

American Gastroenterological Association Technical Review on the Diagnosis and Treatment of Hemorrhoids

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Hemorrhoids are a common condition, but their true prevalence is unknown. Most patients and many physicians tend to attribute any anorectal symptom to hemorrhoids. Furthermore, anal cushions are normal structural components of the anal canal that are present from infancy.¹ Despite their confusing epidemiology, it is important for gastroenterologists, surgeons, and primary care physicians alike to be able to accurately diagnose hemorrhoids and offer a rational, effective treatment plan.

Materials and Methods

We performed a literature search for all English-language articles dealing with hemorrhoids published from 1990 to 2002. Databases searched included MEDLINE, PreMEDLINE, the Cochrane Database of Systematic Reviews, the Database of Abstracts of Reviews of Effectiveness, the American College of Physicians Journal Club, and the Cochrane Central Registry of Controlled Trials. Additional references were obtained from the bibliographies of selected articles. We selected pertinent studies emphasizing randomized controlled trials to formulate this technical review.

Etiology and Pathophysiology

Hemorrhoids are found in the subepithelial space of the anal canal. They consist of connective tissue cushions surrounding the direct arteriovenous communications between the terminal branches of the superior rectal arteries and the superior, inferior, and middle rectal veins.¹ Anal subepithelial smooth muscle arises from the conjoined longitudinal muscle layer, passes through the internal anal sphincter, and inserts into the subepithelial vascular space. There, the smooth muscle suspends and contributes to the bulk of the hemorrhoidal cushions.^{1,2} The cushions contribute approximately 15%–20% of the resting anal pressure.³ Perhaps more importantly, they serve as a conformable plug to ensure complete closure of the anal canal. Most people have 3 of these cushions, but cadaver studies have shown that the so-called typical right anterior, right posterior, and left lateral configuration of the cushions occurs only 19% of the time.¹

Symptoms attributed to hemorrhoids include bleeding, protrusion, itching, and pain.^{4,5} For the most part, external hemorrhoids are asymptomatic unless they become thrombosed, in which case they present as an acutely painful perianal lump. Persisting skin tags after resolution of the thrombosis can lead to problems with hygiene and secondary irritation.

Most hemorrhoidal symptoms arise from enlarged internal hemorrhoids. Abnormal swelling of the anal cushions, stretching of the suspensory muscles, and dilation of the submucosal arteriovenous plexus result in the prolapse of upper anal and lower rectal tissue through the anal canal. This tissue is easily traumatized, leading to bleeding. The blood is typically bright red due to the arterial oxygen tension caused by arteriovenous communications within the anal cushions.^{5,6} Prolapse of the rectal mucosa leads to deposition of mucus on the perianal skin, causing itchiness and discomfort.

The pathogenesis of the enlarged, prolapsing cushions is unknown. Many clinicians believe that inadequate fiber intake, prolonged sitting on the toilet, and chronic straining at stool contribute to the development of symptomatic hemorrhoids, yet rigorous proof of such beliefs is lacking. Other factors have also been proposed, including constipation, diarrhea, pregnancy, and family history.⁵ None of these have been rigorously proven, although 0.2% of pregnant women require urgent hemorrhoidectomy for incarcerated prolapsed hemorrhoids.⁷

Multiple studies have shown elevated anal resting pressure in patients with hemorrhoids when compared with controls⁵; voluntary contraction pressure is unchanged. Whether the elevated resting pressure is caused by or due to enlarged hemorrhoids is unknown, but resting tone becomes normal after hemorrhoidectomy.⁸ Ultraslow pressure waves are more common in patients

Abbreviation used in this paper: MPFF, micronized, purified flavonoid fraction.

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with hemorrhoids, but the significance of the waves is uncertain.⁹

Epidemiology

The epidemiology of hemorrhoids has been studied using a number of approaches, each of which has shortcomings. Accordingly, the data must be interpreted with caution. Population-based surveys rely on self-reporting of a condition with symptoms that are nonspecific; moreover, a physician observer does not validate these supposed diagnoses. Hospital discharge data are more reliable in this regard but still remain imperfect; it is likely that most patients with a diagnosis of hemorrhoids at discharge have not in fact undergone a directed anorectal examination. Similar criticism may be leveled at physician visit data; a complete evaluation, including anoscopy, cannot be assumed to have taken place, particularly if the data are from primary care providers. Hospital-based proctoscopy studies show prevalence rates of up to 86%,¹⁰ even though many of their patients are asymptomatic.

Despite these caveats, the community-wide prevalence of hemorrhoids in the United States is reported to be 4.4%, with a peak prevalence occurring between 45 and 65 years of age.¹¹ Increased prevalence rates are associated with higher socioeconomic status, but this association may reflect differences in health-seeking behavior rather than true prevalence.¹¹ Population-based surveys suggest that the prevalence of hemorrhoids decreased in both the United States and United Kingdom during the second half of the 20th century.¹² Hemorrhoids are frequently seen in patients with spinal cord injury.^{13,14}

Evaluation and Classification

For many patients, the presence of any anorectal symptom is indicative of hemorrhoids. Physicians should not make the same assumption. Hemorrhoids are, in fact, frequently the cause of common symptoms such as bleeding, a lump, itching, or pain. However, when hemorrhoids are simply assumed to be the cause, other pathology is too often overlooked. Prolapsing hemorrhoids may cause anal itching, but itching is just as likely to be due to inadequate hygiene, minor incontinence, or perianal dermatitis. Pain associated with a palpable lump is the hallmark of a thrombosed external hemorrhoid, but anal fissure and perianal abscess are equally common causes of anal pain and, in particular, painful defecation. A precise patient history and a careful physical examination are essential for accurate diagnosis; neither should be omitted when a patient has anorectal symptoms.

Bleeding is the most common presenting symptom of hemorrhoids. The blood is typically bright red and may frequently drip or squirt into the toilet bowl. Darker blood and blood mixed in the stool suggest a more proximal source of bleeding. However, because physicians' predictions are not reliable in the evaluation of hematochezia,¹⁵ exclusive reliance on patients' descriptions of bleeding is unwise; further investigation is warranted. Current practice guidelines from both the American Society for Gastrointestinal Endoscopy and the Society for Surgery of the Alimentary Tract advocate a minimum of anoscopy and flexible sigmoidoscopy for bright-red rectal bleeding.^{16,17} Complete colonic evaluation by colonoscopy or air-contrast barium enema is indicated when the bleeding is atypical for hemorrhoids, when no source is evident on anorectal examination, or when the patient has significant risk factors for colonic neoplasia. The decision to pursue further evaluation also depends on the patient's age and general medical condition.¹⁶ Hemorrhoids alone do not cause a positive result with a stool guaiac test,^{18,19} so fecal occult blood should not be attributed to hemorrhoids until the colon is adequately evaluated. Anemia due to hemorrhoidal disease is rare (0.5 patients/100,000 population) and responds to hemorrhoidectomy.²⁰

Because symptoms caused by other conditions are frequently attributed to hemorrhoids, a careful anorectal evaluation is warranted for any patient who reports hemorrhoids. External examination will enable the discovery of pathology such as perianal abscess or anal fistula. The cardinal symptom of anal fissure is postdefecatory pain, but anal fissure also frequently causes minor rectal bleeding. Anal fissure is best seen with eversion of the anal canal by opposing traction with the thumbs. Any skin tags, thrombosed external hemorrhoids, mixed hemorrhoids, and incarcerated rectal mucosal prolapse will be evident on external examination. Internal hemorrhoids and associated rectal mucosal prolapse are best evaluated through an anoscope with an adequate light source.

