Endothelial Keratoplasty
DSEK and DMEK
Advances in Targeted Corneal Tissue Transplantation

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Outline: Endothelial Keratoplasty
- Challenges
- Why DSEK/DMEK?
- Results
- Complications

100+ years of Corneal Transplantation
- Dr. Edward Zimm 1905

Penetrating Keratoplasty (PKP)

DALK vs Endothelial Keratoplasty (DSEK/DMEK)

USA 2014
DSEK vs DMEK
- 2014
  - DMEK: 2865
  - DSEK: 23,100
Cornea Transplants: USA 1988-2014

Targeted Corneal Tissue Transplantation
Indications:

Anterior – DALK (Large Diameter)
- Thinning – Keratoconus, LASIK/RK ectasia
- Scars – HSK
- Therapeutic (ulcers, melt)

Posterior – DSEK/DMEK
- Endothelial Dysfunction
  - Fuchs’, Failed graft, Pseudo-ophakic Bullous Keratopathy (PBK)

Corneal Edema – PBK, Failed Graft
- Slit Lamp Exam (SLE)
- Endothelial Cell Count (ECC)
- Pathology Cross Section

Fuchs’ Corneal Dystrophy
- SLE
- ECC
- Gene expression in basement membrane

Posterior Targeted Tissue Corneal Transplantations

Variations:
- DSEK
  - Ultrathin DSEK
- DMEK

Recent advances in posterior lamellar surgery allow endothelial replacement while leaving the surface of the cornea and topography unchanged.

85yo female Fuchs Dystrophy

OD: PKP 2006 elsewhere
+0.75+4.50x30 20/30
OS: DSEK 2008 Dr Erdey
+0.75+0.5x11 20/20

Endothelial Keratoplasty

- Replaces deficient endothelium
  - Fuchs’ Endothelial Dystrophy
  - Pseudophakic Bullous Keratopathy
  - PKP failures

Descemet’s Stripping Endothelial Keratoplasty (DSEK)

- Endothelial replacement with addition of “sliver” of stromal tissue

Goal:

- Implant the highest concentration of donor endothelial cells possible
  - Typical graft size of donor 8.5 to 9.0mm
DSEK after 10 yrs: What do we know?

- Topographically near-neutral (unlike PKP)
- +1.5 hyperopic shift (DSEK > Ultathin DSEK)
- Very rapid visual recovery vs PKP
- Stronger eye (3.0 mm incision)
- Safer intra-operatively-topical anesthesia
- Post-op care easier

Unlike PKP...No DSEK grafts failed from:

- Trauma
- Ocular surface complications

Ophthalmology 2011;118:725–729  - Price

DSEK vs PKP  5-yr endothelial cell survival

Ophthalmology 2011;118:725–729  - Price

DSEK:
If it’s so good, why change?
It’s all about vision quality!

- 80% BSCVA 20/40
- Only 30% achieve 20/20
Descemet’s Membrane Endothelial (DMEK)

Transplant ONLY donor Descemets and endothelium

DMEK

- Makes an eye look perfect
  - Exact anatomic replacement
  - Better visually outcome than DSEK
  - Faster visual recovery than DSEK
  - Has lower rejection than DSEK (< 1% 1st 2 yrs)
- "your eye doctor may insist they’ve never had a transplant"

DMEK: Donor loss during preparation: steep learning curve!

- up to 20% (Griebel, Price)
- Solution: April 2011
  Central Ohio Lions Eye Bank (COLEB) preparing and distributing DMEK grafts to surgeons (only second US eye bank to do so!)

DMEK: Donor Preparation

DMEK: Descemet’s donor scroll insertion

DMEK scroll in the Anterior Chamber

It's a Jelly Fish!
DMEK: Descemet's donor scroll insertion

DMEK: Post-Operative Day 1 (POD1)

DMEK: POD1

DMEK: Graft failure

Visual outcome @ 6mos (n = 221)

BSCVA:
- ≥20/40 98%
- ≥20/25 79%
- ≥20/20 46%
- ≥20/18 14%

Negligible refractive shift

Contact Lens & Anterior Eye - Melles
Volume 36, Issue 1, Pages 13-21, February 2013

DMEK Graft failure

- High early during "learning curve"
- Repeat with typical DSEK

Graft attachment

Rebubbling rate: most for partial detachment

- DSEK: <2%
- DMEK: 63% early
  <5% with experience
Better scroll adhesion? How?

- Same size Descemets rhexis as donor scroll
- Trypan blue toxic – minimize exposure to scroll
- Reduce scroll manipulation at each step to absolute minimum
- Reduce time to un-scroll and position in eye
- "No touch"

Air bubble management - EK

- DSEK/DMEK
- Risk of pupillary block glaucoma
- BASAL PI @ 6
- BEWARE FLOWMAX Patients!
- Nausea vomiting, and EYE PAIN = SEE THEM ASAP!

Urrets-Zavalia syndrome

- Atonic pupil
  - 7 to 8 mm permanently dilated
  - Secondary to pupillary block with air bubble, intraocular pressure 50-70mmHg
  - Prevention with peripheral iridectomy/dilation

Graft Rejection after 2 yrs: DMEK (400 eyes) vs DSEK vs PK

- DMEK 20x less than PK.
- DMEK 15x less than DSEK

Ophthalmology 2012;119:536–540 Anshu, Price

ULTRATHIN Descemet's Stripping Endothelial Keratoplasty (DSEK) – vs DMEK

- 80-120u (ultrathin) vs. 120-220u (traditional DSEK)
- Less donor loss
- Lower re-bubbling rate
- Easier graft positioning
- % of patients reaching 20/20 approaches DMEK with less learning curve

Busin: Eurotimes

DMEK vs DSEK

Conclusions:

- Only 748 DMEK vs 22,301DSEK 2012
- Very rapid visual recovery
- 79% 20/25 or better BSCVA @ 6 mos
- Minimal Refractive Changes
- 15x less endothelial graft rejection
- challenging Donor Preparation
- Higher re-bubbling rates
Treatment of Endothelial dysfunction - Conclusions:

- DSEK is current standard of care.
- PKP should be avoided.
- Expect to see a shift to Ultrathin DSEK
- DMEK is our preferred method
- COLEB: DMEK and Ultrathin DSEK available!

Thank You!