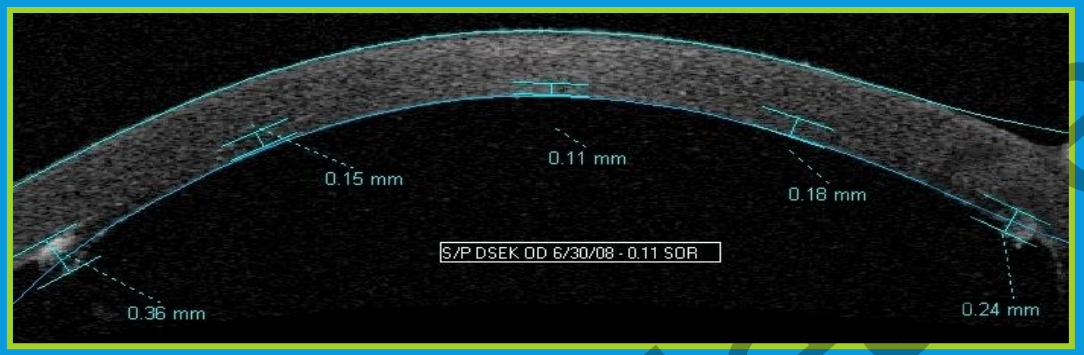

ENDOTHELIAL KERATOPLASTY
UTRA-THIN DSEK

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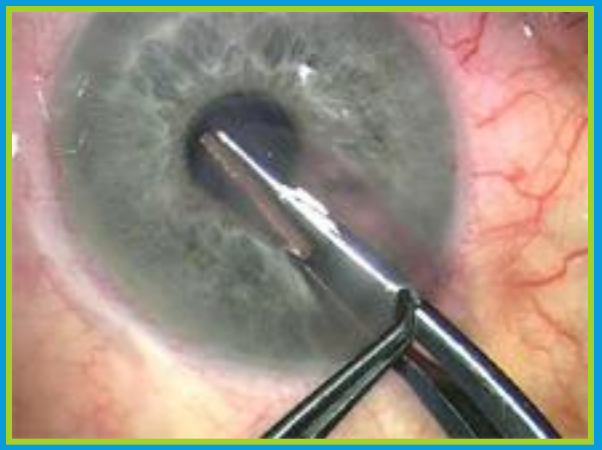
FINANCIAL DISCLOSURES

I have the following financial interests or relationships to disclose:

- Alcon Laboratories, Inc.
- Allergan, Inc.
- Bausch + Lomb, Inc.
- Katena
- Kala Pharmaceuticals
- Mati Pharmaceuticals
- Mimetogen
- Omeros
- PRN
- TearLab
- TearScience
- Senju
- Shire

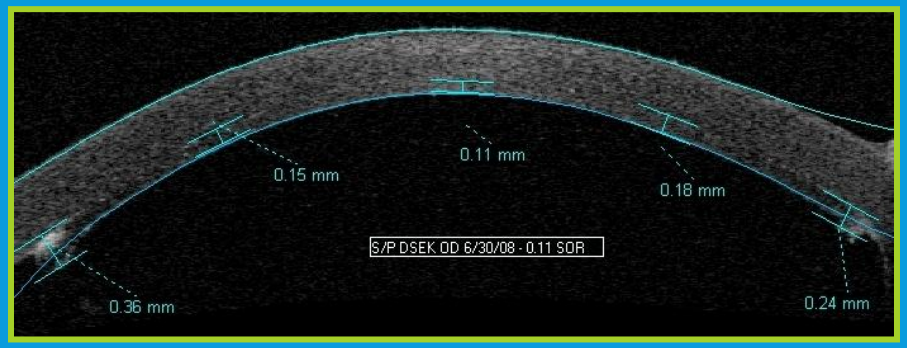
CORNEAL THICKNESS IN DSEK

- Historically there has been a surgeon bias toward thicker tissue
  - Eye banks instructed to cut tissue 180 – 200 microns
  - Thicker tissue is easier to handle
  - Can use Forceps for insertion
- We noted that certain DSEK patients were achieving 20/20 vision and others were not
  - Suspected tissue thickness played a role



