

Management of cataract in dry eye disease: Preferred practice pattern guidelines

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Cataract surgery is one of the most commonly performed ophthalmic surgeries in the world. Dry eye disease (DED) is found to coexist in most patients with cataracts due to the overlapping age groups of both these conditions. Preoperative evaluation for DED is important to improve outcomes. A pre-existing DED affecting the tear film is likely to affect biometry. Moreover, special intraoperative considerations are needed in eyes with DED to reduce complications and improve postoperative outcomes. Dry eye disease (DED) is known to occur following an uneventful cataract surgery or a pre-existing DED is likely to worsen following cataract surgery as well. In these situations, despite a good visual outcome, patient dissatisfaction is common owing to the distressing DED symptoms. This review aims to summarize the preoperative, intraoperative, and postoperative considerations when performing cataract surgery in the presence of a coexisting DED.

Key words: Cataract surgery, dry eye disease, practice pattern

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Cataract surgery is one of the most frequently performed ophthalmic surgeries^[1,2] and recent developments have made the outcomes of cataract surgery almost predictable and replicable in restoring an emmetropic status. The advent of femtosecond laser incisions and presbyopia-correcting intraocular lenses (IOL) has led to the transformation of cataract surgery into refractive surgery. However, a coexisting ocular surface disease such as dry eye disease (DED) is likely to cause suboptimal outcomes. It is not uncommon for DED to coexist with cataracts since both these conditions are known to occur with advancing age.^[3,4] As such, patients requiring cataract surgery often have a coexisting DED with or without symptoms.

Cataract surgery itself is also known to cause DED postoperatively.^[5,6] Studies have shown that approximately one-tenth to one-third of patients undergoing cataract surgery have DED postoperatively.^[7,8] Mechanisms like corneal nerve transection, inflammation, goblet cell loss, phototoxicity from the operating microscope, preservative-induced toxicity, and worsening of meibomian gland dysfunction (MGD)

are the likely contributory factors.^[9] Murine models of DED have shown significant increase in inflammatory infiltrates, lymphangiogenesis, and neovascularization following cataract surgery compared to non-DED models.^[10] Reduction in corneal sensitivity is proportionate to the length and depth of incision and influenced by additional corneal procedures like limbal relaxing incisions (LRI) and astigmatic keratotomy (AK).^[11] Small incision cataract surgery (SICS) reportedly results in a higher severity of DED as compared to phacoemulsification likely due to larger incisions.^[12] Extracapsular cataract extraction (ECCE) also results in more postoperative inflammation compared to phacoemulsification thereby worsening DED.^[13] Intraoperative factors include surface toxicity induced by irrigating fluids, topical anesthetics, and antibiotics.^[14] In femtosecond laser-assisted cataract surgeries (FLACS), there is another additional factor of goblet cell damage during conjunctival docking.^[15] Thus, since cataract surgery causes the development of DED in a normal eye, it is obvious that it will cause the worsening of a pre-existing DED. In this review, we aim to summarize the preoperative, intraoperative, and postoperative considerations during cataract surgery in the context of DED.

Preoperative evaluation

Careful history taking and maintaining a high index of

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suspicion for DED is important considering it is frequently seen in patients presenting with cataracts. The common risk factors for developing DED include systemic disease, systemic medications, hormone replacement therapy, and previous corneal refractive surgeries.^[7,8,16] History to ascertain the presence of these should be asked. Patients complaining of dryness, grittiness, burning sensation, and itching deserve a closer look as these symptoms are suggestive of DED. An objective way of assessing the symptoms would be to use questionnaires such as the ocular surface disease index (OSDI), Standard Patient Evaluation of Eye Dryness (SPEED), and Dry Eye Questionnaire (DEQ) and they can be used where feasible.^[7] A recently developed index called the Ocular surface frailty index (OSFI) has introduced the concept of ocular surface frailty, making it susceptible to developing DED.^[17]

Irrespective of the symptoms and history, a careful examination to look for signs of DED is essential. The presence of tear film debris, blocked meibomian gland orifices, loss of corneal and conjunctival sheen, and unexplained corneal

staining are some of the signs indicating DED [Fig. 1]. Examining the ocular adnexa might give a clue to the underlying systemic pathology if any.

