UT-DSAEK vs. DMEK:

A clearer look at visual function and safety

Morten Brok Molbech Madsen
Department of Ophthalmology, Aarhus University Hospital, Denmark

On October 20, 2023, Morten Madsen defended his thesis "A comparison of visual function and side-effects after UT-DSAEK or DMEK for Fuchs' endothelial dystrophy" at Aarhus University. The PhD project was conducted at the department of Dept. of Ophthalmology, Aarhus University Hospital, Denmark. The supervisors were Jesper Hjortdal, MD, PhD, DMSci, (main) and Anders Ivarsen, MD, PhD, (co-supervisor) both at the Dept. of Ophthalmology, Aarhus University Hospital, and Dept. of Clinical Medicine, Aarhus University, Aarhus, Denmark.

For decades, penetrating keratoplasty was the gold standard for treating corneal endothelial dysfunction. However, around the beginning of the millennium, a significant shift in surgical techniques occurred. Two newer procedures—Descemet's stripping automated endothelial keratoplasty (DSAEK) and Descemet's membrane endothelial keratoplasty (DMEK)—offered improved visual acuity, faster recovery, less surgically induced astigmatism, and a lower risk of graft rejection compared to full-thickness corneal transplants. While both DSAEK and DMEK involve transplanting healthy endothelium and Descemet's membrane, DSAEK also includes a variable amount of stromal tissue. Additionally, both procedures can be performed in combination with phacoemulsification and intraocular lens implantation as so-called triple procedures. Although DMEK has consistently outperformed DSAEK in terms of visual acuity and patient satisfaction, its technical complexity has maintained the popularity of DSAEK. The observation that thinner grafts result in better visual outcomes led to the development of ultrathin DSAEK (UT-DSAEK), which is defined as grafts thinner than 100 µm.

Key points:

- Compared to UT-DSAEK, DMEK provides better visual acuity and similar contrast sensitivity 12 months after surgery.
- Standard cataract surgery results in better visual acuity and contrast sensitivity compared to both UT-DSAEK and DMEK.
- Although UT-DSAEK is associated with greater endothelial cell loss than DMEK, the overall complication rates were similar between the two procedures.

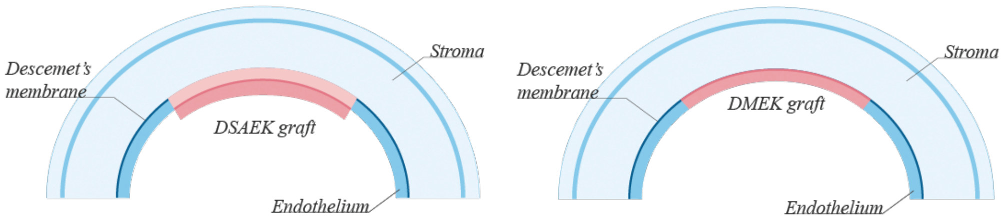

Figure 1. Schematic presentation of ultrathin Descemet's stripping automated endothelial keratoplasty (UT-DSAEK) to the left and Descemet's membrane endothelial keratoplasty (DMEK) to the right.

This thesis aimed to compare visual function and side effects in patients undergoing UT-DSAEK and DMEK. The study included patients with Fuchs' endothelial dystrophy and cataract, who were randomized to receive either UT-DSAEK or DMEK in combination with cataract surgery. A separate, non-randomized control group composed of patients with cataract alone underwent only phacoemulsification and lens implantation.

In the first paper of the thesis, visual function was evaluated across the three groups. Patients treated with DMEK showed significantly better visual acuity 12 months after surgery than those who received UT-DSAEK. However, contrast sensitivity was comparable between the two groups. UT-DSAEK was also associated with greater endothelial cell loss. Interestingly, the cataract-only group outperformed both keratoplasty groups in terms of visual acuity and contrast sensitivity, indicating ongoing challenges of fully restoring vision after endothelial keratoplasty. The second paper assessed central retinal thickness at 3- and 6-months postoperatively. No significant differences were found among the groups, and no signs of cystoid macular edema or other retinal abnormalities appeared on OCT. Retinal thickness did not correlate with visual outcomes. The third paper evaluated retinal nerve fiber layer thickness and iris function 12 months after surgery. These outcomes were comparable across all groups, indicating that neither DMEK nor UT-DSAEK caused notable long-term effects on these parameters when compared with standard cataract surgery.

In summary, the thesis confirms that DMEK provides superior visual acuity compared to UT-DSAEK, despite the improvements offered by thinner DSAEK grafts. Both surgical approaches demonstrated similar frequencies of complications.

Future directions:

- To investigate the underlying causes of the observed difference in visual acuity between UT-DSAEK and DMEK.
- To investigate patient-reported satisfaction following UT-DSAEK and DMEK to better capture subjective experiences, which may not be reflected by objective measures.

References

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