DSEK THICKNESS STUDY

- Evaluation of post-op DSEK graft thickness
  - measured by AS-OCT
  - 12 months post op
  - 33 eyes
- Results
  - Thin EK eyes (≤ 131 µm)
    - 100% ≥ 20/25, 71% achieved 20/20
  - Thick EK eyes (> 131 µm)
    - 50% ≥ 20/25, 19% achieved 20/20 (p<0.01)



Neff , Holland et al. ASCRS Annual Meeting 2009 and Cornea 2011

FOLLOW UP DSEK THICKNESS STUDY

"Thin" <120µm
- Mean 100µm
- Range 60-110µm

"Thick" ≥120µm
- Mean 140µm
- Range 120-180µm

	Thin EK (n=33)	Thick EK (n=34)	Total eyes (n=67)	P value
LogMAR				
Median	0.10	0.18	0.10	0.008
Mean	0.09	0.17	0.13	
Range	0- 0.3	0- 0.54	0 to .54	
Snellen				
Mean	20/25	20/32	20/29	0.008
Range	20/20-20/40	20/20-20/70	20/20-20/70	
% of eyes achieving 20/20	10 (30%)	8 (24%)	19 (28%)	0.53
% of eyes achieving ≥20/25	27 (82%)	15 (44%)	43 (64%)	0.001
% of eyes achieving ≥20/30	31 (94%)	24 (71%)	55 (83%)	0.02

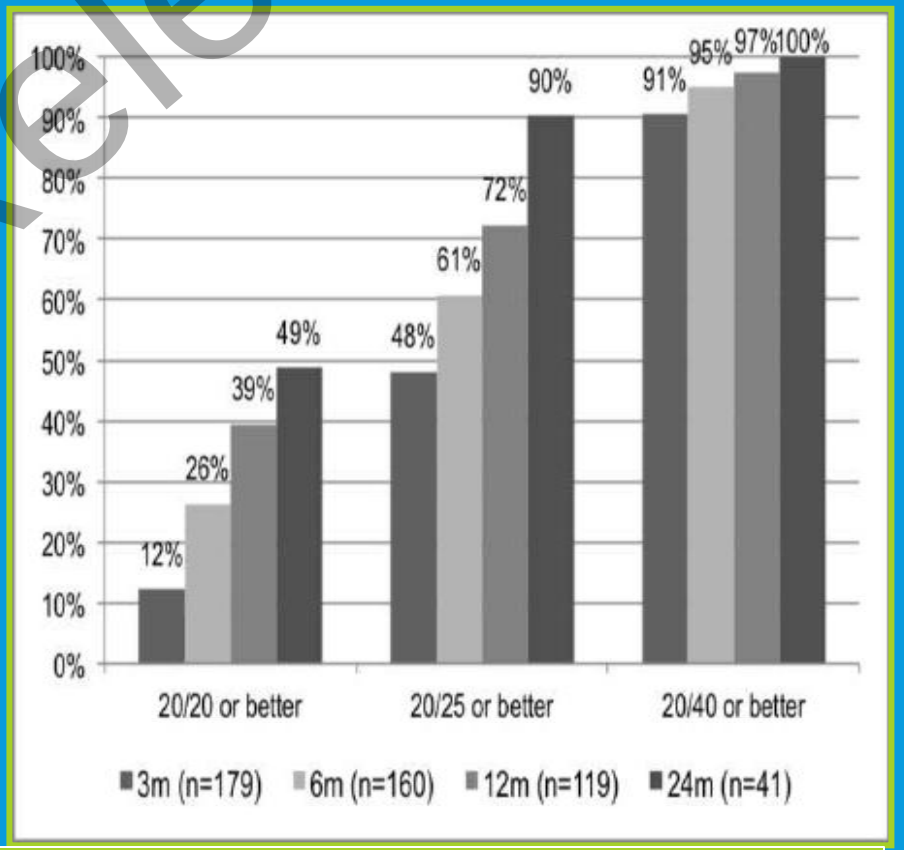
LogMAR, logarithim of minimum angle of resolution

Ang, A and Holland, EJ Cornea Society/EBAA Fall Educational Symp 2012

DISCUSSION – POST-OP THICKNESS VS. BSCVA

Busin study of "Ultra-Thin" DSAEK (n=285)[1]:

- Microkeratome double pass technique
- Mean central graft thickness at 3 month postop: 78.3 ± 28.9 µm
- Visual outcomes comparable to Guerra and Price[2] 1 year DMEK results:
  - 41% achieved ≥20/20
  - 80% achieved ≥20/25



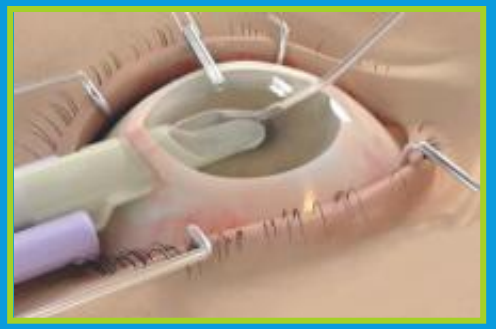
1. Busin M, et al. Ultrathin DSEK with the microkeratome double-pass technique: two-year outcomes. *Ophthalmology.* 2013
2. Guerra FP, Anshu A, Price MO, et al. *Ophthalmology* 2011.

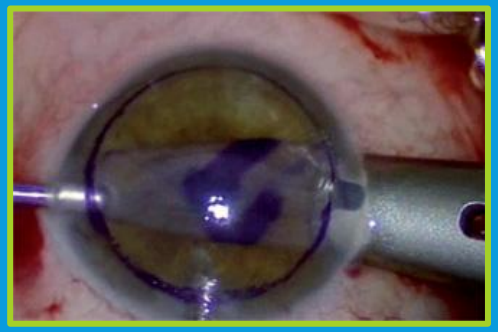
DISADVANTAGES OF ULTRA - THIN DSEK

- Tissue harder to handle with forceps
- Tissue less rigid and harder to unfold within anterior chamber
- Possibly more endothelial cell loss due to tissue handling problems
- Need for an inserter device to assist in manipulating thin EK tissue

DSEK INSERTION DEVICES

- Allows for easy placement of even very thin tissue
- Incision size <4mm
- Examples
  - Tan Endo Guide
  - EndoSaver
  - Busin Glide
- Our present Eye Bank request is for tissue 50-70 microns



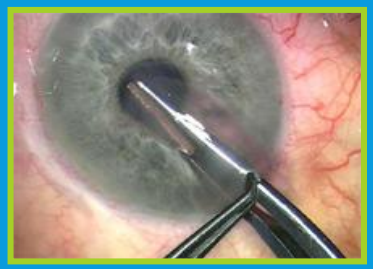


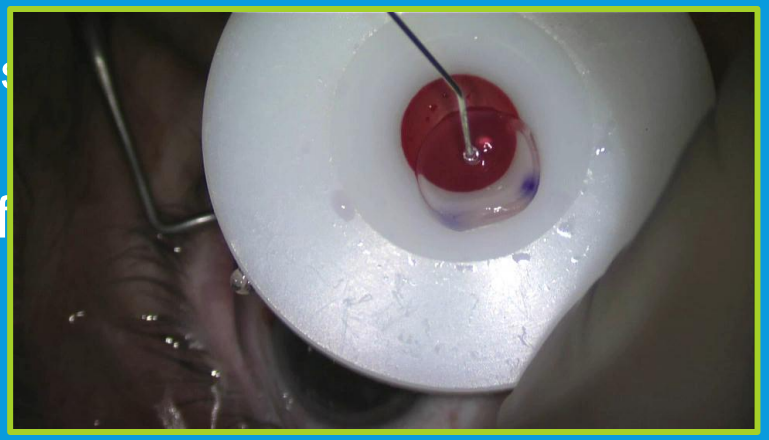
ENDOSERTER RESULTS

Endoserter vs. Forceps Study

- Graft detachment rate:
  - 6% in the injector group
  - 28% eyes in the forcep group
- Graft failure:
  - 1% with Endoserter
  - 6.5% with forceps
- Visual outcomes:
  - Endoserter - 74% were ≥ 20/40 at 6 months
  - Forceps - 72% were ≥ 20/40 at 6 months
- 6 month post-op endothelial cell loss of
  - Endoserter - 28%
  - Forceps - 44%