When either signs or symptoms are present, a battery of investigations needs to be done to ascertain the type and severity of DED. Schirmer's test, tear film break-up time (TBUT), and corneal fluorescein staining (CFS) are the basic necessary investigations that are required. A patient with low Schirmer's and TBUT, especially in the presence of symptoms, should be considered as a DED patient and treated as such. Wherever possible, tear film osmolality, noninvasive TBUT, tear meniscus height, and lipid layer thickness could be assessed. However, these latter investigations need special equipment and are not mandatory. Parameters at baseline and 1-month post-procedure help in predicting the persistence of DED symptoms beyond 3 months.^[11] The American society of cataract and refractive surgery (ASCRS) cornea clinical committee developed a consensus-based algorithm for effective preoperative diagnosis and treatment of ocular surface disease (OSD).^[18]

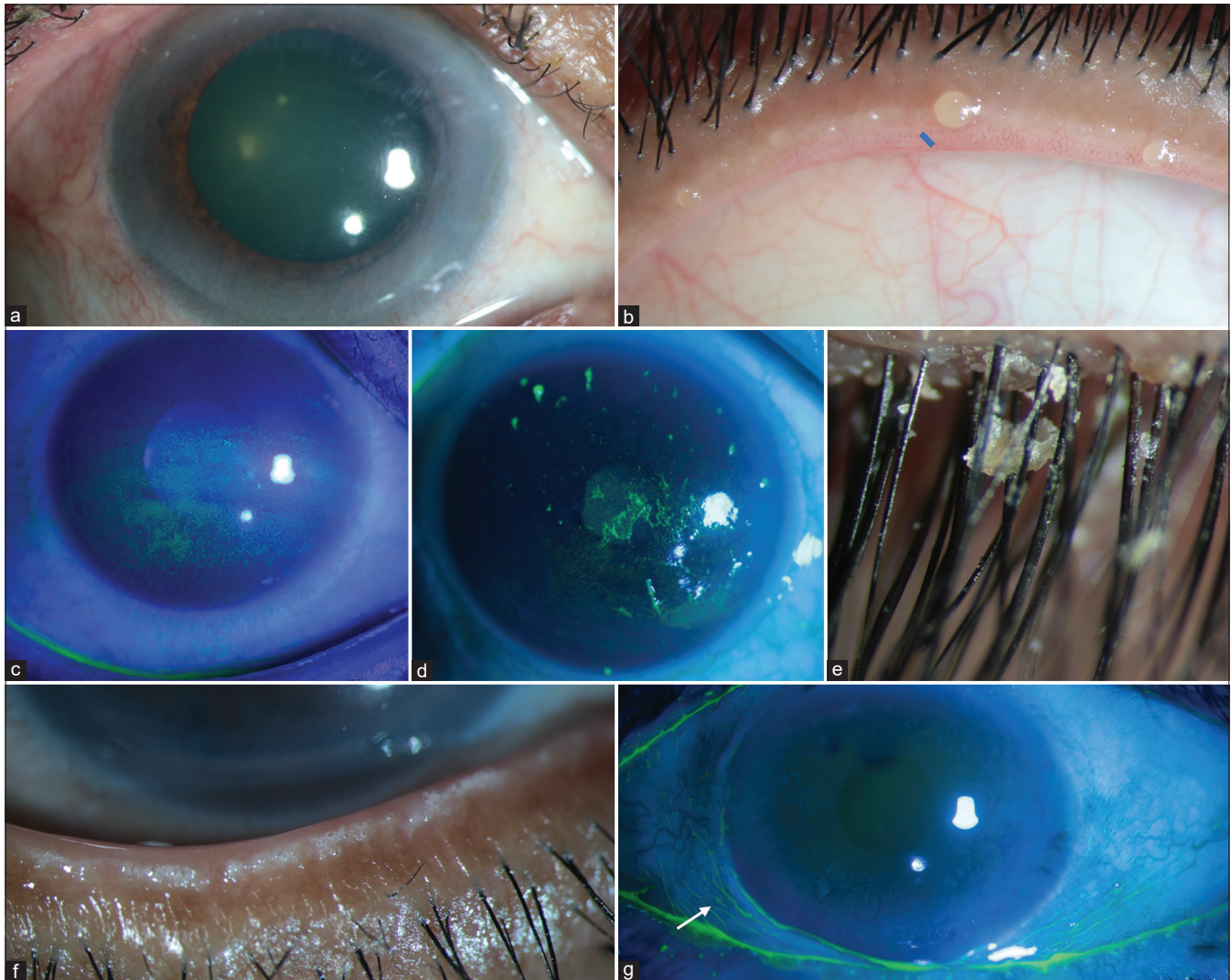


Figure 1: Red flag signs to be looked for during ocular surface evaluation: (a) Inflamed ocular surface, (b) Meibomian gland dysfunction with clogged meibomian gland orifices, (c) Superficial punctate keratopathy, (d) Filamentary keratitis, (e) Severe blepharitis like demodex infestation, (f) Frothy discharge over lid margins, (g) Conjunctivochalasis with conjunctival folds well delineated after fluorescein staining (White arrow)

Patients with OSD secondary to systemic immune-mediated disease are likely to have chronic cicatrizing conjunctivitis (CC). Fornices and eyelids should be carefully inspected for malposition, trichiasis, lid margin keratinization, forniceal shortening, and symblephara. The presence of keratopathy is an important factor not only making the surgery complex but also resulting in suboptimal postoperative outcomes. Unpredictable IOL power calculations, errors in measuring steep corneal axis for toric IOLs, increased photosensitivity leading to poor patient cooperation under topical anesthesia, and sub-optimal visual outcomes owing to the keratopathy itself are some of the expected issues in such eyes.^[19,20] Careful assessment of the corneal scarring and vascularization aids in planning the site of the incision for better visualization during the surgery. Patients with aqueous deficient dry eyes (ADDE) should undergo a detailed autoimmune workup with the initiation of immunomodulatory treatment (IMT) when required before surgery [Table 1].