Portal hypertension can cause varices of the anal canal. These varices are distinct from hemorrhoids and should not be considered a cause of hemorrhoids.^{21,22} In fact, patients with portal hypertension and varices do not have an increased incidence of hemorrhoids.²² Variceal bleeding should not be considered the same as hemorrhoidal bleeding, so standard hemorrhoidal treatments should not be used. Rectal variceal bleeding is best treated by correction of the underlying portal hypertension; transjugular intrahepatic portosystemic shunts have been successfully used in the treatment of refractory bleeding.²³ If local therapy is necessary, oversewing of the varices

rather than attempted excision is the procedure of choice. There are a few case reports of injection sclerotherapy for bleeding rectal varices,^{24,25} but the overall success rate of this approach is unknown.

The evaluation of patients with hemorrhoids should include an assessment of their symptoms. As mentioned previously, the presence, quantity, and frequency of bleeding are important. The presence, timing, and reducibility of prolapsed tissue help to classify the extent of the hemorrhoids and dictate therapeutic options. The effect of the hemorrhoids on hygiene is a factor when deciding on operative treatment. Anal pain is generally not associated with hemorrhoids unless thrombosis has occurred. Thus, anal pain suggests other pathology and mandates closer investigation. As many as 20% of patients with hemorrhoids have concomitant anal fissures.²⁶ New-onset anal pain in the absence of a visible source suggests the possibility of a small intersphincteric abscess.

Hemorrhoids are defined as internal or external according to their position relative to the dentate line. External hemorrhoids become symptomatic only when thrombosed or when skin tags are so large that hygiene is impossible. Thrombosed external hemorrhoids are common. Such patients present with acute-onset anal pain and a palpable perianal lump. Thrombosed external hemorrhoids occasionally bleed when local pressure causes erosion through the overlying skin. Thrombosed internal hemorrhoids are far less common; typical symptoms include pain, pressure, bleeding, mucus production, and an inability to reduce spontaneously prolapsing tissue.

Symptoms of internal hemorrhoids include bleeding and protrusion. Prolapsed hemorrhoids are a cause of soiling and mucus discharge, and both lead to secondary pruritus ani. Advanced prolapsed hemorrhoids may become incarcerated and strangulated.

Most colorectal surgeons use the grading system published in 1985 by Banov et al.²⁷ Internal hemorrhoids that bleed but do not prolapse are designated as first-degree hemorrhoids. Those that prolapse and reduce spontaneously (with or without bleeding) are second-degree hemorrhoids. Prolapsed hemorrhoids that require reduction are third-degree hemorrhoids. Prolapsed internal hemorrhoids that cannot be reduced are fourth-degree hemorrhoids; they usually include both internal and external components and are confluent from skin tag to inner anal canal. Acutely thrombosed, incarcerated internal hemorrhoids and incarcerated, thrombosed hemorrhoids involving circumferential rectal mucosal prolapse are also fourth-degree hemorrhoids.

Accurate classification is important for both assessing the reported efficacy of various hemorrhoidal treatments and selecting the optimal treatment for an individual patient. The American Society of Colon and Rectal Surgeons uses the Banov classification in its practice parameters for the treatment of hemorrhoids. However, a descriptive system is sometimes more useful than one based on symptoms because of the range in severity within each grade. Large third-degree hemorrhoids may only be treatable with excision, for example, if they extend to the dentate line, if chronic prolapse has caused epithelial changes, or if the volume of tissue is simply too large to be managed nonoperatively. Smaller third-degree hemorrhoids, in contrast, may be readily treatable by nonoperative methods.

Medical Treatment

Few recent studies concern either the prevention or the medical management of hemorrhoids. The almost-universal recommendations are to add dietary fiber and to avoid straining at stool. One double-blind, placebo-controlled trial showed that the use of psyllium reduced hemorrhoidal bleeding and painful defecation,²⁸ but other studies of fiber have shown less impressive or insignificant results.^{29–31} Because diarrhea exacerbates hemorrhoidal symptoms, controlling it with fiber, antimotility agents, and specific treatment of any underlying cause will likely be of benefit.

Over-the-counter topical agents and suppositories have become equally ubiquitous in the empirical treatment of hemorrhoidal symptoms, but data supporting their use are lacking. Topical analgesics may bring symptomatic relief of local pain and itching. Corticosteroid creams may ameliorate local perianal inflammation, but no data suggest that they actually reduce hemorrhoidal swelling, bleeding, or protrusion. Long-term use of high-potency corticosteroid creams is deleterious and should be avoided. In one prospective series, nitroglycerin ointment relieved pain due to thrombosed external hemorrhoids, presumably by decreasing anal tone.³²

Several studies have assessed the use of oral micronized, purified flavonoid fraction (MPFF) (Daflon; Servier Laboratories, Neuilly-Sur-Seine, France). Flavonoids increase venous tone, lymphatic drainage, and capillary resistance and normalize capillary permeability. Two placebo-controlled trials showed symptomatic improvement with use of MPFF,^{33,34} but results were inconsistent when MPFF and fiber were combined. Ho et al. reported that a combination of MPFF and fiber led to faster relief of hemorrhoidal bleeding than either fiber and rubber band ligation or fiber alone.³⁵ In contrast, Thanapong-

sathorn et al. compared fiber with and without MPFF in a double-blind trial and found similar improvement at 14 days.³⁶ MPFF has not been approved for use in the United States by the Food and Drug Administration.

Nonoperative Treatment

Several methods that do not involve surgical excision are available to treat patients with hemorrhoids. These procedures are usually performed in the office setting and do not require anesthesia. Although nonexcisional, they all function as ablative by thrombosis, sclerosis, or necrosis of the mucosal portion of the hemorrhoidal complex.

Sclerotherapy

Sclerotherapy is one of the oldest forms of nonoperative treatment; it was first described in 1869 by Morgan in Dublin. It is reserved for first- or second-degree hemorrhoids. A submucosal injection of 5 mL of 5% phenol in oil, 5% quinine and urea, or hypertonic (23.4%) salt solution at the base of the hemorrhoidal complex causes thrombosis of vessels, sclerosis of connective tissue, and shrinkage and fixation of overlying mucosa. Sclerotherapy requires no anesthesia and takes only minutes to perform through an anoscope.³⁷ Khoury et al. performed a prospective trial of patients with first- or second-degree hemorrhoids who had initially been treated with medical therapy.³⁸ In that trial, sclerotherapy improved or cured 89.9% of the patients, with no difference between single or multiple injections. In contrast, Senapati and Nicholls performed a randomized controlled trial and found no difference in bleeding rates at 6 months following sclerotherapy with bulk laxatives or bulk laxatives alone.³⁹ Even though sclerotherapy is minimally invasive, it can cause complications. Pain is variably reported in 12%–70% of patients.^{37,40,41} Impotence,⁴² urinary retention, and abscess²⁶ have also been reported. In one study, hemorrhoidal symptoms recurred in about 30% of patients 4 years after initially successful sclerotherapy.³⁷

Cryotherapy

Cryotherapy has been advocated as a technique for destroying enlarged internal hemorrhoids. Initial reports were enthusiastic⁴³; however, the technique is relatively time consuming, and subsequent reports have shown disappointing results.⁴⁴ Smith et al. performed a trial comparing cryotherapy with closed hemorrhoidectomy on different hemorrhoids in the same patient.⁴⁵ The cryotherapy site was associated with prolonged pain, foul-smelling discharge, and a greater need for additional

therapy. Cryotherapy is now only rarely used for the treatment of patients with hemorrhoids.

