By median gross number of distinct services, the highest-utilization states were Florida (5851.0), Texas (4311.0), California (2968.0), North Carolina (1976.0), and Virginia (1970.0). The lowest were Alaska (23.0), Wyoming (41.0), Vermont (41.5), Hawaii (61.0), and Montana (74.0). When standardized per 1,000,000 residents aged ≥ 65 years, the highest medians were observed in Oklahoma (2374.31), Kansas (2184.63), Mississippi (1831.46), Arkansas (1708.08), and Indiana (1606.89), with Oklahoma and Kansas consistently ranking at the top. The lowest adjusted medians were seen in Hawaii (211.36), Minnesota (223.14), Oregon (239.19), Alaska (240.37), and New Mexico (349.64). Most states exhibited flat or declining adjusted utilization rates over the study period, with exceptions such as Arizona (537.57–780.49), Utah (946.44–1285.77), and North Dakota (691.16–911.58), where rates increased.

Conclusion: State-level analysis revealed wide variation in percutaneous kyphoplasty utilization among Medicare Part B beneficiaries, with most states demonstrating flat or declining trends from 2015 to 2023. A small number of states exhibited persistent increases, suggesting regional practice differences. These disparities may reflect variations in patient demographics, fracture epidemiology, provider availability, or reimbursement practices. Further investigation into these drivers is warranted.

Abstract No. 598

The Effect of Socioeconomic Status on Clinical Outcomes in Genicular Artery Embolization



(Article No. 108506)

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Purpose: Genicular artery embolization (GAE) is a nonsurgical, minimally invasive procedure utilized in treatment options for medically resistant knee osteoarthritis (KOA) in poor surgical candidates or those looking to avoid or delay total knee arthroplasty. Previous studies have reported that the prevalence of OA and resulting outcomes are affected by socioeconomic and geographic disparities; however, this has not been reported in GAE. Here, we report patient SES, based upon area deprivation index (ADI), effects on clinical outcomes in GAE patients.

Materials and Methods: 48 GAE patients were retrospectively analyzed from September 2021 to April 2025. GAE was performed using standard techniques which included 200- μ m polyethylene glycol microspheres or Lipiodol for embolization in all cases. Patients were followed at 1, 3, and 6 months post-treatment. Patients were classified by ADI, which demonstrates SES deprivation based on zip code of residence. A cut-off of 50th percentile differentiated “Advantaged” or “Disadvantaged” groups. Clinical outcomes were assessed with the Ontario and McMaster Universities Osteoarthritis Index (WOMAC) scoring system at pre-GAE visit and up to 6 months post-GAE. WOMAC scores were compared between groups utilizing student’s t-test with $p \leq 0.05$ as significant.

Results: Patients were classified as Advantaged ($n=13$) or Disadvantaged ($n=24$) with 11 patients unable to be classified and excluded. All cases were technically successful. Within the Advantaged group, the mean WOMAC score prior and 6 months after GAE was 64.0 ± 16.4 and 42 ± 22.2 , respectively ($p < 0.05$). In the Disadvantaged group, the mean WOMAC score prior and 6 months after GAE was 59.6 ± 18.7 and 54.1 ± 21.2 , respectively ($p > 0.05$). T-tests comparing the WOMAC scores demonstrated a significant reduction of scores for Advantaged patients compared to Disadvantaged patients ($p < 0.05$).

Conclusion: Socioeconomic Advantaged vs Disadvantaged status in patients undergoing GAE for KOA demonstrated a significant difference in outcome scores. Advantaged patients had significantly larger reductions in these scores compared to Disadvantaged

patients. This regional data may reflect the benefit of future efforts to improve healthcare access and evidence-based management patterns. Socioeconomic barriers may contribute to clinical outcomes following GAE. This data emphasizes the benefit of studying healthcare access and neighborhood-level factors to overcome barriers with respect to post-operative outcomes after GAE.

Abstract No. 599

Biomechanical Assessment of Stresses, Weight, and Movement Within the Sacroiliac Joint to Better Understand Fixation Device Placement: A Finite Element Analysis (FEA) Study



(Article No. 108507)

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Purpose: The sacroiliac (SI) joints, located between the iliac bones and sacrum, provide stability and absorb impact during movement. Over time, these joints may become painful due to arthritis, ligament stiffness, or injuries from falls, accidents, or surgery. SI joint fusion is often performed to alleviate pain. This FEA study examines the biomechanical performance of the sacroiliac joint under various natural loading conditions, aiming to determine the location of the movement and stressors within the joint. This information expects to identify the best location and trajectory for surgical intervention of the sacroiliac joint for improved technique and placement ultimately leading to better patient outcomes.

Materials and Methods: Finite element analysis (FEA) simulated the biomechanical performance of pelvic models under clinical loading conditions. This analysis was conducted using modelling and simulation tools developed within the ANSYS environment. Load scenarios included flexion, extension and rotation set to mimic a single leg stance, ramp movement to 7.5Nm. Weight mimicked a double leg stance, ramp force 880N. All testing included both ligament strain and bone stress. Boundary conditions were the nodes on the left of the pelvis and the right ends of the pelvis were completely fixed. The weight condition describes the vertical downward force of 880N that was applied to the sacral plate. This condition serves as a baseline before movement (e.g., flexion-extension lateral bending, axial rotation) is applied.

Results: Greatest load-bearing region lies inferior near S3 where you can see direct migration of stress at a peak value of 20 MPa from the sacral plate where the loading condition is being applied. Thus, the best location and posterior trajectory for surgical intervention of the SIJ with the intention of bone fusion is a posterior inline trajectory, positioned inferiorly near pelvic anatomical landmark S3. Furthermore, this location in the SIJ space is the most direct and precise, shown in the image d of the axial slices figure.

Conclusion: These FEA results clearly demonstrated and illustrated the SIJ hot-spots. These hot-spots represent the optimum area to place SIJ fixation devices. Using the identified posterior trajectory to target this area, practitioners may more accurately place these fusion devices within the SIJ to improve patient outcomes.

Abstract No. 600**Trends in the Utilization of Anesthetic and Neurolytic Celiac Plexus Nerve Blocks in Medicare Part B Beneficiaries from 2000 to 2023**

(Article No. 108508)

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Purpose: The aim of this study was to evaluate long-term utilization trends of anesthetic and neurolytic celiac plexus nerve blocks among Medicare Part B beneficiaries using the Centers for Medicare & Medicaid Services (CMS) data.

Materials and Methods: Publicly available CMS Part B national summary data files (2000–2023) were analyzed. Anesthetic celiac plexus blocks and neurolytic celiac plexus blocks were identified using Current Procedural Terminology (CPT) codes 64530 and 64680, respectively. Annual counts of beneficiaries were extracted and standardized as procedures per 1,000,000 Medicare Part B beneficiaries, with denominator data obtained from the Harvey L. Neiman Health Policy Institute. This was done in order to make the counts comparable across different years. Joinpoint regression was used to identify inflection points in utilization and calculate annual percent changes (APCs) with 95% confidence intervals.

Results: The highest gross number of beneficiaries was observed in 2018 for anesthetic blocks ($n = 2,709$) and in 2004 for neurolytic blocks ($n = 1,878$), while the lowest counts occurred in 2001 ($n = 1,464$) and 2023 ($n = 754$), respectively. Standardized utilization rates peaked in 2013 for anesthetic blocks (80.97 per 1,000,000) and in 2004 for neurolytic blocks (55.70 per 1,000,000), with nadirs in 2002 (44.99) and 2023 (26.39), respectively. For anesthetic blocks, joinpoints were identified in 2004 and 2011, with APCs of -0.42% (2000–2004; $P = 0.87$), $+7.93\%$ (2004–2011; $P = 0.17$), and -1.62% (2011–2023; $P = 0.14$). No joinpoints were identified for neurolytic blocks; the overall APC from 2000–2023 was -2.40% ($P < 0.001$).

Conclusion: Utilization of anesthetic and neurolytic celiac plexus nerve blocks among Medicare Part B beneficiaries declined overall from 2000–2023, with the steepest decrease observed for neurolytic blocks. Anesthetic block utilization increased modestly between 2004–2011 but has since trended downward. These findings suggest shifting practice patterns and highlight the need for further investigation into clinical, policy, and reimbursement factors driving these changes.

Abstract No. 601**Transarterial Embolization and Percutaneous Cryoablation in Soft Tissue Tumors: A Feasible Palliative Approach**

(Article No. 108509)

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Purpose: Soft tissue tumors (STTs) are rare, heterogeneous neoplasms with over 100 histologically distinct subtypes, ranging from benign, intermediate and malignant lesions of mesenchymal origin. Accurate diagnosis and management of soft tissue tumors necessitate a multimodal approach that integrates clinical assessment, advanced imaging, and histopathologic analysis. The purpose of this study is to evaluate the safety and feasibility of transarterial embolization (TAE) and percutaneous cryoablation (PCA) as a palliative treatment strategy for primary, metastatic, and recurrent (STTs) at a local institution.

Materials and Methods: A retrospective study at a quaternary academic medical center included 6 adult patients. Between 2024 and 2025, a total of 7 transarterial embolization (TAE) and percutaneous cryoablation (PCA) procedures were performed. Demographics, tumor characteristics, and clinical outcomes were collected. The median tumor volume was 464cm^3 (range: 20–19,153 cm^3). Treatment-related changes in size, devascularization and intratumoral necrosis were recorded. Assessment of symptoms prior and post treatment was used to assess palliative management. Median number of months to follow-up was 2 (range: 1–4).

Results: The cohort consisted of 4 male and 2 female patients with a median age of 61 years (range: 29–90). Diagnoses included malignant and benign pathologies in the chest wall, abdominal wall, and upper/lower extremities. All procedures achieved technical success with angiographic tumor devascularization. No major peri-procedural complications occurred. Four of 6 patients were discharged same day. Two patients with poor pain control prior to intervention were admitted 1 night for pain management. One patient underwent a subsequent intervention for tumor progression, although demonstrating clinical improvement in pain control post (TAE) and (PCA). Symptom improvement and a marked reduction in tumor hypervascularity was reported in all patients who presented to clinic for follow up ($n=3$).

