Eliminating the Possibility of Upside-Down DMEK Grafts: A Novel Stromal Side S-stamp Technique for DMEK

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Disclosure Slide

• I have no financial disclosures
• None of the authors have any financial disclosures regarding the contents of this presentation
Graft Orientation in DMEK

- DMEK Grafts Scroll “Endothelium Out”
- Proposed mechanisms:
  1. Endothelial Edema (Price)
  2. Intrinsic Elastic Properties (Melles)
     - Elastin (Moshirfar)

Moshirfar, M. Cornea. 2013 Apr;32(4):e52-3
Scroll Based Orientation Techniques

- Rely upon the tendency of DMEK tissue to scroll with endothelium on the outside
- Can be used before and after insertion
- Limited or no direct tissue manipulation
Scroll Based Orientation Techniques

Moutsouris Sign (Melles Group)


Intraoperative photos courtesy of Mark A. Terry MD
Scroll Based Orientation Techniques

Hand Held Slit Beam (Price Group)

Tangential Illumination

As demonstrated by Soosan Jacob, MS, DNB, FRCS
https://www.youtube.com/watch?v=K3SmgJ2exWY

Scroll Based Orientation Techniques

Immediate Pre-Insertion Graft Orientation

Rotate Straiko-Jones Tube Clockwise

Correct Side Up

Up Side Down

As Yet Unpublished Technique
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Our Success with Scroll Based Techniques

• Initial 32 cases with Gas & Glass technique
  – 4 primary graft failures (12.5%)

• 3 of 4 PGFs (75%) were due to Up Side Down grafts

• Additional series (Ham 2007, Dirisamer 2012) have also reported Up Side Down grafts as a cause of PGF

Limitations of Scroll Based Techniques

- Scroll Based Techniques depend upon tissue behaving as it is “supposed to”
- Orientation is difficult with corneal edema, flat or tight scrolls, floppy grafts or shallow AC
- Moutsouri’s technique can be impractical if the tissue is not aligned with a paracentesis and involves additional manipulation of tissue
Ideal Orientation Technique

- Orientation independent of tissue confirmation
- Limit trauma to the tissue
- Intuitive
- Low cost of implementation
Punched Orientation Marks (Kruse Group)

- Not intuitive
- Loss of tissue/endothelium
- Fear of decreased peripheral graft attachment

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What about an S-Stamp?

- Familiar/Intuitive to many DSAEK surgeons
- Provide definitive orientation independent of scroll conformation
- Concerns: Endothelial cell loss, visibility prior to tissue elevation and durability of S mark
- No standardized technique for DMEK S-Stamp
Development of a Stromal Sided S-Stamp Technique

Technique conceived by Philip Dye, Lions VisionGift, Portland, OR
S-Stamp Cell Loss

- Five 8.0 mm DMEK graft were stamped twice
- Vital dye staining (calcein-AM) was performed and the tissue analyzed with FIJI software to determine the absolute and percentage cell loss per stamp
- Mean attributable incremental cell loss of 1.5% (range 0.83-2.7%, SD 0.595) per S-stamp

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Three S-Stamped DMEK Tissues Utilized in Simulated Surgery Demonstrating 100% S-Stamp Visibility/Tissue Orientation
Durability of S

Zero Hours

24 Hours

72 Hours

96 Hours
S-Stamp

• Intuitive for the surgeon
• Acceptable mean 1.5% incremental endothelial cell loss from S-stamp
• Durable
• Inexpensive
• Definitive graft orientation prior to elevation
Early Clinical Results With S-Stamp

• To date 37 cases have been completed with an S-stamp without a single Up Side Down graft or PGF
• Comparison of re-bubble rates (1 of 32 vs. 2 of 37) show no statistically significant difference
• We have eliminated our primary cause of primary graft failure in DMEK
• Awaiting six month ECD for comparison with unstamped tissue