

Long-term outcome of custom toric intraocular lens for treating high astigmatism in case of cataract associated with pellucid marginal corneal degeneration

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Pellucid marginal corneal degeneration (PMCD) is a progressive corneal ectasia that ultimately results in high regular astigmatism and correction of this astigmatism is always challenging. However, when a PMCD patient develops a cataract, it provides a golden opportunity to treat this coexisting astigmatism with toric intraocular lens (IOL) implantation. Regular toric IOLs would correct astigmatism only up to 6 diopters in the IOL plane but higher astigmatism would require customization of such IOLs. Our case report describes the long term outcomes of customized toric IOL to tackle this high astigmatism during cataract surgery in PMCD cases.

Key words: Blue sclera, custom toric IOL, high astigmatism, pellucid marginal corneal degeneration

Pellucid marginal corneal degeneration (PMCD) is a non-inflammatory progressive corneal thinning disorder that commonly affects the inferior cornea. Visual rehabilitation in PMCD becomes demanding as the progression of PMCD ultimately results in high astigmatism^[1] and even more challenging if a PMCD patient develops a cataract. Toric intraocular lenses are a good option to correct astigmatism in cataract associated with PMCD with the best predictable visual outcomes.^[2] However, for astigmatism, more than 6 D, which is a common feature with PMCD, regular toric intraocular lens (IOL) may not serve the purpose and there may be a need for an IOL with higher toricity. This case report aims to demonstrate the anatomical and functional outcomes after implantation of a custom toric IOL to correct high astigmatism in two eyes with cataract and PMCD.

Access this article online	
Quick Response Code:	Website: www.ijo.in
	DOI: 10.4103/ijo.IJO_2943_20

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Received: 12-Sep-2020

Revision: 04-Oct-2020

Accepted: 23-Nov-2020

Published: 23-Nov-2020

Case Reports

Case 1

A 69-year-old male presented with painless progressive dimness of vision left eye (LE) more than right eye (RE) since 6 months. He had a corrected distance visual acuity (CDVA) of 20/125 in the RE and 20/400 in the LE. There was no history of contact lens usage. Slit-lamp examination revealed an inferior band of corneal thinning extending from 4 to 8 o'clock position separated from limbus by the normal clear cornea of about 2 mm with ectasia above the thinning area and grade 2 nuclear cataracts as per Lens Opacities Classification System LOCS grading system in both eyes (LE > RE) [Fig. 1a and b]. Corneal topography (Pentacam[®] HR Oculus, GmbH, Wetzlar, Germany) in both eyes showed against the rule astigmatism of 11.8 diopters in the RE and 14.6 diopters in the LE with characteristic crab claw configuration on curvature map and pachymetry map showed peripheral corneal thinning suggesting PMCD. Aberrometry (iTrace, Tracey Technologies, Houston) showed significantly high corneal aberrations responsible for poor total quality of vision. [Fig. 1c]. He underwent LE temporal clear corneal phacoemulsification with customized toric IOL [Ultima Smart Toric (UST), Care group, India] implantation of +18.00 D spherical power with 22.5 D cylindrical power. Postoperatively IOL was well-centered [Fig. 1d] with UDVA 20/30 improving to 20/20 with -1.5 Dcyl at 160°. Postoperative aberrometry showed improved visual quality and stable IOL in the LE [Fig. 1e]. Postoperative aniseikonia was 3% in the LE, using a scleral contact lens for the RE. He continued to have the same visual acuity and refraction with a perfectly aligned IOL till a follow-up of 39 months.

Case 2

A 52-year-old female who is a known case of PMCD presented with painless progressive dimness of vision in the LE more than the RE for 9 months. She had UDVA of 20/60 in the RE improving to CDVA of 20/30 with -1 Dcyl at 180°, and UDVA of 20/400 improving to CDVA of 20/60 in the LE with +2.5 Dsph/-9 Dcyl at 120°. There was no history of contact lens usage.

Slit-lamp examination showed clinical features of PMCD in both eyes (LE > RE) along with grade 1 cataract as per the LOCS grading system. Corneal topography on Pentacam[®] HR showed typical features of PMCD in both eyes with LE astigmatism of +9.00 at 118.3°. We planned for LE cataract surgery along with UST IOL customized for her toricity. UST IOL of the spherical equivalent of +18.5 D with a cylindrical power of +12.5 D was implanted. Postoperatively, her UDVA was 20/40 with CDVA of 20/20 with -2.5 Dcyl at 65°. Aniseikonia charting showed no significant distortion. Postoperative aberrometry showed

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Cite this article as: Matalia H, Nandini C, Matalia J. Long-term outcome of custom toric intraocular lens for treating high astigmatism in case of cataract associated with pellucid marginal corneal degeneration. Indian J Ophthalmol 2020;68:3082-4.