Conclusion: Dual application of TAE and PCA for STTs is not well defined in current literature. Our results demonstrate a safe, feasible, and reproducible approach for palliative treatment in unresectable soft tissue tumors. While follow-up in this initial study was limited, findings suggest that TAE and PCA can provide subjective pain control and local disease stabilization, even in patients with recurrent or advanced disease. Larger studies are needed to better define the role of combined embolization and ablation in the multidisciplinary care of patients with complex STTs.

Abstract No. 602**Minimally Invasive Treatment of Aneurysmal Bone Cysts with Gelified Ethanol (DiscoGel): Evaluation of Feasibility, Safety, and Efficacy**

(Article No. 108510)

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Purpose: The aim of this study was to evaluate safety and effectiveness of radio-opaque gelified ethanol sclerotherapy in treating primary aneurysmal bone cyst

Materials and Methods: In this single-center, retrospective study (January 1, 2012, to June 30, 2024), 32 patients with primary aneurysmal bone cysts were treated with percutaneous sclerotherapy using radio-opaque gelified ethanol at various skeletal sites. Of these, 27 patients were included in the analysis, 5 patients were excluded due to follow-up of less than 12 months. The primary outcome measure was the safety of the procedures. Secondary outcomes measures included clinical success, defined as the absence of post-sclerotherapy fractures or the need for surgical revision, and radiological success, determined by the conversion of an active or aggressive aneurysmal bone cyst to inactive, according to Campanacci's classification.

Results: No major complications related to the procedure were observed. One minor complication (3.7%) was reported: One local collection resolved with antibiotic therapy. The remaining patients showed favorable clinical and radiological outcomes. No fractures were recorded after sclerotherapy. Surgical revision for progressive recurrence was necessary in 2 cases (7.4%). Aneurysmal bone cyst becoming inactive in 21 of 27 (77.8%) patients after 12 months, 13 of 14 (92.8%) patients after 24 months, and 7 of 7 (100%) and 5 of 5 (100%) patients after more than 36 and 48 months, respectively.

Conclusion: Radio-opaque gelified ethanol sclerotherapy offers a safe, effective, and minimally invasive treatment for primary aneurysmal bone cyst. It may be considered a first-line approach, similar to other sclerotherapy methods, potentially avoiding the need for invasive surgery as an initial treatment option

Abstract No. 603

Femoral Arterial Access in Pediatric Angiographic Procedures: Predictors of Technical Success, Adverse Events and Thrombotic Risk



(Article No. 108511)

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Purpose: To identify predictors of technical success and adverse events (AEs) associated with ultrasound (US)-guided femoral arterial (FA) access in children undergoing catheter-directed angiography and interventions.

Materials and Methods: Retrospective study including 661 consecutive FA accesses in patients aged ≤ 18 years (male 53% [350/661]) at a tertiary pediatric hospital between January 2020 and December 2024. Baseline demographics, corrected FA diameter and technical details were analyzed using univariable and multivariable Firth logistic regression to identify predictors of technical success (which was defined as successful placement of vascular sheath) and AEs (graded according to Society of Interventional Radiology [SIR] classification).

Results: The median age was 7.9 years (range, 1.1 months–17.9 years) and the median corrected FA diameter was 4.6 mm (range, 1.2–9.6 mm). The technical success rate was 99.2% (656/661). 49.8% [329/661] of the accesses were intended for interventions. 69% of the accesses (450/661) were performed using a 4 French vascular sheath with a median sheath-to-artery (S/A) ratio of 0.5 (IQR 0.4–0.6). The overall AE rate was 5.4% (36/661), with 1.7% (11/661) classified as SIR moderate and severe grades. Vasospasm (2.0% [13/661]), which was more common in arteries with corrected diameter ≤ 3.9 mm, was associated with both access failure and thrombosis ($P=.009$). Prophylactic intra-arterial nitroglycerin administration significantly reduced vasospasm risk ($P<.001$). Arterial thrombosis was diagnosed in 0.9% (6/661) of accesses, with median age of 0.3 years, weight of 6.4 kg and corrected FA diameter of 1.7 mm. All cases were treated with unfractionated heparin and followed by subcutaneous low molecular weighed heparin, with no ischemic sequelae (median follow up = 525.5 days; range, 169–1616 days). Independent predictors of thrombosis included sheath-to-artery ratio ≥ 1 (OR 107.4 [95% CI: 7.6–8094.3], $P<.001$) and use of vascular closure device (OR 180.7 [95% CI: 2.0–10042.1], $P=.02$). Hematoma was associated with ≥ 6 French sheath and body weight ≥ 75 kg ($P<.001$).

Conclusion: US-guided FA access has a high success and low AE rate in a high-volume pediatric practice. Arteries > 3.9 mm and use of prophylactic intra-arterial nitroglycerin reduce risk of vasospasm and access failure. Optimization of sheath-to-artery ratio and avoidance of VCD use can mitigate the risk of thrombosis in children.

Abstract No. 604

LAVA in the Portovenous System: Preliminary Assessment of EVOH Efficacy and Safety During Portal Embolization



(Article No. 108512)

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Purpose: EVOH is an effective embolic agent for the closure of intracranial and extracranial arteries. Limited literature is available for EVOH use in the portovenous system. We aim to assess the efficacy and safety of LAVA EVOH embolization in the portal system at a single tertiary referral center.

Materials and Methods: A retrospective analysis was performed to identify all cases performed between July 26, 2024, to June 3, 2025, using portal EVOH embolization. Inclusion criteria included variceal embolization for bleeding varices (with or

without TIPS) or portosystemic shunt embolization for hepatic encephalopathy (HE). Technical success was defined as successful intraprocedural occlusion of the targeted shunt or varix. Clinical success was defined as freedom from same site re-intervention in the event repeat procedures were required to address new variceal bleeding or refractory hepatic encephalopathy. Complications were reviewed and stratified by Society of Interventional Radiology classification guidelines.

Results: A total of 30 patients met inclusion criteria (15 male, median age 61, range 2–75 yrs) with 22 variceal (73.3%) and 8 shunt (26.7%) embolization procedures performed. Of the cases, 30 (100%) were technically successful and 29 (96.7%) achieved clinical success. TIPS was performed in conjunction with 13 variceal embolizations (59.1%). Average pre-procedural MELD was 16.6 ± 8.4 ($n = 28$, excluding 2 PELD) and post-procedural MELD was 17.1 ± 8.2 ($p = 0.76$). Both LAVA 34 ($n = 26$) and LAVA 18 ($n = 4$) (SIRTEX Medical) were utilized with adjunctive embolic materials as follows: coils ($n = 20$), plugs ($n = 5$), and Histoacryl ($n = 1$). Three episodes of nontarget embolization were observed (10%)—2 related to catheter technique and 1 late visualization of distal varix to portal communication. A total of 7 procedural AEs (3 related to EVOH) were recorded including 5 mild AEs (3 nontarget embolizations, 1 access site hematoma, and 1 TIPS related portal vein infarct) and 2 severe AEs. Both severe AEs occurred due to severe hepatic encephalopathy after TIPS and were successfully treated with TIPS reduction or increased lactulose. Four patients died within a year of embolization, though no deaths were related to embolization complications.

Conclusion: EVOH embolization in the portal system demonstrates technical and clinical success for portal venous occlusion. Further clinical studies are needed to evaluate portal EVOH embolization for long-term outcomes.

Abstract No. 605

Navigating the Liver: A Comparative Study of Transjugular Intrahepatic Portal Shunt (TIPS) Techniques



(Article No. 108513)

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Purpose: To compare the procedure characteristics, patient outcomes, and complication rates when TIPS is performed with intracardiac echocardiography vs. conventional fluoroscopy vs. complex techniques.

Materials and Methods: A retrospective single-center study with 61 TIPS procedures using conventional techniques, ICE guidance, or complex approaches, including direct percutaneous transhepatic or transsplenic access, was performed from January 2020 to July 2025. Procedure characteristics included pre and post-TIPS portosystemic gradients, fluoroscopy time, procedure time, number of puncture attempts to access the portal system, and technical success. Complications, such as bleeding, pseudoaneurysm, and death were also collected.

Results: Of the 61 TIPS procedures, 37 patients (61%) were male and 24 (39%) were female. Conventional fluoroscopy was used in 30 procedures (49%), intracardiac echocardiography (ICE) in 25

(41%), and 6 procedures (10%) were classified as complex TIPS, requiring additional direct percutaneous transhepatic or transsplenic access; only one of the complex cases used ICE. Procedure times differed significantly among the three groups, $F(2,61)=4.65$, $p=.014$. Post hoc comparisons indicated that complex TIPS procedures had longer procedure times (151 ± 36.4 min) than both ICE (98.5 ± 47.8 min, $p=.011$) and conventional TIPS (92.9 ± 38.5 min, $p=.024$). However, procedure times did not differ between ICE and conventional TIPS ($p=.885$). Interestingly, there was a significant difference in the number of puncture attempts across groups, $H(2)=11.96$, $p=.003$. ICE TIPS required fewer puncture attempts than both conventional TIPS ($p=.003$) and complex TIPS ($p=.012$). No significant differences were observed among groups for complication rate ($p=.317$) or technical success ($H(2)=0.52$, $p=.770$).

Conclusion: The use of ICE guidance during TIPS procedures resulted in significantly reduced puncture attempts when compared to the use of conventional fluoroscopic techniques and complex TIPS cases. However, there was no difference in post-operative complication rates or technical success. These findings highlight potential benefits of ICE-guided TIPS, warranting future prospective, powered studies.

Abstract No. 606

Utilizing Machine Learning to Predict 30-Day Mortality from Acute Variceal Hemorrhage After TIPS



(Article No. 108514)

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Purpose: Traditional clinical scores such as MELD, Child-Pugh, and AIMS-65 rely on laboratory and demographic variables but do not incorporate imaging or procedure-specific factors that directly influence outcomes after transjugular intrahepatic portosystemic shunt (TIPS) for variceal hemorrhage. We evaluated whether a multimodal score incorporating variceal morphology, portal hemodynamics, and procedural complexity, analyzed with machine learning, can improve prediction of 30-day mortality compared with logistic regression (LR) and established clinical scores, by leveraging imaging and procedural data not captured in prior models.