Care should be taken to perform the cataract surgery when the ocular surface is stable. Acute cases with inflamed ocular surfaces must be referred to a specialist for management and cataract surgery must be performed when the ocular surface is adequately stabilized.

Table 1: Preoperative considerations in patients undergoing cataract surgery

Screening for DED

Questionnaires (OSDI, SPEED, DEQ, etc.) for symptoms of DED
History of autoimmune diseases and systemic medications
Ocular adnexal examination for abnormalities and blocked meibomian gland orifices
Tear film metrics-TBUT, Schirmer's test, tear meniscus height, tear film osmolarity
Ocular surface examination for conjunctivochalasis, corneal epitheliopathy, loss of sheen, abnormal staining patterns
Treat any significant conjunctivochalasis and meibomian gland dysfunction to avoid postoperative de novo DED

DED without keratopathy

Differentiate EDE from ADDE
Immune screening in cases of ADDE
Initiate IMT where indicated, continue during the surgery and postoperatively
Identify lid malposition, trichiatric eyelashes, and lid margin keratinization
Enhance tear film retention using punctal plugs or punctal cautery

DED with keratopathy

Detailed history, clinical examination, and immune work-up
Use of IMT with or without topical or oral steroids depending on the severity of disease
Careful biometry using standard keratometry readings where necessary
Planning of site and size of incision based on corneal clarity and adnexal changes
Treatment of lid margin keratinization by mucus membrane grafting

DED=Dry eye disease, OSDI=ocular surface disease index, SPEED=Standard Patient Evaluation of Eye Dryness, DEQ=Dry Eye Questionnaire, TBUT=tear film break-up time, EDE=evaporative dry eye disease, ADDE=aqueous deficient dry eye disease, IMT=immunomodulatory treatment

Biometry

Tear film acts as the first refracting medium with the magnitude of change in refraction at the air-tear film interface being the largest compared to any other interface in the optical system. Alterations in tear film physiology, therefore, impact the overall quality of vision with an increase in higher-order aberrations (HOAs) and irregular astigmatism.^[21,22] It is not uncommon to have an overestimation of astigmatism in eyes with DED owing to the fluctuations of keratometry values caused by alterations in the tear film osmolarity despite having an otherwise clear cornea.^[23] It is advisable to correlate astigmatism with the refractive acceptance of the patient also. In case of discrepancies, biometry should be repeated after the ocular surface is treated. Advances in quantitative objective assessments of QOV and biometry have also addressed these challenges to an extent in DED. Instruments like keratometers, topographers, and wavefront analyzers rely on the pre-corneal tear film for the acquisition of the biometry parameters. Indices such as surface regularity index (SRI) and surface asymmetry index (SAI) are incorporated into the topographers and help understand the status of the ocular surface.^[24] Preoperative optimization of the surface not only helps in the clinical improvement of DED but also improves the accuracy of the optimal measurements.^[25] Performing biometry after ocular surface stabilization with preoperative use of 0.05% cyclosporine might be useful.^[26] It is advisable to adequately manage DED preoperatively and to repeat biometry till minimal fluctuation in keratometry is detected.^[25] Keratopathy can be present in the form of superficial punctate keratitis, epithelial defects, epithelial irregularities, superficial vascularization, and stromal scarring due to chronic ocular surface inflammation.^[27] Wherever possible corneal topography measurements can be taken into consideration for IOL power calculations. In cases where keratopathy is too severe, the use of standard keratometry values for IOL calculations could be considered. [Fig. 2] Patients with advanced keratopathy who are scleral contact lens (SCL) users often have unreliable keratometry and poor media clarity. In pre-existing SCL users, novel methods have also been described to select the target refraction of IOL taking the effective scleral lens system power into consideration. This can be cost-effective and also helps in early visual rehabilitation avoiding the need for lens replacement post-surgery.^[28] Since corneal asphericity is affected in patients with keratopathy, the use of non-aspheric IOLs is preferred.

