Minnesota Lions Eye Bank Laboratory Department

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Minnesota Lions Eye Bank Mission
To help restore sight through eye donation

Descemet Membrane Endothelial Keratoplasty (DMEK) Preparation

Corneal Transplant History

1905  First successful cornea transplant is performed in Czech Republic.

Dr. Eduard Zirm

History
- 1905 - First human cornea transplant
- 1925 - Helen Keller challenge to Lions members to be “Knights of the Blind”
- 1937 - First U.S. Cornea Transplant
- 1944 - First U.S. Eye Bank
- 1960 - Minnesota Lions Eye Bank
- 1961 - Eye Bank Association of America
History – Cornea Transplants

- 1974 < 5,000 cornea transplants
- 2016 > 80,000 cornea transplants
- Cornea transplants 95% successful

Cross section

Eye Recovery

- Procurement - Enucleation

Eye Recovery

- Procurement - In Situ

Evaluation

- Preserved cornea in viewing chamber

Sclera

- Whole sclera anchors prosthetic eyes after enucleation.
- Quarter sclera is used to cover glaucoma shunts.
Specular Microscopy
Endothelial cell count
- >2000/mm² for endothelial transplant
- Minimum cell density needed for adequate function is ≈ 400–700 cells/mm².

Slit Lamp Biomicroscope
- Scars
- Edema
- Defects
- Guttae
- Infiltrates
- Foreign bodies

Ocular Coherence Tomography
- Micron-resolution images
- Shows structural features e.g., scars and defects
- Allows precise measurement of cornea dimensions
- Used pre and post processing

Pachymetry

Suitability
- Corneal condition determines which surgery it's suitable for:
  - Penetrating Keratoplasty
  - Anterior Lamellar Keratoplasty
  - Deep Anterior Lamellar Keratoplasty
  - Endothelial Keratoplasties
  - Keratolimbal Allograft
  - Keratoprosthesis

Penetrating Keratoplasty (PK)
Penetrating Keratoplasty (PK)

Superficial Corneal Scar

Anterior Lamellar Graft (ALK)

Keratolimbal Allograft (KLAL) for Stem Cell Deficiency

Cross section

Corneal endothelium

- Purpose: control hydration (maintain stromal deturgescence) and deliver nutrients and other molecules from the aqueous humor
- 6000 cells/mm² at birth
- 3400/mm² at age 15
- 2300/mm² at age 85
Processed Tissue Endothelial Keratoplasty

- **DSAEK**
  Descemet Stripping Automated Endothelial Keratoplasty
- **DMEK**
  Descemet Membrane Endothelial Keratoplasty

Descemet's Stripping Automated Endothelial Keratoplasty (DSAEK)

Processing - DSAEK

Microkeratome Dissection

Range of thickness for graft: 50-150 µm

Descemet's Stripping Procedure

Graft Insertion
Unfolding of graft

DSAEG

DMEK

Loading the inserter

Injecting graft

Double scroll
Unfolding graft

Unfolding graft

Graft in place

DMEK vs DSAEK

- More anatomic with no optical interface
- Better refractive outcomes/visual acuity
- May have lower rejection rates
- Faster recovery
- Surgically more challenging as a procedure
- May have a higher dislocation rate

Descemets Membrane

- Serves as the basement membrane of the endothelial cells
- Cells continually secrete collagen throughout life
- 3 µm thick at birth
- 10-13 µm by age 70

Cornea suitability for DMEK

- >50 yrs old—scroll not as tight & thicker
- Endothelial cell count >2200 cells/mm²
- No defects or scars affecting Descemets
- Healthy endothelium
- IOL scars- surgeon preference
- Diabetes- ok
DMEK preparation

- Secure on suction base
- Score peripheral membrane
- Free up edges
- Peel membrane off stoma
- Trephine and/or apply “S” stamp if requested

Indications for DMEK/DSAEK

- Similar for each
- Post cataract surgery edema
- Fuchs’ dystrophy
- Repeat corneal transplant
- Other causes of endothelial dysfunction
- Unspecified

Tissue Utilization – US Eye Banks

<table>
<thead>
<tr>
<th>Tissue Type</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
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<tbody>
<tr>
<td>Corneal Grafts Total</td>
<td>82,994</td>
<td>78,304</td>
<td>76,431</td>
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<td>Penetrating keratoplasty</td>
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<td>Anterior Lamellar Keratoplasty</td>
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<td>Endothelial keratoplasty</td>
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<td>Keratoconjunctival graft</td>
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<td>Glaucoma Shunt Patch or other non-keratoplasty use</td>
<td>917</td>
<td>527</td>
<td>755</td>
<td>687</td>
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<td>Other keratoplasty</td>
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<td>17</td>
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Domestic Endothelial Keratoplasty 2013 - 2016

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<tr>
<th>Domestic Surgery Use</th>
<th>2013</th>
<th>2014</th>
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<tbody>
<tr>
<td>Total Endothelial Keratoplasty procedures</td>
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<td>DSEK, DSAEK, DLEK Procedures</td>
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<td>DMEK or DMAEK Procedures</td>
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Information

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