Rubber Band Ligation

Rubber band ligation relies on the tight encirclement of redundant mucosa, connective tissue, and blood vessels in the hemorrhoidal complex. The encirclement must be well proximal (at least 2 cm) to the dentate line. Placement of the band too far distally leads to immediate, usually severe pain due to the presence of somatic sensory nerve afferents that are absent above the anal transition zone. Internal hemorrhoid ligation can be performed in the office setting with one of several commercially available instruments, including devices that use suction to draw the redundant tissue into the applicator to make the procedure a one-person effort.⁴⁶ No anesthesia is required. The resulting scar fixes the connective tissue to the rectal wall and resolves the prolapse. Endoscopic variceal ligators have also been shown to be effective tools for hemorrhoid ligation.⁴⁷

Rubber band ligation is most commonly used for first-, second-, or third-degree hemorrhoids. Some authorities recommend it for fourth-degree hemorrhoids after operative reduction of the incarcerated prolapse.⁴⁸ Up to 3 hemorrhoids can be banded in a single session,^{49–51} although many authorities prefer to limit treatment to 1 or 2 columns at a time. Like the other nonoperative treatments, rubber band ligation does not address the external hemorrhoid component. Success rates vary, depending on the degree of hemorrhoids treated, length of follow-up, and criteria for success.^{37,47,49,52–60} Wroblewski et al. reported that 80% of their patients improved and 69% were symptom-free at a mean follow-up of 5 years.⁶¹ Steinberg et al. reported 89% patient satisfaction at a similar follow-up interval, but only 44% of their patients were symptom-free.⁶² The recurrence rate may be as high as 68% at 4 or 5 years of follow-up,^{37,56,58,59} but symptoms usually respond to repeat ligation; only 10% of such patients require excisional hemorrhoidectomy.^{56,59}

The most common complication of rubber band ligation is pain, which is reported in 5%–60% of treated patients.^{51,63–65} Pain following the procedure tends to be relatively minor and almost always can be satisfactorily managed with sitz baths and over-the-counter analgesics. Other complications, such as abscess, urinary retention, band slippage, prolapse and thrombosis of adjacent hemorrhoids, and minor bleeding from the ulcer, occur in <5% of patients.⁵² Severe bleeding occasionally requires intervention when the eschar from the band sloughs, usually 1–2 weeks after treatment. Necrotizing pelvic sepsis is a rare complication of rubber band ligation.^{66,67}

The clinical triad of severe pain, high fever, and urinary retention suggests the diagnosis. Such patients require emergency examination under anesthesia, with radical debridement of all necrotic tissue. The risk of necrotizing pelvic infection is increased in immunocompromised patients, including those with uncontrolled acquired immunodeficiency syndrome, neutropenia, and severe diabetes mellitus.⁶⁸

Bipolar Diathermy, Direct-Current Electrotherapy, and Infrared Photocoagulation

These techniques all rely on the coagulation, occlusion, and obliteration or sclerosis of the hemorrhoidal vascular pedicle above the level of the anal transition zone. The area of tissue damage sloughs, leaving an ulcer that eventually forms fibrotic tissue at the treatment site.

Bipolar diathermy or cautery is applied in 1-second pulses of 20 W until the underlying tissue coagulates (often <30 seconds).^{69,70} About 12% of patients experience pain, bleeding, fissure, or spasm of the internal sphincter.^{69,70} Multiple applications to the same site are often required, especially for second- and third-degree hemorrhoids (up to 3 per site).⁷¹ The depth of injury from bipolar cautery is 2.2 mm and does not increase with multiple applications at the same site.⁷¹ Bipolar cautery has been used to treat first-, second-, and third-degree internal hemorrhoids; success rates (defined by relief of bleeding) range from 88% to 100% in randomized trials.^{69–73} It does not eliminate prolapsing tissue, and up to 20% of patients will require excisional hemorrhoidectomy.^{71,73}

Direct-current electrotherapy requires the prolonged (up to 14 minutes) application of 110-V direct current (up to 15 mA) to the base of the hemorrhoidal complex well above the anal transition zone.^{70,72–76} Current and time requirements increase for higher-grade hemorrhoids. Multiple treatments to the same site are required in up to 30% of patients.⁷⁴ Even though multiple sites can be treated in one setting with minimal pain, the technique has not been widely accepted because of the lengthy treatment time and the limited control of prolapse in higher-grade hemorrhoids (only a 44% success rate).⁷⁶ However, in several randomized trials using adequate levels of current (16 mA) and prolonged treatment times (10 minutes), bleeding was controlled in 88% of patients with first-, second-, or third-degree hemorrhoids.^{70,72} Complications included pain (33%), ulcer formation (4%), and bleeding (10%).^{72,75}

Infrared photocoagulation focuses infrared radiation from a tungsten-halogen lamp via a polymer probe tip. The probe tip must touch the hemorrhoidal tissue at its

base; 0.5- to 2-second pulses of energy are delivered to the area.⁷¹ Multiple (2–6) hemorrhoids can be treated at one time.³⁷ The depth of tissue injury after one treatment is about 2.5 mm, and the penetration increases with subsequent treatment at the same site.⁷¹ According to 2 randomized studies, hemorrhoidal bleeding was successfully controlled in 67%–96% of patients with first- or second-degree hemorrhoids.^{37,71} Complications, including pain and bleeding, are uncommon.

Each method of nonoperative treatment described has its proponents. Randomized controlled trials have compared each method with one or more of the others, yet no single study has compared all 5 (sclerotherapy, rubber band ligation, bipolar diathermy, direct-current electrotherapy, and infrared photocoagulation). A meta-analysis by Johanson and Rimm examined 5 trials involving 862 patients with first- or second-degree hemorrhoids who underwent infrared photocoagulation, sclerotherapy, or rubber band ligation.⁷⁷ Rubber band ligation was more effective than sclerotherapy, and patients treated with rubber band ligation required fewer additional treatments than those treated with sclerotherapy or infrared photocoagulation. However, rubber band ligation was associated with a significantly higher incidence of pain than the other 2 treatments. Thus, Johanson and Rimm favored infrared photocoagulation as the nonoperative treatment of choice.

MacRae et al. performed a similar meta-analysis covering 23 studies that compared rubber band ligation, infrared photocoagulation, sclerotherapy, hemorrhoidectomy, and manual dilation of the anus for patients with first-, second-, or third-degree hemorrhoids.⁷⁸ Like Johanson and Rimm, they found that rubber band ligation was more effective than sclerotherapy, less likely to require additional therapy than either sclerotherapy or infrared photocoagulation, and more likely to cause pain. Despite these identical findings, MacRae et al. concluded that rubber band ligation was the initial procedure of choice for first-, second-, and third-degree hemorrhoids because of its higher rate of efficacy.

Surgical Treatment

Surgical hemorrhoidectomy is the most effective treatment for hemorrhoids overall and for third-degree hemorrhoids in particular.⁷⁸ Recurrence following a properly performed hemorrhoidectomy is uncommon.⁷⁹ However, nonoperative techniques are preferred when feasible in the first instance because surgery is associated with more pain and complications.⁷⁸ Hemorrhoidectomy techniques include excising internal and external components in 1–3 quadrants around the anal canal,^{80,81}

suturing or banding the internal hemorrhoids and excising the external component,⁴⁸ or performing a circular excision of the internal hemorrhoids and prolapsing rectal mucosa proximal to the dentate line.^{82–84}

Anal dilatation has been advocated as a nonexcisional operation for hemorrhoids,⁸⁵ and this approach has had some acceptance in European centers. However, anal endosonography has shown sphincter injuries associated with anal dilatation,⁸⁶ and several clinical series have reported high rates of associated incontinence.⁸⁷ Konsten and Baeten reported long-term follow-up (median, 17 years) results of a randomized prospective trial of hemorrhoidectomy versus anal dilatation; 52% of patients who underwent anal dilatation had impaired continence at the time of follow-up.⁸⁸ Furthermore, anal dilatation has a higher failure rate than operative hemorrhoidectomy in prospective randomized trials.^{88,89} Because of the risk of incontinence, most authorities now advocate abandoning this approach to the treatment of patients with hemorrhoids.

