Comparative Evaluation of Big-Bubble Deep Anterior Lamellar Keratoplasty and Penetrating Keratoplasty in a Case of Macular Corneal Dystrophy

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Purpose: A case of a 54-year-old patient with macular corneal dystrophy who underwent a penetrating keratoplasty (PK) in the left eye and a deep anterior lamellar keratoplasty (DALK) in the right eye is described. The merits of PK versus DALK for visual rehabilitation in macular corneal dystrophy are discussed.

Methods: After deep lamellar dissection in the left eye, the remaining bed of residual stroma, Descemet membrane, and endothelium was unacceptably hazy and thus converted to PK. The right eye had successful DALK because a relatively clear bed was noted after deep lamellar separation using the big-bubble technique.

Results: The spectacle-corrected visual acuities at 2-year follow-up are 6/6 OD and 6/9+ OS. There is mild residual haze in the right eye, although the visual acuity is better in this eye. Endothelial cell counts were satisfactory and not significantly different in both eyes.

Conclusions: This case demonstrates that DALK with the big-bubble technique can be successfully carried out for visual rehabilitation in macular dystrophy. DALK should be considered in cases with no significant Descemet membrane and endothelial involvement because of the potential advantages offered by retaining the host endothelium.

Key Words: deep anterior lamellar keratoplasty, macular dystrophy, penetrating keratoplasty

(*Cornea* 2009;28:583–585)

Penetrating keratoplasty (PK) is commonly performed for visual rehabilitation in cases of corneal opacity including macular corneal dystrophy. Traditional teaching guides us against lamellar keratoplasty for macular dystrophy because of involvement of deep stroma/Descemet membrane and concern about endothelial health.

This case describes a patient with macular corneal dystrophy who underwent PK in his left eye and deep anterior lamellar keratoplasty (DALK) with the big-bubble technique in the right eye. The postoperative best-corrected visual acuities (BCVAs), graft clarity, and endothelial cell counts are compared.

Received for publication April 26, 2008; revision received August 15, 2008; accepted August 25, 2008.

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CASE REPORT

A 54-year-old man was referred with increasing glare and reduced vision affecting both eyes. BCVAs at presentation were 6/12 OU.

Bilateral multiple gray-white stromal opacities extending into the deep stroma, consistent with macular dystrophy, were present throughout the cornea. Keratoplasty was offered because driving was essential for his occupation.

He underwent deep lamellar dissection using the Melles technique in the left eye.[1] The residual bed was found to be significantly hazy largely because of Descemet membrane involvement. Thus, the operation was converted to PK, and an 8.0-mm donor button was secured onto the 7.75-mm host rim with continuous 10.0 nylon sutures. The corneal sutures were adjusted 4 months postoperatively with a resulting improvement in visual acuity to 6/9 OS.

The big-bubble technique was used to perform lamellar separation in the right eye.[2] The resulting lamellar bed was noted to be relatively clear. The Descemet membrane was stripped off the donor corneal button and an 8.0-mm lenticule trephined. This was secured over a 7.75-mm recipient bed with continuous 10.0 nylon sutures. Suture adjustment was carried out 2 months postoperatively with a resulting improvement in visual acuity to 6/6 OD.

In both cases, full-thickness donor corneal tissues stored in Eagle's minimal essential medium were used for transplantation. Topical steroids (dexamethasone 0.1% 4 times a day) and antibiotics (chloramphenicol 4 times a day) were prescribed after surgery to either eye. The topical antibiotic was stopped 2 weeks postoperatively after epithelial healing. The topical steroid was tapered and reduced postoperatively to once daily in the right (DALK) and left (PK) eyes at 3 and 12 months, respectively.

The endothelial cell counts in both eyes remained comparable at 1917 cells per square millimeter (17 months postoperatively) in the right eye and 1794 cells per square millimeter (25 months postoperatively) in the left eye.

The residual haze and peripheral Descemet membrane folds in the right (DALK) eye (Fig. 1) were not visually significant. The left corneal graft was clear at final follow-up (Fig. 2). BCVAs at 23 and 31 months postoperatively were recorded at 6/6 OD (refraction: +0.50/−1.50 × 095) and 6/9 OS (refraction: +3.50/−3.00 × 003), respectively. Somewhat surprisingly, subjective visual clarity was reported to be better in the right eye.

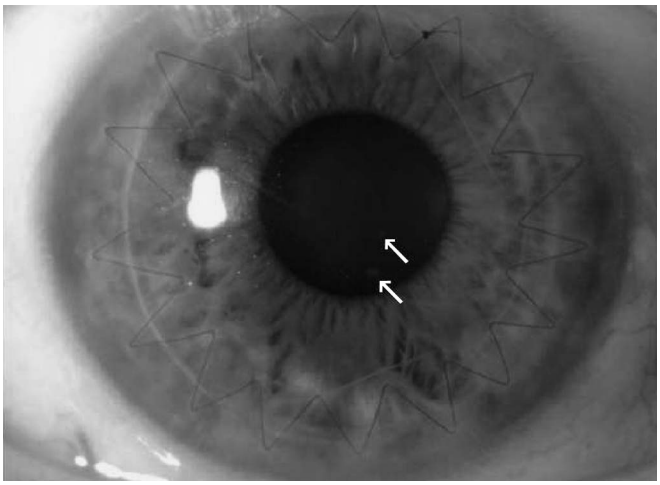

FIGURE 1. Right eye (DALK) showing peripheral DM folds and minimal residual opacities (arrows). DM, Descemet membrane.

