

**Figure 1** Anterior segment photographs comparing both eyes with deep lamellar keratoplasty, the left eye (B) shows marked apical thinning with subepithelial scarring and nuclear sclerotic cataract in the right eye (A).

(DLK) is gaining popularity as an alternative option for the surgical management of keratoconus.<sup>4</sup> It has obvious advantages in that endothelial rejection is rare and it is essentially an extraocular procedure.<sup>5</sup>

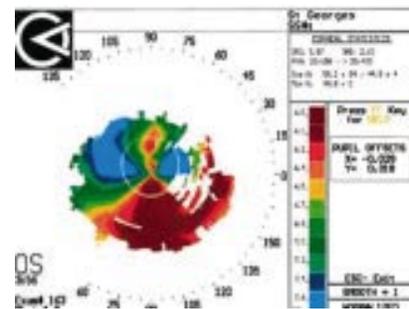
Recurrent keratoconus following penetrating keratoplasty is rare but has been described.<sup>6,7</sup> We report on the first case of recurrent ectasia following deep lamellar keratoplasty supported by clinical and histological evidence.

#### Case report

A 38 year old chronic schizophrenic male was referred to the anterior segment clinic with advanced bilateral keratoconus. He had previously been treated with hard contact lenses. His condition had deteriorated over the years and he was now keen on surgical intervention. On examination, visual acuity was counting fingers in both eyes with no improvement with pinhole. Anterior segment examination revealed bilateral advanced cones with subepithelial scarring. Fundal examination was unremarkable.

The patient underwent uneventful right lamellar keratoplasty with lyophilised corneal tissue under general anaesthetic. The left eye had the same procedure with intraoperative Botox injection to the upper lid 1 year later. Again, the procedure was uneventful but postoperatively, he developed a persistent central epithelial defect which later became infected. There was no improvement in the patient's condition despite intensive antibiotics and steroids and the patient underwent an emergency left lamellar keratoplasty 1 month later. Twelve months postoperatively, corrected VA had improved to 6/60 right eye and 6/18 left eye. Topographical data and refraction were not done at this time and he was noted to have bilateral lens opacities.

Three years later the patient was reviewed with decreased vision in both eyes. On examination, unocular visual acuity was counting fingers and hand movements in the right and



**Figure 2** Corneal topography of the left eye showing inferior steepening of the vertical meridian following deep lamellar keratoplasty consistent with recurrence of ectasia.

left eye, respectively. Anterior segment examination revealed bilateral central subepithelial corneal opacities more pronounced in the left eye with severe apical thinning (Fig 1). He had bilateral nuclear cataracts more marked in the right eye. Corneal topography demonstrated marked inferior steepening in the left eye consistent with keratoconus (Fig 2). A repeat DLK was performed on the left eye and histology from the second grafted corneal button showed degenerative thinning consistent with ectasia. The original host tissue in comparison revealed breaks in Bowman's membrane which is typical of keratoconus (Fig 3). At his last clinic visit 1 month later, having undergone bilateral cataract extraction and IOL implantation in the preceding year, his visual acuity was 6/9–2 right eye with +3.25/–8.00×140 correction and 6/9 left eye with +4.00/–4.50×180.

#### Comment

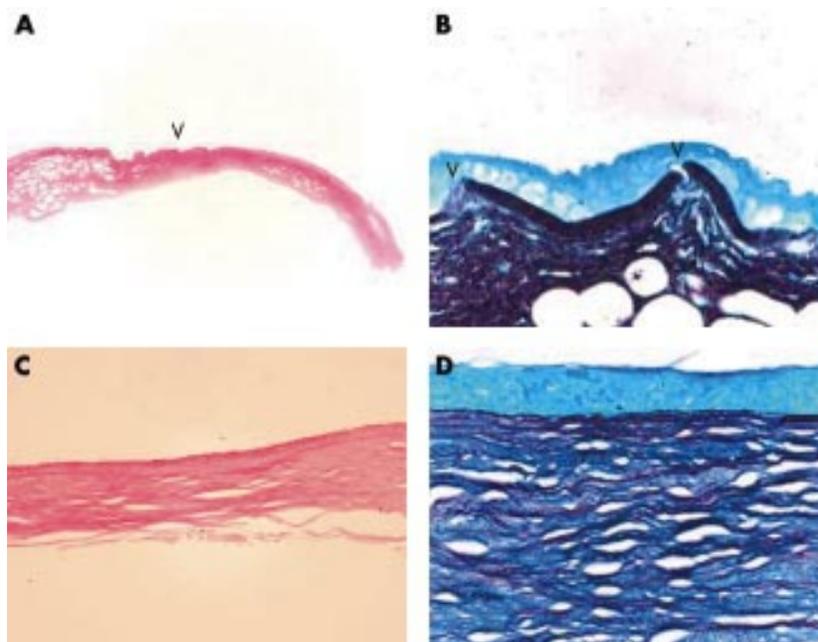
Lamellar keratoplasty (LK) has been an established procedure for corneal pathology for over a 100 years. Advances in surgical techniques such as deep lamellar anterior keratoplasty have expanded the application of lamellar surgery and have achieved visual results approaching those of penetrating keratoplasty while reducing the rate of rejection and improving the long term graft stability.<sup>4</sup> The procedure can be defined as the excision of superficial stromal layers. A number of techniques have been used for dissection of the stroma such as air, viscoelastic, and fluid injection.<sup>9–12</sup> The entire stroma can be completely excised so that only Descemet's membrane and endothelial cells remain.