Intraoperative considerations

As mentioned earlier, cataract surgery is known to cause DED de novo and worsen a pre-existing DED. Certain intraoperative measures when taken, help to minimize postoperative DED [Fig. 3]. Intraoperative factors like toxicity from medications, surface drying, surgical incisions, surgical time, phototoxicity, phacoemulsification energy, and surface handling are important in the pathophysiology of cataract surgery-induced iatrogenic DED.^[9] Excessive use of povidone-iodine (PI) or topical anesthetics result is known to cause epithelial toxicity.^[29,30] Use of 0.05% PI for 30 secs before surgery reportedly lowers bacterial contamination rate while limiting ocular surface damage.^[31] While drying of the ocular surface can be damaging, repeated irrigation can also

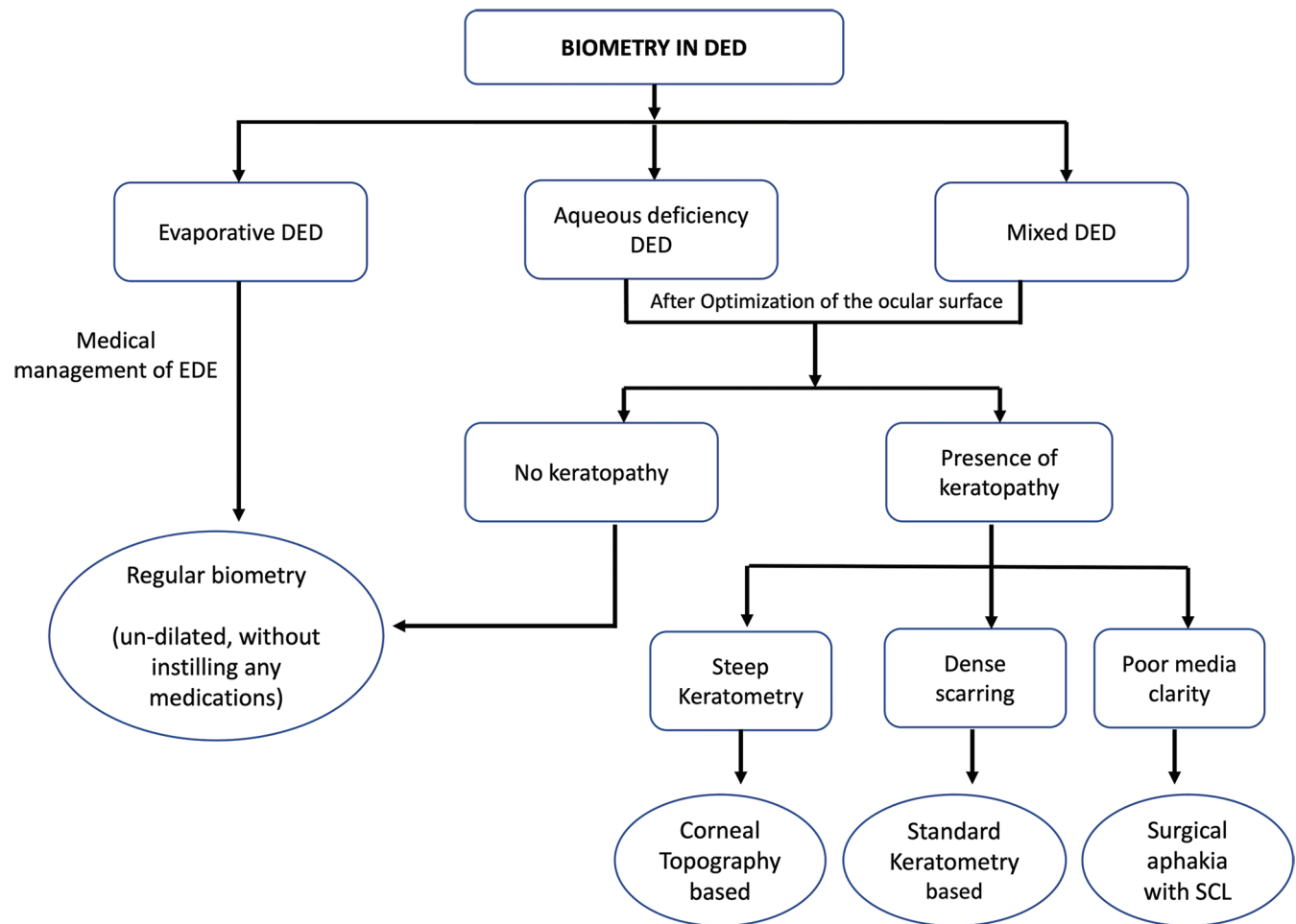


Figure 2: Algorithm depicting preferred practice pattern for biometry in DED. DED: dry eye disease; EDE: evaporative DED; SCL: Scleral contact lenses

be detrimental causing surface toxicity. Coating the ocular surface with dispersive viscoelastic (HPMC) has been shown to reduce postoperative DED as compared to using a balanced salt solution.^[32] Choi *et al.*^[11] reported that duration of exposure to microscope light was associated with increased symptoms of DED, lower TBUT, TMH, and Schirmers 1 test in patients with no prior DED. The use of microscope filters can significantly reduce phototoxicity. Minimal conjunctival manipulation and avoiding forceps-induced damage is another simple yet important step to be kept in mind.^[9] The size of the incision has an effect on the postoperative ocular surface status due to corneal nerve transection. Additional incisions such as limbal relaxing incisions (LRIs) and astigmatic keratotomies (AK) are also known to result in DED. The option of toric IOLs might therefore be preferred particularly in cases of pre-existing DED.^[9,33] Avoiding manual marking with ink and use of marker-less alignment systems such as Callisto Eye with Z-Align (Callisto Eye with Z-Align (Carl Zeiss Meditec AG), Verion digital marker (Alcon Laboratories), iTrace with Zaldivar Toric Caliper (Tracey Technologies), and TrueGuide software (TrueVision 3D Surgical, Inc) can be surface protective.^[34,35]