Materials and Methods: We retrospectively analyzed 305 patients undergoing TIPS between August 2011 and August 2023 at a single institution, filtering for patients with acute variceal hemorrhage with known variceal location. Variables include variceal morphology, portal hemodynamics through pre-TIPS hepatic venous pressure gradient (HVPG) and portosystemic gradient changes, laboratory indices, transfusion and vasopressor use, and procedural characteristics. We trained and evaluated a spectrum of machine-learning algorithms spanning linear and non-linear function classes, including Gradient Boosting (GB), Random Forest (RF), and Support Vector Machine (SVM), and compared them with LR (control). Performance was quantified using AUC values under the ROC curve and concise operating-point metrics to reflect clinical trade-offs; model interpretability was stratified using SHAP values to identify the most clinically significant variables.

Results: Among 90 patients (11% 30-day mortality), tree-based ensembles outperformed LR. GB showed the highest discrimination ($AUC \approx 0.90$), RF was next ($AUC \approx 0.84$), and SVM was comparable to LR ($AUC \approx 0.75$). At clinically chosen thresholds, GB produced the fewest false positives with the highest overall accuracy, while RF provided the best sensitivity and specificity; both significantly improved practical utility over LR.

Conclusion: A multimodal ML framework substantially improves 30-day mortality prediction after TIPS versus logistic regression, thereby moving risk assessment from one-size-fits-all scores toward individualized, patient-specific probabilities. By integrating imaging, hemodynamics, labs, and procedural complexity, the model delivers higher discrimination with clinically useful actionable operating points, supporting more actionable post-TIPS risk stratification and decision making that can be prospectively validated and calibrated for bedside use.

Abstract No. 607

Feasibility and Safety of a Novel 72-Hour Emergency Department-to-Outpatient IR Pathway: A Single-Center Cohort Study



(Article No. 108515)

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Purpose: Evaluate feasibility/safety of a novel 72-h ED→IR triage pathway that discharges ED patients home with scheduled outpatient IR to avoid admissions, decrease ED crowding, deliver value-based care, and optimize resource use.

Materials and Methods: Retrospective review, single academic center, July 2024 to July 2025; 2,430 IR cases screened. Excluded: neuro-IR (n=107), ordered as ER (526), performed more than 3 days from placing order (n=1,618), and patients without an ER visit (n=85). Included: ED patients needing an IR procedure, no admission indication, discharged and scheduled ≤72h as an outpatient procedure (n=94). Procedures: central venous access 33%, hemodialysis-access interventions 29%, nephrostomies 15%, G/GJ tubes 12%, misc 11%. Primary endpoints: (1) pathway success (arrival + procedure as scheduled ≤72h) and (2) technical success. Secondary: ED LOS, pre-IR bouncebacks/admissions, periprocedural complications, and post-IR morbidity/mortality through 60d. EHR used for baseline acuity/comorbidities.

Results: Median age 57; 55% male; 40% uninsured. High acuity: ASA III 87%; CKD 71%; 22% anticoagulated. Median ED→IR 55 h; ED LOS 8 h. Pathway completion 97% (91/94). Intended procedure performed 99% (93/94); technical success 99% (93/94). Pre-IR bounceback 2% (2/94); no pre-IR deaths. Periprocedural complications 3% (3/94). Post-procedure, 38% (36/94) had any ED visit/admission within 30 d (median 13 d), of which 15% (14/94) were IR-related. ICU transfer ≤30 d: 0%. Mortality at 30 and 60 d: 1% each (1/94).

Conclusion: A 72-h ED→IR outpatient pathway is feasible/safe in a high-acuity cohort, reliably achieving technical success while

obviating bridging admissions. Most post-procedure returns were non-IR-related, suggesting this model can reduce ED crowding without compromising short-term outcomes. Future studies should compare with conventional IR utilization and assess cost-effectiveness.

Abstract No. 608

EPIC Workflow Changes to Improve Interventional Radiology Consult Triage and Reduce Overnight Paging Volume



(Article No. 108516)

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Purpose: While IR procedures for hospitalized patients have often been ordered directly by referrers, increasing patient and procedure complexity have driven a shift towards consultation whereby the IR service integrates the clinical question and history to determine an appropriate plan and/or procedure. Within Radiant (the default EPIC environment for Radiology) initial implementations typically enable direct ordering by referring clinicians. At our institution, we converted to a consult-driven workflow with an IR consult order that collects triage information, including order priority, to populate a worklist. Only consults with “STAT” priority generate a direct page to the on-call physician. This replaced a prior workflow wherein all procedure requests, regardless of priority, were accompanied by a page. In this study, we quantify the impact of our intervention, particularly with respect to after-hours requests.

Materials and Methods: Retrospective review identified 6,488 IR consult orders from July 1, 2024, to June 30, 2025. Pertinent patient and referral details were used to analyze rates of consult placement and cancellation according to priority and time. Data were analyzed using R; t-tests were used to compare continuous variables.

Results: Of 6,488 consults placed, 4,667 (71.9%) were completed while the remainder were cancelled prior to fulfillment, primarily due to either a change in clinical plan or a mistake preceding order modification. During this period 3,791 IR procedures were performed on hospitalized inpatients. Order priority prevented 1,452 requests from generating an unnecessary page after-hours (27.9 per week), representing 71.7% of after-hours orders. Routine requests occurred more frequently during business hours (1.08 vs. 0.138 consults/hr; $p < 0.0001$), whereas no significant difference was observed for STAT consults (0.083 vs. 0.073 consults/hr; $p = 0.14$). A substantial number of consults (13%, n=613) reflected requests intended for a different procedural subspecialty, including within Radiology.

Conclusion: Among other important benefits, implementation of an IR consult-driven workflow significantly reduced after-hours pages to the on-call physician by routing non-STAT consults to a routine queue. The frequency of consults ordered with STAT priority did not vary significantly with time-of-day, suggesting appropriate use of the priority modifier. A substantial incidence of erroneous consults intended for other procedural subspecialties suggests that a unified imaging-guided procedure order may further improve IR triage and referrer experience.

Abstract No. 609**Efficacy of D-Lead Wipes, Hydrogen Peroxide, and Soap in Reducing Surface Lead Contamination on Radiation Protection Apparel: A Zone-Randomized Study**

(Article No. 108517)

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Purpose: Lead radiation protection apparel (RPA) is routinely used in interventional radiology to reduce occupational radiation exposure. Prior studies have demonstrated persistent surface lead contamination, a heavy metal hazard with no known safe exposure threshold. This study evaluates the effectiveness of three cleaning modalities (D-Lead wipe [ESCA Tech, Inc], 3% hydrogen peroxide, soap with gauze) in reducing surface lead on RPAs using a randomized zone-based approach, addressing an occupational health risk in interventional radiology.

Materials and Methods: We conducted a zone-randomized cleaning study of 35 lead aprons in a tertiary-care angiography suite between August and September 2025. Three high-touch zones per apron, the left upper chest (A), right upper chest (B), mid-abdomen (C), were sampled in 8 × 8 cm squares. Zones were randomized 1:1:1 to one of three cleaning interventions: D-Lead wipe (1 wipe), 3% hydrogen peroxide (1 pump), or soap with gauze (soaked and dried). Surface lead was assessed using an EPA-recognized rapid qualitative test before and after intervention. Zones testing negative at baseline were excluded from analysis. A no-intervention control confirmed assay stability over repeated testing. The primary outcome was a clearance in detectable lead residue post-cleaning.

Results: 105 randomized zones from 35 lead aprons were tested. Pre-intervention, 68.6% of zones (72/105) tested positive for lead residue. After a single cleaning, 24 of 72 pre-intervention positive zones were cleared (33.3%; 95% CI, 23.5%–44.8%; exact binomial, $p < 0.0001$). Post-intervention clearance rates were D-Lead wipe 45.8% (11/24; 95% CI, 27.9%–64.9%), hydrogen peroxide 30.4% (7/23; 95% CI, 15.7%–50.8%), soap and gauze 24.0% (6/25; 95% CI, 11.5%–43.4%). Zone-specific clearance was highest for the right upper chest (B) at 71.4% (10/14; 95% CI, 45.4%–88.3%), followed by the left upper chest (A) at 25.9% (7/27; 95% CI, 14.0%–43.6%) and mid-abdomen (C) at 22.6% (7/31; 95% CI, 11.4%–39.8%). Zone B showed higher clearance compared to Zone A and C combined (71.4% vs 24.1%; OR 7.86; Fisher's exact, $p = 0.001$). The overall difference between cleaning methods was not significant (Wald $\chi^2 = 3.7$; df = 2; $p = 0.16$).

Conclusion: A single cleaning pass significantly reduces detectable surface lead on RPAs ($p < 0.0001$), with D-Lead wipes showing numerically higher clearance than hydrogen peroxide and soap ($p = 0.16$). Lead residue persisted in approximately two-thirds of zones after cleaning. Continued refinement of cleaning protocols is needed to enhance staff safety in high-radiation environments.

Abstract No. 610**First Case, Best Case: Unlocking Efficiency in Interventional Radiology**

(Article No. 108518)

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Purpose: Delays in first case start (FCS) times in hospital-based interventional radiology (IR) departments contribute to procedural backlogs, increased staff overtime, and reduced patient and provider satisfaction. Improving FCS is a recognized operational priority in IR workflow optimization.

Materials and Methods: A prospective quality improvement study was conducted in a tertiary-care academic IR department over 12 months. Baseline metrics were collected for 3 months, including the proportion of on-time FCS (patient entry within 15 minutes of scheduled start). A multidisciplinary intervention was implemented: standardized patient arrival times, a pre-procedure nursing checklist, daily morning huddles, and real-time case tracking. Primary outcomes were on-time FCS rate, daily case volume, room turnover time, and staff overtime hours. Statistical analysis used chi-square and paired t-tests (significance: $p < 0.05$).

Results: On-time FCS increased from 41% to 78% post-intervention ($p < 0.001$). Mean daily case volume rose from 7 to 8 cases per IR suite (12% increase). Room turnover time improved by 10 minutes ($p = 0.02$), and staff overtime hours decreased by 21%. Root cause analysis revealed delays from incomplete labs and late arrivals. Staff reported improved communication and morale.

Conclusion: A structured, multidisciplinary quality improvement initiative significantly improved first case start times, procedural throughput, and staff efficiency in a hospital-based IR department. These findings support the adoption of standardized workflow interventions to enhance operational performance in IR practice.

