

Graft Detachment After Descemet Membrane Endothelial Keratoplasty

Allowing partially detached grafts the chance to clear spontaneously is often best.

BY JACK S. PARKER, BA, AND GERRIT R. J. MELLES, MD, PhD

Recently, we described the isolated transplantation of Descemet membrane and its monolayer of attached endothelium in a procedure known as Descemet membrane endothelial keratoplasty (DMEK).^{1,2} The most common complication after DMEK is graft detachment.^{3,4} In our first series of 150 consecutive eyes after DMEK, 36 eyes (24%) experienced some degree of graft dislocation after surgery, but only half of these (12%) were clinically significant; that is, the graft dislocation either reduced the patient's final visual acuity or required surgical reintervention.⁵ Seemingly, some detachments are worse than others; recognizing which cases require secondary intervention and avoiding the most frequent causes are the two keys to the prevention and management of graft detachment after DMEK.

CAUSES OF DETACHMENT

In a normal DMEK surgery, an air bubble is used to move and position the donor membrane in the recipient anterior chamber, and to smoothly spread out the tissue, flat against the patient's posterior stroma. This "no-touch" technique has previously been described in detail.⁶ (A video of this technique is available at www.niios.com.) Completely unfolding the donor membrane is essential to a successful transplant. Otherwise, remnant folds, rolls, or wrinkles may interfere with the patient's final visual acuity or produce a graft detachment, because less of the graft material may directly contact the host posterior stroma.

The worst mistake is allowing the edges of the graft to fold "inward" or curl in a roll toward the patient's posterior stroma underneath the rest of the donor membrane. A good visual is to picture a coin, with one edge bent inward. These inward folds are particularly problematic because, after surgery, they tend to spring away from the posterior stroma, producing a progressively expanding graft detachment (Figure). In our experience, this is the

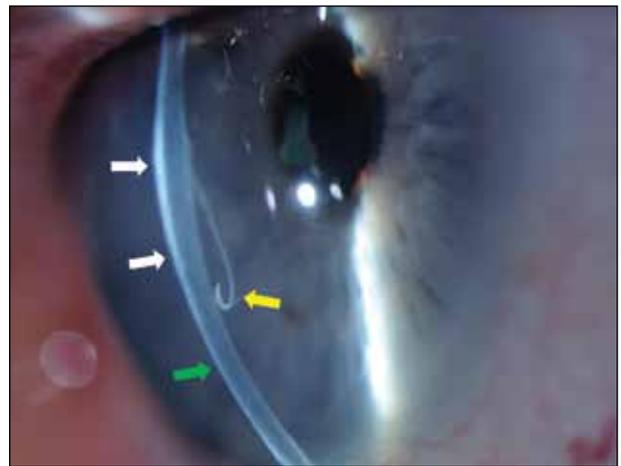


Figure. A cornea 3 months after DMEK. The edema (white arrows) overlying the area of detachment (yellow arrow) dissipates over time, and corneal clearance coincident with stromal thinning (green arrow) proceeds from the periphery toward the center. Note how the small, inwardly folded edge produces a much larger area of detachment.

most common reason why grafts detach after surgery.⁵

As a precaution, therefore, the surgeon should carefully check the edge of the graft for inward folds at the end of the procedure. If found, they can usually be easily smoothed out, using a combination of bubble bumping and Droutsas taps (rolling the air bubble in the recipient anterior chamber while intermittently tapping the corneal surface over the folded edge to completely smooth out the folded membrane).⁶

From our study, the second most common cause of detachment was insufficient support from the air bubble after surgery.⁵ Following DMEK, a fairly large air bubble is left in the anterior chamber to keep the graft pressed up against the recipient stroma. In aphakic eyes or eyes

with a history of vitrectomy, however, the air bubble has room to drift posterior to the iris, leaving the transplanted membrane unsupported. These grafts may then be massaged off the recipient posterior stroma by continuous movement of the eyelids over the hypotonic globe until the grafts eventually detach. Consequently, aphakic and postvitrectomy eyes may be better suited to forms of endothelial keratoplasty other than DMEK such as Descemet stripping automated endothelial keratoplasty, because some studies suggest that a thicker graft may adhere better to the recipient anterior stroma and therefore depend less on support from the air bubble to remain attached.^{7,8}

Other, less common causes of detachment included mistakenly implanting the graft upside down, the use of plastic materials during surgery (especially to inject the graft into the host anterior chamber), stromal irregularities in the recipient eye underneath the site of the main incision, morphological abnormalities in the cells of the donor endothelium (eg, Fuchs dystrophy), and irido-Descemet graft adhesion, which caused detachment by traction.⁵

