Cleveland Clinic Foundation,
9500 Euclid Ave,
Cleveland, OH 44195, USA
Tel: 216 444 8157;
Fax: 216 445 8475.
E-mail: searsj@ccf.org

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Sir,

Toric posterior chamber (in-the-bag) intraocular lens implantation to correct postpenetrating keratoplasty astigmatism

Postkeratoplasty astigmatism is a cause of significant visual impairment and can be difficult to treat satisfactorily. Treatment options include compression sutures, astigmatic keratotomy, targeted suture removal, hard contact lens wear, excimer laser photoablation, and toric intraocular lenses. This is the first United Kingdom report of the use of a toric posterior chamber intraocular lens used to correct this type of astigmatism.

Case report

A 51-year-old lady underwent phacoemulsification and toric posterior chamber intraocular lens implantation in order to correct 11.50 Dioptres (D) of postpenetrating keratoplasty (PKP) astigmatism. She had undergone a right PKP 5 years previously for corneal scarring and contact lens intolerance. After the removal of her corneal sutures, she required a prescription of –5.00/ $+15.00 \times 175$; a contact lens trial failed. Paired arcuate keratotomies and compression sutures (subsequently removed) resulted in a refraction of $-4.50/+11.50 \times 170$. She had an early nucleosclerotic cataract and she was listed for a right phacoemulsification and toric intraocular lens implantation under local anaesthetic.

Preoperative refraction revealed OD: $-4.50/+11.50 \times 170$ (OS: $-0.75/+4.0 \times 70$). Her preoperative keratometry showed: 38.31 D at 80° and 50.55 D at 170° (IOLMaster, Carl Zeiss) equating to 12.44 D at 170°. Corneal topography (Keratron, Optikon 2000) showed a similar degree of regular astigmatism (Figure 1). After preoperative refraction and biometry, a custom-made toric intraocular lens of spherical power 13.00 D and cylindrical power 15.00 D was ordered from HumanOptics (Mannheim, Germany) with a refractive aim of plano ($+0.13$ Spherical equivalent). The required IOL power was calculated by the manufacturer, using the above preoperative measurements.

Cataract surgery was performed under topical and intracameral anaesthetic (amethocaine 0.5% and

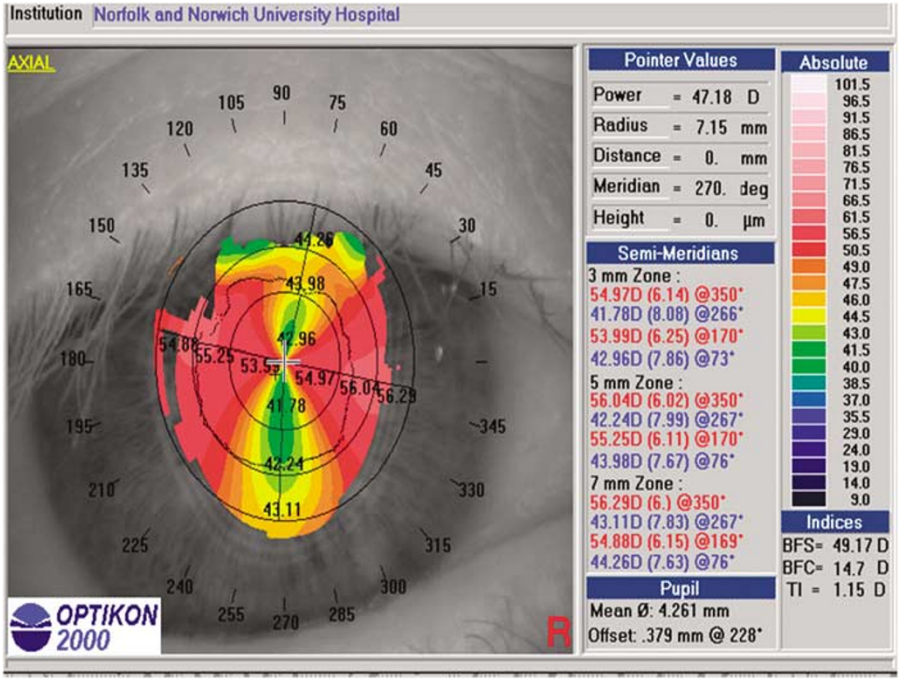

Figure 1 Corneal topography of the patient's right eye following removal of the corneal sutures, revealing significant against-the-rule astigmatism.

