

Letter to the Editor

Single-pass Ultrathin DSAEK (UT-DSAEK) with the SLC Expert Microkeratome[®]

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Editor,

The novel technique of ‘Ultrathin Descemet Stripping Automated Endothelial Keratoplasty’ (UT-DSAEK) gives hope to combine the benefits of standard DS(A)EK (straightforward and reproducible procedure) with that of ‘Descemet Membrane Endothelial Keratoplasty’ (DMEK; fast visual recovery, low rejection rates) (Bachmann et al. 2016). Ultrathin Descemet Stripping Automated Endothelial Keratoplasty (UTDSAEK) grafts can be prepared using either a double- (after a first lamellar cut, a second cut is adjusted in depth to the resulting thickness) or a single-pass system. Current single-pass techniques suffer from high variance with deviations in graft thickness $> 30 \mu\text{m}$. Moreover, a thickness $< 100 \mu\text{m}$ is not achieved in about 10% even when preparation is performed by experienced surgeons (Nahum et al. 2015; Villarrubia & Cano-Ortiz 2015). The SLC Expert Microkeratome[®] (Gebauer Medizintechnik GmbH, Neuhausen, Germany) is a novel device for UT-DSAEK preparation (Fuest et al. 2015). It is able to cut corneal lamellae of adjustable thickness based on anterior segment optical coherence tomography (AS-OCT; Visante-OCT[®] Anterior Segment Model 1000, Zeiss, Jena) thickness calculations. After mounting the donor cornea onto an anterior chamber bank, a suction block with a depression of adjustable depth is applied onto the anterior surface. A vacuum (0.9 mbar) to the anterior

surface is applied during cutting ensuring a firm position in relation to the oscillating cutting blade. To the best of the authors’ knowledge, this is the first clinical study reporting on this new technique for the preparation of Ultrathin DSAEK grafts.

Medical records of our first five consecutive eyes of five patients (mean age: 60 ± 9.34 years; three males) with corneal endothelial decompensation and complex anatomic anterior segment disorders (Table S1) in which UT-DSAEK using the SLC Expert Microkeratome[®] was performed between March and July 2015 were analysed retrospectively.

Targeted central thickness of the resulting donor lamella was defined before preparation ranging from 50 to $80 \mu\text{m}$. Central and peripheral corneal thickness (3 mm from centre) was determined by AS-OCT measurements along four meridians before and directly after preparation. Deviations from the targeted central graft thickness as well as differences between peripheral and central graft thickness were calculated. Obtained differences from eight peripheral measuring points to central thickness measurements were divided into two groups ($0\text{--}135^\circ$ and $180\text{--}315^\circ$) to investigate uniformity in thickness relative to cut direction.

Clinical outcome parameters included best spectacle-corrected visual acuity (BSCVA; logMAR), endothelial cell density (ECD; Tomey EM-3000, Erlangen, Germany), central corneal thickness (CCT) and graft thickness measured by AS-OCT (SPECTRALIS[®] Anterior Segment Module, Spectral-Domain OCT, Heidelberg Engineering GmbH, Heidelberg, Germany) before surgery as well as 1 and 3 months postoperatively.

All five donor preparations were successfully performed. Deviations from the central targeted thickness were below $19.5 \mu\text{m}$ at any time (Table S1). The difference between peripheral and central graft thickness averaged along eight meridians was $44.1 \pm 16.7 \mu\text{m}$ regardless of the cutting direction.

In two eyes, partial graft detachment necessitated a second intracameral air injection; no further complications occurred.

Mean preoperative BSCVA improved from 1.56 ± 0.67 logMAR to 0.92 ± 0.79 logMAR at 3 months. Endothelial cell density (ECD) of donor buttons was

2804 ± 228.3 cells/ mm^2 preoperatively and 1489.8 ± 336.3 cells/ mm^2 at 3 months (Table S1). Central corneal thickness (CCT) was $815.7 \pm 222.2 \mu\text{m}$ preoperatively and $562.8 \pm 99.0 \mu\text{m}$ postoperatively with a hosts’ corneal thickness without the donor lamella of $527.9 \pm 82.5 \mu\text{m}$.

Descemet Stripping Automated Endothelial Keratoplasty (DSAEK) grafts prepared using microkeratomes are typically thinner centrally than peripherally, resulting in a hyperopic shift (Dupps et al. 2008; Scoria et al. 2009). Our results showed comparatively uniformity in graft thickness which may suggest that the uniform profile of UT-DSAEK grafts prepared by the SLC Expert microkeratome may have less impact on sphere and aberrations than ‘standard’ DSAEK grafts (Rudolph et al. 2012).

Our case series is limited by the small sample size; however, we can conclude that graft preparation with the SLC Expert Microkeratome[®], and the subsequent transplantation of these very thin grafts even in eyes with complex anterior segment pathologies seems to be safe and reproducible. Further clinical studies are desirable to evaluate the practicability and the clinical results of this novel technique particular in relation to DMEK.

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Supporting Information

Additional Supporting Information may be found in the online version of this article:

Table S1. Demographic data of UT-DSA EK recipients and summary of results.