Apart from the above-listed strategies to prevent de novo DED, additional measures can help reduce worsening of a pre-existing DED. Patients with a dry ocular surface might

experience photophobia due to increased light scattering. Operating under topical anesthesia poses a challenge for such patients. Patient cooperation is likely to improve under retro-illumination which additionally reduces photo-toxicity and improves intraoperative visualization as well.^[36] Special care should be taken to prevent damage to the corneal epithelium as the epithelial wound healing is slower in these eyes and can progress to corneal melts if unaddressed postoperatively. Careful inspection to look for conjunctivochalasis is essential preoperatively which needs to be addressed if significant by excision of redundant conjunctiva to improve the symptoms.^[37] However, this should be planned judiciously only when indicated, as excessive handling of the conjunctiva can increase inflammation, worsening DED postoperatively. Placement of a BCL at the end of surgery can be helpful in both reducing the patient's symptoms and improving the epithelial health.^[38] Use of topical antibiotics to avoid infective keratitis, and change of BCL every 4–6 weeks is advisable.

In patients with DED with CC and severe keratopathy, the above measures might not be enough. These patients often have significant corneal scarring, dermalized ocular surface, lid malposition, and limited exposure due to symblepharon and ankyloblepharon. Release of the symblepharon flush cut close to the lid is required to ensure adequate exposure and