Abstract No. 611**Inpatient Interventional Radiology Procedures: Cost Center or Hidden Value?**

(Article No. 108519)

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Purpose: The US healthcare system uses various payment systems for procedures and diagnoses. Compared to distinct fees associated with procedures in the outpatient setting, inpatient reimbursement utilizes a more opaque diagnosis related group (DRG) that is dependent on diagnoses, comorbidities, and procedures/surgeries performed. Given this structure, the contribution of IR to DRG reimbursement may not be readily apparent. This work aims to

611.1.				
DRG with MCC	Reimbursement	DRG with MCC, with IR procedure	Reimbursement	Difference
Compression fracture	\$13,828	Compression fracture with vertebral augmentation	\$25,059	\$11,231
PE	\$11,419	PE with thrombectomy	\$37,350	\$25,931
Variceal GI bleed	\$14,734	Variceal GI bleed with TIPS	\$43,991	\$29,257
Average	\$13,327		\$35,467	\$22,140

highlight case examples of inpatient IR services that result in meaningful changes to non-physician DRG reimbursement.

Materials and Methods: Centers for Medicare & Medicaid Services (CMS) schedules were used to calculate DRG reimbursements for three common inpatient clinical presentations. Averages were calculated with and without major complication or comorbidity (MCC), and with and without an associated IR procedure: compression fracture with or without vertebral augmentation, pulmonary embolism (PE) with or without thrombectomy, and variceal gastrointestinal (GI) hemorrhage with or without TIPS placement. Given the potential for outpatient vertebral augmentation procedures following an admission, reimbursement was calculated simulating this scenario versus inpatient augmentation.

Results: Average DRG reimbursement for compression fractures, PE, and variceal GI bleeding was \$6523 for patients without MCC and \$13,327 for patients with MCC. With the addition of vertebral augmentation, PE thrombectomy, and TIPS placement, the average DRG reimbursement was \$14,836 (\$8312 increase) for patients without MCC and \$35,467 (\$22,140 increase) for patients with MCC. Compared to delayed outpatient vertebral augmentation, inpatient augmentation resulted in a decrease of \$2858 for patients without MCC and an increase of \$4087 for patients with MCC.

Conclusion: DRG code changes due to IR procedural management of inpatients can result in large increases in reimbursement for admission, although these financial implications may be obscured by the limited transparency of DRG payments. These findings may help interventional radiologists advocate for inpatient resources and improve inpatient access to IR services.

AI Disclosure Statement: During the preparation of this work, the author(s) used ChatGPT 5 for spelling and grammar.

Abstract No. 612

Patient Engagement with Clickable Terms in Augmented Radiology Reports: A Prospective Study of 101 Participants Highlighting Opportunities for Increasing Interventional Radiology Awareness



(Article No. 108520)

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Purpose: Patients are increasingly accessing their radiology reports online but encounter complex medical terms that limit their

understanding. As a result, patients may remain unaware of potential treatment options for their conditions, including minimally invasive procedures offered by IR. Radiology report simplification platforms that incorporate interactive patient-education features offer a novel strategy to improve comprehension and expand awareness of IR pathways.

Materials and Methods: We conducted a prospective study enrolling 101 patients to review de-identified, augmented versions of their own reports in a web application. The platform displayed clickable medical terms linked to patient-friendly educational materials. Engagement was measured by the number of sessions, term clicks, and clicks per session as tracked by the web application. Reports were also manually reviewed for positive IR-relevant findings to assess opportunities for patient education about minimally invasive treatment pathways.

Results: Recruited patients underwent CT (n = 32), MRI (n = 26), US (n = 22), and nuclear medicine (n = 21) studies and accessed their respective reports in the web interface an average of 1.48 times. Participants interacted with clickable terms an average of 5.26 times per user, with an average of 3.56 times per session, though 45/101 (44.6%) of users did not click any terms. Overall, 54/101 participants (53.5%) had at least one IR-relevant positive finding. Reports containing at least one IR-relevant term included 16 CT (50%), 17 MRI (65%), 11 ultrasound (50%), and 10 nuclear medicine (48%) studies. The distribution of positive IR-relevant findings varied by modality: CT most frequently reported enlarged lymph nodes and pulmonary nodules, MRI highlighted spine and musculoskeletal abnormalities, ultrasound frequently identified thyroid nodules and cholelithiasis, and nuclear medicine scans revealed nodal or metastatic disease.

Conclusion: This study demonstrates that patients actively engage with clickable terms in their reports and can be exposed to IR-related concepts. Linking positive findings to educational content within reports represents an opportunity to improve awareness and expand access to minimally invasive care, including image-guided biopsy, ablation of lung or thyroid nodules, percutaneous or endoscopic management of cholelithiasis, and vertebral augmentation and joint injections in this study.

AI Disclosure Statement: The authors declare the use of GPT5 (September 2025 Version) in order to improve the grammar, spelling, and readability of this submission.

Abstract No. 613

Evaluating Outpatient Interventional Radiology: Identifying Key Factors Impacting Lost to Follow up in Outpatient Interventional Radiology Clinic



(Article No. 108521)

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Purpose: Over the years, interventional radiology (IR) has evolved from a primarily procedure-based specialty to one that encompasses longitudinal patient care, particularly in the outpatient arena. While the clinic plays a pivotal role in pre- and post-procedure care and management, maintaining continuity remains a challenge, with lost to follow-up (LTFU) posing significant barriers. LTFU is a complex issue with a wide array of contributing factors. The purpose of this study was to identify the LTFU rate in outpatient IR, along with identifying key drivers preventing successful follow-up. These factors will be the subject of targeted interventions to improve the follow-up rate, patient care, and clinical efficiency.

Materials and Methods: Following institutional review board approval/exemption, a retrospective review of outpatient IR clinic follow-up was performed over 21 months (September 2023-May 2025). All distinct outpatient IR clinic follow-up encounters were included in the data set. The total distinct follow-ups, completion rate, cancellation rate, no-show rate, and no-appointment rate were calculated. Data analysis was then performed to determine the LTFU rate and associated factors contributing to it.

Results: A total of 1360 distinct follow-up encounters were identified over the 21 months. A total of 1035/1360 (76%) patients completed the clinic follow-up as intended. In comparison, 325/1360 (24%) patients did not complete the follow-up visit. Further breakdown of this group showed: 218 (16%) never had a follow-up scheduled, 51 (4%) cancelled their appointment, and 56 (4%) were no-shows for their appointment.

Conclusion: Analysis suggested a relatively high compliance with outpatient IR clinic follow-up. However, despite a 76% follow-up rate, a few key factors were identified as major contributors to lost-to-follow-up rates. These findings include scheduling gaps, cancellations, and no shows. Identifying strategies to mitigate these barriers could further optimize patient outcomes and continuity in clinical IR.

Abstract No. 614

Reinventing Interventional Radiology Night Call: Impact of Two Call Models on Clinical Productivity, Physician Wellness and Academic Missions



(Article No. 108522)

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Purpose: To assess the impact of two interventional radiology (IR) call models on clinical productivity, physician wellness, and academic missions.

Materials and Methods: Two different IR call models were implemented at a tertiary academic medical center. Under Model A (2022 and 2023), the inpatient service was covered by a different attending each weekday in 24-hour shifts with attendings expected to work clinically the day following the 24-hour shift. Under Model B (2024), there was a separate weekday inpatient daytime attending and night float attending; these attendings remained on the same shift for the whole week. Data regarding yearly IR division work relative value units (wRVUs) and clinical full-time equivalents (cFTEs) were collected. An anonymized survey was sent to 10 attendings who practiced under both call

models. Questions were graded on a Likert scale or prompted a preference between the 2 models, where applicable. Responses were compared using a Wilcoxon signed-rank test.

Results: Divisional wRVUs per cFTE were 6017, 7149, and 6186 for 2022, 2023 and 2024, respectively. Under Model B, when time spent on the night float attending was counted towards cFTE, the 2024 divisional wRVU per cFTE was 5832 (6% decrease compared to 6186). The survey response rate was 100%. Attendings reported significantly increased hours of sleep ($P=0.04$) under model B (median 6, IQR 6-8) compared to model A (median 5.5, IQR 5-6). Attendings also felt more prepared to work the following day under model B ($P=0.04$). There was a trend towards less fatigue under model B ($P=0.11$). For direct comparative questions (Model B/Model A/Equivalent), attendings stated that model B was superior to model A in providing better quality of patient care (60%/0%/40%), greater patient safety (70%/0%/30%), promoting physician wellness (70%/0%/30%), achieving the division's educational mission (50%/0%/50%) and achieving the division's research mission (40%/0%/60%). Overall, 60% of attendings preferred model B and 40% had no preference. No responder found model A to be superior to model B for any question.

Conclusion: A night float attending call model may promote physician wellness and better achieve a division's clinical and academic missions with minimal impact on clinical productivity compared to a traditional 24-hour call model.

Abstract No. 615

Outcomes of Inferior Vena Cava Filter Use in Lung Transplant Recipients: A Single-Center Retrospective Study



(Article No. 108523)

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Purpose: Inferior vena cava (IVC) filters are often used in lung transplant recipients who develop venous thromboembolism (VTE), particularly when anticoagulation is temporarily contraindicated due to procedures such as bronchoscopy. However, data on filter safety, retrieval rates, and long-term outcomes in this unique population remain limited.

Materials and Methods: We performed a retrospective review of lung transplant recipients who underwent IVC filter placement between January 2021 and April 2025. Data collected included filter type, VTE indication, retrieval attempts (including technique, fluoroscopy time, and radiation dose), complications, and survival outcomes.

Results: Ninety-five lung transplant patients received retrievable IVC filters (93 Argon Option Elite, 2 Celect) during the study period. The most common indication was deep vein thrombosis (DVT), followed by combined DVT and pulmonary embolism (PE) in the immediate post-transplant period. Of these, 63 filters (66.3%) were successfully retrieved, with a median dwell time of 7.7 months (IQR 4-10). Retrieval was achieved using snare technique in 53 cases and forceps-assisted technique in 10; all

retrieval attempts were technically successful. One complication—filter migration into the right renal vein—was managed with successful forceps retrieval. No filter-related deaths were reported. Reasons for non-retrieval included persistent VTE, ongoing hospitalization, repeated bronchoscopic procedures, unrelated death, and loss to follow-up.