Indications for surgical hemorrhoidectomy include hemorrhoids too extensive for nonoperative management, failure of nonoperative management, patient preference, and concomitant conditions (such as fissure or fistula) that require surgery. About 5%–10% of patients, usually those with third- or fourth-degree hemorrhoids, need surgical hemorrhoidectomy.^{4,26}

Surgical hemorrhoidectomy can be performed with either open or closed techniques. In the Milligan-Morgan hemorrhoidectomy, widely used in the United Kingdom, the internal and external components of each hemorrhoid are excised and the skin is left open in a 3-leaf clover pattern that heals secondarily for 4–8 weeks.⁸⁰ In the Ferguson hemorrhoidectomy, each hemorrhoid component is excised and the wounds are closed primarily.⁸¹

Four randomized trials have studied open versus closed hemorrhoidectomy.^{90–93} Three of these trials showed no difference in postoperative pain.^{90–92} Differences in healing times were not consistent between trials. One randomized trial showed decreased pain and a more rapid return to work following submucosal (partially closed) versus Milligan-Morgan hemorrhoidectomy.⁹⁴

Postoperative pain remains the major drawback of excisional hemorrhoidectomy. Narcotic analgesics are generally required, and recent studies show that most patients do not return to work for 2–4 weeks following surgery.^{95–100} Several trials have assessed the effect of excision techniques on postoperative pain.^{101–112} Randomized trials have shown no difference in pain scores between diathermy and scissors hemorrhoidectomy,^{101,111,112} although the oral pain medication re-

quirement was less in the diathermy groups.^{101,111} Early reports suggested that laser hemorrhoidectomy was associated with decreased postoperative pain,^{102,103} but a randomized trial of the Nd:YAG laser versus cold scalpel excision for closed hemorrhoidectomy did not detect any difference in postoperative pain or analgesic use.¹⁰⁴ In fact, the trial found that laser hemorrhoidectomy was associated with impaired wound healing and higher cost. Four randomized controlled trials evaluating the ultrasonically activated scalpel showed conflicting results with respect to postoperative pain.^{105–108} Two small randomized trials suggested a possible minor advantage with a bipolar diathermy device (LigaSure; Valleylab, Boulder, CO), but pain scores themselves did not differ significantly.^{109,110}

Other strategies to reduce pain have included limiting the incision,¹¹³ suturing only the vascular pedicle without an incision,¹¹⁴ using a lateral internal sphincterotomy in conjunction with an external hemorrhoidectomy,¹¹⁵ administering metronidazole,¹¹⁶ injecting local anesthetics at the operative site,^{117–119} and using drugs such as anal sphincter relaxants,¹²⁰ anxiolytics, parasympathomimetics (to avoid urinary retention),¹²¹ and topical nitroglycerin.¹²² However, each strategy has had limited or mixed results.

The complications of hemorrhoidectomy are usually minor but occur with significant frequency.²⁶ These complications include urinary retention (2%–36%),^{26,102,104,123–128} bleeding (0.03%–6%),^{26,103,104,123,124,126–129} anal stenosis (0%–6%),^{82,83,101–103,123,127,129} infection (0.5%–5.5%),^{26,104,123,125,128} and incontinence (2%–12%).^{82,83,123} Sphincter defects have been documented (by ultrasonography and anal manometry) in up to 12% of patients after hemorrhoidectomy.^{89,130–133} The use of excessive retraction with extensive dilation of the anal canal is probably responsible for sphincter injury and incontinence.^{87,89,134} Lateral internal sphincterotomy has been suggested as an adjunct to hemorrhoid excision, but randomized studies have not confirmed its usefulness. In fact, these studies have actually shown an increase in incontinence.⁸⁹

Emergency hemorrhoidectomy for incarcerated, gangrenous hemorrhoids can be performed safely, with results comparable to those obtained after elective hemorrhoidectomy.¹²⁹ A randomized trial of the Milligan-Morgan hemorrhoidectomy versus incision and rubber band ligation for acute strangulated hemorrhoids showed that both techniques can be performed safely; early recovery was slightly improved after incision and ligation.⁴⁸

In 1998, Longo introduced an alternative approach to conventional hemorrhoidectomy by modifying the circu-

lar stapling device commonly used for low rectal anastomoses.¹³⁵ Stapled hemorrhoidectomy (also called, among other names, stapled anopexy, prolapsectomy, or circumferential mucosectomy) removes a ring of redundant rectal mucosa above the anal canal and proximal to the hemorrhoids themselves. The goal is to resuspend the prolapsing hemorrhoidal tissue back within the anal canal as well as to interrupt the arterial inflow that traverses the excised segment. In contrast to conventional hemorrhoidectomy, skin tags and enlarged external hemorrhoids are not removed using the stapled technique.

Eight randomized controlled trials have now studied stapled versus conventional hemorrhoidectomy.^{95–100,136,137} All 8 showed decreased pain in the stapled groups, and 6 also showed a more rapid return to normal activities.^{95–100} Complication, impaired continence, and recurrence rates were comparable between stapled and conventional groups. The disposable stapler adds cost to the operation, but some of this is recouped by shorter operating times^{95–97,99,137} and length of stay^{95,97,136} in countries in which patients are routinely hospitalized. A systematic review of stapled hemorrhoidectomy concluded that the procedure was as safe as conventional hemorrhoidectomy and was associated with shorter operating time, convalescence, and postoperative disability. Efficacy of the technique compared with conventional hemorrhoidectomy could not be determined due to a paucity of long-term data.¹³⁸

Despite these promising results, several important caveats regarding stapled hemorrhoidectomy remain. One randomized trial was suspended when 5 of 22 patients developed pain and fecal urgency that persisted for up to 15 months,¹³⁹ yet no other group has reported similar findings. Several serious complications have been reported after stapled hemorrhoidectomy, including rectal perforation,¹⁴⁰ retroperitoneal sepsis,¹⁴¹ and pelvic sepsis.^{142,143} The true incidence of such complications remains unknown, but their common denominator may be excision of full-thickness rectal wall rather than mucosa and submucosa only.¹⁴⁴ Smooth muscle fibers have been detected in a variable percentage of stapled hemorrhoidectomy specimens,^{96,97,99,100,137} although such fibers have also been detected following conventional hemorrhoidectomy.^{96,137} One histologic study suggested that at least some of those fibers were from the internal anal sphincter rather than the more proximal rectal wall.¹⁴⁴ Of potentially more functional consequence, fragmentation of the internal sphincter was noted in 14% of patients who underwent stapled hemorrhoidectomy using the standard 37-mm anal dilator.¹⁴⁵

Patients with other diseases in addition to hemorrhoids pose special risks. Infection with human immunodeficiency virus does not contraindicate hemorrhoidectomy,¹⁴⁶ but patients who are severely immunocompromised because of acquired immunodeficiency syndrome are at high risk for complications.¹⁴⁷ Crohn's disease of the intestine does not seem to contraindicate hemorrhoidectomy; in a Ferguson Clinic series, only 1 of 17 patients developed anal disease (follow-up, 12 years).¹⁴⁸ However, patients with anorectal Crohn's disease or Crohn's proctitis have a substantial risk of local complications that can be severe enough to require proctectomy.¹⁴⁹

Conclusions

Hemorrhoids are a common condition with symptoms that include bleeding, protrusion, and itching. Because other conditions can lead to identical symptoms, a directed physical examination, including anoscopy and proctosigmoidoscopy, should be performed. Care depends on the extent of hemorrhoidal disease. First-degree hemorrhoids can be treated with medical management alone or with one of several nonoperative outpatient therapies. Second-degree and relatively small and third-degree hemorrhoids can be treated with nonoperative therapy. Surgery is generally reserved for the minority of patients who have large third-degree or fourth-degree hemorrhoids, acutely incarcerated and thrombosed hemorrhoids, hemorrhoids with an extensive and symptomatic external component, or patients who have undergone less aggressive therapy with poor results.