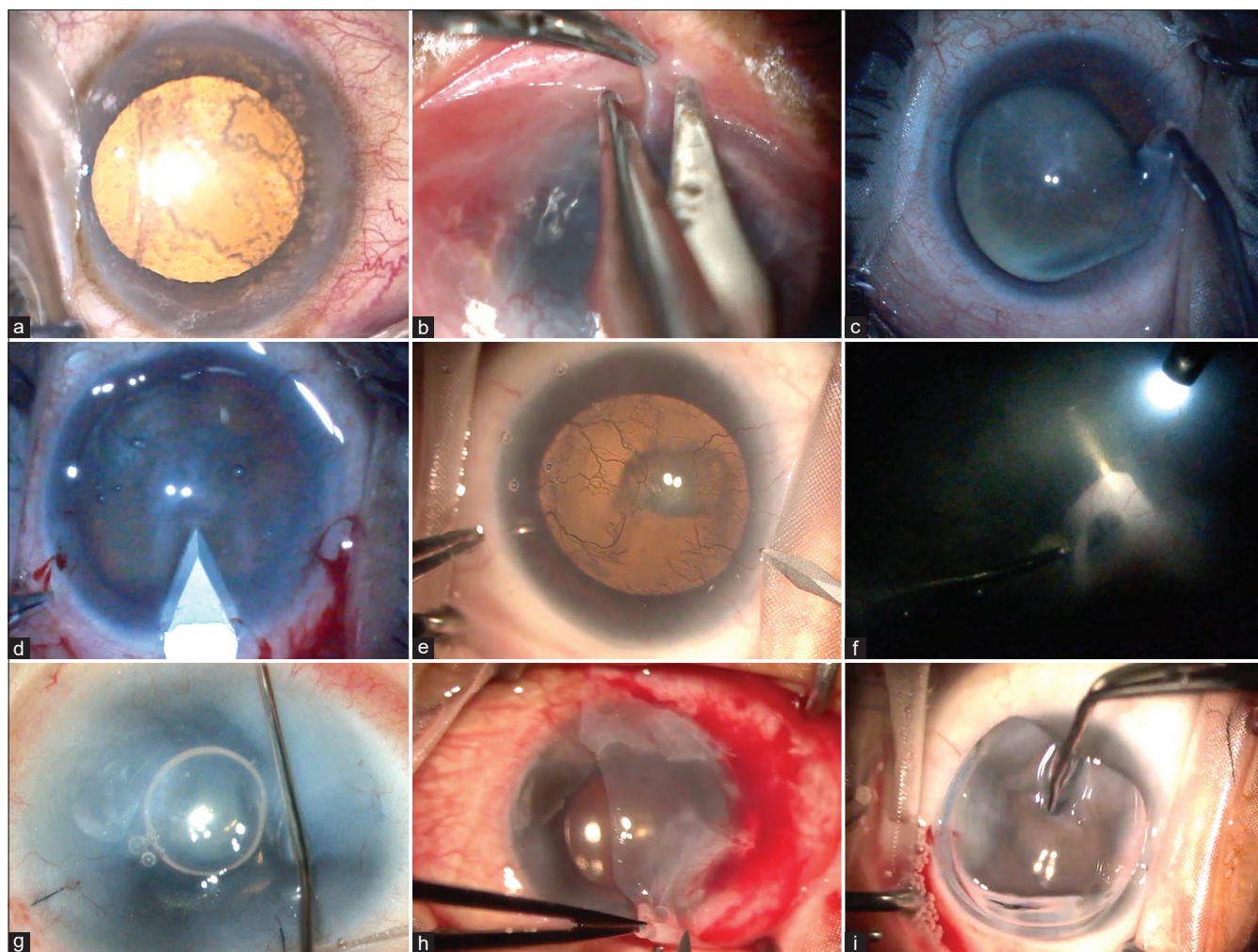


Figure 3: Safe cataract surgery techniques in dry eye disease: (a) Avoiding dry spots and medication toxicity, (b) Releasing the symblepharon to facilitate placement of eye speculum, (c) coating ocular surface with viscoelastic, (d) Planning incisions away from scarred cornea (e) Retro-illumination for enhancing media clarity, (f) Endo-illuminator assistance in hazy media (g) Suturing and hydrating incisions in scarred corneas, (h) Placement of amniotic membrane over areas of corneal and conjunctival defects, (i) Placement of therapeutic bandage contact lens

reduce traction on the globe.^[27] The direction of deviation of the globe after placement of the speculum points toward the location of the symblepharon attachment. Free movement of the globe in all directions should be ensured before initiating surgery. Placement of stay sutures through the eyelids or lateral canthotomy may be necessary in cases like ocular cicatricial pemphigoid (OCP), where forniceal foreshortening precludes placement of a speculum. Once adequate exposure and placement of the speculum are ensured, incisions should be placed preferably avoiding areas of corneal scarring and ensuring better visibility. The temporal incision can be preferred in eyes with limited exposure. Clear corneal incisions are preferred in cases of OCP to avoid disturbing the conjunctiva and worsening of the disease. Necrotising scleritis is known to occur when scleral tunnels are made in cases of autoimmune diseases such as rheumatoid arthritis (RA). Liberal use of OVDs throughout surgery and the use of Trypan blue for capsulorhexis are useful in cases with poor visibility.^[39] Having a light pipe or endo-illuminator handy can also be extremely helpful in these scenarios.^[40,41] In eyes where surgical aphakia is planned, it may be worthwhile to form

primary posterior capsulotomy as undertaking Nd: YAG laser capsulotomy later may be difficult. The placement of therapeutic BCL is highly recommended to protect the ocular surface.^[42] Amniotic membrane transplantation needs to be performed in cases with epithelial defects which can occur following the release of symblepharon.^[43] Additionally, planning a suture or permanent lateral paramedian tarsorrhaphy in eyes with lagophthalmos or cicatricial ectropion can be rewarding. Table 2 summarizes the intraoperative considerations for prevention of de novo DED and worsening of a pre-existing DED with or without keratopathy and CC changes.

Postoperative considerations

Adequate postoperative medical therapy is essential to tone down the negative impact of cataract surgery on the ocular surface [Table 3]. Symptoms of DED and ocular surface changes are likely to persist in cases who have higher than baseline values of OSDI, shorter TBUT, and MGD at 1 month post-surgery.^[44,45] Thus, screening for these findings at 1 month can help identify those at risk of persistent symptoms. Studies have shown lubricants to alleviate symptoms of DED with

preservative-free eyedrops being superior to preserved ones.^[36,46,47] Restricting the use of topical nonsteroidal anti-inflammatory agents (NSAID) can prevent toxicity to the ocular surface. Postoperative use of topical NSAIDs has been reported to cause sterile melts in some studies while equivocal evidence has been found in few others.^[20,48] Thus, cautious use of NSAIDs only when indicated is preferable. Mucin secretagogues like diquafosol and rebamipide have shown promising results as well. Diquafosol is a P2Y2 receptor agonist which increases mucin secretion and protects corneal epithelium.^[49] Rebamipide on the other hand is a quinolone derivative with positive effect on corneal epithelium and TF stability. It has been reported to be effective in DED;^[50] however, studies of its use in post-cataract surgery DED are lacking.

In addition to topical lubricants, adequate immunosuppression needs to be maintained in patients with immune-mediated diseases such as Sjogren’s syndrome (SS) and OCP. Topical steroids in solution form are preferred over suspension form to avoid precipitates on the ocular surface. The use of cyclosporine, a fungal-derived peptide that inhibits T-cell activation, has been reported to improve ocular surface health in pre-existing DED. Studies have reported

improved tear film dynamics with preoperative and extended postoperative use of 0.05% cyclosporine eyedrops following cataract surgery.^[51,52] Ongoing IMT needs to be maintained where indicated, usually stepping up the dose is not needed. A close follow-up is needed to look for epithelial healing issues and detect them at an earlier stage. The use of BCL with close follow-up to avoid infection may help improve patient comfort and aid in epithelial healing particularly when there was an epithelial defect intraoperatively. Visual rehabilitation is aided by scleral contact lenses and can be used as early as 2 weeks postoperatively.

