Toric IOL implantation in cataract surgery with high astigmatism in pellucid marginal degeneration.

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INTRODUCTION

Pellucid marginal degeneration (PMD) is a rare, idiopathic, degenerative corneal condition resulting in progressive bilateral thinning in the inferior and peripheral regions of the cornea. It is characterized by a peripheral band of thinning, usually occurring in the inferior quadrant in a crescentic fashion. A 1-2 mm margin of normal cornea typically lies between the thinning and the limbus, in contrast to keratoconus where maximal thinning occurs at the apex of the protrusion.

PMD typically presents in the second to fifth decade of life, and is associated with reduced visual acuity and significant irregular myopic astigmatism.

The treatment of PMD is challenging. Conservative management includes spectacles and contact lenses for early and moderate cases, with various forms of corneal surgery frequently necessary for more advanced PMD.

For PMD patients with concomitant cataract, another viable option may be to implant a toric intraocular lens. With advances in diagnostic and surgical technologies over recent years, both PMD induced astigmatism and cataract can be successfully treated at the same time with phacoemulsification and implantation of a toric IOL.

Here I present one such challenging case which highlights the benefits of such an approach for PMD patients with cataract.

PATIENT HISTORY

A 69-year-old female presented to our ophthalmology clinic with decreased visual acuity in her left eye due to immature cataract and high astigmatism of 12.0 D. Although PMD usually affects both eyes, our patient's right eye was not affected by the disease.

She had undergone cataract surgery in her right eye at another clinic two years previously with implantation of an aspheric monofocal intraocular lens (IOL), with a residual refractive error of +0.5 D (sphere), -2.25 D (cylinder) at 70-degrees.

PREOPERATIVE ASSESSMENT

I strongly recommend that all eye surgeons take a number of biometric measurements on different days during morning hours when they can expect best tear film for the calculation of IOL power. Although precise and reliable biometric measurements are vital in obtaining predictable outcomes with all toric lenses, they become even more relevant in complex cases such as this one with PMD.

Optical biometry had been performed two years previously at another clinic using AL-Scan (Nidek Co, Ltd., Gamagori, Japan) showing a flat meridian of 43.56 D at 99-degrees, steep meridian of 55.96 D at 9-degrees, and astigmatism of 12.40 D at 9-degrees.

We performed our own optical biometry (Lenstar LS 900 (Haag-Streit, Switzerland). The mean of multiple measurements taken over several days showed a flat meridian of 40.91 D at 98-degrees, a steep meridian of 53.13 D at 8-degrees and astigmatism of 12.22 D at 8-degrees.

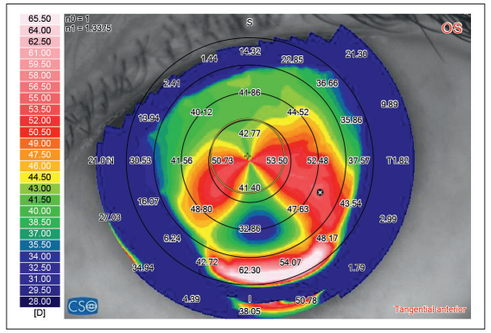

Figure 1: Patient's corneal map

The concordance between corneal topography performed elsewhere in 2017 and at our clinic in 2019 showed stable changes typical of PMD.

The combination of high astigmatism and immature cataract in this patient meant that spectacles and contact lenses were not an option. It was also decided that a spherical monofocal IOL would not provide a satisfactory outcome given the severity of the astigmatism and the pathology present in the affected eye.

