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Higher-Order Aberrations after Endothelial Keratoplasty: Comparison of DMEK and "thin" DSAEK

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Introduction

Proponents of "thin" DSAEK (postoperative graft thickness <100 microns) argue that this surgery yields visual outcomes to rival those following DMEK. However, patients following bilateral endothelial keratoplasty have reported preference of their DMEK eye, despite similar VA outcome in their fellow DSAEK eye. This may be related to the presence of higher-order aberrations. Higher-order aberrations (HOA) in "thin" DSAEK eyes have not been compared to those in DMEK eyes. Our goal was to determine whether higher-order aberrations in DMEK and "thin" DSAEK eyes were significantly different. We also sought to compare these HOA to those of normal corneas

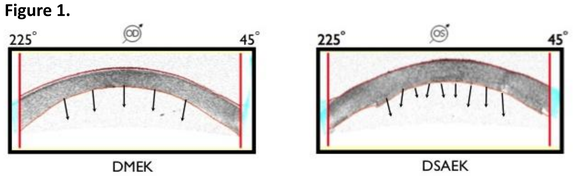
Methods

34 eyes underwent DMEK and 30 eyes underwent DSAEK for Fuchs dystrophy. 30 eyes undergoing cataract surgery were used for controls. DSAEK graft thickness was measured 6 months postoperatively or later with anterior segment Ocular Coherance Tomography (Visante OCT, Anterior Segment Imaging). Grafts measured postoperatively were identified to be 100 microns or thinner. The root mean squared (RMS) obtained with the Pentacam (Oculus, Arlington, USA) 6 months postoperatively were compared between groups. That is, the mean RMS of the total cornea, the front of the cornea, the back of the cornea, and back corneal spherical aberration RMS were compared, in the central corneal 4 mm zone.

Disclosures - None

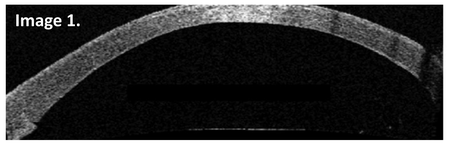
DMEK is associated with fewer Higher-Order Aberrations than "thin" DSAEK. This may explain patient preference for their DMEK eye.

Figure 1.



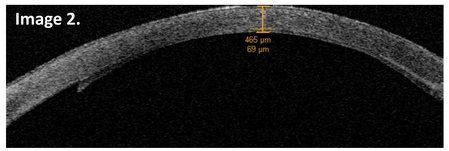
OCT of DMEK Graft

Image 1.



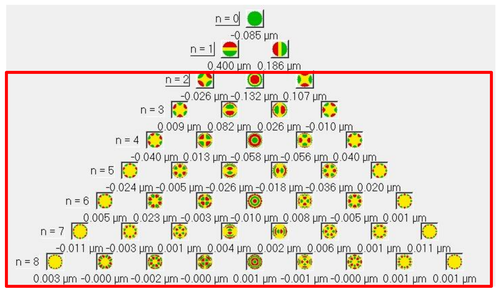
OCT of DSAEK Graft

Image 2.



How Are We Measuring Higher-Order Aberrations related to the Back of the Cornea?

Figure 2.



Higher-Order Aberrations are optical aberrations of the 3rd degree or higher and are typically associated with halos and glare.

DMEK Induced Similar Amounts of Higher-Order Aberrations as Cataract Surgery (Back of the Cornea)

p = .96

"Thin" DSAEK Induced Significantly *More* Higher-Order Aberrations Than DMEK (Back of the Cornea)

p = .001

Comparison of Spherical Aberration between "Thin" DSAEK and DMEK Approach Statistically Significant Levels (Back of the Cornea)

p = .07

Comparison of Posterior Corneal Optical Aberration Between Groups

Table 1.

	Thin' DSAEK	DMEK	Controls
Back of the Cornea Total Higher Order Abberation	0.43	0.25	0.25
Back of the Cornea Spherical Abberation	-0.23	-0.17	-0.17

	p value: 'Thin' DSAEK vs. DMEK	p value: 'Thin' DSAEK vs. controls	p value: DMEK vs. Controls
Back of the Cornea Total Higher Order Abberation	0.0001	0.0005	0.96
Back of the Cornea Spherical Abberation	0.07	0.12	0.99

Table 1 compares optical aberrations related to the back of the cornea for each surgical subgroup. All values represent the mean RMS. In addition, statistical values comparing the three groups show significance levels.

Results

The mean total RMS and front corneal RMS was not different between groups. The back corneal RMS was .25 for DMEK, .43 for thin DSAEK, and .25 for controls. The difference between DMEK and the thin DSAEK group was statistically significant (p = .0001), as was the difference between the thin DSAEK group and the controls (p = .0005). The difference between DMEK and controls was not statistically significant (p =.96). The mean RMS for back corneal spherical aberration was -0.17 for DMEK, -0.23 for thin DSAEK, and -0.17 for controls. The difference between DMEK and controls was not significant (p=.99), however, it was of borderline significance when comparing the other groups (DMEK vs. thin DSAEK, p = .07; thin DSAEK vs. controls, p = .12).

Clinical Significance

DMEK represents the closest possible anatomical replacement of a diseased endothelium. Although DSAEK offers good visual results, it does induce higher-order aberrations. DMEK, on the other hand, does not add any stromal tissue. The higher-order aberrations associated with DMEK are on par with those seen in control eyes. This may account for patient preference of their DMEK eye in cases of DSAEK in the fellow eye. DMEK surgery restores normal corneal anatomy to the greatest degree possible.

References

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