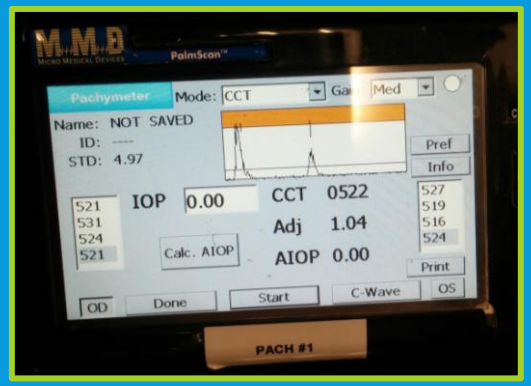
Foster JB, Walter K, et al. Cornea 2012

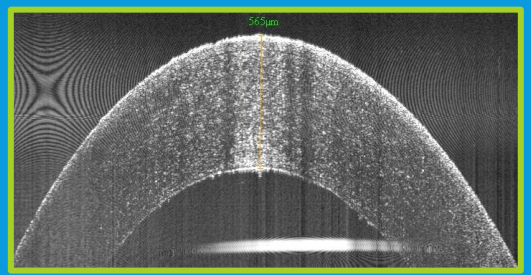




KEYS TO ULTRA-THIN DSAEK PREP
MINNESOTA LIONS EYE BANK

- Choose the correct donor cornea
  - Preferred thickness ≤ 550 µm
  - Exclude uneven stroma
  - Exclude LASIK surgery history
- Each Technician creates a pachymetry nomogram
  - Specific to individual operator
    - Pachymeter – Spec micrometer, OCT, and US
    - AAC set & microkeratome head (200, 250, 300, 350 µm)
    - Hand pass speed





ULTRA-THIN DSAEK PROCESSING
MINNESOTA LIONS EYE BANK

- Obtain full thickness pachymetry in viewing chamber by specular micrometer and OCT
  - Both have accuracy of ± 10 µm
- Center cornea on Moria artificial anterior chamber (AAC)
- Remove epithelium
- Ultrasound pachymetry immediately prior to microkeratome pass

ULTRA-THIN DSAEK PROCESSING
MINNESOTA LIONS EYE BANK

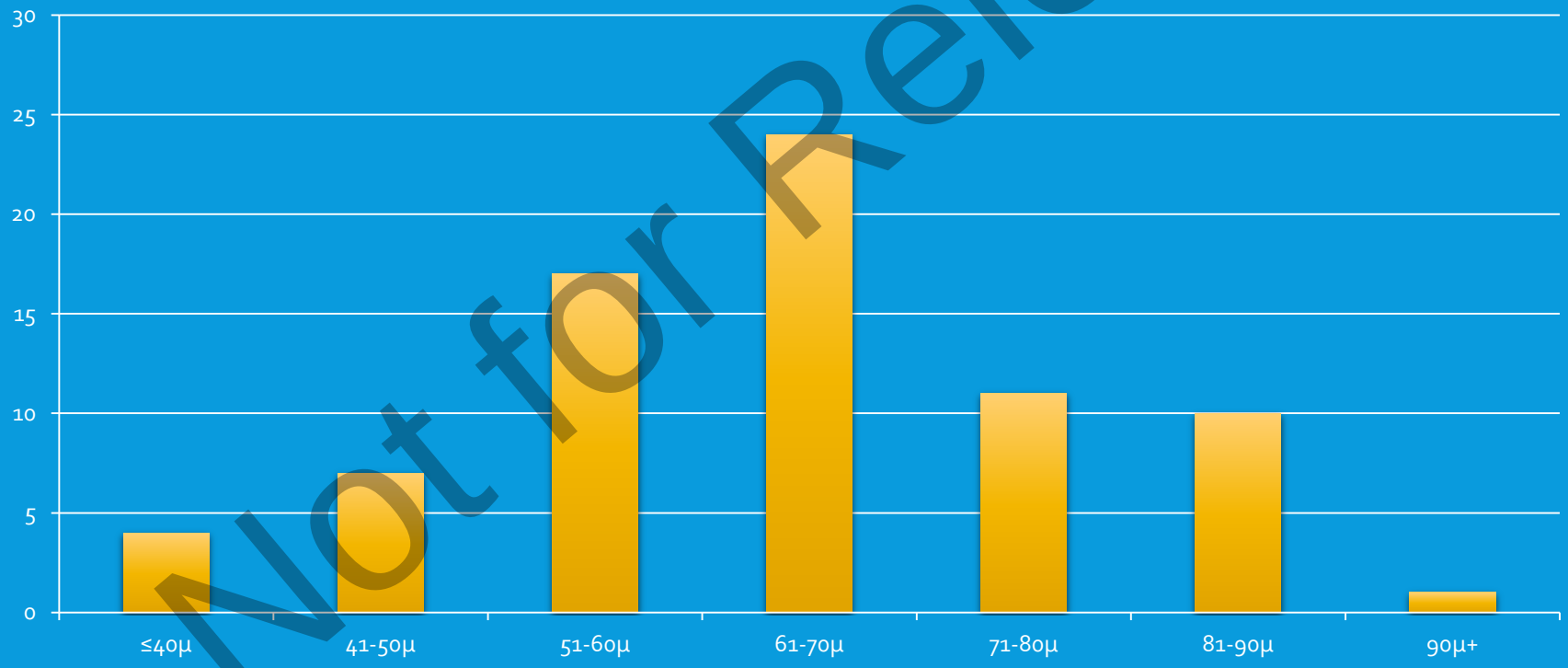
- Perform single microkeratome pass
- Ultrasound pachymetry immediately after microkeratome pass
- Obtain post-cut pachymetry in viewing chamber by specular micrometer and OCT
  - Thickness stabilizes ~15-30' post-cut