DISCUSSION

Successful DALKs for corneal dystrophies have been reported previously.[3–6] In our case, a clear stromal bed allowed a DALK to be performed in the right eye. This was precluded in the left eye because of poor clarity of the residual bed. Dissection in the left eye was carried out using Melles technique.[1] This technique relies on relative clarity of the cornea to allow view of the endothelium/air reflex for judgment of dissection depth. Residual stroma is more likely with this technique if the pre-Descemet plane is not found at the start of dissection. Failure to achieve acceptable bed clarity in the left eye led to the use of the big-bubble technique for the right eye. This resulted in true separation of stroma from Descemet membrane, ensuring best possible bed clarity.

Comparison of DALK and PK for various corneal opacities has shown faster recovery of BCVA in the PK group, but there was no difference in final visual and contrast acuities.[3] In the same study, the PK group was shown to have decreased endothelial density over 2 years compared with the DALK group. This would clearly have implications for long-term graft survival. Specific comparison of DALK and PK for macular and lattice dystrophies showed progressive loss of endothelial density in macular dystrophy group who underwent DALK when compared with the lattice DALK group. This is likely to be attributable to the natural progression of disease. This study also reported no difference in visual acuities between the 2 groups.[4] However, Borderie et al[7] reported a higher proportion of the lamellar keratoplasty group achieving visual acuities of 20/40 or better compared with the PK group (53% vs 44%) at 1 year. In the reported case, BCVA and subjectively perceived vision were better in the right (DALK) eye compared with the left (PK) eye. This may reflect the higher astigmatism in the PK eye. No significant difference, however, in astigmatic outcome between DALK and PK has been reported.[3,7]

In a large retrospective case series reporting 229 PKs carried out for macular dystrophy, endothelial rejection episodes occurred in 20% of eyes, resulting in irreversible endothelial failure in 3.5% of eyes. The endothelial rejection accounted for nearly 35% of the failed corneal transplants in this series. Poor graft survival was also reported in patients older than 40 years as a result of increased rejection, infection, and recurrence of dystrophy. No cause for the age effect was evident, however.[7]

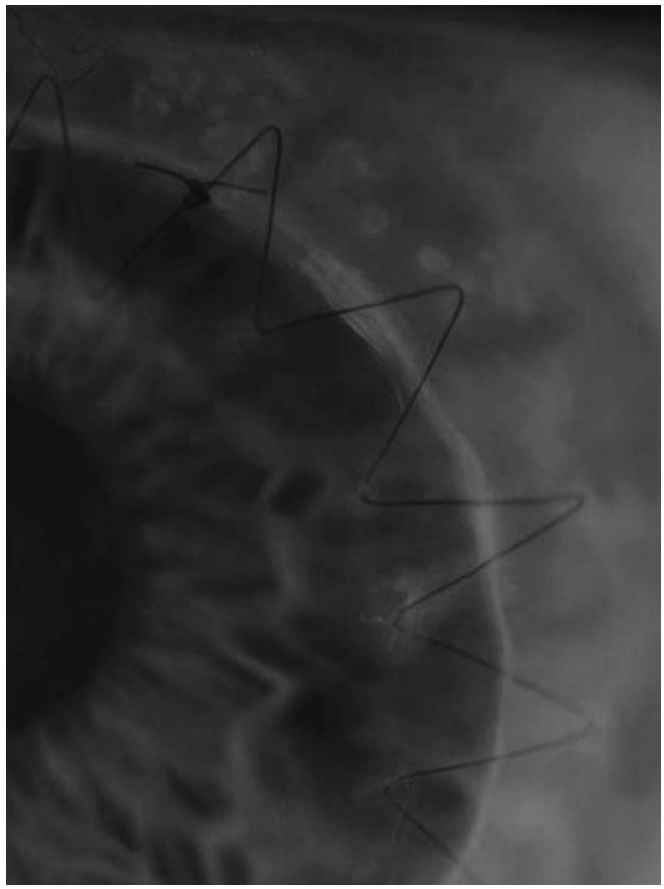

FIGURE 2. Left eye (PK) showing clear graft with visible iris details centrally compared with host rim opacities obscuring the peripheral iris.

Stromal dystrophies are known to recur within the donor material after corneal transplantation and therefore may require multiple grafts. The recurrence of macular dystrophy in patients who have undergone PK has been reported to be up to 25% in an average follow-up period of 7–22 years.[8–10] Although no comparable figures for DALK exist, it is envisaged that recurrence of stromal disease is comparatively easier to manage with lamellar regrafting.

This case report demonstrates that DALK is a viable alternative to PK in the surgical management of macular dystrophy when the residual bed with Descemet membrane and endothelium is healthy. DALK, like all new surgical techniques, presents the surgeon with a learning curve and unfamiliar complications such as Descemet membrane rupture and double-chamber formation.[11] However, given the more serious complications associated with "open-sky" surgery and the added advantages of lower rejection and graft failure

rates, comparable visual acuities, ease of regrafting, low endothelial loss rates, and reduction in steroid therapy, DALK should perhaps be considered as the first choice of treatment.

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