Donor tissue preparation for Descemet Membrane Endothelial keratoplasty (DMEK)

ASCRS - 2015
The NIIOS Team

Introduction

Endothelial Keratoplasty

<table>
<thead>
<tr>
<th></th>
<th>DSAEK / DSEK</th>
<th>DMEK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Donor lamellae</td>
<td>stroma + DM + endothelium</td>
<td>DM + endothelium</td>
</tr>
<tr>
<td>Graft thickness</td>
<td>250 µm – 75 µm</td>
<td>20 µm</td>
</tr>
</tbody>
</table>

DMEK graft preparation

To harvest a roll of DM carrying autologous endothelium for transplantation in DMEK

Current criteria for using a donor cornea:
• Donor not < 40 years
• Cell count of 2300 cells/mm² pre-DMEK preparation

Aim of dissection

More efficient use of donor corneal tissue with Descemet membrane endothelial keratoplasty (DMEK): two lamellar keratoplasty procedures with one donor cornea

J.T. Lie, E.A. Groeneveld-van de Bekk, L. Ham, et al.
Br J Ophthalmol 2016 94: 1265-1266 originally published online June 24, 2016
doi: 10.1136/bjo.2009.171629

Cornea → DMEK graft + Anterior remnant
DMEK dissection

**Equipment:**
- Cornea holder
- Non toothed forceps
- Hockey stick blade
- McPherson forceps
- Punch (9.5mm)
- Petridish
- Trypan Blue
- Pipette
- Soft contact lens

**Relevant anatomy:**

I. Corneoscleral rim endothelial side up
- Scleral rim
- Iris root
- Uveal remnants
- Trabecular meshwork
- Cornea
- Schwalbe’s line

II. Collagen fibers in the stroma circumferentially near the limbus and meridionally towards the centre*
- In the peripheral 1-2 mm there is stronger adhesion between DM and the stroma

**Detachment and stripping:**
1. Stain with trypan blue
2. Start peripherally outside the trabecular meshwork
3. Push centrally to detach a small amount of DM
4. Turn the cornea and repeat previous step till DM is detached for 360° and cleared over 2mm inwards
### Detachment and stripping

5. Strip DM off with Mc Pherson forceps

6. Pull DM towards centrally from different angles

7. Detach DM completely, keeping attached trabecular meshwork intact

8. Anterior part of the cornea is replaced by a soft contact lens

### Harvesting the graft

9. Trephine the central 9.5 mm on a soft contact lens

10. Remove the DM outer circle over 360°

11. DMEK graft will form a roll spontaneously (endothelium is on the outside)

### Troubleshooting tears during preparation DM graft

#### Tear in periphery
- Don’t panic: it is outside trephination area!

#### Tear which continues to tear to central
- If tear is small: Try to chip it off to avoid further tearing
- If tear is near trephination area: Try to detach DM from stroma with hockeystick blade around and underneath tear, then continue further stripping
- If all of the above fails try to detach DM further down the rim and try to strip DM from there

### Results DMEK preparation

- >95% of DMEK preparations successful!

- Damaged endothelium

- Tear
DSEK versus DMEK: Interface

| Interface after DSEK | Interface after DMEK |

DMEK

- BCVA (6m):
  - ≥20/40 (≥0.5) in 95%
  - ≥20/25 (≥0.8) in 75%

- ECD (6m): ± 1800 cells/mm²

- 'Low-cost', high accessibility

DMEK Surgical technique

Incisions and Descemetorhexis


Preparation of the graft


DMEK roll

1. 2. 3. 4. 5.

Fixating the graft

- Complete air-fill of the AC 45-60 min
- 30-50% air-fill left over

Conclusions

- Standardized ‘no touch’ procedure
- Feasible with proper training
- Accessible to most corneal surgeons
- Minimal costs
- Potentially:
  - The fastest and most complete visual recovery
  - Preferred treatment method endothelial disorders
Intraocular Graft Unfolding Techniques in Descemet membrane endothelial keratoplasty (DMEK)

ASCRS - 2015

The NIIOS Team

Study

Purpose
To define and evaluate various DM-graft unfolding techniques in DMEK

Methods
• Retrospective video analysis of 100 consecutive DMEK cases
• ≥ 6 months of follow up (BCVA, ECD, Complications)
• Unfolding methods were categorized into 4 basic techniques

(1) Standardized “no-touch” technique using a double roll


(2) Two cannulas parallel (“Dirisamer technique“)
Carpet unrolling while fixating one graft edge

(3) Air-bubble assisted unrolling ("Dapena maneuver")

(4) "Single sliding cannula maneuver"

Combined unfolding techniques

Results

- Technique 1: used in 73% of surgeries
- Combination of techniques: in 44%
- None of the techniques correlated with - BCVA ($P=0.511$)
- ECD ($P=0.408$)
- Postop. complication rate ($P=0.540$)
Conclusions

• DMEK may be facilitated by using controlled techniques for unfolding the DM-graft:
  1. as stand-alone techniques OR
  2. various combinations

• Choosing the most suitable technique will make the operation safer and easier

• Without compromising the result or affecting the final outcome
Purpose
Evaluation of the clinical outcomes of DMEK

Methods
• Retrospective evaluation of 300 consecutive DMEK eyes
• 1 month to 6 years of follow up (Visual outcome, ECD, Complications)

Results: VA
• Fast and complete visual rehabilitation
• Vision remains stable in time

Results: Refractive outcome
• Hyperopic shift of ~0.3D → probably caused by post-op steepening of posterior cornea
• Refractive stability at 3 months after DMEK

Results: ECD
• ECD decrease may be comparable to earlier EK-techniques
• After 6 months, ECD decrease may be less than after PK
Results: Complications

- Graft detachment (~10%)
- Primary graft failure (~1%)
- Late onset graft failure (<1%)
- Allograft rejection episode (~2%)

Conclusions

- Fast and often complete visual rehabilitation
- Fast stabilization of refraction with only small refractive shift
- ECD decrease comparable to earlier endothelial keratoplasty techniques
- Low complication rate