FUCHS’ DYSTROPHY
Posterior lamellar keratoplasty techniques share disadvantages of longer learning curve
by Soosan Jacob MD

Descemet’s membrane endothelial keratoplasty (DMEK) combined with cataract extraction is a useful option for treating patients with Fuchs’ corneal dystrophy that avoids some of the disadvantages of other approaches.

These patients have traditionally undergone a triple procedure with cataract extraction and penetrating keratoplasty (PKP). However, PKP is known to have disadvantages such as surface and suture related problems as well as neurotrophic problems. It also has the disadvantage of having a full thickness 360-degree avascular wound that takes at least one year to heal. It has the greatest risk of traumatic wound rupture. Despite often having a clear graft, functional vision might still be compromised because of unpredictable refractive errors and astigmatism.

Recent advances in posterior lamellar corneal transplantation have been especially advantageous to patients with early corneal decompensation either secondary to Fuchs’ or secondary to aphakic or pseudophakic bullous keratopathy.

In the absence of stromal scarring, these patients can undergo a lamellar keratoplasty technique. This closed system surgery decreases the risk of expulsive haemorrhage. Postoperatively, the refraction and visual rehabilitation for the patient are much faster and there is no irregular astigmatism. The innervation of the cornea is maintained and there are no surface or suture related complications. As the endothelial cells are only exposed to the anterior chamber (AC), there is less chance of graft rejection.

All posterior lamellar keratoplasty techniques share the disadvantages of a longer learning curve and greater endothelial cell loss during surgery secondary to graft handling. This can result in a greater incidence of primary graft failure.

In Descemet’s Stripping Automated Endothelial Keratoplasty (DSAEK), endothelium with a thin stromal carrier is used as the graft. The overall pachymetry is increased and the grafted endothelium has to function well enough to keep the patient’s own stroma as well as the carrier stroma in the non-oedematous state. It can also lead to a hyperopic shift in refraction postoperatively. DSAEK requires specific instrumentation for graft preparation, though pre-cut tissue is available from some eye banks.

DMEK does not have these disadvantages. It has the advantages of not requiring any special instrumentation for graft preparation thus allowing more widespread acceptance and usage. However, the Descemet’s membrane is more difficult to handle, as it is devoid of any stromal carrier. It also has been found to have a higher rate of graft dislocation as compared to DSAEK and a higher incidence of re-bubbling.

The DMEK graft is prepared from a high quality donor cornea. This is done by partially trephining the graft and then using the Sinskey hook to lift up the edge of the cut Descemet’s membrane. Once an adequate edge is lifted, a non-toothed forceps is used to gently grab the Descemet’s membrane at its very edge. The Descemet’s membrane is then separated from the underlying stroma in a capsulorhexis-like circumferential manner (Figure 1). It is stained with trypan blue and replaced in the sterile corneal storage medium while the recipient eye is prepared.

Phacoemulsification is carried out as usual. The corneal epithelium may be removed to aid visualisation. Cortex is removed and the IOL is implanted within the bag. All residual viscoelastic is removed and the IOL is implanted within the bag. All residual viscoelastic is removed and the IOL is implanted within the bag. All residual viscoelastic is removed and the IOL is implanted within the bag. All residual viscoelastic is removed and the IOL is implanted within the bag. All residual viscoelastic is removed and the IOL is implanted within the bag. All residual viscoelastic is removed and the IOL is implanted within the bag. All residual viscoelastic is removed and the IOL is implanted within the bag.

The cartridge of a Staar ICL injector is then filled with balanced salt solution while the recipient Descemet’s membrane is then stained with trypan blue. A blunt 8.5mm trephine is used to place a mark on the corneal surface and a reverse Sinskey hook is used to score and then strip the membrane (Figure 2C). The stripped membrane is inspected to verify that no tags are left behind. Corneal stab incisions may be made to milk out fluid from the interface at the end. These are put outside the pupillary zone but within the zone that would be covered by the graft.

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prevent sudden accidental extrusion of the graft. The cartridge tip is held occluded with a finger and the graft is gently placed into the saline in the cartridge in such a manner that one rolled edge lies superiorly (Figure 3A). The cartridge is fixed to the injector and gentle tapping of the finger occluding the cartridge allows the graft to slide forwards. The cartridge is then introduced through the clear corneal incision and the graft is gently introduced into the AC by plunging the soft tipped injector, taking care not to fold the graft (Figure 3B).

Wound-assisted implantation is avoided and the anterior chamber maintainer (ACM) flow is titrated carefully to prevent backflow and extrusion of the graft. The graft orientation is then checked. As the Descemet’s membrane has elastic properties, the edges of the graft always curve towards the side of the Descemet’s membrane. The ACM is turned off and can be removed at this stage or later. The graft is unfolded gently by tapping with a small air bubble (Figure 3C). Once unfolded, a larger air bubble is injected under the graft to float it up against the stroma. Proper unfurling and positioning of the graft is confirmed and if required adjusted. Any interface fluid is removed via the pre-placed stab incisions in the cornea. The anterior chamber is filled with an adequately large air bubble to allow the graft to adhere well (Figure 3D). The patient is made to lie face up for about an hour at the end of which, air is released just enough to avoid over-fill and pupillary block postoperatively.

Graft dislocation may occur postoperatively and the patient may require re-bubbling. Even though the rate of graft rejection is less in DSAEK and DMEK as compared to PKP, it can still occur and patients should be informed about the warning signs of rejection.

**Figure 3A:** The DMEK graft is loaded gently into the cartridge of a Staar ICL injector filled with balanced salt solution

**Figure 3B:** It is then injected into the anterior chamber (AC) in such a way that the edge is rolled anteriorly. The Descemet’s membrane now faces the corneal stroma and endothelium faces posteriorly towards the IOL

**Figure 3C:** A small air bubble injected into the AC above the graft is tapped so as to envelop the graft

**Figure 3D:** An air bubble is then injected under the graft to float it superiorly against the stroma. Graft positioning is verified and interface fluid is milked out through pre-placed stab incisions in the corneal stroma


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