Conclusion: IVC filters are frequently placed in lung transplant recipients due to a complex interplay of thromboembolic risk and procedural contraindications to anticoagulation. Retrieval rates in this population were higher than previously reported, with a low complication rate. These findings underscore the importance of structured surveillance and individualized risk-benefit assessment in filter management post-lung transplant.

Abstract No. 616

Efficacy of Unilateral Balloon Expandable Covered Stent Graft Placement Covering the Contralateral Brachiocephalic Vein for Malignant Superior Vena Cava Syndrome



(Article No. 108524)

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Purpose: Malignant superior vena cava syndrome is often associated with intrathoracic malignancies. Endovascular management involves placement of a stent across the obstructed SVC. This study examines the safety and efficacy of placing a unilateral balloon-expandable covered stent graft that covers the contralateral brachiocephalic vein.

Materials and Methods: Between January 2020 and July 2024 a total of 30 patients (19 men and 11 women; mean age, 66.7 years; range, 42-87 years) with malignant SVC syndrome underwent endovascular management with unilateral balloon-expandable covered stent graft placement (Viabahn VBX stent graft) covering the contralateral innominate vein. The presenting symptoms included neck and facial swelling (n = 23; 76.7%), bilateral upper extremity swelling (n = 17; 57.7%), dyspnea (n = 16; 53.3%), unilateral upper extremity swelling (n = 9; 30%). SVC reconstruction was completed using 11 mm Viabahn VBX balloon expandable stent grafts that were unilaterally placed within the SVC and across the venous confluence to a patent brachiocephalic vein to relieve venous stenosis or obstruction and prevent tumor overgrowth. The stent grafts were subsequently balloon expanded to 14 mm. Clinical outcomes, survival and patency were assessed.

Results: Balloon-expandable covered stent graft placement was technically successful in all patients (n=30, 100%). There were no major complications. Two patients experienced minor access related hematomas (n=2, 6.7%). All 30 (100%) patients experienced complete symptomatic relief in 1-7 days (mean 3.4) after stent graft placement. No patients experienced SVC obstruction or contralateral upper extremity venous thrombosis during the follow-up period. Cumulative primary stent patency rates at 1 and 3 months were 100% and 97% respectively.

Conclusion: Unilateral balloon mounted covered stent graft placement covering the contralateral brachiocephalic vein is a safe and effective method for treating malignant SVC syndrome.

Abstract No. 617

Pulmonary Arterial Perfusion in Acute Pulmonary Embolism: Perfusion Deficit Correlates with Short Term Outcomes



(Article No. 108525)

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Purpose: To evaluate pulmonary arterial perfusion imaging using dual-energy CT (DECT) as a predictor of outcomes and potential clinical decision-making tool for patients with pulmonary embolism (PE).

Materials and Methods: We retrospectively analyzed dual-energy CT pulmonary angiography exams in patients with central PE. Patients with segmental/subsegmental PE or parenchymal lung disease were excluded. Median age of the final cohort was 61.5 years ($\pm$ 11.3), with 59.1% female and 40.9% male. Anatomic imaging was used to identify clot extent, quantified using the Qanadli score. Perfusion data based on dual-energy iodine perfusion imaging were extracted and registered to all 5 lung lobes to quantify perfusion to each lobe. Perfusion deficits were compared across clotted vs. non-clotted lobes. Perfusion was also compared to Qanadli scores, discretized into low (< 18), intermediate (18-33), and high (>33) categories, as well as 30-day mortality. Statistical testing included t-tests, Wilcoxon rank-sum with Benjamini-Hochberg correction, and correlation analyses.

Results: A total of 110 lobes were analyzed (65 clotted, 45 non-clotted), distributed by arterial level as follows: 60 main pulmonary arteries, 30 interlobar arteries, and 20 lobar arteries. The most common cancers were colorectal (11.4%), liver (11.4%), breast (11.4%), sarcoma (11.4%), and pancreas (8.6%). Clotted lobes had greater perfusion deficits than non-clotted lobes ($28.8\% \pm 13.4\%$ vs $16.3\% \pm 5.3\%$; $p = 1.1 \times 10^{-9}$). Perfusion deficit was also associated with worse 30-day mortality ($p = 0.0001$) as well as median overall survival ($p < 0.001$). Perfusion deficit, however, was not associated with Qanadli severity ($p = 0.3$).

Conclusion: DECT-derived perfusion strongly correlates with clot presence and predicts 30-day mortality, supporting its value as a functional biomarker of PE severity. Lack of association with Qanadli scores suggests perfusion imaging provides complementary prognostic information beyond anatomic measures. For example, small, non-occlusive thrombi yield the same contribution as occlusive clots to the Qanadli score but do not have a significant impact on actual perfusion. On the other hand, lobes without clot also demonstrated low perfusion, likely reflecting underlying lung disease; this information could help inform about overall lung function and facilitate the clinical decision-making for reperfusion interventions to clotted lobes in these patients. These findings highlight the potential of DECT perfusion to supplement serologic, anatomic, and hemodynamic assessments and refine risk stratification.

Abstract No. 618

Volumetric CT Analysis of Inferior Vena Cava Filters Predicts Long-Term Complication Risk



(Article No. 108526)

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Purpose: Inferior vena cava (IVC) filters are widely used to prevent pulmonary embolism in patients with contraindications to anticoagulation. However, prolonged dwell times are associated with complications such as penetration and fracture. This study aimed to analyze temporal changes in IVC anatomy and filter orientation using serial volumetric CT analysis to identify imaging predictors of long-term complications.

Materials and Methods: This retrospective study (2010-2024) included 31 patients (mean age 60.1 years; 61.3% male) with IVC filters in place for ≥ 3 years. Scans were analyzed at baseline, intermediate, and final follow-up using 3D Slicer software. Measurements included IVC diameters at the filter apex, midpoint, and base, filter tilt angle from the caval axis, cross-sectional area at the base of IVC filter, and IVC segmental volume. Complications were defined as migration (>10 mm), strut penetration (>3 mm beyond IVC wall), and fracture. Associations with patient demographics, filter type, and dimensional changes were assessed.

Results: The baseline CT scan was obtained at a median of 30 days post-placement, and the median follow-up was 5.7 years (range 4.2-9.5). The filter types and indications are mentioned in 618.1. No immediate adverse events were noted. Progressive IVC remodeling was observed: IVC diameter decreased from 19.4 ± 2.6 to 17.7 ± 2.9 mm at the apex ($p=0.46$), and 21.3 ± 3.2 to 17.7 ± 3.6 mm at the base ($p=0.05$). Similarly, filter tilt angle increased from $7.8^\circ \pm 2.3$ to $12.9^\circ \pm 3.8$ ($p=0.16$). Overall, 7/31 (22.6%) patients developed complications: 4 migration (12.9%), 6 penetration (19.4%), and 1 fracture (3.2%). IVC diameter reduction at the base (11.5% vs 4.6%, $p=0.04$), greater increase in filter tilt (9.3° vs 4.2° , $p=0.03$), greater decrease in surface area of IVC at the filter base (13.6% vs 5.1%, $p=0.03$), and greater reduction of IVC segmental volumes (22.1% vs 9.4%, $p=0.04$) were all associated with development of complications. No associations with filter type, indication, age, or sex were noted.

Conclusion: Progressive caval remodeling and increasing filter tilt were associated with long-term complications after prolonged IVC filter dwell times. Serial volumetric CT analysis may help identify patients at risk and guide surveillance strategies.

618.1. IVC filter type and primary indications

Variable	Value (n = 31)
Filter Type	
Gunther Tulip:	10 (32.3%)
TrapEase:	7 (22.6%)
Celect:	6 (19.4%)
Other:	8 (25.8%)
Primary Indication for Filter	
Malignancy-related VTE:	14 (45.2%)
Perioperative Contraindication:	11 (35.5%)
Trauma:	3 (9.7%)
Other/Unclassified:	3 (9.7%)

Abstract No. 619

The Use of Inferior Vena Cava Filters in High Risk Patients Undergoing Total Joint Arthroplasty



(Article No. 108527)

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Purpose: The inferior vena cava filter (IVCF) has been utilized to reduce the risk of pulmonary embolism (PE) in individuals at high risk for venous thromboembolism (VTE) and deep-vein thrombosis (DVT) with contraindications to pharmacologic prophylaxis. Patients undergoing total joint arthroplasty (TJA) are at an increased risk of thromboembolic events, and the consideration of IVCF has not been fully explored in this subset of patients.

Materials and Methods: TriNetX was used to evaluate patient electronic medical records between January 1, 2016, and December 1, 2024. Patients were identified who had undergone a first-time total hip (THA) or total knee (TKA) arthroplasty. Patients were then divided into two groups based on IVCF status (TKA/THA-IVCF vs TKA/THA-only). Patients considered "high-risk," or had a previous history of PE, DVT, or personal history of hypercoagulable state were solely included and 1-to-1 propensity matched. Final cohorts for the TKA groups with and without IVCF were 135. Final cohorts for the THA groups with and without IVCF were 159. Primary outcomes measured were the rates of DVT and PE at 1, 3, and 6 months. Secondary outcome measured was the rate of IVCF retrieval at 6 months.

Results: TKA-IVCF was associated with slightly higher rates of DVT at one (RR = 2.1, 95% CI [1.028,4.29]), three (RR = 2.1, 95% CI [1.305,3.38]), and six months (RR = 1.923, 95% CI [1.277,2.896]) compared to TKA-only. Similarly, THA-IVCF was associated with significantly higher rates of DVT at one (RR = 4.636, 95% CI [2.511,8.562]), three (RR = 3.2, 95% CI [2.163,4.734]), and six months (RR = 3.148, 95% CI [2.168,4.572]) than THA-only. TKA-IVCF (RR = 1.824, 95% CI [1.061,3.133]) and THA-IVCF (RR = 2.133, 95% CI [1.203,3.782]) were associated with slightly more PEs at six months, respectively, than their non-IVCF counterparts. At 6months, 79filters (58.5%) from TKA-IVCF and 95filters (59.7%) from THA-IVCF were retrieved. No significant difference in filter retrieval was found between both groups.

