Introduction

- Treatment of endothelial dysfunction has been revolutionized over the past 15 years with the popularization of endothelial keratoplasty
- Descemet’s stripping automated endothelial keratoplasty (DSAEK) has become the standard of care but more recently Descemet’s membrane endothelial keratoplasty (DMEK) has been investigated

DMEK vs. DSAEK

- Advantages of DMEK
  - Better and faster visual outcomes
  - Less higher order aberrations
  - Less refractive change
  - Lower rejection rate
- Disadvantages of DMEK
  - Technically difficult insertion
  - Higher dislocation rate
  - More tissue wastage

Problem

- Unexplained visual acuities
- Hyperopic shift
**Question**

- Is there a tissue preparation technique that would provide the low tissue wastage and surgical ease of DSAEK but also the better visual outcomes and lower rejection rate of DMEK?

**Purpose**

- To compare human donor corneal lenticule thickness, endothelial cell viability, area of cell damage and cell count between DSAEK tissue prepared with a double pass microkeratome cut versus the standard single pass.

**Methods**

- Eleven matched pairs of human donor corneas unfit for transplant were used for analysis
- Tissue was prepared using a Moria CB microkeratome and artificial anterior chamber

**Methods- Vital Staining**

- 2x Objective
- 10x Objective
- Stained with trypan blue for 120 seconds and alizarin red for 90 seconds

**Methods- ImageJ Micro Analysis**

- One cornea was prepared using the standard single pass cut
- 300 or 350 micron head
- Second cornea was prepared with a double pass cut
- 200 or 250 micron head for the first pass
- Single use 130, 110 or 90 micron head for the second pass
- Four 0.5mm² areas were counted
- Total of 1mm² for each cornea
- Ratio of non-viable cells to total cell count measured
Results - Thickness (Microns)

<table>
<thead>
<tr>
<th></th>
<th>Double pass</th>
<th>Single pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central</td>
<td>92 +/-20</td>
<td>Central-126 +/-34</td>
</tr>
<tr>
<td>3mm</td>
<td>92 +/-23</td>
<td>3mm- 120 +/-38</td>
</tr>
<tr>
<td>6mm</td>
<td>102 +/-25</td>
<td>6mm-133 +/-45</td>
</tr>
<tr>
<td>8mm</td>
<td>150 +/-29</td>
<td>8mm- 179 +/-51</td>
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</tbody>
</table>

Statistically significant decrease in central thickness in double pass group (p=0.039)
No perforations occurred in either group

Results - Macro Analysis

<table>
<thead>
<tr>
<th></th>
<th>Double pass area of cell damage</th>
<th>Single pass area of cell damage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central</td>
<td>1.69 +/-1.07</td>
<td>1.36 +/-1.18</td>
</tr>
<tr>
<td>3mm</td>
<td>1.36 +/-1.18</td>
<td></td>
</tr>
<tr>
<td>6mm</td>
<td>1.36 +/-1.18</td>
<td></td>
</tr>
<tr>
<td>8mm</td>
<td>1.36 +/-1.18</td>
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</tbody>
</table>

No statistical difference in area of cell damage between the two groups (p=0.37)

Results - Micro Analysis

<table>
<thead>
<tr>
<th></th>
<th>Double pass cell count:</th>
<th>Single pass cell count:</th>
</tr>
</thead>
<tbody>
<tr>
<td>2050 +/-264</td>
<td>2144 +/-283</td>
<td></td>
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</table>

No statistical difference in cell count between the two groups (p=0.345)

Results - Micro Analysis

<table>
<thead>
<tr>
<th></th>
<th>Double pass ratio of non-viable to total cell count:</th>
<th>Single pass ratio of non-viable to total cell count:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.0145 +/-0.031</td>
<td>0.0028 +/-0.0062</td>
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</table>

Statistically significant increase in non-viable cells in the double pass group (p=0.015)

Conclusions

- DSAEK tissue prepared with this double pass technique was predictably thinner than the standard single pass technique with no increased risk for perforation
- There was a small but significant increased risk for non-viable endothelial cells with no decrease in cell count

Methods - OCT

- Double pass
- Single Pass
**Purpose**

- To examine the central corneal thickness, cell density, and visual outcomes of ultra-thin DSAEK grafts in patients undergoing DSAEK surgery

**Methods**

- Donor cornea is centered on an artificial anterior chamber with a static pressure of 90 mmHG
- Epithelium is removed with a LASIK spear
- CCT is measured and appropriate head size is chosen
- A first pass is made with a Moria microkeratome and the anterior cap is removed
- CCT is measured and the appropriate head size is chosen
- A second pass is made with a Moria microkeratome 180 degrees from the first pass
- The anterior cap is replaced.

**Results**

- Central Thickness
  - Average – 64.9 microns (SD 26.1)
  - Thickest graft – 129 microns
  - 83 microns
  - Thinnest graft – 39 microns
- Peripheral Thickness
  - Average – 104.6 microns (SD 26.7)
Results

- Average cell density at 6 months
  - 7 eyes = 2184 cells
- Average uncorrected visual acuity at 6 months
  - 7 eyes = 20/32
- Best corrected visual acuity at 6 months
  - 7 eyes = 20/23

Limitations

- Small sample size
- Two surgeons
- Multiple insertion techniques
- Incomplete follow-up

Ultra-Thin

Ultra-Thin

Conclusions

- The double-pass technique for DSAEK donor tissue preparation produces grafts that are consistently thin both centrally and peripherally
  - This was reproducible
  - Can be performed by an eye bank
- Acceptable cell counts and visual acuity
- Further study is needed to determine if ultra-thin grafts yield the advantages of DMEK and traditional DSAEK

Moria Donor Prep
Donor Insertion

Acknowledgements
- Michael Taravella, MD
- Aaron Waite, MD
- Shawn Richards, MD
- Francisco LaRosa, MD
- Raul Velez-Montoya, MD
- Rocky Mountain Lions Eye Bank

References

Thank you