

## 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 Zirm 1905

### Penetrating Keratoplasty (PKP)




1. Donor Cornea Removed



2. Donor Cornea Secured in place with sutures

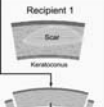
### DALK vs Endothelial Keratoplasty (DSEK/DMEK)

Anterior



Epithelium and Stroma

Recipient 1




Scar  
Keratoconus

Deep Anterior Lamellar Keratoplasty

DALK

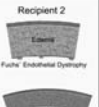
SPLITTING

Posterior



Descemet's Membrane and Endothelium

Recipient 2



Fuchs' Endothelial Dystrophy

Descemet's Stripping Endothelial Keratoplasty

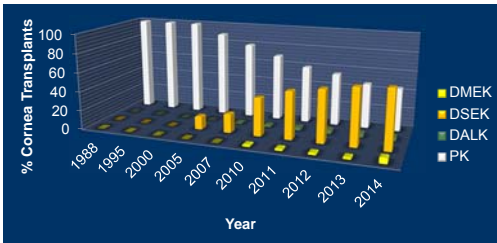
Descemet's Membrane Endothelial Keratoplasty

DMEK/DSEK

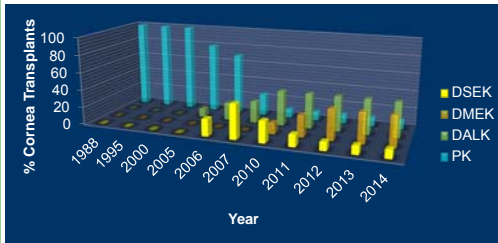
### USA 2014 DSEK vs DMEK

- 2014    DMEK    2865    DSEK    23,100

### Cornea Transplants: USA 1988-2014



### Cornea Transplants: Erdely-Searcy Eye Group 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-phakic Bullous Keratopathy (PBK)

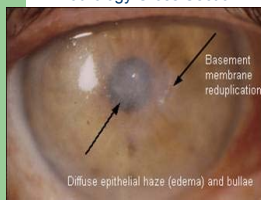


### Cornea Endothelial Failure

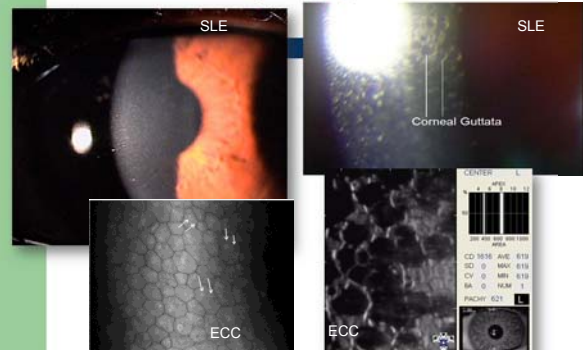
- Posterior Targeted Tissue Corneal Transplantations

### Corneal Edema – PBK, Failed Graft

- Slit Lamp Exam (SLE)
- Endothelial Cell Count (ECC)
- Pathology Cross Section



### Fuchs' Corneal Dystrophy



**Posterior Targeted Tissue Corneal Transplantations Variations:**

- DSEK
  - Ultrathin DSEK
- DMEK

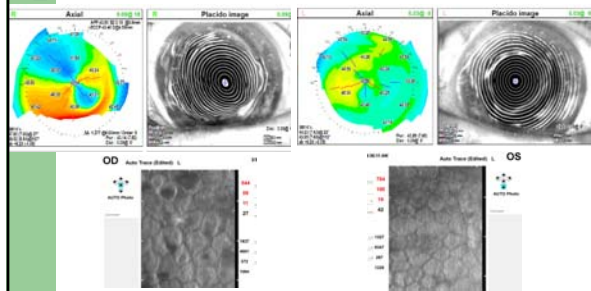
**Posterior Targeted Tissue Corneal Transplantations**

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

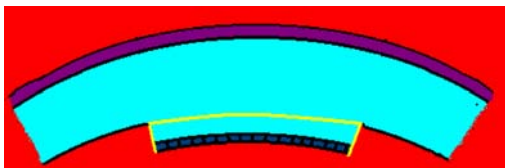


**Endothelial Keratoplasty**

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

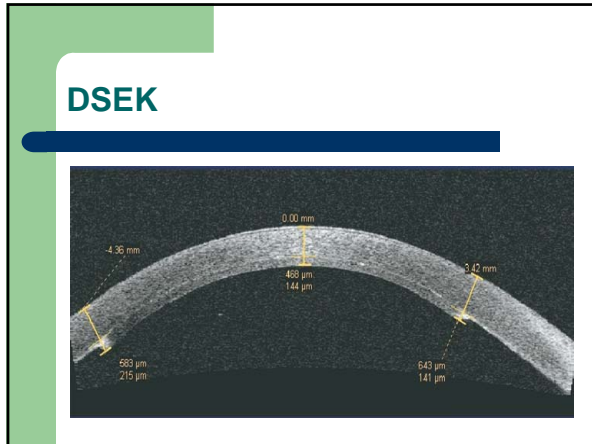
**Descemet's Stripping Endothelial Keratoplasty (DSEK)**