Conclusion: IVCF are effective at preventing PE formation in patients undergoing TJA. While later endpoints may indicate that these IVCF fail in doing so, greater filter retrievals at these times predispose those patients to higher rates of PE formation. Further randomized-control trials are necessary to ascertain IVCF efficacy in this patient subset.

Abstract No. 620

Disparities in State-Level Utilization of Inferior Vena Cava Filters Among Medicare Part B Beneficiaries from 2013 to 2023



(Article No. 108528)

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Purpose: Geographic disparities in the utilization of inferior vena cava (IVC) filters remain poorly characterized. This study aimed to examine state-level disparities in IVC filter utilization among Medicare Part B beneficiaries in the United States from 2013 to 2023.

Materials and Methods: The CMS “Medicare Physician & Other Practitioners—by Geography and Service” dataset (2013–2023) was queried. IVC filter insertions were identified using Current Procedural Terminology (CPT) code 37191. The variable *Tot_Bene_Day_Srvcs* was used to quantify the number of distinct services, with facility and non-facility counts combined where applicable. Counts were standardized by calculating services per 1,000,000 residents aged 65 years or older in each state, using state-level population data from the Annie E. Casey Foundation. Median values across the study period were calculated to identify states with the highest and lowest utilization.

Results: By median gross number of distinct services, the highest-utilization states were Illinois (1401.5), Pennsylvania (1199.0), Ohio (1104.0), Florida (926.0), and California (920.0). The lowest were Wyoming (21.0), Alaska (21.5), Vermont (30.0), Hawaii (33.0), and Maine (46.0). When adjusted per 1,000,000 residents aged 65 or older, the highest medians were observed in the District of Columbia (2338.00), South Dakota (942.07), New Jersey (887.54), Connecticut (813.00), and Mississippi (773.98). The lowest were Hawaii (122.67), Maine (161.29), Wyoming (218.76), Oregon (253.29), and Vermont (256.61). Across states (excluding DC), adjusted rates ranged from 72.76–1977.46. Most states demonstrated a steady decline in adjusted utilization from 2013 to 2023.

Conclusion: This analysis revealed wide state-level disparities in IVC filter utilization among Medicare Part B beneficiaries, with markedly higher rates in certain states and a consistent overall decline in use. These findings suggest variation in access, practice patterns, or clinical decision-making. Further research is warranted to explore the drivers behind these disparities and the implications for patient care.

Abstract No. 621

Gaps in IVC Filter Retrieval: Benchmarking Outcomes Through a Global Multicenter Analysis



(Article No. 108529)

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Purpose: Despite multiple FDA safety communications (2010, 2014) and multidisciplinary guideline statements (CHEST, 2016; SIR, 2020) recommending timely retrieval of inferior vena cava (IVC) filters, retrieval rates remain low. This represents not a knowledge gap but an implementation failure. We leveraged a global, multi-institutional dataset to quantify morbidity and mortality associated with indwelling filters compared to retrieval, entirely in the post-guideline era.

Materials and Methods: We queried the TriNetX Global Collaborative Network, encompassing >150 health systems and

>150 million patient records, to identify adults undergoing IVC filter insertion (CPT 37191) between 2018–2025. Patients were stratified into Filter Remains (no retrieval) and Filter Removed (retrieval CPT 37193 within 1 day–6 months). Propensity score matching balanced demographic covariates. Outcomes included severe sepsis, hemorrhage, cerebral infarction, and all-cause mortality. Risk ratios (RR), risk differences, and numbers needed to treat (NNT) were calculated.

Results: A total of 58,549 patients across 155 health systems were analyzed (46,173 Filter Remains; 12,376 Filter Removed). Despite clear guidelines, only ~21% underwent retrieval. Retained filters were associated with significantly worse outcomes:

- Severe sepsis: 10.8% vs 2.5% (RR 4.3; NNT=12).
- Hemorrhage: 2.6% vs 1.1% (RR 2.3; NNT=69).
- Cerebral infarction: 10.0% vs 4.9% (RR 2.0; NNT=20).
- Mortality: 30.2% vs 4.2% (RR 7.2; NNT=4).

Conclusion: In a cohort spanning 2018–2025—well after FDA safety advisories and professional society guidelines—only one in five filters was retrieved, and retained filters were associated with sharply higher rates of infection, stroke, hemorrhage, and death. Absolute differences translate to one death prevented for every 4 filters retrieved. These findings demonstrate a persistent guidelines-to-practice gap and highlight the need for structured retrieval pathways, automated alerts, and institutional accountability to align practice with safety standards.

Abstract No. 622

Contralateral Suppression as a Rescue Tool in Adrenal Venous Sampling: Improving Sensitivity in Unilateral Primary Aldosteronism



(Article No. 108530)

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Purpose: The right adrenal vein is frequently difficult to cannulate during adrenal venous sampling (AVS). In such cases, contralateral suppression indices (CSI) may be used as a rescue strategy to infer lateralization. Prior validation has emphasized unilateral disease, with few right adrenalectomy cases and limited evaluation of bilateral outcomes. We assessed CSI performance against surgical and medical outcomes and explored optimized thresholds.

Materials and Methods: We retrospectively reviewed 135 AVS cases (2022–2025). Ground truth was defined as adrenalectomy with clinical/biochemical cure (16 right, 25 left) or bilateral disease with medical management and improvement (n=17). CSI was calculated as adrenal A/C ÷ IVC A/C. Diagnostic accuracy was evaluated with ROC analysis, expert consensus thresholds (CSI < 0.5 and contralateral A/C < 9), and exploratory threshold mapping (CSI 0.1–2.5; A/C 0.5–30). Sensitivity, specificity, 95% confidence intervals, and McNemar’s test were reported.

Results: For right PA, left CSI achieved AUC 0.92. Expert consensus thresholds yielded sensitivity 0.75 (95% CI 0.47–

0.91) and specificity 0.98 (0.88–1.00). Optimized thresholds (CSI < 0.7, A/C < 3.0) improved sensitivity to 0.88 (0.62–0.98) while preserving specificity 1.00 (0.91–1.00); McNemar $p \approx 0.03$. For left PA, right CSI AUC was 0.97; expert consensus thresholds provided sensitivity 0.96 (0.79–0.99) and specificity 0.94 (0.80–0.99). Optimized thresholds (CSI < 0.55, A/C < 4.0) yielded identical performance; McNemar $p = 0.7$. In bilateral disease ($n=17$), contralateral indices showed no discrimination (AUC 0.49–0.68). Contralateral indices were significantly lower contralateral to the diseased side in unilateral PA (all $p < 0.001$, Mann–Whitney).

Conclusion: Contralateral suppression serves as a reliable rescue tool in AVS when right-sided cannulation fails. Expert consensus thresholds remain highly specific, and optimized cutoffs improved sensitivity for right PA without sacrificing specificity. CSI failed to discriminate bilateral disease, underscoring the need for full AVS and multicenter validation of refined criteria.

Abstract No. 623

Direct Puncture Sclerotherapy in Perineal Vascular Anomalies



(Article No. 108531)

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Purpose: To describe the presentation, procedural techniques, and clinical response in patients with perineal vascular anomalies (VAs) treated with image-guided percutaneous sclerotherapy.

Materials and Methods: Five patients (age range 5–74; 3 females) with VAs in the perineal region treated with percutaneous sclerotherapy were included. Relevant comorbidities were present in select patients, including hidradenitis suppurativa, Klippel–Trenaunay syndrome, and PIK3CA mutation. All patients underwent preoperative ultrasound and pelvic MRI to confirm and characterize venous, lymphatic, or venolymphatic anomalies. Clinical presentation and response, time to reintervention, and complications were measured and analyzed. Medications used included intravascular 3% sodium tetradecyl sulfate (STS) foam and intravascular and intralesional bleomycin. STS was used for deeper and larger vascular channels while bleomycin was preferred for superficial or small channels at risk of rupture.

Results: Presenting symptoms included perineal pain (80%) and swelling (60%). Patients underwent a range of 1–9 and median of 4 interventions. The mean interval between sclerotherapy sessions was 42.4 weeks, with a median of 25.7 weeks (IQR 7.6–60.1 weeks). Three patients received STS alone constituted in a foam with air ranging from 1:1–4, one patient received bleomycin alone, and one patient received both. Treatments were well-tolerated without complication. Reintervention was primarily dictated by recurrence of symptoms in the setting of residual or recurrent vascular pockets that were eventually controlled. Patients treated with bleomycin had greater degree of symptom resolution, though there is insufficient power to assess for statistical significance.

Conclusion: Direct puncture sclerotherapy appears to be a safe and effective technique in the treatment of perineal and gluteal VAs. Because patients with VAs in the perineal region are often poor surgical candidates, sclerotherapy serves a critical role,

offering durable clinical response, minimal recovery time, and improved quality of life. Further studies are warranted to define how STS and bleomycin concentrations and volumes influence lesion involution and long-term symptom relief.

Abstract No. 624

Percutaneous Mechanical Thrombectomy Versus Catheter-Directed Thrombolysis in Acute Iliofemoral DVT: Lower Early Mortality in a Propensity-Matched, Multicenter Cohort



(Article No. 108532)

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Purpose: Assess whether percutaneous mechanical thrombectomy (PMT) versus catheter-directed thrombolysis (CDT) is associated with improved early clinical outcomes in acute iliofemoral deep vein thrombosis (DVT).

Materials and Methods: We performed a retrospective comparative-effectiveness analysis using the TriNetX network database. Adults with ICD-10-CM acute iliofemoral DVT (I82.41x/I82.42x) temporally linked to an index procedure (–3 to +1 days) were included. Exposures were classified for PMT (CPT 37187/37188; ICD-10-PCS 06C3ZZ) vs CDT (CPT 37212/37214; ICD-10-PCS 3E03317/3E04317). Prior DVT (–180 to –3 d), prior PMT/CDT (–180 to –3 d), prior IVC filter (–30 to 0 d), pregnancy, and age < 18 were all excluded. Propensity-score matching (1:1) balanced demographics, encounter type, index year, cancer $\pm$ metastases, recent surgery/trauma, PE at presentation, remote VTE and IVC filter history, baseline labs (platelets, hemoglobin, creatinine/eGFR, INR), and baseline anticoagulant (≤ 7 d) and antiplatelet (≤ 30 d) use. All-cause mortality was defined as occurring between 1 to 30 days following the procedure. Secondary outcomes analyzed included pulmonary embolism (ICD-10-CM I26.x) and IVC filter procedures (CPT 37191/37192/37193) also within 1 to 30 days post-operation. Effects were analyzed with risk ratios (RR), Kaplan–Meier (KM) estimates with log-rank tests, and hazard ratios (HR) from Cox models.