DEGREES OF DETACHMENT

The most appropriate therapy varies according to the extent of the detachment. Small detachments (less than one-third of the graft area) resolve spontaneously and do not require intervention. In 16 consecutive eyes with small detachments, two grafts reattached themselves. Of the remaining 14 eyes, all corneas cleared normally, with 90% of patients achieving a visual acuity of 20/40.⁵

The decision tree for larger detachments may be more complicated. Even with a graft detachment area of greater than one-third, most corneas eventually clear over a longer period of time, and 50% of patients achieve a visual acuity of 20/40 or better.⁵ In four eyes in which the graft was implanted upside down, a large detachment developed. Two of these eyes later experienced corneal clearance and a visual acuity of better than 20/25, despite persistent large graft detachments (possibly a result of endothelial cell migration from the detached graft onto the patient's posterior stroma).⁸ Because, in our experience, a satisfactory visual result can be obtained in approximately half of cases with large, persistent detachments without any subsequent intervention, our recommendation is to tailor reoperation, either with regrafting or rebubbling, to the patient's preferences (ie, for more surgery in light of the possibility of better vision versus waiting for the possibility of spontaneous corneal clearance, which may require up to 3 months).^{4,5}

Complete detachments are, in contrast, straightforward. Eyes with total detachments and free-floating Descemet rolls in the anterior chamber universally demonstrated persistent stromal edema without any indication of corneal clearance. These require secondary intervention, either in the form of early repositioning or later retransplantation.⁵

CONCLUSION

The key to managing graft detachment after DMEK is for the surgeon to avoid preventable causes and recognize early on which cases will require secondary intervention. In our experience, grafts do not need to blanket the entirety of the denuded posterior cornea to completely resolve stromal edema and restore the patient's vision to nearly perfect levels. Surgeons may observe small detachments in the expectation of corneal clearance and good visual results. Complete detachments necessitate a reoperation, because some degree of physical contact between the donor endothelium and the recipient stroma is necessary to trigger corneal deswelling. Large, subtotal detachments allow surgeons a choice between monitoring spontaneous clearance and reintervention. The decision will depend on his or her experience, the speed at which vision is recovered, corneal clearance, or the patient's needs. ■

Jack S. Parker, BA, is a corneal fellow at the Netherlands Institute for Innovative Ocular Surgery in Rotterdam, the Melles Cornea Clinic Rotterdam, Netherlands, and the UAB Callahan Eye Hospital in Birmingham, Alabama. Mr. Parker may be reached at +31 10 297 4444; parker@nijos.com.



Gerrit R. J. Melles, MD, PhD, practices at the Netherlands Institute for Innovative Ocular Surgery, Rotterdam, the Melles Cornea Clinic Rotterdam, and Amnitrans EyeBank Rotterdam, Netherlands. Dr. Melles may be reached at +31 10 297 4444; melles@nijos.com; www.nijos.com.



1. Melles GRJ. Posterior lamellar keratoplasty. DLEK to DSEK to DMEK. *Cornea*. 2006;25:879-881.
2. Melles GRJ, Ong TS, Ververs B, van der Wees J. Descemet membrane endothelial keratoplasty (DMEK). *Cornea*. 2006;25:987-990.
3. Price MO, Giebel AW, Fairchild KM, Price FW Jr. Descemet's membrane endothelial keratoplasty: prospective multicenter study of visual and refractive outcomes and endothelial survival. *Ophthalmology*. 2009;116:2361-2368.
4. Dapena I, Moutsouris K, Ham L, Melles GR. Graft detachment rate. *Ophthalmology*. 2010;117:847-847e1.
5. Dirisamer M, van Dijk K, Dapena I, et al. Prevention and management of graft detachment in Descemet membrane endothelial keratoplasty. *Arch Ophthalmol*. 2012;130(3):280-291.
6. Dapena I, Moutsouris K, Droustas K, et al. Standardized 'no touch' technique for Descemet membrane endothelial keratoplasty (DMEK). *Arch Ophthalmol*. 2011;129:88-94.
7. Dapena I, Ham L, Melles GRJ. Endothelial keratoplasty: DSEK/DSEAK or DMEK – the thinner the better? *Curr Opin Ophthalmol*. 2009;20:299-307.
8. Dirisamer M, Ham L, Dapena I, et al. Descemet membrane endothelial transfer (DMET): 'free floating' donor Descemet implantation as a potential alternative to keratoplasty. *Cornea*. 2012;31:194-197.