ROBERT D. MADOFF

*University of Minnesota
Minneapolis, Minnesota*

JAMES W. FLESHMAN

*Washington University School of Medicine
St. Louis, Missouri*

References

1. Thomson WH. The nature of haemorrhoids. *Br J Surg* 1975;62:542–552.
2. Hansen HH. [The importance of the Musculus canalis ani for continence and anorectal diseases (author's translation)]. *Langenbecks Arch Chir* 1976;341:23–37.
3. Lestar B, Penninckx F, Kerremans R. The composition of anal basal pressure. An in vivo and in vitro study in man. *Int J Colorectal Dis* 1989;4:118–122.
4. Dennison AR, Whiston RJ, Rooney S, Morris DL. The management of hemorrhoids. *Am J Gastroenterol* 1989;84:475–481.
5. Loder PB, Kamm MA, Nicholls RJ, Phillips RK. Haemorrhoids: pathology, pathophysiology and aetiology. *Br J Surg* 1994;81:946–954.
6. Thulesius O, Gjores JE. Arterio-venous anastomoses in the anal region with reference to the pathogenesis and treatment of haemorrhoids. *Acta Chir Scand* 1973;139:476–478.

7. Saleeby RG Jr, Rosen L, Stasik JJ, Riether RD, Sheets J, Khubchandani IT. Hemorrhoidectomy during pregnancy: risk or relief? *Dis Colon Rectum* 1991;34:260–261.
8. Read MG, Read NW, Haynes WG, Donnelly TC, Johnson AG. A prospective study of the effect of haemorrhoidectomy on sphincter function and faecal continence. *Br J Surg* 1982;69:396–398.
9. Sun WM, Read NW, Shorthouse AJ. Hypertensive anal cushions as a cause of the high anal canal pressures in patients with haemorrhoids. *Br J Surg* 1990;77:458–462.
10. Haas PA, Haas GP, Schmaltz S, Fox TA Jr. The prevalence of hemorrhoids. *Dis Colon Rectum* 1983;26:435–439.
11. Johanson JF, Sonnenberg A. The prevalence of hemorrhoids and chronic constipation. An epidemiologic study. *Gastroenterology* 1990;98:380–386.
12. Johanson JF, Sonnenberg A. Temporal changes in the occurrence of hemorrhoids in the United States and England. *Dis Colon Rectum* 1991;34:585–591; discussion 591–593.
13. Stone JM, Nino-Murcia M, Wolfe VA, Perkasch I. Chronic gastrointestinal problems in spinal cord injury patients: a prospective analysis. *Am J Gastroenterol* 1990;85:1114–1119.
14. Delco F, Sonnenberg A. Associations between hemorrhoids and other diagnoses. *Dis Colon Rectum* 1998;41:1534–1541; discussion 1541–1542.
15. Segal WN, Greenberg PD, Rockey DC, Cello JP, McQuaid KR. The outpatient evaluation of hematochezia. *Am J Gastroenterol* 1998;93:179–182.
16. American Society for Gastrointestinal Endoscopy. The role of endoscopy in the patient with lower gastrointestinal bleeding. Guidelines for clinical application. *Gastrointest Endosc* 1988;34:23S–25S.
17. The Society for Surgery of the Alimentary Tract. Surgical management of hemorrhoids. Available at: <http://www.ssat.com/cgi-bin/hemorr.cgi>. Accessed August 11, 2003.
18. Nakama H, Kamijo N, Fujimori K, Horiuchi A, Abdul Fattah S, Zhang B. Immunochemical fecal occult blood test is not suitable for diagnosis of hemorrhoids. *Am J Med* 1997;102:551–554.
19. Korkis AM, McDougall CJ. Rectal bleeding in patients less than 50 years of age. *Dig Dis Sci* 1995;40:1520–1523.
20. Kluiber RM, Wolff BG. Evaluation of anemia caused by hemorrhoidal bleeding. *Dis Colon Rectum* 1994;37:1006–1007.
21. Misra SP, Dwivedi M, Misra V. Prevalence and factors influencing hemorrhoids, anorectal varices, and colopathy in patients with portal hypertension. *Endoscopy* 1996;28:340–345.
22. Goenka MK, Kochhar R, Nagi B, Mehta SK. Rectosigmoid varices and other mucosal changes in patients with portal hypertension. *Am J Gastroenterol* 1991;86:1185–1189.
23. Shibata D, Brophy DP, Gordon FD, Anastopoulos HT, Sentovich SM, Bleday R. Transjugular intrahepatic portosystemic shunt for treatment of bleeding ectopic varices with portal hypertension. *Dis Colon Rectum* 1999;42:1581–1585.
24. Herman BE, Baum S, Denobile J, Volpe RJ. Massive bleeding from rectal varices. *Am J Gastroenterol* 1993;88:939–942.
25. Ikeda K, Konishi Y, Nakamura T, Nabeshima M, Yamamoto S, Migihashi R, Chiba T. Rectal varices successfully treated by endoscopic injection sclerotherapy after careful hemodynamic evaluation: a case report. *Gastrointest Endosc* 2001;54:788–791.
26. Bleday R, Pena JP, Rothenberger DA, Goldberg SM, Buls JG. Symptomatic hemorrhoids: current incidence and complications of operative therapy. *Dis Colon Rectum* 1992;35:477–481.
27. Banov L Jr, Knoepp LF Jr, Erdman LH, Alia RT. Management of hemorrhoidal disease. *J S C Med Assoc* 1985;81:398–401.
28. Moesgaard F, Nielsen ML, Hansen JB, Knudsen JT. High-fiber diet reduces bleeding and pain in patients with hemorrhoids: a double-blind trial of Vi-Siblin. *Dis Colon Rectum* 1982;25:454–456.
29. Perez-Miranda M, Gomez-Cedenilla A, Leon-Colombo T, Pajares J, Mate-Jimenez J. Effect of fiber supplements on internal bleeding hemorrhoids. *Hepatogastroenterology* 1996;43:1504–1507.
30. Broader JH, Gunn IF, Alexander-Williams J. Evaluation of a bulk-forming evacuant in the management of haemorrhoids. *Br J Surg* 1974;61:142–144.
31. Webster DJ, Gough DC, Craven JL. The use of bulk evacuant in patients with haemorrhoids. *Br J Surg* 1978;65:291–292.
32. Gorfine SR. Treatment of benign anal disease with topical nitroglycerin. *Dis Colon Rectum* 1995;38:453–456; discussion 456–457.
33. Cospite M. Double-blind, placebo-controlled evaluation of clinical activity and safety of Daflon 500 mg in the treatment of acute hemorrhoids. *Angiology* 1994;45:566–573.
34. Godeberge P. Daflon 500 mg in the treatment of hemorrhoidal disease: a demonstrated efficacy in comparison with placebo. *Angiology* 1994;45:574–578.
35. Ho YH, Tan M, Seow-Choen F. Micronized purified flavonoid fraction compared favorably with rubber band ligation and fiber alone in the management of bleeding hemorrhoids: randomized controlled trial. *Dis Colon Rectum* 2000;43:66–69.
36. Thanapongsathorn W, Vajrabukka T. Clinical trial of oral diosmin (Daflon) in the treatment of hemorrhoids. *Dis Colon Rectum* 1992;35:1085–1088.
37. Walker AJ, Leicester RJ, Nicholls RJ, Mann CV. A prospective study of infrared coagulation, injection and rubber band ligation in the treatment of haemorrhoids. *Int J Colorectal Dis* 1990;5:113–116.
38. Khoury GA, Lake SP, Lewis MC, Lewis AA. A randomized trial to compare single with multiple phenol injection treatment for haemorrhoids. *Br J Surg* 1985;72:741–742.
39. Senapati A, Nicholls RJ. A randomised trial to compare the results of injection sclerotherapy with a bulk laxative alone in the treatment of bleeding haemorrhoids. *Int J Colorectal Dis* 1988;3:124–126.
40. Sim AJ, Murie JA, Mackenzie I. Three year follow-up study on the treatment of first and second degree hemorrhoids by sclerosant injection or rubber band ligation. *Surg Gynecol Obstet* 1983;157:534–536.
41. Sim AJ, Murie JA, Mackenzie I. Comparison of rubber band ligation and sclerosant injection for first and second degree haemorrhoids—a prospective clinical trial. *Acta Chir Scand* 1981;147:717–720.
42. Bullock N. Impotence after sclerotherapy of haemorrhoids: case reports. *Br Med J* 1997;314:419.
43. O'Callaghan JD, Matheson TS, Hall R. Inpatient treatment of prolapsing piles: cryosurgery versus Milligan-Morgan haemorrhoidectomy. *Br J Surg* 1982;69:157–159.
44. Goligher JC. Cryosurgery for hemorrhoids. *Dis Colon Rectum* 1976;19:213–218.
45. Smith LE, Goodreau JJ, Fouty WJ. Operative hemorrhoidectomy versus cryodestruction. *Dis Colon Rectum* 1979;22:10–16.
46. Budding J. Solo operated haemorrhoid ligator rectoscope. A report on 200 consecutive bandings. *Int J Colorectal Dis* 1997;12:42–44.
47. Trowers EA, Ganga U, Rizk R, Ojo E, Hodges D. Endoscopic hemorrhoidal ligation: preliminary clinical experience. *Gastrointest Endosc* 1998;48:49–52.
48. Rasmussen OO, Larsen KG, Naver L, Christiansen J. Emergency haemorrhoidectomy compared with incision and banding for the treatment of acute strangulated haemorrhoids. A prospective randomised study. *Eur J Surg* 1991;157:613–614.
49. Lee HH, Spencer RJ, Beart RW Jr. Multiple hemorrhoidal bandings in a single session. *Dis Colon Rectum* 1994;37:37–41.
50. Lau WY, Chow HP, Poon GP, Wong SH. Rubber band ligation of

