



Histopathologic Features of Descemet Membrane Endothelial Keratoplasty Graft Remnants, Folds, and Detachments

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Purpose: To describe the histologic features of postmortem eyes after Descemet membrane endothelial keratoplasty (DMEK) and their potential clinical implications.

Design: Histopathologic study.

Participants: Eleven postmortem DMEK corneas of 8 patients who underwent surgery for Fuchs endothelial dystrophy, with an average postoperative time of 4 ± 1.9 years (range, 7 months–6.5 years).

Methods: Eleven corneas transplanted with a DMEK graft were procured after death and processed for light microscopy evaluation.

Main Outcome Measures: Histologic findings at the donor–host interface and at the host edge.

Results: Of the 11 corneas available for analysis, 9 showed normal anatomic features in the corneal center; that is, the donor–host interface resembled that of a virgin eye. One eye also had an anatomically normal periphery, but the remaining 10 eyes showed specific abnormalities in the periphery. Nine demonstrated overlapping of the DMEK graft onto the host edge of the descemetorhexis (and in 6 of these, the overlapping tissue showed a contracted inward fold at its peripheral edge with scar tissue); 1 eye showed a dense, acellular scar overlying a portion of the DMEK graft that clinically had shown a detachment followed by spontaneous adherence; 3 eyes showed subtle graft folds with scar tissue anteriorly; in 2 eyes (of the same patient), the anterior banded layer of the host Descemet membrane (DM) was still in situ across the cornea (both of these eyes had required rebubbling); and 2 eyes showed host DM remnants within the corneolimbus tunnel incision that may have interfered with incisional wound healing.

Conclusion: Incomplete host DM removal may relate to postoperative DMEK graft detachment and wound instability. Graft detachments may reattach with interface scarring. Rebubbling procedures may be performed within 4 to 6 weeks, before portions of the detached graft scar. Subtle DMEK graft folds may explain subjective reports of monocular diplopia. *Ophthalmology* 2016;■:1–9 © 2016 by the American Academy of Ophthalmology



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In the past decade, we have introduced several techniques for endothelial keratoplasty, culminating in the selective replacement of Descemet membrane (DM) and its endothelium, currently referred to as Descemet membrane endothelial keratoplasty (DMEK).^{1,2} The most common postoperative complication associated with these techniques is incomplete adherence of the donor DM to the recipient posterior stroma, that is, a graft detachment. Other graft-related problems include the presence of DM remnants, graft folds, and interface opacities, potentially affecting the optical quality of the transplanted cornea.³

Descemet membrane endothelial keratoplasty graft detachments challenge surgeons to decide whether or when to intervene. Relatively small detachments ($\leq 1/3$ of the graft surface area) may allow corneal clearance by endothelial repopulation of the denuded recipient stroma⁴ or by spontaneous reattachment,⁵ whereas larger detachments

usually can be managed by rebubbling, although opinions vary on timing such a procedure.⁶ In some cases, the cause of detachments may be poorly understood, especially in uncomplicated eyes, that is, in eyes with mild edema that could be well pressurized at termination of the surgery—in other words, in eyes without risk factors for incomplete graft adherence.^{6,7}

Clinically, small graft detachments, graft folds, or interposition of DM remnants seem to be well tolerated by the eye. However, although minor detachments may clear, they may reduce graft longevity.⁸ Graft folds commonly are associated with pigmentary depositions, both of which may be associated with a subclinical inflammatory response.⁹ Reattached grafts as well as corneas that undergo repeat DMEK often show diffuse interface scarring. Hence, the aim of this study was to evaluate the histopathologic features in a series of 11 postmortem DMEK eyes to

Table 1. Patient Characteristics and Postoperative Course

Eye No.	Patient Characteristics				Postoperative Course*					Histologic Results and Comments: Central vs. Peripheral Cornea
	Patient Age (yrs) [†]	Gender	Indication	Eye	Donor Age (yrs)	BCVA (Snellen [Decimal])	Pachymetry (μm)	Endothelial Cell Density (cells/mm^2)	Time from Surgery to Death(mos)	
1	96	M	FED	Right	79	20/30 (0.6)	578	1083	28	No explanation for subnormal BCVA other than age Central cornea: unremarkable Periphery: • Donor-onto-host DM doubling
2 [‡]	86	M	FED	Right	81	20/30 (0.6)	499	1352	7	No explanation for subnormal BCVA Central and peripheral cornea: • Host anterior banded DM remnant • Donor-onto-host DM doubling • Small inward fold with scar tissue inside Rebubbling procedure for flat graft detachment
3 [‡]	85	M	FED	Left	78	20/20 (1.0)	511	1340	15	Central and peripheral cornea: • Host anterior banded DM remnant • Donor-onto-host DM doubling • Small inward fold with scar tissue inside Rebubbling procedure for flat graft detachment DM
4 [§]	62	M	FED	Right	61	20/60 (0.3) [¶]	577	677	55	Amblyopia Central cornea: unremarkable Periphery: • Donor-onto-host DM doubling • Peripheral detachment spontaneously adhered with scar tissue formation • Small host DM remnant in incision
5 [§]	62	M	FED	Left	68	20/28 (0.7)	552	1258	47	BCVA 20/25 (0.8) up to 2 yrs after surgery Central cornea: unremarkable Periphery: • Donor-onto-host DM doubling • Peripheral posterior hump filled with scar tissue • Inward fold with scar tissue on inside • Two remnants of host DM in incision
6	73	M	FED	Right	61	20/20 (1.0)	540	2442	70	Central cornea: unremarkable Peripheral posterior hump filled with scar tissue
7	80	F	FED	Right	81	20/50 (0.4)	533	1643	49	BCVA 20/28 (0.7) up to 3 yrs after surgery Diabetic retinopathy Central and peripheral cornea unremarkable

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