Endothelial viability of precut pre-Descemetic grafts prepared using an innovative microkeratome technology

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EuCornea, Amsterdam 5 October 2013
Financial disclosure

- R.M.M.A. Nuijts: Acufocus (S), Alcon (C,L,S), Asico (C,P), Bausch & Lomb (C), Gebauer (S), HumanOptic (S), Ophtec (S), TheaPharma (C)
- J. Brekelmans: None
- P. Steijger-Vermaat: None
- T. Wesseling: None
- F. W.F. van Marion: None
- M.M. Dickman: None

This study was financially supported by:
DMEK outcomes and embracement

Why not DMEK?

- **Donor preparation**

- **Donor positioning and adherence**
  - Total detachment 0% - 6.7%
  - Partial detachment 4.7 - 6.7%
  - Re-bubbling
    - Early post-operative 1% - 52%
    - Total (up to 6 months) 1% - 82%
  - Primary graft failure 0% - 8.1%

- **Re-operations**
  - Secondary DSAEK 0% - 6.7%
  - Secondary DMEK 0% - 4.7%
  - Secondary PKP 0% - 7.1%

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<tr>
<th>Author</th>
<th>N</th>
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<tr>
<td>Van Dijk, K., et al. 2013</td>
<td>300</td>
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<td>Dapena, I., et al. 2013</td>
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<td>Retrospective</td>
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<td>Tourtas, T., et al. 2012</td>
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<td>Heindl, L.M., et al. 2011</td>
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<td>Guerra, F.P., et al. 2011</td>
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<td>Prospective interventional series</td>
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DMEK donor preparation

- SCUBA
- Pneumatic dissection
- DMEK-S
- Partial trephination
- Pre-peeled DMEK

A. Krabcova, I., 2011
B. Price Vision Group, 2012
C. McKee, H.D., 2012
D. Muraine, M., 2013
Standardized automatic donor preparation?!

- Thickness predictability
- Graft thickness profile
- Endothelial cell viability
Gebauer SLC Expert Microkeratome

Adjustable cavity
- Porous rigid reference member (RMM)
- Vacuum based corneal applanation
- Dissection of any desired thickness (30-950 micrometer)

Corneal profiling
- Set of RRM curvatures
- Correction for peripheral to central corneal thickness differences

Technical specifications
- 10,000 rpm
- 1.0 mm/sec
- 9.5 mm trephination diameter
PDAEK (Pre-Descemetic Automated Endothelial Keratoplasty)

PDAEK lamella preparation with Gebauer SLc Expert
Graft thickness predictability

n=21
Expected SD±6.0µm
Post-cut SD±7.7µm
Corneal profiling

Pre-cut

Corrected (with profile)  Uncorrected (without profile)

Post-cut
HEC – Endothelial Viability

**Hoechst**
- All cells
- DNA
- Blue

**Ethidium**
- Dead cells
- DNA
- Red

**Calcein**
- Living cells
- Cytoplasm
- Green
Total endothelial viability (calcein) staining

1. CCT 80 µm
   Viable ECD 1769
   75%

2. CCT 80 µm
   Viable ECD 1527
   71%

3. CCT 30 µm
   Viable ECD 1407
   71%

4. CCT 50 µm
   Viable ECD 1611
   67%

5. CCT 50 µm
   Viable ECD 1477
   65%
Trypan blue staining

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Histology

Bowman graft (~ 25 µm thick)

Pre-Descemetic graft (~ 25 µm thick)
Take home messages

• We established a POC for standardized harvesting of PDAEK lamellae:
  – Highly accurate thickness predictability (± 7.7µm)
  – Corneal profiling allows harvesting planar grafts, potentially minimizing postoperative hyperopic shift
  – Satisfactory central endothelial density and morphology
  – Clinical outcomes remain to be investigated
Thank you for your kind attention!

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