Treating Cataracts and Irregular Astigmatism

Irregular astigmatism can be addressed before, during, or after surgery, with the best choice depending on the patient’s individual characteristics.

BY JUSTIN SCHWEITZER, OD

Cataracts and irregular corneal astigmatism are conditions that are often encountered simultaneously by eye care providers. Conditions such as Salzmann nodular degeneration, pterygium, epithelial basement membrane dystrophy (EBMD), keratoconus, corneal ectasia, corneal scars, and ocular surface disease often induce irregular astigmatism. These conditions present additional challenges when cataract surgery is imminent.

Depending on its cause and severity, irregular astigmatism can be addressed before surgery with phototherapeutic keratectomy (PTK), at the time of cataract surgery with astigmatic keratotomy (AK) or toric IOLs, or after surgery with specialty contact lenses. Each technology is indicated in different conditions and situations.

PREOPERATIVE EVALUATION

A detailed cataract workup should be performed on all patients prior to surgery. Workups include corneal topography, optical biometry measurement to calculate IOL power, and evaluation of the anterior and posterior segments.

Conditions such as keratoconus, corneal ectasia, and other subtle irregularities of the cornea are best discovered with corneal topography. Corneal topographers provide the best assessment of the degree of astigmatism present, its location, and the severity of the irregularity. Topographers also assist in obtaining accurate corneal curvature measurements that can be used in determining the correct IOL power for the patient. Salzmann nodular degeneration, pterygia, EBMD, corneal scars and other corneal dystrophies will usually be seen on slit-lamp examination, and the amount of astigmatism can be quantified with topography. If the irregularities are subtle and the astigmatism is regular, the eye care provider can move forward with preparing...
TREATMENT OF IRREGULAR ASTIGMATISM AT THE TIME OF CATARACT SURGERY

Toric IOLs and AK are important tools in the arsenal for treating cataracts and astigmatism at the time of surgery. The arcuate incisions used in AK can be a powerful tool for correcting regular astigmatic corneas, but when the cornea is irregular they can further destabilize the cornea and cause more irregularities. Toric IOLs have the ability to correct more than 4.00 D of astigmatism. These implants work best in eyes that have regular astigmatism, but in some situations they can be used in eyes that have a mild amount of irregular corneal astigmatism.

Patients with mild irregularities who have recently done well with spectacle correction are good candidates to consider for a toric IOL. Those who achieve good vision with spectacles have fairly regular and symmetric corneal astigmatism, as eyeglasses will not fully correct irregular astigmatism.

Certain corneal conditions that show irregularities on corneal topography, such as mild keratoconus and mild corneal ectasia, can also do well with a toric IOL. Evaluating the central 3 to 5 mm on corneal topography helps to determine the degree of irregularity overlying the pupil. Regardless of irregularities in peripheral zones, if the central 3- to 5-mm zone is reasonably regular the patient will likely do well with a toric IOL (Figure 3).
topography readings, considering any previous corneal surgery, and determining if the patient is capable of wearing a specialty contact lens will help in making this decision.

Cataract surgery with a planned postoperative contact lens fitting can be a powerful tool in cases in which significant corneal irregularity exists but it is difficult to decide in what axis the toric IOL should be placed (Figure 4). If the patient has previously worn a specialty contact lens, such as a rigid gas permeable (RGP) lens, and he or she wants to continue wearing contacts after cataract surgery, then a nontoric IOL may be the best choice for cataract surgery. If a toric IOL is implanted and the patient wants to continue wearing a specialty contact lens, the contact lens will mask the corneal astigmatism and thus unmask the lenticular astigmatism from the toric IOL. The design of the specialty contact lens would then have to have an anterior toric surface to balance out the unmasked toric IOL effect.11,12

Certain patients will present with corneas that are highly irregular or unstable. In these cases the eye care provider must decide if a specialty contact lens fitting will be possible after cataract surgery or if the patient would benefit from penetrating keratoplasty (PKP) with subsequent cataract surgery.13 A discussion with the patient is imperative to set expectations and determine the patient’s comfort level for proceeding with a specialty contact lens fitting after cataract surgery. If the eye care provider believes that an accurate contact lens fit will not be attainable or the patient does not have a desire to wear a contact lens, then PKP with subsequent cataract surgery will likely yield the best outcome, despite the long postoperative recovery.

**CASE STUDY**

A 47-year-old man was referred to our center with complaints of decreased near and distance visual acuity, glare and halos at night. He had a history of keratoconus and successful RGP contact lenses wear over the past 15 years. He wondered if a corneal transplant and cataract surgery would help his vision.

Three years before the patient presented to our center, his BCVA with RGP contact lenses was 20/20 in the right eye and 20/60+ in the left. His BCVA at this visit was 20/40 in the right eye and 20/400 in the left. RGP
over-refraction improved the BCVA in his right eye to 20/20 but showed no improvement in the left.

Brightness acuity testing was 20/400 in the right eye and was not performed in the left. Intraocular pressures were 7 mm Hg in the right eye and 8 mm Hg in the left. Ultrasound pachymetry was thin at 513 µm in the right eye and 534 µm in the left.

Corneal topography (Pentacam; Oculus) confirmed significant keratoconus in both eyes (Figures 5 and 6). Examining the topographies closely showed inferior steepening in both eyes, and, more important, steepening and irregularity in the central 3- to 5-mm zone. Topography confirmed irregular, asymmetric astigmatism of nearly 10.00 D in the right eye and 6.00 D in the left.

Anterior segment evaluation showed mild central scarring consistent with keratoconus in each eye. Examination through a dilated pupil revealed a 2+ posterior subcapsular cataract in the right eye and a 3+ posterior subcapsular cataract in the left. Examination of the fundus was normal.

Properly addressing the irregular astigmatism was the key decision point in this case. A toric IOL was not the best option because of the significant irregularity of his cornea in the central 3- to 5-mm zone on corneal topography and the mild corneal scarring present centrally. A combined procedure of a corneal transplant plus cataract extraction is a consideration, but avoiding the morbidity of PKP would be desirable. Finally, cataract extraction followed by a specialty contact lens fitting postoperatively could be a likely solution. Because this patient had worn contacts successfully for the past 15 years and he has significant cataracts in both eyes, it was felt that there was a good chance removing his cataracts and fitting him with a contact would provide quality vision.

The patient agreed, and uneventful cataract surgery was performed in the left eye. Three weeks postopera-

Figure 5. Topography OD showing keratoconus.

Figure 6. Topography OS showing keratoconus.
tively, the patient was successfully fit with a 16-mm diameter scleral lens in the left eye, and his subsequent BCVA was 20/20. Uneventful cataract surgery was then scheduled and performed in the right eye. Three weeks postoperatively a 16 mm diameter scleral lens was successfully fit in the right eye, and BCVA was 20/20.

**CONCLUSION**

Patients with cataracts and irregular corneal astigmatism present unique challenges in making cataract surgical decisions. Treatment of irregular astigmatism must be personalized for each patient. Treatment of irregular astigmatism preoperatively can be beneficial in obtaining more accurate IOL calculations. At times, patients with mild irregularities or asymmetry in the central 3 to 5 mm of the cornea will be able to move forward with surgery with consideration of implanting a toric IOL. In other cases, patients with significant irregular astigmatism may benefit from cataract extraction and a postoperative specialty contact lens fitting. It is crucial that eye care providers customize treatment for each patient with cataracts and irregular corneal astigmatism. If irregular astigmatism is properly addressed, successful surgical outcomes will be achieved to restore vision.

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