Results: After 1:1 propensity-score matching, 13,580 adults were included (6,790 per arm). In the 30-day mortality analysis, only 6,701 CDT and 6,752 PMT patients were evaluated due to outcome-window exclusions. Pre-match demographics in the overall sample were similar across cohorts with a mean age ~ 55 years and a 51% male proportion, which were balanced after matching. 30-day mortality was 5.4% with CDT vs 2.3% with PMT (RR 2.32, 95% CI 1.93–2.79; HR 2.36, 95% CI 1.95–2.84; log-rank $p < 0.001$). This absolute difference (3.1%) corresponds to an estimated number-needed-to-treat of approximately 32 favoring PMT. PE at 30 days did not differ (RR 1.03, 95% CI 0.78–1.36). IVC filter use was higher with CDT (RR 1.96, 95% CI 1.68–2.28).

Conclusion: In acute iliofemoral DVT, PMT is associated with substantially lower 30-day mortality than CDT, without an increase in 30-day PE and with less IVC filter utilization. Our findings support PMT as the preferred acute intervention when clinically feasible and justifies prospective evaluation of survival and resource utilization.

Abstract No. 625

Outcomes Following Mechanical Thrombectomy, Catheter-Directed Thrombolysis, and Systemic Thrombolysis in Acute Pulmonary Embolism



(Article No. 108533)

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Purpose: Despite guideline-based treatment options, comparative data on outcomes across treatment modalities for acute pulmonary embolism (PE) remains limited. We aimed to compare 30- and 90-day post-intervention mortality, intensive care unit (ICU) length of stay, and time to physiologic stabilization among patients treated with mechanical thrombectomy (MT), systemic thrombolysis (ST), and catheter-directed thrombolysis (CDT).

Materials and Methods: This retrospective cohort study included adults (18–89 years old) treated for acute PE at two large tertiary care centers in Northeast Florida between January 2010 and January 2025. Patients were identified using diagnosis and procedure codes for MT (e.g., 37184/37185), CDT (e.g., 36014/36015 with same-day lytic administration), or ST (e.g., alteplase or tenecteplase without catheter-based intervention). Patients with major confounding conditions such as sepsis, trauma, systemic malignancy, or recent major surgery were excluded. Extracted data included demographics, comorbidities, lifestyle risk factors, ICU/hospital stay details, vital signs, lab values, and imaging reports. Post-intervention mortality and potential association with comorbidities and risk factors were analyzed using chi-square tests, with Cramer's V used to assess effect size.

Results: A total of 170 patients were included: MT (n=76), ST (n=69), and CDT (n=25). A significantly greater proportion of MT patients were alive at 90 days post-discharge (68/76 – 89%) compared to CDT (21/25 – 84%) and ST (48/69 – 69.5%) ($p < 0.035$; Cramer's $V = 0.174$). Similar trends were seen for 30-day and 90-day mortality: MT (7/76 – 9.2%, 8/76 – 10.5%), CDT (4/25 – 16%, 4/25 – 16%), and ST (20/69 – 29%, 21/69 – 30.4%), with significant differences ($p < 0.008$ and $p < 0.009$, respectively) and medium effect sizes (Cramer's $V = 0.237$ and 0.235). No comorbidities or risk factors were significantly associated with mortality.

Conclusion: Our analysis suggests that MT may offer a reduced risk of death following treatment for acute PE, regardless of comorbidities or other baseline risk factors. These findings support the potential role of MT as a preferred therapy in select patients and may inform future decisions regarding risk stratification, triage, and procedural planning. Ongoing analysis of time to physiological improvement may help clarify which interventions lead to faster recovery and reduced hospital resource utilization.

Abstract No. 626

Progressive Right Ventricular Recovery After Mechanical Thrombectomy in Pulmonary Embolism: A Longitudinal Analysis



(Article No. 108534)

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Purpose: To evaluate longitudinal changes in right ventricular function after catheter-directed mechanical thrombectomy in the setting of acute pulmonary embolism (PE).

Materials and Methods: A retrospective review was conducted of patients who underwent catheter-directed mechanical thrombectomy for acute PE at a single institution between November 2019 and June 2023 (n=268). Among these, 53 patients with available sequential echocardiograms during one week before, one month after and beyond one month after thrombectomy were selected for analysis. Evaluated parameters were Tricuspid Annular Plane Systolic Excursion (TAPSE), RV systolic pressure (RVSP), RV free wall systolic maximum velocity (RVFW S' Vmax), RV early diastolic basal diameter (RVD1), and severities of RV dilation, systolic dysfunction, and tricuspid regurgitation (TR). An independent cardiologist reviewed all echocardiograms. Repeated measures ANOVA was used for statistical analysis. $P < 0.05$ was considered significant.

Results: Median age was 61 years; 57% were female. Prior PE or deep vein thrombosis (DVT) was present in 21%, and 43% had concurrent DVT. Median systolic/diastolic [mean] pulmonary artery pressures (PAP) decreased from 45/20 [31] mmHg to 32/14 [21] mmHg after thrombectomy. Median echocardiographic follow-up time was 3 months. PE severity was low/ intermediate-low, intermediate-high and high-risk in 11%, 64% and 25% of the patients, respectively. Pre-, one-month and beyond-one-month post-thrombectomy RV indices were as follows: TAPSE: 1.7, 2.2 and 2.4 mm, RVD1: 44, 39 and 36 mm, RVSP: 43, 34 and 27 mmHg, RVFW S' Vmax: 104, 124 and 122 mm/s. Moderate-to-severe RV dilation: 48%, 15% and 4%, moderate-to-severe RV systolic dysfunction: 58%, 18% and 2% and moderate-to-severe TR: 14%, 4% and 0% ($p < 0.001$ for all).

Conclusion: Catheter-directed mechanical thrombectomy significantly improves RV function and functional TR severity, with continued improvement observed beyond one-month post-procedure.

Abstract No. 627

Risk Factors for Chest Port-related Skin Complications in Oncologic Population



(Article No. 108535)

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Purpose: Although uncommon, chest ports can complicate the skin over the port reservoir such as skin erosion or wound dehiscence (port-related skin complications). The purpose of this study was to identify risk factors for port-related skin complications in oncologic population.

Materials and Methods: Among 4,704 ports placed in 4,524 patients between 2013 and 2024, 4,245 (Male/Female: 2058/2187, median age: 63 years old) were placed for treatment of cancer. Skin complications including erosion, wound dehiscence and others (erythema, rash, and bleeding/hematoma) were recorded through chart review. Port site infection and delayed wound healing related to bevacizumab were not considered as skin complications. Patient characteristics (age, gender, BMI, diabetes, steroid/anticoagulant/ antiplatelet agent use, leukopenia /neutropenia/ thrombocytopenia/ hypoalbuminemia at the time of port

placement, clinical history) and port characteristics (right vs. left, lumen number, catheter tip location, and prior port removal) were recorded. Multivariate proportional subdistribution hazards regression (PSHREG) was used to identify risk factors for skin complications.

Results: The cumulative follow-up period of all patients was 2,207,538 catheter-days (median: 342 catheter-days, range: 1-3,956 catheter-days). A total of 118/4245 patients (2.8%) developed port-related skin complications (0.053 events/1000 catheter days) resulting in port removal in 90/118 (76.3%). The median time to skin complications was 138 days (range: 4-3,381 catheter-days). The skin complications were comprised of 70 erosions, 25 wound dehiscence, and 23 others (16 erythema, 4 rash, and 3 bleeding/hematoma). Port site skin complications led to removal in 90 cases (90/118, 76.3%) which included: 66/70 erosions, 16/25 wound dehiscence, 8/23 others (5/15 erythema, 2/4 rash, 1/3 bleeding). Univariate PSHREG analysis indicated that underweight BMI ($BMI < 18.5$) ($P < 0.01$), leukopenia ($P = 0.04$), neutropenia ($P = 0.01$), central nervous system (CNS) cancer ($P < 0.01$), and lung cancer ($P < 0.01$) to be the significant risk factors. Multivariate analysis further confirmed that underweight BMI (hazard ratio (HR): 2.53, 95% confidence interval (CI): 1.32-4.85, $P < 0.01$), CNS cancer (HR: 8.39, 95% CI: 3.56-19.80, $P < 0.01$), and lung cancer (HR: 1.75, 95% CI: 1.16-2.63, $P < 0.01$) were independent risk factors for skin complications.

Conclusion: Underweight BMI (< 18.5), CNS cancer, and lung cancer are independent risk factors for chest port skin complications.

Abstract No. 628

Risk Factors for Chest Port-Related Thrombotic Complications in Lung Cancer Population



(Article No. 108536)

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Purpose: Venous thromboembolism is prevalent in lung cancer population, and the prevalence has been reported to be higher compared to other solid malignancies. Patients with advanced lung cancer often require a chest port (port) for administration of chemotherapy. To establish preventative measures, we attempted to elucidate risk factors or subgroups at risk for port-related thrombotic complications.

Materials and Methods: Among 4,473 ports placed in 4,473 patients between 2013 and 2024, 968 ports were placed in 968 patients with lung cancer (Female/Male: 465/459, median age: 65 years old). Thrombotic complications including catheter-related venous thrombosis and fibrin sheath requiring port removal were identified through chart and imaging review. Patient characteristics (age, gender, BMI, diabetes, steroid/anticoagulant/ antiplatelet agent use, leukopenia /neutropenia/ thrombocytopenia/ hypoalbuminemia, coagulopathy (INR > 1.5) at the time of port placement, clinical history) and port characteristics (right vs. left, lumen number, catheter tip location, and prior port removal) were recorded. Multivariate proportional subdistribution hazards regression (PSHREG) was used to identify risk factors for port-related thrombotic complications.

