

## KERATOCONUS

# Late onset post-keratoplasty astigmatism in patients with keratoconus

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## Achieving the best visual results requires optometric support

A successful corneal graft requires both clarity and an acceptable refraction. A clear corneal graft may be an optical failure if high astigmatism limits visual acuity. Early postoperative astigmatism following penetrating keratoplasty (PK) may occur more frequently in keratoconus than other conditions, although all corneal grafts are beset by this problem. This may occur despite meticulous surgical technique; optimising graft centration, tissue distribution, and suture placement. A myriad of different suture adjustment regimens have been described for minimising early postoperative astigmatism. If significant astigmatism remains, which cannot be corrected by optical means, then further surgical procedures may be utilised to reduce the astigmatism. Relaxing incisions, arcuate keratotomies, and transverse keratotomies are flattening procedures that may be performed in the steep meridian. Compression sutures and wedge resection are steepening procedures that may be performed in the flat meridian.<sup>1</sup> The use of laser ablation procedures (PARK or LASIK) has also been described.<sup>2</sup> It may occasionally be necessary to perform a repeat PK because of untreatable astigmatism.

There are few data in the literature on the long term stability of the refraction following PK for keratoconus. The majority of studies reporting on refractive outcomes following PK give results at 18 months to 4 years of postoperative follow up.<sup>3,4</sup> Long term data on outcomes of PK for keratoconus tend to concentrate on survival rather than recording refractive outcomes.<sup>5</sup> In the absence of published studies, our clinical experience suggests that there con-

tinues to be a slow long term drift in the axis and magnitude of astigmatism if patients are followed for 10–15 years following PK. The work presented in this month's issue of the *BJO* (p 371) by Lim *et al* on late onset post-keratoplasty astigmatism in patients with keratoconus identifies a subgroup of patients who developed excessive astigmatism years after successful surgery. They highlight an interesting mechanism for the induction of significant astigmatism; the continued progression of the pathological process of keratoconus in the host cornea leading to peripheral corneal thinning. This observation is important for two reasons. Firstly it allows the selection of an appropriate treatment to reduce the astigmatism. They employed compression sutures at the graft-host interface in the area of peripheral thinning, rather than use incision or ablation procedures in an ectatic cornea to flatten the steep meridian. In general, refractive treatments are confined to the donor button or interface since this maintains the strength and integrity of the host cornea, which may later require regrafting for unrelated reasons. However, in this situation thinning of the host cornea is the cause of the increased astigmatism and so a "strengthening" procedure in this area is a logical choice.

Secondly, it demonstrates one of the limitations of penetrating keratoplasty as a treatment for keratoconus where the entire cornea has a tendency to ectasia. The fact that the entire corneal stroma is not replaced allows the pathological process to continue in the remaining host cornea leading to late onset astigmatism. However, it has been shown that performing PKs larger than

8.5 mm increases the likelihood of graft rejection. Recently, with the development of a novel dissection technique, interest in deep anterior lamellar keratoplasty (DALK) as a treatment for keratoconus has been renewed.<sup>6</sup> If comparable visual outcomes can be achieved with DALK then this technique may allow larger corneal grafts to be performed since the procedure carries, at least theoretically, a much lower risk of rejection than PK. It may even be possible to transplant the entire corneal stroma and epithelium. This would avoid host thinning and allow long term refractive stability.

It has often been said that corneal grafts are easy to do, but difficult to look after. The work by Lim *et al* provides further evidence for this assertion. The majority of patients need lifelong follow up after penetrating keratoplasty. They need to be warned to expect that changes in their refraction could occur possibly many years after surgery. Achieving the best visual results for these patients requires optometric support with contact lens fitting services and topographical analysis. Early and late adjustment of the graft may be required to achieve an optically successful graft shape.

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