Outcomes and complications

Visual outcomes after cataract surgery in DED are influenced by the absence or presence and severity of the associated keratopathy. Numerous studies have shown good results with phacoemulsification in pre-existing DED secondary to SS,^[20] OCP,^[53] Steven–Johnson syndrome (SJS),^[54] and ocular graft-versus-host disease (GVHD).^[55] ECCE was more frequently performed in eyes with CC given the associated surgical complexity.^[20] Significant visual improvement is reported in these cases, indicating that cataract surgery in these eyes is rewarding despite the risks.

PCR with vitreous loss was the most common complication reported across various types of DED. A large retrospective study revealed an overall complication rate of 6.4%. The most common intraoperative complication noted was PCR (3.4%), followed by zonular dehiscence (0.6%) and iridodialysis (0.3%). Common postoperative complications noted were Descemet’s membrane detachment (0.9%), followed by wound dehiscence (0.6%) and corneal epithelial defects (0.3%).^[20] The ocular surface breakdown has been reported in up to 10% of cases and needs to be actively looked for during follow-ups.^[53] A low threshold

Table 2: Intraoperative considerations in DED and cataract surgery

Preventing <i>de novo</i> DED
Avoid excessive use of irrigating fluid, anesthetic agents, povidone-iodine
Use of HPMC 2% preferred over BSS
Prevent phototoxicity using microscope filters
Reduced instrumentation to prevent conjunctival damage
Prefer toric IOL over astigmatic keratotomies and limbal relaxing incisions
Use markerless alignment systems for toric IOL placement
Pre-existing DED without keratopathy
Use of local anesthesia in patients with photophobia
Avoid excessive use of irrigating fluid, anesthetic agents, povidone-iodine
Use of HPMC 2% preferred over BSS
Prevent phototoxicity using microscope filters
Reduced instrumentation to prevent conjunctival damage
Simultaneous management of conjunctivochalasis
Placement of BCL at the end of surgery
Pre-existing DED with keratopathy
Release of symblephara, ankyloblephara ensuring adequate exposure, and free eyeball movement
Stay sutures through eyelids in cases of shortened fornices
Plan incision appropriately bearing in mind the primary condition
Liberal use of viscoelastic over the ocular surface throughout the surgery
Use of trypan blue and endo-illuminator to enhance visualization
Additional procedures such as primary posterior capsulotomy in an aphakic patient, AMG, and tarsorrhaphy as needed.
Placement of BCL at the end of surgery

DED=Dry eye disease, HPMC=hydroxy-propyl-methyl cellulose, BSS=balanced salt solution, IOL=intraocular lens, BCL=bandage contact lens, AMG=amniotic membrane grafting

Table 3: Postoperative considerations in DED

Preventing <i>de novo</i> DED
Screening for DED
Use of preservative-free lubricants
Cautious use of nonsteroidal anti-inflammatory drugs only when necessary
Use of mucin secretagogues
Pre-existing DED without keratopathy
Use of preservative-free lubricants
Cautious use of nonsteroidal anti-inflammatory drugs only when necessary
Use of mucin secretagogues
Continue and maintain patients on adequate immune suppression where indicated
Consider use of topical cyclosporin or oral lactoferrin to improve DED
Pre-existing DED with keratopathy
Evaluation for epithelial defects and exacerbation of ocular surface inflammation
Maintain ongoing IMT
Use of preservative-free lubricants and mucin secretagogues
Consider use of topical cyclosporin or oral lactoferrin to improve DED
Consider use of scleral contact lenses

DED=Dry eye disease, IMT=immunosuppressive treatment

Table 4: An overview of literature on visual outcomes and complications following cataract surgery in pre-existing dry eye disease (DED)

