Double anterior chamber following deep anterior lamellar keratoplasty with endothelium-on donor tissue

Deep anterior lamellar keratoplasty (DALK) is a well-established technique for corneal transplantation because of its lower risk of postoperative graft rejection than penetrating keratoplasty. One possible complication of DALK is the formation of a double anterior chamber (AC). During surgery, a microperforation of the Descemet’s membrane (DM) may create a channel that allows aqueous fluid to enter the host–donor interface, forming a pseudo–anterior chamber. Double ACs are typically observed in the immediate postoperative period. Management may include the injection of intracameral air or isoexpansible gas into the AC to tamponade the detached DM. There also have been reports in the literature of resolution through spontaneous DM reattachment. Early surgical management of a double AC may help prevent poor visual outcomes from wrinkling, fibrosis, and shrinkage of DM, although prospective and comparative studies are lacking. This case demonstrates the potential impact of delayed treatment of double AC following DALK.

A 23-year-old Tongan male presented with deteriorating vision for 6 months, with a best-corrected visual acuity of 6/45 in the right eye. The diagnosis of bilateral keratoconus was confirmed using topography (Fig. 1). DALK with intact donor DM and endothelium was performed on his right eye. An 8.0 mm diameter trephination of the recipient cornea to a depth of 300 mm was performed. A 27-gauge needle was inserted into the deep corneal stroma to form a type 1 bubble. The stroma was then incised under viscoelastic conditions. During removal of the residual stroma, there was a microperforation in the DM at the 12 o’clock position, which was managed by injecting air into the AC to prevent leakage while the 8.25 mm donor cornea tissue was secured with 16 interrupted 10-0 nylon sutures. The DM remained intact and well opposed to the donor cornea with a 60% air fill at the conclusion of the surgery and supine positioning over the following 48 hours.

Following surgery, the patient was started on 2-hourly topical prednisolone (1%). Two weeks after surgery, the uncorrected visual acuity improved to 6/9−2, and the graft was clear with no air remaining in the AC and no interface fluid. The patient failed to attend the next follow-up appointment but attended 2 weeks later. Six weeks after surgery, a small pocket of subendothelial fluid was visible. Visual acuity of 6/24 unaided with correction to 6/12 was noted at that visit.

The patient failed to attend a subsequent follow-up appointment and discontinued prednisolone 1% because his supply was exhausted. He attended follow-up at 4 months and despite a thin, clear graft, his visual acuity had deteriorated to 6/60+1 unaided with correction to 6/24. At that time, a double AC was clearly visible on slit-lamp examination. Prednisolone 1% was recommenced, but the patient failed to attend further appointments over the next 3 months before finally presenting 9 months postoperatively. AC optical coherence tomography revealed a well-established double AC with a host–graft junction forming a tight, membranous structure (Fig. 2). The double AC was surgically revised by excision of the host endothelium and DM remnants using micro-MST scissors.

The patient failed to attend 3 further appointments following the revision procedure and discontinued prednisolone 1% after 3 months when his supply was once again exhausted. The patient re-presented 6 months after revision surgery with mild peripheral corneal edema and visual acuity of 6/21−1 unaided with correction to 6/18+2. There was no evidence of graft rejection at that time, and prednisolone 1% was recommenced 4 times a day.

Two months later, the patient presented with a 10-day history of red, painful right eye with reduced vision. Several broken sutures and graft edema were noted on examination, with a diagnosis of graft rejection. The patient declined admission to the hospital or intravenous methylprednisolone and self-discharged with topical prednisolone alone. Two weeks later, the redness subsided, and the right corrected visual acuity improved to 6/12.

This case report describes the rare complication of double AC formation following preserved donor endothelium DALK and highlights the importance of prompt treatment and regular attendance at postoperative follow-up appointments. It is likely that the DM microperforation failed to seal despite compression and contributed to double AC formation. Delayed formation of the double AC at 1 month is atypical, with most double ACs forming immediately following surgery. The presence of donor endothelium also may have contributed to the double AC formation by pumping aqueous solution into the DM interface. Removing the donor DM and endothelium during DALK reduces interface opacity and eliminates the risk of endothelial rejection but may cause some donor tissue irregularity. Interestingly, a previous study involving 59 DALKs noted...
Fig. 1—OCULUS Pentacam corneal tomography of the right eye prior to initial deep anterior lamellar keratoplasty demonstrating a 7 D cylinder at 14.3 degrees (A) and 9 months after double anterior revision demonstrating a 6.3 D cylinder at 103.2 degrees (B).
no difference in visual outcomes or complications between Decemet’s-on and Decemet’s-off DALK for keratoconus.8

Delayed treatment of the double AC because of multiple missed appointments is an important factor in this case. This delay allowed for the formation of a well-established double AC with a rigid membrane-like structure, dividing the AC.

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