Studies have shown that in deep lamellar keratoplasty, endothelial rejection reaction is rare with cell counts being maintained for a longer period.<sup>5</sup> This confers obvious advantages over penetrating keratoplasty in the treatment of keratoconus. However, it is still a relatively new procedure and is technically more challenging.

There have been a few cases in the literature of recurrent keratoconus following penetrating keratoplasty successfully treated with regrafting.<sup>6,7</sup> In all these cases, the pathogenesis of this complication was unclear. In our patient, ectasia recurred in the left eye 3 years after deep lamellar keratoplasty and this was confirmed both clinically and histologically. Donor factors include the possibility of ectatic disease which may have been missed or remained subclinical throughout the donor's life. New screening methods utilising the Orbscan are being explored looking at the topography of donor corneas that could

### Corneal ectasia following deep lamellar keratoplasty

Keratoconus is a bilateral non-inflammatory corneal ectasia with an incidence of approximately one per 2000 in the general population.<sup>1</sup> Contact lenses are the most common treatment. When contact lenses fail, a surgical approach is necessary for visual rehabilitation. Penetrating keratoplasty has been the traditional and most common mode of treatment and has excellent results.<sup>2,3</sup> However, more recently, deep lamellar keratoplasty



**Figure 3** Histopathology slides of the original host keratoconic cornea showing apical thinning and subepithelial scarring in the low magnification (A) High magnification with Jones stain shows disruption of Bowman's membrane (B). In comparison, the deep lamellar keratoplasty corneal button shows apical thinning (C) but no disruption of Bowman's membrane (D). Low power (haematoxylin and eosin stain) high power (Jones stain).

prevent potential problems with using ectatic corneas if routinely employed.<sup>13</sup>

Another consideration is that the cryolathed corneal lenticule used at the time of repeat surgery may have been inherently thin as the procedure was done as an emergency. Adequate preparation of the donor tissue is therefore necessary before surgery. The inflammatory pathways activated following the first DLK failure due to infection, in particular the metalloproteinase system (gelatinolytic activity of stromal collagenase (matrix metalloproteinase-1 (MMP-1)), may play an important part through thinning of the stromal tissue.<sup>14</sup>

These lenticules are devoid of keratocytes; invasion of the graft by host keratocytes, which may be metabolically prone to producing abnormal corneal architecture, may contribute to ectasia.

In summary, we have reported the first case of recurrent ectasia in a relatively new treatment option—deep lamellar keratoplasty for keratoconus. Protection of the lamellar graft from infection and inflammation is important in order to obtain the best visual potential. Preoperative and postoperative data such as refraction, topography, and pachymetry are vital in monitoring progression of these patients. As lamellar surgery becomes increasingly popular it is important to recognise such late complications which may require further surgical intervention in the future.

**N Patel**

Retinal Research Unit, Department of Ophthalmology, Kings College Hospital, East Dulwich Grove, Dulwich, London SE22 8PT, UK

**A Mearza, C K Rostron**

Department of Ophthalmology, St George's Hospital and School of Medicine, University of London, Blackshaw Road, Tooting, London SW17 0QT, UK

**J Chow**

Department of Histopathology, St George's Hospital and School of Medicine, University of London, Blackshaw Road, Tooting, London SW17 0QT, UK

Correspondence to: N Patel; drnish1975@yahoo.com

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