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Case report

Ipsilateral rotational autokeratoplasty for central corneal scar: An alternative to penetrating keratoplasty

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ABSTRACT

A 49-year-old woman was referred to our clinic for penetrating keratoplasty. A central corneal scar involving the visual axis with high irregular astigmatism up to 15.8 D was noted. Because the scar was located mostly in the central cornea, ipsilateral rotational autokeratoplasty was suggested and performed. An 8.5-mm punch was used to trephine the cornea eccentrically and superiorly intentionally. The trephined corneal button was then rotated 150° to relocate the scar to the temporal upper part of the cornea. The graft was soon clear with a normal curvature centrally. The astigmatism was −0.5 D, the visual acuity was 20/40, and the endothelial cell loss was 2.66% 2 years after the operation. A rotational autograft carries no risk of immunological complications such as rejection associated with allografts and has lower endothelial cell loss rate. It can be an effective alternative to standard penetrating keratoplasty for some patients with central corneal scars.

1. Introduction

Central corneal opacities, such as scars following penetrating corneal injuries, cause significant visual impairment. The usual treatment is penetrating keratoplasty (PK) using donor corneal tissue. However, endothelial rejection rates of 15–20% are common, and are even higher in vascularized corneas.[1] Late corneal failure might be anticipated owing to the continued loss of donor corneal endothelial cells with time.[2] In addition, there might be a long waiting time because of the scarcity of donor material. Ipsilateral rotational autokeratoplasty (IRA) has been reported as an alternative to PK in those who have a nonprogressive central corneal opacity and a clear cornea in one side.[3,4] The procedure involves an eccentric trephination of the cornea, rotating the opacity out of the visual axis and the clear peripheral cornea to the center. We report a case receiving IRA for traumatic corneal scar.

2. Case presentation

A 49-year-old female patient visited our clinic with the chief complaint of visual loss in the left eye due to a stab injury 1 year earlier. She underwent suture repairs to the corneal laceration, extraction of the traumatic cataract, and implantation of the intraocular lens. Unfortunately, her blurred vision persisted, and she was referred to our clinic. On examination, the corrected visual acuity was counting finger at 30 cm. A central corneal scar involving the visual axis and a residual clear cornea measuring ~4 mm in diameter on the temporal upper side of the scar were noted (Figure 1A and B). The topography showed irregular astigmatism of up to 15.8 D at 3 mm zone diameter, and 20.6 D at 4.5 mm zone diameter (Figure 2A). The specular microscopy revealed an endothelium cell count of 1690 cell/mm^2. After digital simulation (Figure 3), IRA was suggested and performed. An 8.5-mm punch was used to trephine the cornea eccentrically and superiorly intentionally. The trephined corneal button was then rotated 150° to relocate the scar to the temporal upper part

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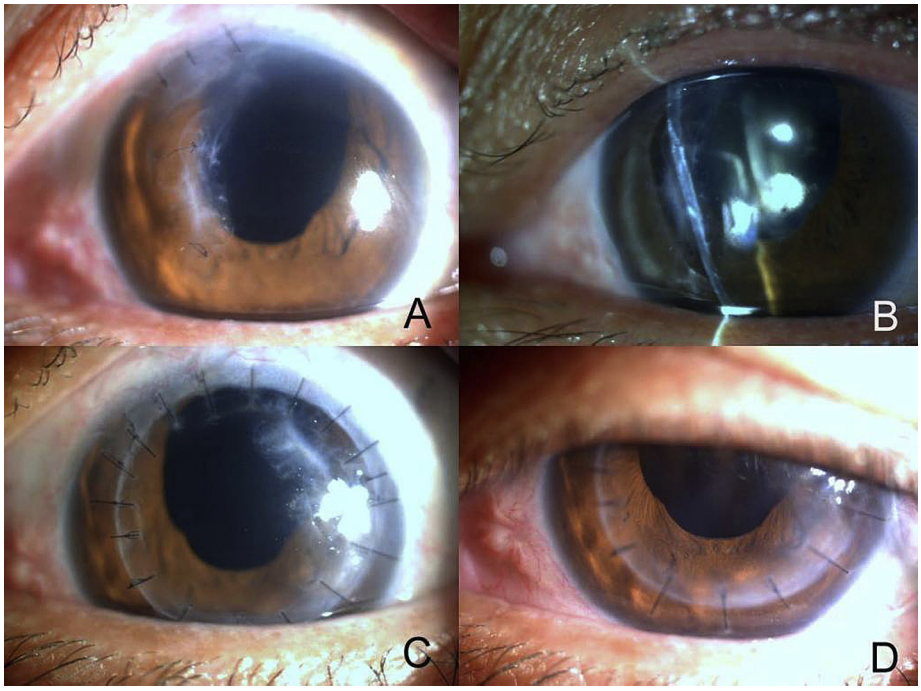