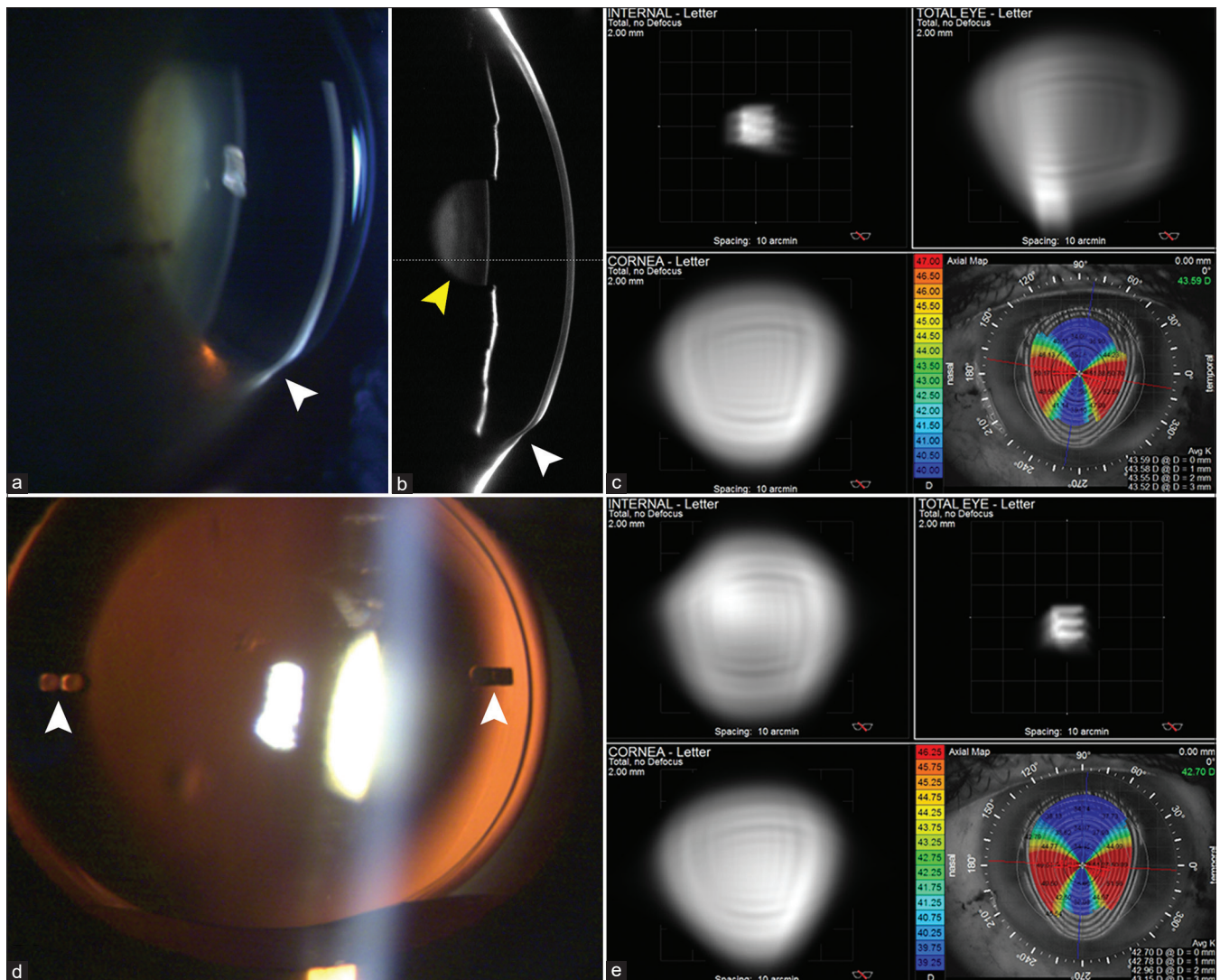


Figure 1: (a) Slit-lamp photograph shows inferior corneal thinning (white arrowhead) with ectasia above, suggestive of pellucid marginal corneal degeneration along with grade 2 nuclear cataract (as per Lens Opacities Classification System grading) (b) Scheimpflug imaging shows inferior corneal thinning (white arrowhead) with ectasia along with nuclear cataract (yellow arrowhead) (c) Preoperative aberrometry showing significantly high corneal aberrations with low internal aberrations leading to high total aberrations and poor total quality of vision (d) Slit-lamp photograph in fundus retro illumination demonstrating well-centered custom toric IOL aligned at 0–180° (arrowheads showing alignment marks) (e) Postoperative aberrometry showing internal aberrations negating corneal aberrations leading to reduced total aberrations and good total quality of vision

improved visual quality with no rotation of IOL. The patient was followed up for 37 months during which the refraction and IOL position remained stable.

Discussion

The Ultima Smart Toric (UST, Care group, India) intraocular lens is a custom-made, aspheric, plate haptic, hydrophilic acrylic, toric IOL that can be used to treat high astigmatism. In PMCD, astigmatism in the central 3-mm zone is relatively regular which has the advantage of reliable IOL power calculations, thus safe use of the custom toric lens.^[3] As toricity is inbuilt, there is no need to mark steep axis intraoperatively and to rotate IOL, thus reducing multiple markings and the error associated with that. Axis of placement of lens is horizontal along 0–180. This reduces the parallax error between corneal marking and the lens as the surgeon usually sits on the temporal side.

Balestrazzi *et al.* concluded in their largest series of PMD cataractous patients that implantation of toric IOL up to 6D was a safe, predictable, and effective surgical procedure to correct refractive astigmatism.^[2]

Luck reported the successful visual outcome after implanting a custom toric IOL to treat high astigmatism in the case of PMD.^[4] Later in 2011, it was confirmed to be keratoconus and not PMCD.^[5]

At the last follow up, either of the cases did not show any change in CDVA, topography including astigmatism. In both cases, aberrometry showed improvement in the quality of vision without any rotation till the three years of follow up suggesting better rotational stability.

It is believed that toric IOL >6 diopters causes distorted vision. In our patients, aniseikonia charting was done and none

of them evidenced any postoperative distortion (acceptable limit for distortion <5%).^[6]

Paryani *et al.* has reported one case of improved visual quality at 3-month follow-up after implantation of custom toric IOL in cataract with PMCD.^[7] To the best of our knowledge and literature search, ours is the first case report showing long-term anatomical and functional outcomes of customized high toric IOL implanted for treating high astigmatism in cataract with PMCD.

Conclusion

Customized toric IOL implantation is a safe option in treating a cataract with high astigmatism due to PMCD and effective in providing predictable anatomical and functional outcomes in the long term.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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