lidocaine 0.5%). Preoperatively, the cornea was marked at the 3 and 9 o'clock meridians (0 and 180°) with tissue ink applied with a Sinskey hook. This was performed with the patient upright to avoid the torsional effects that can be encountered when patients are supine. The steep axis (170°) was marked using a two-bladed axis marker and a Mendez degree gauge. A 2.5 mm clear corneal incision was made at 120°, through which standard phacoemulsification was performed. The incision was placed at this meridian to suit a right-handed surgeon operating from the top of the operating table. The importance of complication-free surgery and in-the-bag placement of the implant outweighed the limited amount of astigmatism that could be corrected by operating on axis. The incision was enlarged to 3.5 mm and a foldable toric intraocular lens was inserted and placed in the bag with the axis of the cylinder carefully aligned to the 170 meridian. A single 10/0 nylon suture was placed in the corneal section that was removed 2 weeks later. No complications were encountered pre- or postoperatively. Postoperative refraction, 5 weeks after surgery and 3 weeks after the removal of the corneal suture, revealed reduction of her astigmatism: she achieved 6/7.5 vision with correction of $-1.50/+3.00\times10$. Her optician later found and prescribed $-0.75/+1.25\times20$.

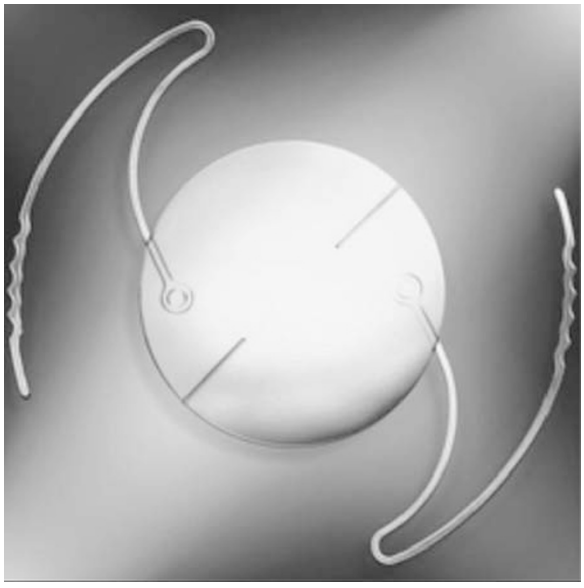

Figure 2 The toric intraocular lens showing the marked axis and the *Z*-shaped haptic.

Comment

The reduction of astigmatism achieved by a toric intraocular lens gives a best-corrected (spectacle) visual acuity (BCVA) of 6/7.5. The risks to the eye of combating astigmatism in this manner are no greater than for cataract surgery in any eye that has undergone corneal transplantation.

There are theoretical concerns regarding endothelial cell population damage, graft failure, and rejection in cataract surgery following PKP. A recent paper by Nagra *et al*[1] reviewed 29 eyes of 24 patients that underwent cataract surgery after PKP. Twenty-three of these eyes underwent phacoemulsification. They encountered one instance of graft failure (3%) in an eye that had three previous episodes of endothelial rejection. The degree of postoperative endothelial cell loss was not commented upon, but preoperative cell counts varied from 576 to 3344 cells/mm^2 with no apparent predictive effect on graft clarity or survival (all the eyes that had cell counts measured preoperatively did well).

There is also the theoretical risk that the implant can rotate and the angle of the corrective cylinder can change as a result-leading to ametropia. The serrated *Z* design haptic of the intraocular lens is designed to prevent this (Figure 2). Placement of the intraocular lens in the bag and subsequent fibrosis of the residual capsule should provide stability. There is always a risk of posterior capsular rupture at cataract surgery but in the hands of an experienced surgeon this is minimal. This particular toric IOL is not designed for sulcus placement and this hypothetical problem has not been encountered in our practice. Toric intraocular lens placement in the sulcus is described for correction of astigmatism in keratoconus[2] and sulcus toric intraocular lenses are available from HumanOptics (Mannheim, Germany).

