A Single pass Microkeratome preparation of Ultra-Thin DSAEK Grafts in the Eye Bank

Eric Abdullayev MD,MBA,CEBT
Director of Clinical Development and Research
International Sight Restoration Eye Bank
Tampa, Florida USA

Eye Bank Association of America
2012 Annual Meeting
June 20-23, 2012, Hollywood FL, USA

Endothelium

- Extremely thin
- Innermost layer of cornea
- Pumps excess fluid out of the stroma
- Essential in keeping the cornea clear
- Once cells destroyed by disease or trauma, they are lost forever

Financial Disclosure

I have no any financial interest in any of the techniques or products discussed

Normal Corneal Endothelium

- Primary function of the endothelium is to maintain the health and transparency of the corneal stroma

- Tight Junctions
- Metabolic Pump
Endothelial Corneal Disease

- Normal corneal endothelium
- Diseased corneal endothelium - Fuch’s dystrophy

Fuch’s Distrophy

- Normal endothelial cells - Density 3200
- GUTTATA - cells loss
  Not suitable for EK or PKP

Severe Polymegathism or large cells (post cataract sx complication)

- Normal endothelial cells - Density 3200
- Large cells - cells count 1350
  Not suitable for EK or PKP

Endothelial Corneal Disease

Clinical Evaluation

- Clinical Evaluation
  - Blurred Vision
  - Fluctuating Vision
  - Halos around lights
  - Photophobia
  - Foreign body sensations
  - Contact lens intolerance

- Clinical Signs
  - Stromal edema
  - Increased thickness
  - Loss of transparency
  - Decreased visual acuity
  - Epithelial edema
  - Epithelial edema
**The Traditional Transplant Procedure or Full Thickness Cornea Transplant**

1. White arrow shows opaque, damaged cornea.
2. Round shaped portion of damaged cornea is removed.
3. A donor button of clear cornea is replaced.
4. The donor cornea is sutured into place.

---

**DSAEK procedure**

---

**DSAEK Benefits**

• The eye is left much stronger and more resistant to injury.

• There is minimal change in refractive error because the patient’s cornea is essentially intact.

• Suture-related problems can be eliminated.

• Visual recovery is significantly faster and better.
**DSAEK procedure**

Too thick of tissue will lead to poor pump function

<table>
<thead>
<tr>
<th>Host (recipient)</th>
<th>550 (range: 480-650) µ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lenticule (donor)</td>
<td>150 (50-250) µ</td>
</tr>
<tr>
<td>Cornea after DSEK</td>
<td><strong>700</strong> (530-900) µ</td>
</tr>
</tbody>
</table>

INTERNATIONAL SIGHT RESTORATION EYE BANK
TAMPA FL USA

- FDA- registered
- AHCA- registered
- EBAA- accredited

- Number donor corneas suitable for DSAEK: **50**
  - Donor age between **19** and **79**
  - Average endothelial cell density before precut: **3155/mm²**
  - Central stromal thickness prior precut: **493µ**

- Backlight Microscopy
- Specular Microscopy
Backlight Microscopy

Back Light Microscopy (Direct) - Normal Cornea

Back Light Microscopy (Direct) - Epithelial Sloughing

Back Light Microscopy
(Distant or Artificial "Red Reflex")
FOLDS
Back Light Microscopy (Direct)
Endothelial Stress Striae

Back Light Microscopy (Direct)
Arcus

Back Light Microscopy - Artificial “Red Reflex”
Surgical Scars (cataract surgery)

Materials and Methods
Donor corneas preservation
ISO 5 Class Sterile Room with Ophthalmic Microscope

Ophthalmic Microscope
Center of donor cornea identified and marked

Ophthalmic Microscope
Tissue mounted on chamber and centered

Ophthalmic Microscope
Epithelium removed during processing
Corneal Pachymetry (Pachymeter- MMD AP2000)

Measuring Range : 45µ and up

• Waveform measuring the ultra-thin DSAEK flap at 56 micron; flap was created by single pass method

Single Pass Ultra-Thin Graft Preparation

Increasing stromal resistance by raising pressure in the anterior chamber

Standard pressure up to 90 mmHg

Our approach— pressure > to 90 mmHg for several seconds

Graft Preparation

Cut Slowly – 6 seconds pass
Physiology of the cut

RESULTS

- 50 - donor corneas were prepared using pressurized single pass cut:
  *No complication were observed
- 78.4µ - Average central stromal thickness \(\approx\) (thinnest graft was 50 and thickest 100 microns)
- 3132/mm\(^2\) - Average endothelial cell density -
- 9.76 mm - Cap size
RESULTS

49 corneas transplanted

<table>
<thead>
<tr>
<th></th>
<th>49%</th>
<th>51%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abroad</td>
<td></td>
<td></td>
</tr>
<tr>
<td>US-24</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Complications

- Graft Failure – 1
- Interface Haze -3

Conclusion

- Our method for single pass microkeratome ultra-thin graft preparation is a safe technique and can be performed in eye-banks with no increased risk of perforation.
- Use of standard Moria equipment eliminates the needs for this procedure-fee increase.
- The prepared ultra-thin graft survives long distance international shipping. Foreign patients can also benefit from this advanced procedure.

Thank you !!!