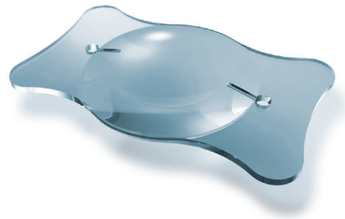

Figure 2: ZEISS AT TORBI 709M

We opted to implant a ZEISS AT TORBI 709M lens with an IOL power of +10.0 D and +12.00 D for correction of the corneal astigmatism with a targeted spherical equivalent of emmetropia based on outputs from a combination of Barrett and ZEISS toric calculators. We selected this particular bitoric lens as it offers a larger cylinder range up to 12 D and enables a reliable and predictable refractive outcome with a high degree of customization. The design of the lens was also a factor in our choice, as the 4-haptic profile makes surgical manoeuvring on either side of the marked axis much easier in such a complex case. The haptic design also ensures excellent rotational stability of the implant postoperatively, which is reassuring for the surgeon given the importance of stability for optimal refractive results in cases of high astigmatism.

SURGERY

Once the correct lens has been selected, I then proceed to mark the reference axes preoperatively with the help of a manual ASICO bubble marker with the patient sitting upright to avoid issues relating to cyclotorsion. The steep axis is then marked on the cornea using a Mendez ring with the patient lying down and before the surgery commences.The surgery was performed under peribulbar block, resulting in slightly longer surgical time. This was due to the complexity of this case and the anticipated fine adjustments required for exact placement of the toric lens after phacoemulsification cataract extraction.

Because of the extreme toricity in this particular patient, it meant that the corneal surgical field was not always in sharp focus, requiring a lot of adjustments of the focusing microscope and illumination. We were fortunate to be able to use the OPMI LUMERA microscope which enables the surgeon to change from oblique to coaxial illumination or to use a combination of the two modalities in order to counteract shadows appearing in the surgical field because of the high corneal toricity. The rest of the surgery was uneventful and we were able to obtain precise alignment of the lens in the capsular bag.

DISCUSSION & CONCLUSION

Our strategy to implant a toric IOL in this cataract patient with high astigmatism and pellucid marginal degeneration proved to be a successful one. Just 8 hours after surgery the patient's uncorrected visual acuity was recorded as 6/9 or 20/30 (Snellen). After 8 days, the patient's uncorrected visual acuity was 6/6 or 20/20 (Snellen), and the addition of +3.0 D spherical spectacle correction resulted in a score of N6 for near vision. The patient did not require any correction for distance vision postoperatively and she remains spectacle independent three months after surgery.

The AT TORBI 709M lens was shown to be stable in the capsular bag and there was no evidence of any postoperative rotation. Two months after surgery there was no inflammation and the patient was very happy with the outcome. We had counselled the patient of the risk of an uncertain visual outcome after surgery, but she was extremely pleased as her vision turned out to be better than her pseudophakic right eye with a visual acuity of 6/9 or 20/30 (Snellen) and +2.25 D cylinder. The patient was very satisfied overall with the quality of her postoperative vision, with a marked reduction in optical phenomena and visual symptoms frequently encountered in high astigmatism cases.

For such a complex case, I would advise other surgeons to try a "dry run" if possible before the actual surgery, taking the patient with a dilated pupil to the operating room to be examined under the surgical microscope. There are two benefits from this approach in cases of high astigmatism: first, it gives the surgeon time to become familiar with shadows appearing in the anterior chamber and to learn to focus on one part of the surgical field. Secondly, it enables the surgeon to decide if the surgical field view is better using a superior or temporal approach. While this might seem time-consuming before the actual surgery, it will enable the surgeon to be better prepared psychologically to deal with the specific challenges of this type of complex surgery.

Adequate preparation, careful preoperative assessment, rigorous surgical technique and the selection of a high-performance implant are the key elements to obtaining a successful outcome and a happy patient even in complex cases such as this.

Anant Gade MD is a Senior Surgeon at the Dr Anant Gade Eye Clinic, Nagpur, Maharashtra, India. He is a specialist in IOL power calculations, toric IOL and multifocal IOL implantation. He has delivered lectures for many different ophthalmological meetings and has also conducted Video Assisted Skill Transfer (VAST) courses for ophthalmologists.