Toric intraocular lens implantation to correct astigmatism can be divided into the phakic and pseudophakic groups. The toric phakic intraocular lens European multicenter study[3] was published in 2003 and assessed the use of iris clip intraocular lenses to correct up to 7.25 D of astigmatism in 70 eyes. Six-month data were presented and longer term follow-up is required. The same iris fixed lenses have also been used to correct myopia with results similar or better to LASIK.[4] In the context of postkeratoplasty astigmatism, Nujits *et al*[5] used the same lens in 16 eyes of 16 patients to treat postgraft astigmatism of up to 10 D. The authors reviewed eight other series of postgraft astigmatism treated with LASIK (138 eyes) and concluded that their $91\pm21\%$ reduction of astigmatism is superior to that achieved by LASIK. Uncorrected visual acuity of 6/12 or better was achieved in 50% of patients who received a toric phakic IOL. Anterior chamber iris fixated lenses raise theoretical concerns about cystoid macula oedema, inflammation, glaucoma, and endothelial cell loss. In this series, endothelial cell loss was $15.2\pm7.6\%$ at 6 months which compares with a natural wastage of 7.8% in the first 3–5 years postkeratoplasty.[6]

Posterior chamber toric intraocular lens implantation has been reported in several large series. Sun *et al*[7] describe 130 cases and Till *et al*[8] describe a further 100 procedures. These series were both of nongrafted eyes and corrected up to 4.75 D of astigmatism. In the first series, the uncorrected visual acuity (UCVA) was 6/12 or better in 84% postoperatively compared with a mean preop UCVA of 6/30–6/36. In the second series, UCVA postoperatively was 6/12 or better in 66% with no mention of the proportion of patients with this level of vision preoperatively. With respect to post-PKP astigmatism and toric pcIOL implantation, there are a few case reports and no large series.

Tehrani *et al*[9] describe a capsular bag implanted 30 D toric lens combined with a sulcus fixated spherical lens to correct 22 D of PKP astigmatism. Buchwald and Lang[10] reported three patients who were implanted with a posterior chamber toric silicone IOL, correcting up to 10 D. Frohn *et al*[11] present one case with PKP astigmatism of 12 D corrected with a posterior chamber PMMA lens. Viestenz *et al*[12] describe implantation of 11 tPCIOLs, to correct an average of 7 D of PKP astigmatism.

LASIK is another modality used to correct post-PKP astigmatism. A recent series of 57 eyes that underwent corrective LASIK following PKP was reported by Hardten *et al*.[13] Preoperatively, BCVA of 6/12 or better was noted in 74%. One year postoperatively, 75% achieved this level of vision with correction and 38% unaided. Mean astigmatism reduced from 4.67 ± 2.18 to 1.94 ± 1.35 D. Nine per cent required retreatment and 16% developed epithelial ingrowth. The level of astigmatism in our patient was more than this and LASIK would have been unlikely to achieve the desired effect.

Posterior chamber implantation of a toric intraocular lens can provide a very good refractive outcome in the context of post-PKP astigmatism. The requisite surgical intervention is safe with few side effects and is unlikely to have any significant impact on graft rejection or survival.

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TFW McMullan, C Goldsmith and CD Illingworth

Department of Ophthalmology, Norfolk and Norwich University Hospital, Colney Lane, Norwich, Norfolk NR4 7UY, UK

Correspondence: CD Illingworth or T McMullan,
Tel: +44 603 288375;
Fax: +44 603 288261.
E-mails: christopher.illingworth@nnuh.nhs.uk or tristanmcmullan@hotmail.com

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Sir,

Inadvertent injection of triamcinolone into the crystalline lens

Intravitreal corticosteroid injection has rapidly acquired popularity as a treatment for intractable macular oedema.[1–2] Several complications have been observed such as cataract progression, raised intraocular pressure,