

## Outcomes of first cases of DMEK at a Canadian university hospital centre



Descemet membrane endothelial keratoplasty (DMEK) provides better visual outcomes and lower rejection rates than Descemet stripping automated endothelial keratoplasty (DSAEK).<sup>1,2</sup> However, steep learning curves, higher rebubbling rates, and failure risks have been noted.<sup>3–6</sup> This study aimed to report and analyze the outcomes of the first DMEK cases in our university-based centre.

Files of all patients who underwent DMEK between March 2016 and October 2018 were retrospectively reviewed at the Centre Hospitalier de l'Université de Montréal (CHUM). DMEKs were performed by five surgeons and included all their first cases. Surgical technique varied between each surgeon. In general, tissues were prestripped and prestamped using the S-stamp technique. Grafts were partially trephined using a Hanna punch and peeled using the stereotactic intracerebral hemorrhage underwater blood aspiration (SCUBA) technique. After staining donor tissues in trypan blue, descemetorhexis was performed 0.5 mm larger than the graft diameter. Grafts were loaded into a modified Jones tube and injected into the anterior chamber (AC). Once adequately positioned, 20% SF<sub>6</sub> gas was injected in the AC. Peripheral iridotomies were performed occasionally. Management of AC gas slightly differed between surgeons. The pupil was dilated, and patients were instructed to lie supine. Prior to discharge, slit-lamp examination was performed to ensure no pupillary block. This study was conducted in compliance with the Declaration of Helsinki, and approval was obtained from the CHUM Research Ethics Board.

Eighty-five eyes from 73 patients were included in this study. Six patients had a second DMEK, for a total of 91 procedures. Mean follow-up time was  $10.6 \pm 7.1$  months. Eighty eyes (94%) had a diagnosis of Fuchs' endothelial corneal dystrophy, and 5 eyes (6%) had pseudophakic bullous keratopathy. Thirty-one patients (36%) had at least one ocular comorbidity, most of them affecting the posterior pole. Twelve eyes (14%) had complex anterior segments, from which 6 had previous DMEK, 4 had DSAEK, 1 had Descemet stripping only, 1 had penetrating keratoplasty, and 2 had pars plana vitrectomy. No patient had had glaucoma surgery prior to DMEK. Mean graft diameter was  $8.0 \pm 0.3$  mm. Five surgeries were combined with phacoemulsification and intraocular lens implantation. Twenty-seven surgeries (30%) had an intraoperative complication, and 14 (15%) grafts had suboptimal preparation (Table 1). Visual outcomes (presented in Table 2) are consistent with current studies.<sup>7</sup> Mean donor endothelial cell count was  $2764 \pm 256$  cells/mm<sup>2</sup> preoperatively,  $1539 \pm 555$  cells/mm<sup>2</sup> at 6 months, and  $1391 \pm 504$  cells/mm<sup>2</sup> at 12 months. Median

endothelial cell loss was 45% at 6 months and 50% at 12 months. Central corneal thickness decreased by  $122 \pm 43$   $\mu$ m ( $p < 0.001$ ) at 6 months and by  $114 \pm 46$   $\mu$ m ( $p < 0.001$ ) at 12 months. Postoperative complications are presented in Table 1. The rebubble rate in our cohort is below rates reported in the literature.<sup>1,4,8</sup> Mean rebubbling time was  $10 \pm 5$  days postoperatively. Rebubbling was performed if the graft detachment involved more than a third of the graft, caused visual axis edema, or progressed during follow-up. Primary graft failure (PGF) occurred in 21% of eyes, a rate slightly above numbers found in current studies (8%–20%).<sup>4,5</sup> Complicated surgery ( $p = 0.008$ ) and suboptimal tissue preparation ( $p = 0.027$ ) were significantly associated with rebubbling and/or PGF. The surgeon who performed the most DMEKs ( $n = 33$ ) had a PGF rate of 12%, whereas the surgeon with the least cases ( $n = 5$ ) had a rate of 40%. This indicates that the learning curve may influence PGF outcomes in our cohort.

In conclusion, this study of initial cases presenting excellent visual outcomes, fast recovery, and no graft rejections suggests that DMEK is a viable option for endothelial disease. We identify intraoperative and graft preparation factors associated with graft failure so that other novice surgeons may better avoid such pitfalls.

**Table 1—Complications and regrant rate**

Intraoperative Complications	n (%)
Difficult graft unfolding	5 (6)
Displacement of the graft requiring same-day operative repositioning	4 (4)
Ejection of the graft	3 (3)
Pupillary block	3 (3)
Intracameral fibrin	2 (2)
Hyphema	1 (1)
Iris extrusion through the operative wound	1 (1)
Intraoperative graft contamination	1 (1)
Suboptimal tissue preparation	
Important endothelial staining (preoperative endothelial damage)	6 (7)
Presence of tears	5 (6)
S-stamp needing to be re-marked	3 (3)
Decentred trephination	2 (2)
Prestripping incomplete	2 (2)
Friable graft/peripheral tears	2 (2)
Postoperative Complications	n (%)
Partial graft detachment	40 (44)
Primary graft failure	19 (21)
Rebubble	14 (15)
Cystoid macular edema	9 (10)
Ocular hypertension	9 (10)
Postoperative pupillary block	8 (9)
Full graft detachment (free floating)	3 (3)
Epiretinal membrane	3 (3)
Surgical mydriasis	1 (1)
Rejection	0
Regrant	20 (22)
DSAEK	11 (12)
DMEK	6 (7)
Penetrating keratoplasty	3 (3)

DSAEK, Descemet stripping automated endothelial keratoplasty; DMEK, Descemet membrane endothelial keratoplasty

**Table 2—Best corrected distance visual acuity before and after DMEK surgery**

Time of Examination	n*	Mean ± SD, logMAR	Snellen Equivalent	p Value†
Preoperative	91/91	0.59 ± 0.50	20/80	—
At 1 month	90/90	0.63 ± 0.65	20/80	0.488
At 3 months	68/72	0.38 ± 0.48	20/50	0.003
At 6 months	57/65	0.25 ± 0.42	20/40	<0.001
At 12 months	55/55	0.18 ± 0.28	20/30	<0.001

DMEK, Descemet membrane endothelial keratoplasty.

\*Here n represents the number of grafts with documented visual acuity at that visit divided by the number of grafts reviewed at that visit.

†Paired Student's *t*-test as compared with pre-DMEK values.

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## Footnotes and Disclosure

The authors have no proprietary or commercial interest in any materials discussed in this communication.

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