- three primary hemorrhoids in a single session. A safe and effective procedure. *Dis Colon Rectum* 1982;25:336-339.
51. Khubchandani IT. A randomized comparison of single and multiple rubber band ligations. *Dis Colon Rectum* 1983;26:705-708.
 52. Bat L, Melzer E, Koler M, Dreznick Z, Shemesh E. Complications of rubber band ligation of symptomatic internal hemorrhoids. *Dis Colon Rectum* 1993;36:287-290.
 53. Bayer I, Myslovaty B, Picovsky BM. Rubber band ligation of hemorrhoids. Convenient and economic treatment. *J Clin Gastroenterol* 1996;23:50-52.
 54. Marshman D, Huber PJ Jr, Timmerman W, Simonton CT, Odom FC, Kaplan ER. Hemorrhoidal ligation. A review of efficacy. *Dis Colon Rectum* 1989;32:369-371.
 55. Alemdaroglu K, Ulualp KM. Single session ligation treatment of bleeding hemorrhoids. *Surg Gynecol Obstet* 1993;177:62-64.
 56. Mattana C, Maria G, Pescatori M. Rubber band ligation of hemorrhoids and rectal mucosal prolapse in constipated patients. *Dis Colon Rectum* 1989;32:372-375.
 57. Hardwick RH, Durley P. Should rubber band ligation of haemorrhoids be performed at the initial outpatient visit? *Ann R Coll Surg Engl* 1994;76:185-187.
 58. Rudd WW. Ligation and cryosurgery of all hemorrhoids. An office procedure. *Int Surg* 1989;74:148-151.
 59. Savioz D, Roche B, Glauser T, Dobrinov A, Ludwig C, Marti MC. Rubber band ligation of hemorrhoids: relapse as a function of time. *Int J Colorectal Dis* 1998;13:154-156.
 60. Cosman BC, Eastman DA, Perkash I, Stone JM. Hemorrhoidal bleeding in chronic spinal cord injury: results of multiple banding. *Int J Colorectal Dis* 1994;9:174-176.
 61. Wroblewski DE, Corman ML, Veidenheimer MC, Collier JA. Long-term evaluation of rubber ring ligation in hemorrhoidal disease. *Dis Colon Rectum* 1980;23:478-482.
 62. Steinberg DM, Liegois H, Alexander-Williams J. Long term review of the results of rubber band ligation of haemorrhoids. *Br J Surg* 1975;62:144-146.
 63. Templeton JL, Spence RA, Kennedy TL, Parks TG, Mackenzie G, Hanna WA. Comparison of infrared coagulation and rubber band ligation for first and second degree haemorrhoids: a randomised prospective clinical trial. *Br Med J (Clin Res Ed)* 1983;286:1387-1389.
 64. Ambrose NS, Hares MM, Alexander-Williams J, Keighley MR. Prospective randomised comparison of photocoagulation and rubber band ligation in treatment of haemorrhoids. *Br Med J (Clin Res Ed)* 1983;286:1389-1391.
 65. Walker AJ, Leicester RJ, Nicholls RJ, Mann CV. A prospective study of infrared coagulation, injection and rubber band ligation in the treatment of haemorrhoids. *Int J Colorectal Dis* 1990;5:113-116.
 66. O'Hara VS. Fatal clostridial infection following hemorrhoidal banding. *Dis Colon Rectum* 1980;23:570-571.
 67. Russell TR, Donohue JH. Hemorrhoidal banding. A warning. *Dis Colon Rectum* 1985;28:291-293.
 68. Shemesh EI, Kodner IJ, Fry RD, Neufeld DM. Severe complication of rubber band ligation of internal hemorrhoids. *Dis Colon Rectum* 1987;30:199-200.
 69. Jensen DM, Jutabha R, Machicado GA, Jensen ME, Cheng S, Gornbein J, Hirabayashi K, Ohning G, Randall G. Prospective randomized comparative study of bipolar electrocoagulation versus heater probe for treatment of chronically bleeding internal hemorrhoids. *Gastrointest Endosc* 1997;46:435-443.
 70. Randall GM, Jensen DM, Machicado GA, Hirabayashi K, Jensen ME, You S, Pelayo E. Prospective randomized comparative study of bipolar versus direct current electrocoagulation for treatment of bleeding internal hemorrhoids. *Gastrointest Endosc* 1994;40:403-410.
 71. Dennison A, Whiston RJ, Rooney S, Chadderton RD, Wherry DC, Morris DL. A randomized comparison of infrared photocoagulation with bipolar diathermy for the outpatient treatment of hemorrhoids. *Dis Colon Rectum* 1990;33:32-34.
 72. Yang R, Migikovsky B, Peicher J, Laine L. Randomized, prospective trial of direct current versus bipolar electrocoagulation for bleeding internal hemorrhoids. *Gastrointest Endosc* 1993;39:766-769.
 73. Hinton CP, Morris DL. A randomized trial comparing direct current therapy and bipolar diathermy in the outpatient treatment of third-degree hemorrhoids. *Dis Colon Rectum* 1990;33:931-932.
 74. Norman DA, Newton R, Nicholas GV. Direct current electrotherapy of internal hemorrhoids: an effective, safe, and painless outpatient approach. *Am J Gastroenterol* 1989;84:482-487.
 75. Zinberg SS, Stern DH, Furman DS, Wittles JM. A personal experience in comparing three nonoperative techniques for treating internal hemorrhoids. *Am J Gastroenterol* 1989;84:488-492.
 76. Varma JS, Chung SC, Li AK. Prospective randomised comparison of current coagulation and injection sclerotherapy for the outpatient treatment of haemorrhoids. *Int J Colorectal Dis* 1991;6:42-45.
 77. Johanson JF, Rimm A. Optimal nonsurgical treatment of hemorrhoids: a comparative analysis of infrared coagulation, rubber band ligation, and injection sclerotherapy. *Am J Gastroenterol* 1992;87:1600-1606.
 78. MacRae HM, Temple LK, McLeod RS. A meta-analysis of hemorrhoidal treatments. *Semin C R Surg* 2002;13:77-83.
 79. Granet E. Hemorrhoidectomy failures: causes, prevention and management. *Dis Colon Rectum* 1968;11:45-48.
 80. Milligan ET, Morgan CN, Jones LE. Surgical anatomy of the anal canal and the operative treatment of haemorrhoids. *Lancet* 1937;2:1119-1124.
 81. Ferguson JA, Mazier WP, Ganchrow MI, Friend WG. The closed technique of hemorrhoidectomy. *Surgery* 1971;70:480-484.
 82. Devien CV, Pujol JP. Total circular hemorrhoidectomy. *Int Surg* 1989;74:154-157.
 83. Boccasanta P, Venturi M, Orio A, Salamina G, Reitano M, Cioffi U, Floridi A, Strinna M, Peracchia A. Circular hemorrhoidectomy in advanced hemorrhoidal disease. *Hepatogastroenterology* 1998;45:969-972.
 84. Wolff BG, Culp CE. The Whitehead hemorrhoidectomy. An unjustly maligned procedure. *Dis Colon Rectum* 1988;31:587-590.
 85. Lord PH. A new regime for the treatment of haemorrhoids. *Proc R Soc Med* 1968;61:935-936.
 86. Speakman CT, Burnett SJ, Kamm MA, Bartram CI. Sphincter injury after anal dilatation demonstrated by anal endosonography. *Br J Surg* 1991;78:1429-1430.
 87. MacDonald A, Smith A, McNeill AD, Finlay IG. Manual dilatation of the anus. *Br J Surg* 1992;79:1381-1382.
 88. Konsten J, Baeten CG. Hemorrhoidectomy vs. Lord's method: 17-year follow-up of a prospective, randomized trial. *Dis Colon Rectum* 2000;43:503-506.
 89. Hiltunen KM, Matikainen M. Anal dilatation, lateral subcutaneous sphincterotomy and hemorrhoidectomy for the treatment of second and third degree haemorrhoids. A prospective randomized study. *Int Surg* 1992;77:261-263.
 90. Ho YH, Seow-Choen F, Tan M, Leong AF. Randomized controlled trial of open and closed hemorrhoidectomy. *Br J Surg* 1997;84:1729-1730.
 91. Carapeti EA, Kamm MA, McDonald PJ, Chadwick SJ, Phillips RK. Randomized trial of open versus closed day-case hemorrhoidectomy. *Br J Surg* 1999;86:612-613.
 92. Arbmán G, Krook H, Haapaniemi S. Closed vs. open hemorrhoidectomy—is there any difference? *Dis Colon Rectum* 2000;43:31-34.
 93. Gencosmanoglu R, Sad O, Koc D, Inceoglu R. Hemorrhoidectomy with bipolar diathermy for the outpatient treatment of hemorrhoids. *Dis Colon Rectum* 1990;33:32-34.