Author	No of eyes	Diagnosis	Mean age (years)	Type of surgery	Pre-op mean LogMAR BCVA	Post-op mean LogMAR BCVA	Complications
Donthineni <i>et al.</i> ^[20] (2020)	668	SS, MGD, CC	58	Phaco MSICS ECCE	1.1	0.3 at 1 week 0.1 at 6 weeks	Overall surgical complication rate: 6.4% Posterior capsular rent: 3.4% Descemet membrane detachment: 0.9% Wound leak and zonulodialysis: 0.6% each Corneal epithelial defect and iridodialysis: 0.3% each
P Narang <i>et al.</i> ^[53] (2016)	40	SJS	-	Phaco ECCE	1.61	1 Month-0.30 LFU-0.48	Posterior capsular rent (2 eyes), Ocular surface breakdown (4 eyes)
Sharma <i>et al.</i> ^[43] (2016)	21	SJS	32±12	Phaco	2.29	1 month: 0.84	Corneal epithelial defect and filamentary keratitis is 2 eyes each
FR de Melo <i>et al.</i> ^[55] (2015)	72	GVHD	56	Phaco	0.39	1 year: 0.08	Cystoid macular edema (4 eyes), keratitis with perforation (2 eyes: 1 infected and 1 sterile)
Puranik <i>et al.</i> ^[54] (2013)	9	OCP	60±2	ECCE Phaco	-	>2 lines improvement in 6 of 9 eyes at 1 year	Superficial punctate keratitis (1 eye), corneal epithelial defect (1 eye), cystoid macular edema (1 eye)
Ram <i>et al.</i> ^[5] (2002)	25	Non-specific	59±10	Phaco	-	0 (13 eyes) 0.2-0.5 (8 eyes) 0.5-1 (4 eyes)	Superficial punctate keratitis (8 eyes) and corneal epithelial defect (8 eyes)
Geerling G <i>et al.</i> ^[28] (2000)	15	OCP	73	Phaco ECCE ICCE	-	0.5 (1 month to 1 year)	Perforation 92 eyes), progressive surface disease (6 eyes)
Ram <i>et al.</i> ^[10] (1998)	21	SS	Group 1: 61±8 Group 2: 61±10	ECCE and ICCE	CFCF-1.3	Group 1: 0.5 Group 2: 0.3	Group 1: Postoperative endophthalmitis (3 eyes), peripheral keratolysis (4 eyes) Group 2: filamentary keratitis (6 eyes) peripheral keratolysis (2 eyes)

DED=Dry eye disease, SS=Sjogren's syndrome, MGD=meibomian gland disease, CC=cicatrising conjunctivitis, BCVA=best corrected visual acuity, MSICS>manual small incision cataract surgery, ECCE=extracapsular cataract extraction, SJS=Steven-Johnson syndrome, GVHD=graft-versus-host disease, OCP=ocular cicatricial pemphigoid, ICCE=intracapsular cataract extraction, CFCF=counting fingers close to face

for performing AMT in cases where the epithelium is non-healing helps. Aggravation of pre-existing OSD can occur following surgery and adequate maintenance of IMT and regular follow-ups are necessary to detect early complications. Sterile corneal melt and necrotizing scleritis have been reported following cataract surgery in RA and other collagen vascular diseases. Such a complication in an otherwise healthy eye following an uneventful cataract surgery could be the first manifestation of an occult underlying systemic disease.^[56] Progression of OCP has been reported at the one-year follow-up of cataract surgery.^[54] Patient counseling regarding postoperative use of SCL being a part of cataract management in advanced keratopathy can be helpful in improving patient satisfaction. Table 4 shows a literature overview of visual outcomes and complications reported following cataract surgery in DED.

Unmet needs and future directions

While cataract surgery has evolved to be a refractive procedure, numerous unmet needs persist in the context of cataract surgery and DED. Lack of clear guidelines for effective preoperative screening and optimization of the ocular surface, unreliable biometry, and management strategies for postoperative worsening of DED remain the major roadblocks to achieving desirable outcomes. Lack of consensus on the use of premium IOLs in DED is another area that needs work to optimize results for our patients. The

development of algorithmic approaches for effective screening, reliable diagnosis, and formulation of safe cataract surgery guidelines can go a long way in making cataract surgery safe, predictable, and replicable for our patients. Future research directed toward addressing these unmet needs can bridge the existing void.

Conclusion

DED frequently coexists in a patient that presents with operable senile cataracts. The insult caused by cataract surgery is known to cause DED de novo, and worsen a pre-existing ocular surface disease. This review summarizes the measures that help improve patient outcomes when cataract surgery is performed in the context of DED.

The careful preoperative examination might help diagnose subtle signs of DED in an asymptomatic patient. In patients known to have DED, biometry needs special considerations and IOL power calculations might be inaccurate. IMT where indicated must be continued and surgery should be planned when the ocular surface is stable. Certain intraoperative measures to reduce surface toxicity due to medications, phototoxicity, judicious planning of location and size of the incision, minimizing conjunctival trauma, and operating under retro-illumination help reduce de novo DED. In eyes with CC and keratopathy,

management of symblephara and ankyloblephara prior to starting surgery ensures adequate exposure. In cases where visualization is poor, trypan blue or endo-illumination is useful aid. Despite an uneventful, carefully planned surgery, DED symptoms are common. Preservative-free lubricants, restricting the use of NSAIDs and use of topical and systemic immunosuppressants where indicated, help improve ocular surface health. Visual outcomes are usually rewarding with SCL playing an important role in cases with advanced keratopathy. A low threshold for interventions when there is epithelial breakdown postoperatively is needed. Overall, performing cataract surgery in DED poses a challenge. However, appropriate preoperative, intraoperative, and postoperative measures are taken timely to improve patient outcomes.

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Conflicts of interest

There are no conflicts of interest.

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