- Endothelial replacement with addition of "sliver" of stromal tissue



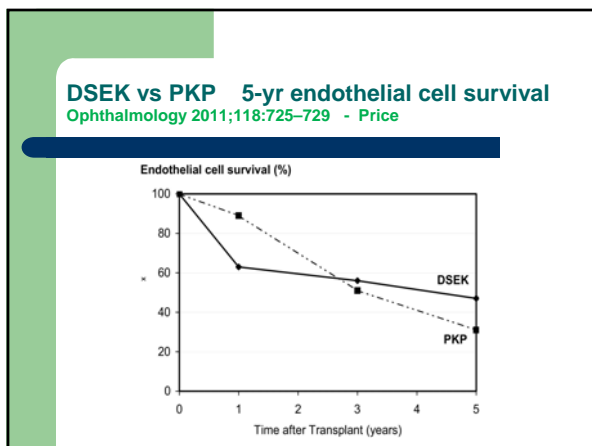
**Goal:**

- 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

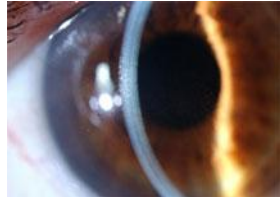
- ### Unlike PKP...No DSEK grafts failed from:
- Trauma
  - Ocular surface complications
- Ophthalmology 2011;118:725-729 - Price



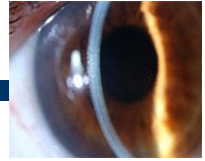
- ### DSEK:
- If it's so good, why change?  
It's all about vision quality!
- 80% BSCVA 20/40
  - Only 30% achieve 20/20
-

### Descemet's Membrane Endothelial (DMEK)

Transplant ONLY donor Descemets and endothelium



### DMEK

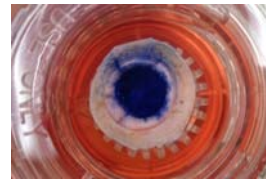


- Makes an eye look perfect
  - Exact anatomic replacement
  - Better visually outcome than DSEK
  - Faster visual recovery than DSEK
  - Has lower rejection than DSEK (< 1% 1<sup>st</sup> 2 yrs)
- "your eye doctor may insist they've never had a transplant"

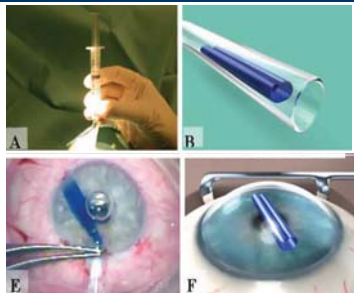
### DMEK: Donor loss during preparation: steep learning curve!

- 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

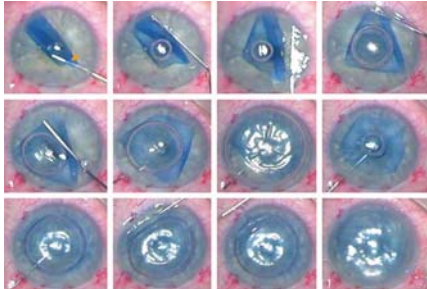


### DMEK scroll in the Anterior Chamber

It's  
A  
Jelly Fish!



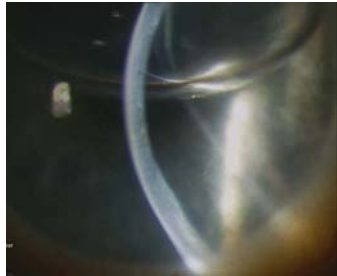
### DMEK: Descemet's donor scroll insertion



### DMEK: Post-Operative Day 1 (POD1)



### DMEK: POD1



### DMEK: Visual outcome @ 6mos (n = 221)

BSCVA:

- $\geq 20/40$  98%
- $\geq 20/25$  79%
- $\geq 20/20$  46%
- $\geq 20/18$  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 Descemet's 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-Zavalía 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 22,301 DSEK 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!**