- tomy: open or closed technique? A prospective, randomized clinical trial. *Dis Colon Rectum* 2002;45:70–75.
94. Hosch SB, Knoefel WT, Pichlmeier U, Schulze V, Busch C, Gawad KA, Broelsch CE, Izbicki JR. Surgical treatment of piles: prospective, randomized study of Parks vs. Milligan-Morgan hemorrhoidectomy. *Dis Colon Rectum* 1998;41:159–164.
95. Boccasanta P, Capretti PG, Venturi M, Cioffi U, De Simone M, Salamina G, Contessini-Avesani E, Peracchia A. Randomised controlled trial between stapled circumferential mucosectomy and conventional circular hemorrhoidectomy in advanced hemorrhoids with external mucosal prolapse. *Am J Surg* 2001;182:64–68.
96. Hetzer FH, Demartines N, Handschin AE, Clavien PA. Stapled vs excision hemorrhoidectomy: long-term results of a prospective randomized trial. *Arch Surg* 2002;137:337–340.
97. Shalaby R, Desoky A. Randomized clinical trial of stapled versus Milligan-Morgan haemorrhoidectomy. *Br J Surg* 2001;88:1049–1053.
98. Mehigan BJ, Monson JR, Hartley JE. Stapling procedure for haemorrhoids versus Milligan-Morgan haemorrhoidectomy: randomised controlled trial. *Lancet* 2000;355:782–785.
99. Ho YH, Cheong WK, Tsang C, Ho J, Eu KW, Tang CL, Seow-Choen F. Stapled hemorrhoidectomy—cost and effectiveness. Randomized, controlled trial including incontinence scoring, anorectal manometry, and endoanal ultrasound assessments at up to three months. *Dis Colon Rectum* 2000;43:1666–1675.
100. Rowsell M, Bello M, Hemingway DM. Circumferential mucosectomy (stapled haemorrhoidectomy) versus conventional haemorrhoidectomy: randomised controlled trial. *Lancet* 2000;355:779–781.
101. Seow-Choen F, Ho YH, Ang HG, Goh HS. Prospective, randomized trial comparing pain and clinical function after conventional scissors excision/ligation vs. diathermy excision without ligation for symptomatic prolapsed hemorrhoids. *Dis Colon Rectum* 1992;35:1165–1169.
102. Wang JY, Chang-Chien CR, Chen JS, Lai CR, Tang RP. The role of lasers in hemorrhoidectomy. *Dis Colon Rectum* 1991;34:78–82.
103. Iwagaki H, Higuchi Y, Fuchimoto S, Orita K. The laser treatment of hemorrhoids: results of a study on 1816 patients. *Jpn J Surg* 1989;19:658–661.
104. Senagore A, Mazier WP, Luchtefeld MA, MacKeigan JM, Wengert T. Treatment of advanced hemorrhoidal disease: a prospective, randomized comparison of cold scalpel vs. contact Nd:YAG laser. *Dis Colon Rectum* 1993;36:1042–1049.
105. Khan S, Pawlak SE, Eggenberger JC, Lee CS, Szilagyi EJ, Wu JS, Margolin MDD. Surgical treatment of hemorrhoids: prospective, randomized trial comparing closed excisional hemorrhoidectomy and the Harmonic Scalpel technique of excisional hemorrhoidectomy. *Dis Colon Rectum* 2001;44:845–849.
106. Tan JJ, Seow-Choen F. Prospective, randomized trial comparing diathermy and Harmonic Scalpel hemorrhoidectomy. *Dis Colon Rectum* 2001;44:677–679.
107. Armstrong DN, Ambroze WL, Schertzer ME, Orangio GR. Harmonic Scalpel vs. electrocautery hemorrhoidectomy: a prospective evaluation. *Dis Colon Rectum* 2001;44:558–564.
108. Chung CC, Ha JP, Tai YP, Tsang WW, Li MK. Double-blind, randomized trial comparing harmonic scalpel hemorrhoidectomy, bipolar scissors hemorrhoidectomy, and scissors excision: ligation technique. *Dis Colon Rectum* 2002;45:789–794.
109. Palazzo FF, Francis DL, Clifton MA. Randomized clinical trial of LigaSure versus open haemorrhoidectomy. *Br J Surg* 2002;89:154–157.
110. Jayne DG, Botterill I, Ambrose NS, Brennan TG, Guillou PJ, O'Riordan DS. Randomized clinical trial of LigaSure versus conventional diathermy for day-case haemorrhoidectomy. *Br J Surg* 2002;89:428–432.
111. Ibrahim S, Tsang C, Lee YL, Eu KW, Seow-Choen F. Prospective, randomized trial comparing pain and complications between diathermy and scissors for closed hemorrhoidectomy. *Dis Colon Rectum* 1998;41:1418–1420.
112. Andrews BT, Layer GT, Jackson BT, Nicholls RJ. Randomized trial comparing diathermy hemorrhoidectomy with the scissor dissection Milligan-Morgan operation. *Dis Colon Rectum* 1993;36:580–583.
113. Ui Y. Anoderm-preserving, completely closed hemorrhoidectomy with no mucosal incision. *Dis Colon Rectum* 1997;40:S99–S101.
114. Patel N, O'Connor T. Suture haemorrhoidectomy: a day-only alternative. *Aust N Z J Surg* 1996;66:830–831.
115. Mathai V, Ong BC, Ho YH. Randomized controlled trial of lateral internal sphincterotomy with haemorrhoidectomy. *Br J Surg* 1996;83:380–382.
116. Carapeti EA, Kamm MA, McDonald PJ, Phillips RK. Double-blind randomised controlled trial of effect of metronidazole on pain after day-case haemorrhoidectomy. *Lancet* 1998;351:169–172.
117. Hussein MK, Taha AM, Haddad FF, Bassim YR. Bupivacaine local injection in anorectal surgery. *Int Surg* 1998;83:56–57.
118. Pryn SJ, Crosse MM, Murison MS, McGinn FP. Postoperative analgesia for haemorrhoidectomy. A comparison between caudal and local infiltration. *Anaesthesia* 1989;44:964–966.
119. Chester JF, Stanford BJ, Gazet JC. Analgesic benefit of locally injected bupivacaine after hemorrhoidectomy. *Dis Colon Rectum* 1990;33:487–489.
120. Ho YH, Seow-Choen F, Low JY, Tan M, Leong AP. Randomized controlled trial of trimebutine (anal sphincter relaxant) for pain after haemorrhoidectomy. *Br J Surg* 1997;84:377–379.
121. Gottesman L, Milsom JW, Mazier WP. The use of anxiolytic and parasympathomimetic agents in the treatment of postoperative urinary retention following anorectal surgery. A prospective, randomized, double-blind study. *Dis Colon Rectum* 1989;32:867–870.
122. Wasvary HJ, Hain J, Mosed-Vogel M, Bendick P, Barkel DC, Klein SN. Randomized, prospective, double-blind, placebo-controlled trial of effect of nitroglycerin ointment on pain after hemorrhoidectomy. *Dis Colon Rectum* 2001;44:1069–1073.
123. Denis J, Dubois N, Ganansia R, du Puy-Montbrun T, Lemarchand N. Hemorrhoidectomy: Hospital Leopold Bellan procedure. *Int Surg* 1989;74:152–153.
124. Reis Neto JA, Quilici FA, Cordeiro F, Reis JA Jr. Open versus semi-open hemorrhoidectomy: a random trial. *Int Surg* 1992;77:84–90.
125. Tajana A. Hemorrhoidectomy according to Milligan-Morgan: ligation and excision technique. *Int Surg* 1989;74:158–161.
126. Lacerda-Filho A, Cunha-Melo JR. Outpatient haemorrhoidectomy under local anaesthesia. *Eur J Surg* 1997;163:935–940.
127. Johnstone CS, Isbister WH. Inpatient management of piles: a surgical audit. *Aust N Z J Surg* 1992;62:720–724.
128. Leff EI. Hemorrhoidectomy—laser vs. nonlaser: outpatient surgical experience. *Dis Colon Rectum* 1992;35:743–746.
129. Eu KW, Seow-Choen F, Goh HS. Comparison of emergency and elective haemorrhoidectomy. *Br J Surg* 1994;81:308–310.
130. Ho YH, Tan M. Ambulatory anorectal manometric findings in patients before and after haemorrhoidectomy. *Int J Colorectal Dis* 1997;12:296–297.
131. Ho YH, Seow-Choen F, Goh HS. Haemorrhoidectomy and disordered rectal and anal physiology in patients with prolapsed haemorrhoids. *Br J Surg* 1995;82:596–598.
132. Felt-Bersma RJ, van Baren R, Koorevaar M, Strijers RL, Cuesta MA. Unsuspected sphincter defects shown by anal endosonography after anorectal surgery. A prospective study. *Dis Colon Rectum* 1995;38:249–253.
133. Abbasakoor F, Nelson M, Beynon J, Patel B, Carr ND. Anal