Figure 1. (A) A central corneal scar involving the visual axis of left eye is noted. (B) Slit lamp examination shows an extreme flat curvature of the scar area. (C) The central cornea is clear with a normal curvature 1 month after ipsilateral rotational autokeratoplasty. The trephination is 8.5 mm and decentered superiorly and temporally to relocate the scar out of visual axis. (D) The scar is covered by the upper eyelid in a nature position.

of the cornea. The graft was soon clear with a normal curvature centrally (Figure 1C and D). The corneal topography showed astigmatism of 2.9 D at 3 mm zone diameter, and 6.3 D at 4.5 mm zone diameter 1 month postoperatively (Figure 2B). Corneal stitches were removed gradually to adjust the astigmatism. The astigmatism was reduced to 2.0 D at 3 mm zone diameter and 3.4 D at 4.5 mm zone diameter 6 months postoperatively (Figure 2C). After 2 years of follow-up, the autorefraction showed a cylinder of −0.5 D, and the corneal topography demonstrated that the astigmatism improved to 1.4 D at 3 mm zone diameter and 2.1 D at 4.5 mm zone diameter (Figure 2D). The visual acuity was 20/40. The endothelium cell count was 1645 cell/mm,[2] which was a 2.66% loss compared with the preoperative number.

3. Discussion

In some situations, IRA has advantages over PK. First, there is no risk of immunological rejection of the graft, which is an important concern especially in pediatric patients. Second, IRA does not require postoperative corticosteroids (unlike PK) and therefore avoids the complications related to long-term steroid use such as cataract formation and increased intraocular pressure. And last but not least, IRA does not require donor cornea and can be performed quickly.

Patient selection is a major limitation of IRA. The corneal opacity should be nonprogressive, and there should be at least 4 mm or 5 mm of clear cornea in the periphery.[3,5] Rotating the opacity under the upper lid to optimize the cosmetic result was also recommended.[5] Bourne and Brubaker[3] introduced a simple geometric method for determining the maximum area of clear postoperative central cornea and the trephine size, whereas others suggested using digital image manipulation software.[6,7] In this case, not only the digital corneal photograph, but also the corneal topographic image, was “trephined” and “rotated” using the tools in Adobe Photoshop. Our plan was to rotate the scar out of the central area on the digital corneal photograph, and also to rotate the temporal upper normal curvature (orange color) area to the central zone. The final result is good, and we believe that the digital image simulation helped significantly in the preoperative planning. Regardless of the method used, the graft size, location, degree of rotation, clear cornea centralization, and scar location should be well planned to obtain good results.

Jonas et al[8] found significantly higher astigmatism in the autograft group than in the PK group. However, other case series have reported astigmatism levels in the same order as those for PK.[5,9,10] The potential causes of the astigmatism include the eccentric trephination, disparity of corneal thickness between the peripheral clear cornea and the central scarred cornea into which it is sutured, and the proximity of one edge of the trephination to the corneal pupillary zone.[8] Our patient had a cylinder of −0.5 D and a visual acuity of 20/40. This was a great improvement compared with the preoperative status.

Chronic endothelial cell loss after PK is still an important unsolved problem. Bertelmann et al[10] showed an endothelial cell loss of 15% in rotational autografts compared with 40% in homografts at 1 year. In this case, the endothelial cell loss was 2.66% at 2 years. Despite the lower endothelial cell loss rate, preoperative evaluation should include specular microscopic studies to assess the endothelial status, as IRA may fail when endothelial cell counts are <1000 mm^2.[11]

IRA is a good option considering the shortage of donor cornea. With proper selection and thorough planning, IRA might be a better alternative to standard PK.