VARIABLES IN ULTRA-THIN DSAEK PREP

Other variables

- Orientation: enter at thickest side to make cuts more uniform
- Hand pressure: harder → deeper cut
- Time on AAC: Generally, longer → thinner
- Amount of epithelium removed: more removed → thinner
- Age of donor: younger corneas stretch, change thickness more easily

DSAEK GRAFT THICKNESS WITH TARGET OF 50-70 MICRONS
E. HOLLAND: 4/1/15 THROUGH 3/31/16



Average thickness: 65 µm
57% in target range of 50-70 µm

ULTRA-THIN VS. OTHER DSAEK
MINNESOTA LIONS EYE BANK
4/1/15 THROUGH 3/31/16

UT DSEAK Target 50-70 µm

- 74 Grafts
- 7 Corneas damaged during processing
- Loss Rate 8.64%

All Other DSAEK

- 544 Grafts
- 18 Corneas damaged during processing
- Loss Rate 3.2%

UT DSEK THICKNESS = 40 µm

Custom Corneal Tissue Information Form - DSAEK

Tissue ID#: 16-1714 OS-C DSAEK

Tissue Processed for:	DSAEK	Graft Thickness (microns):	40
Date Processed:	2016-10-23	Calc Graft Thickness (microns):	------
Time Processed:	10:14		
Origin Eye Bank:	Minnesota Lions Eye Bank	Graft Diameter (mm):	9
Origin Eye Bank ID:	------		

Comments - Post-Cut:

UT DSEK THICKNESS = 31 µm

Custom Corneal Tissue Information Form - DSAEK

Tissue ID#: 16-1318 OD-C DSAEK

Tissue Processed for:	DSAEK	Graft Thickness (microns): 31
Date Processed:	2016-08-26	Calc Graft Thickness (microns): ------
Time Processed:	09:36	Graft Diameter (mm): 9
Origin Eye Bank:	Minnesota Lions Eye Bank	
Origin Eye Bank ID:	------	

ULTRA-THIN DSEK

Technique has evolved and improved

- Eye Banks can provide Ultra-Thin tissue at a reasonable rate
- Surgical advantages
  - Ease of insertion
  - Predictable surgical time
  - Improved Visual Acuity Outcomes vs. Standard DSEK
  - Less complications than DMEK
    - Tissue easier to handle
    - Detachment rate
    - Endothelial cell loss ?

Disadvantages vs. DMEK

- Slower visual recovery
- Visual Acuity?