- endosonography in patients with anorectal symptoms after haemorrhoidectomy. *Br J Surg* 1998;85:1522-1524.
134. van Tets WF, Kuijpers JH, Tran K, Mollen R, van Goor H. Influence of Parks' anal retractor on anal sphincter pressures. *Dis Colon Rectum* 1997;40:1042-1045.
135. Longo A. Treatment of hemorrhoidal disease by reduction of mucosa and hemorrhoidal prolapse with a circular stapling device: a new procedure. *Proceedings of the 6th World Congress of Endoscopic Surgery*, June 3, 1998. Mundozzi Editore, 1998.
136. Ganio E, Altomare DF, Gabrielli F, Milito G, Canuti S. Prospective randomized multicentre trial comparing stapled with open haemorrhoidectomy. *Br J Surg* 2001;88:669-674.
137. Khalil KH, O'Bichere A, Sellu D. Randomized clinical trial of sutured versus stapled closed haemorrhoidectomy. *Br J Surg* 2000;87:1352-1355.
138. Sutherland LM, Burchard AK, Matsuda K, Sweeney JL, Bokey EL, Childs PA, Roberts AK, Waxman BP, Maddern GJ. A systematic review of stapled hemorrhoidectomy. *Arch Surg* 2002;137:1395-1406; discussion 1407.
139. Cheetham MJ, Mortensen NJ, Nystrom PO, Kamm MA, Phillips RK. Persistent pain and faecal urgency after stapled haemorrhoidectomy. *Lancet* 2000;356:730-733.
140. Ripetti V, Caricato M, Arullani A. Rectal perforation, retroperitoneum, and pneumomediastinum after stapling procedure for prolapsed hemorrhoids: report of a case and subsequent considerations. *Dis Colon Rectum* 2002;45:268-270.
141. Maw A, Eu KW, Seow-Choen F. Retroperitoneal sepsis complicating stapled hemorrhoidectomy: report of a case and review of the literature. *Dis Colon Rectum* 2002;45:826-828.
142. Roos P. Haemorrhoid surgery revised. *Lancet* 2000;355:1648.
143. Molloy RG, Kingsmore D. Life threatening pelvic sepsis after stapled haemorrhoidectomy. *Lancet* 2000;355:810.
144. George BD, Shetty D, Lindsey I, Mortensen NJ, Warren BF. Histopathology of stapled haemorrhoidectomy specimens: a cautionary note. *Colorectal Dis* 2002;4:473-476.
145. Ho YH, Seow-Choen F, Tsang C, Eu KW. Randomized trial assessing anal sphincter injuries after stapled haemorrhoidectomy. *Br J Surg* 2001;88:1449-1455.
146. Hewitt WR, Sokol TP, Fleshner PR. Should HIV status alter indications for hemorrhoidectomy? *Dis Colon Rectum* 1996;39:615-618.
147. Morandi E, Merlini D, Salvaggio A, Foschi D, Trabucchi E. Prospective study of healing time after hemorrhoidectomy: influence of HIV infection, acquired immunodeficiency syndrome, and anal wound infection. *Dis Colon Rectum* 1999;42:1140-1144.
148. Wolkowicz AF, Luchtefeld MA. Surgery for symptomatic hemorrhoids and anal fissures in Crohn's disease. *Dis Colon Rectum* 1993;36:545-547.
149. Jeffery PJ, Parks AG, Ritchie JK. Treatment of hemorrhoids in patients with inflammatory bowel disease. *Lancet* 1977;1:1084-1085.

Address requests for reprints to: Chair, Clinical Practice Committee, AGA National Office, c/o Membership Department, 4930 Del Ray Avenue, Bethesda, Maryland 20814. Fax: (301) 654-5920.

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