Results: The cumulative follow-up period of all 968 patients was 487,540 catheter-days (range: 1-3,737 catheter-days; median: 313 catheter-days). A total of 41/968 (4.69%) patients developed port-related thrombotic complications (0.08 events/1000 catheter-days). The median time to thrombotic complications was 227 catheter-days (range: 1-3,437 catheter-days). Univariate analysis indicated that anticoagulant use at anytime ($P = 0.02$) were risk factors for thrombotic complications. Antiplatelet use at any time ($P = 0.02$) was a protective factor for thrombotic complications. Multivariate analysis further demonstrated that anticoagulant use (HR 2.29, 95% CI 1.22-4.27, $P = 0.01$) were independent risk factors for chest port thrombotic complications; while antiplatelet use at any time (HR 0.37, 95% CI 0.17-0.80, $P = 0.01$) was an independent protective factor.

Conclusion: Anticoagulant use was an independent risk factor for chest port thrombotic complications, while antiplatelet use at any time was a protective factor in lung cancer population. Monitoring and maintaining of therapeutic INR in patients with anticoagulant(s) may prevent port-related thrombotic complications.

Abstract No. 629

Intraprocedural Intra-Arterial Dexamethasone During Uterine Fibroid Embolization



(Article No. 108537)

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Purpose: To evaluate the impact of intra-arterial dexamethasone administered during uterine fibroid embolization (UFE) on post-procedural opioid use, hospital admission rates, and Emergency Department (ED) or Urgent Care (UC) visits secondary to post-embolization syndrome (PES)-related symptoms.

Materials and Methods: A retrospective review was performed at a single institution of 145 patients who underwent UFE between January 2021 and June 2025. During the study period, patients were typically discharged home after recovery if tolerating oral intake and oral pain medication; otherwise, they were admitted. Patients were categorized into a treatment group ($n = 48$) that, in addition to routine peri-procedural pain management with intravenous non-steroidal anti-inflammatory drugs, antiemetics, and opioids, received 5 mg intra-arterial dexamethasone followed by 5 mL of 1% lidocaine administered to each uterine artery during embolization, and a control group that did not receive intra-arterial dexamethasone ($n = 97$). Outcomes included post-procedural hospital admission, opioid use, and return to the ED or UC within 2 weeks for PES-related symptoms. Group comparisons were performed using chi-square or Fisher's exact testing.

Results: Post-procedural hospital admissions were significantly more frequent in the control group compared with the dexamethasone group (50.5% vs 12.5%, $p < 0.001$). Rates of post-procedural opioid use were not significantly different between groups (73.2% vs 70.8%, $p = 0.80$). Two-week ED or UC visits for PES-related symptoms were rare and comparable across groups (6.2% vs 6.3%, $p \approx 1.0$).

Conclusion: Intra-arterial dexamethasone administered during UFE was associated with a significant reduction in post-procedural

hospital admissions without increasing opioid use or short-term unplanned healthcare utilization. This simple adjunct reduces resource burden and enhances patient care. Prospective validation is warranted.

AI Disclosure Statement: During the preparation of this work, the authors used the large language model ChatGPT (Version 5.0) to improve grammar, spelling, and readability in alignment with recommendations from the International Committee of Medical Journal Editors, the World Association of Medical Editors, and the Council of Science Editors. The authors reviewed and edited the work and take full responsibility for this content.

629.1.			
Outcome	Control Group (97 patients)	Treatment Group (48 patients)	p-value
Admitted (Y)	50.5% (49/97)	12.5% (6/48)	< 0.001
Received Narcotics in PACU (Y)	73.2% (71/97)	70.8% (34/48)	0.8
Returned to ED/UC (Y)	6.2% (6/97)	6.3% (3/48)	~1.00

Abstract No. 630

Are #Fibroids on Your #FYP? A Content Analysis of Uterine Fibroid Health Narratives and Treatment Options on TikTok



(Article No. 108538)

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Purpose: To analyze the discourse on TikTok surrounding uterine fibroids (UFs) and uterine fibroid embolization (UFE).

Materials and Methods: Performed a cross-sectional content analysis of TikTok videos, two hashtag sets: general UF (#fibroids, #fibroidawareness, #uterinefibroids, #uterinemyoma, #fibroidremoval) and UFE-specific (#uterinearteryembolization, #uterinefibroidembolization, #UFE). Top 50 videos/hashtag (like count) of the last 6 months retrieved. Inclusion: UF/UFE-focused; exclusion: duplicates, non-English, off-topic. Videos coded for author type (OB/GYN, interventional radiologist (IR), lay, etc.), treatments (hysterectomy, UFE, etc.), misinformation, and tone (educational, promotional, etc.). Engagement metrics were summarized descriptively; treatment mentions were compared via χ^2 analysis.

Results: Of general UF hashtags, 195 met criteria; 12 (6.1%) mentioned UFE, significantly less than UFE-specific content ($\chi^2=50$, $p<0.001$). UFE discussion came mainly from lay ($n=4$, 2.1%) and IRs ($n=4$, 2.1%). Myomectomy was the most common treatment discussed ($n=60$, 30.8%), significantly greater than UFE ($\chi^2=32$, $p<0.001$). Common authors: lay ($n=107$, 54.8%), healthcare providers ($n=42$, 21.5%; OB/GYN $n=22$, 52.4%), and

alternative ($n=36$, 18.5%) promoting unfounded causes (e.g., constipation, distress) and alternative remedies (teas, oils). Of UFE-specific hashtags, 98 met criteria; 80 (81.6%) discussed UFE. Common authors: lay ($n=42$, 42.9%), IRs ($n=13$, 13.3%); lay posts focused on personal experiences, while providers' content was educational. 1 herbalist (1%) attributed persistent UF post UFE to physiologic imbalances, suggesting alternative remedies.

Conclusion: Despite being an established, evidence-based treatment, UFE is significantly underrepresented in general TikTok discourse on UF, appearing in 6.1% of general UF videos, significantly less than myomectomy, and was more reliably discussed with UFE-specific hashtags. Social media's increasing ubiquity as a health information source reflects and shapes the understanding of UF management. The necessity to intentionally seek UFE content, coupled with the low rate at which gynecologists recommend UFE, underscores its poor visibility. This lack of visibility reinforces its persistent underutilization and patient unawareness. Addressing this requires structured collaboration between IR and OB/GYN and greater investment in accessible, evidence-based patient education.

Abstract No. 631

Early Experience with Pulsed Electric Field Ablation of Breast Cancer: Evaluation of Pathology and Imaging Response



(Article No. 108539)

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Purpose: Pulsed electric field (PEF) ablation uses high-voltage, short-duration electric pulses to induce irreversible electroporation and cell death while preserving surrounding connective tissue. This has been used in several oncologic applications outside of breast cancer. This small, single-center experience aims to provide preliminary evidence on the feasibility, safety, and early clinical outcomes of PEF as a novel locoregional therapy for breast cancer.

Materials and Methods: Retrospective chart review was performed for five patients with a diagnosis of T1 breast cancer who underwent PEF ablation using the Aliya PEF System (Galvanize Therapeutics, Redwood, CA). Data were gathered on procedural tolerability, peri-procedural complications, and short-term oncologic control, based on comparison of pre-and post-operative imaging at the three-month interval.

Results: PEF ablation was well-tolerated; no major adverse events were recorded. Mean initial size of the target lesions was 0.961 cm³ (standard deviation $\pm$ 0.683 cm³). Two patients exhibited 100% tumor volume reduction with adjunct systemic therapy, one patient demonstrated 40% tumor volume reduction with no adjunct systemic therapy, and two patients did not receive post-op imaging due to placement on hospice or subsequent death for reasons unrelated to breast cancer.

Conclusion: PEF ablation is feasible and well-tolerated with no immediate major procedural complications. Available three-month outcomes varied but demonstrated a positive response, suggesting potential as a safe, locoregional treatment for small breast cancers. Limitations include the retrospective design, small sample size,

incomplete follow-up, and confounding from systemic therapy. Future prospective, controlled, and adequately powered studies would aid in further evaluating this novel use of PEF ablation.

Abstract No. 632

Percutaneous Drainage for Management of Tubo-Ovarian Abscesses: Multicenter Retrospective Review



(Article No. 108540)

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Purpose: Tubo-ovarian abscess (TOA) is a complication of pelvic inflammatory disease. In the event of failure of medical management, image-guided drainage is a minimally invasive treatment option. This study aims to compare clinical outcomes of image-guided drainage, surgical, and medical management in the treatment of TOA at three tertiary hospitals.

Materials and Methods: A retrospective study between January 2022 and November 2024 was conducted of patients with TOA, confirmed by imaging and PID criteria. Primary outcomes were hospital admission length and 30-day readmission rate from partial treatment or relapse. Secondary outcomes were days of antibiotic usage before image-guided or surgical drainage and size of TOA at admission. Baseline demographics, intrauterine device

(IUD) presence, and image modality of drainage were also analyzed.

Results: Out of 116 patients (median age = 38.5 years) who underwent treatment for TOA, 35 had image-guided drainage, 17 had surgical drainage, and 64 were treated with medical management alone. The majority of image-guided drainage was done with CT (83%). Around half the time (49.1%), interventional radiology (IR) was consulted. The majority of these consults led to drainage (63.2%) with an “unsafe window” being the most common reason it was unsuccessful (11.2%). Mean hospital length was significant between surgical drainage (12 days), image-guided drainage (7.2 days), and medical management (3.9 days). While there was no significance in 30-day readmission, surgical drainage showed the highest rate (11.8%), followed by image-guided drainage (3%) and medical management (1.5%). Mean TOA size was largest in IR drainage (8.1 cm) vs surgery (6.9 cm) and medical therapy (6.0 cm); $p > 0.05$. Bilateral TOAs were most common in surgery (57.9%) versus IR (34.3%) and medical therapy (26.6%). There was no significant difference in presence of an IUD between groups.

Conclusion: Interventional drainage managed larger TOAs, with shorter length of stay than surgery, and low readmission rates when medical management failed in our multi-center retrospective review. Furthermore, the benefits of drainage versus surgery include decreased invasiveness, increased potential to preserve fertility, and faster recovery times. This research adds to the growing literature that after first-line treatment with medical management, IR drainage should be highly considered and utilized for TOAs.

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