DMEK COURSE – Advanced Surgical Techniques and Surgical Pearls

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DMEK continues to evolve and improve in the surgical techniques and instrumentation. In this course, we shall present the surgical steps of DMEK, new DMEK instruments, new delivery systems for donor descemet’s membrane (DM), easy unrolling and effective attachment of the donor DM to the inner surface of the recipient cornea.Use of air and SF-6 will be covered. Donor DM preparation techniques including the water-pillow technique will be presented. The do’s and don’ts of DMEK will be covered. Techniques to optimize DM attachment to patient cornea will be presented. Use of intra-operative slitlamp and real time intraoperative OCT imaging techniques to facilitate DMEK in totally cloudy cornea with very poor AC visualization will be presented.

Arthur Giebel, MD

• The Sandwich
• Squeezing failure out of DMEK
• Three Common Scenarios of DMEK
• Pseudophakic – has already had cataract surgery
• Triple EK/CE/IOL – has a cataract ... needs both DMEK and CEIOL
• Post Vitrectomy – has a history of vitrectomy
“If you can handle 99% of cases, you can probably figure out how to handle the other 1%.” – Yours truly

- Pseudophakic DMEK
- Work of cataract surgery already done
- No need for dilation ... preop drops include pilocarpine
- DMEK Sandwich
- DMEK made easy - Incisions
  - Incisions - paracenteses, 1 main temporal wound
    - Inferior paracentesis
      - Escape valve for pupillary block
      - Away from other 2 incisions
    - Superonasal paracentesis
      - Comfortable superior access away from main incision
    - Temporal main wound
      - Greatest distance from cornea center
      - Easy access for topical
- DMEK made easy – Host prep
- Peel guttate-laden DM
  - Air or Healon (cohesive), but NO Viscoat (dispersive)
  - Y-hook, circle capsule polisher ... Dexatome, Rake (ASICO)
- Perform inferior PI
  - Paracentesis blade through main wound (under Healon or chamber maintainer)
- Fill AC with air while preparing DMEK donor
• DMEK made easy – Donor prep
  • “Precut” donor shortens time
    • Inspect with trypan stain – remove, stain, rinse, inspect
    • Punch to desired size (e.g. 2-4mm < W-W) … less than arcus
    • Free donor and soak in trypan
    • Load carrier with donor – without air bubbles
  • Non-precut …
    • SCUBA technique with score, stain, slowly lift x360, punch, then as above
• DMEK made easy – Chamber prep
  • Remove air, replace with BSS … no air bubbles in AC
  • Verify incision size … injector fits?
  • 10-0 suture standby

• ?
  • Chamber stability
  • Pupil small/round/centered, lens posterior
  • No vitreous present
  • Any other abnormality?
• DMEK made easy – Implant into AC
• NO AIR BUBBLES in injector or in AC
• Inject donor
  • Short slow pulses
    • Maintain AC depth
• Avoid over inflation
• Avoid donor going through pupil or iridectomy
• Remove injector slowly with low AC pressure

• Suture temporal wound

• DMEK made easy – Unroll

• Unroll donor with ...
  • Corneal tap/stroke/massage, or ...
  • Fluid jets outside roll, or ...
  • Dial the donor to line up with paracentesis ...
    • Unroll with fluid pulsed from inside the roll, or ...
    • Manually open the roll from insid with cannula stroking/laying down donor across iris face

• Hold with the “Sandwich” squeeze – a shallow AC that prevents rerolling

• Sandwich technique

• Dilemma – 3 hands needed
  • 2 for each end of donor
  • 1 for injecting air

• Solution – sandwiching frees up 2 hands!
  • Shallow AC keeps donor from rolling up
  • Donor held between cornea and iris

• Don’t need entire donor unrolled, just enough to get a bubble under

• DMEK made easy – Air hold

• Place a small bubble under correctly oriented donor portion
  • Air can hold with 1 hand what the iris takes “2” hands for
• Tilt/rotate eye with forceps to get bubble to center under donor
• Massage/tap/stroke to unfold/unroll the donor near completely
• Deepen the AC with BSS
• Tile/rotate eye as needed to let donor “fall off of bubble” towards centration
• Massage/tap/stroke to center the donor
• ***1cc syringe with 27g cannula (30g too small)
• DMEK made easy – Air/gas fill
• 20% SF6 fill
  • Avoid overfilling by placing BSS through pupil
• Inject gas into previous bubble to avoid trauma from “fish eggs”
  • (Note: smaller cannula at high risk for fish eggs, e.g.. 30g)
• Fill completely with paracentesis at lowest point so BSS can escape
• DMEK made easy – Congratulations!
• Breathe
• Antibiotic/steroid drops
• Drink water/hydrate ... urinate 2x
• If complete gas fill, then can sit up, move around, but avoid looking down.
• If incomplete gas fill, then begin using bubble right away ... supine, chin up.
• DMEK made easy – Pupil clearance
• IOP check @1 hr
• If pupil block, consider dilating with neosynephrine/tropicamide
• ***Avoid atropine
• If air block, consider burping inferior paracentesis
• Discharge to home when sure that pupil block not an issue.
• DMEK made easy – Post op Positioning
• Use the bubble!
• The bigger the bubble, the easier to get the inferior donor attached.
• Focus on inferior donor FIRST, then either side, and lastly superior donor
• Position head to encourage eye position
  • Chin up first day/night with 20min break Q2hr
  • Alternate chin up with either side every hour
    • With neck problems, alternating side to side may be just as good with big bubble
• Triple DMEK/CEIOL – Pupil drops
• Use same incisions for DMEK as for CEIOL
• Dilate for CEIOL, Constrict pupil for DMEK
  • Avoid epi in the BSS bottle
  • Avoid tropicamide/cyclopentolate ... dilate with ONLY phenylephrine
  • Constrict after lens implantation and visco removal with Miochol
• Triple DMEK/CEIOL – Poor miosis
• DMEK Sandwich
  • If pupil poorly constricting
    • Watch chamber depth to avoid lens/endo touch
    • Consider a decentered unrolling until bubble-lift
• Postop cautions
• Triple DMEK/CEIOl – Postop caution
• Watch sticky capsulorhexis edge and sticky iris
• Avoid atropine or prolonged cycloplegia/dilation
  • Increases risk of posterior synechia and permanently dilated pupil
  • May require surgical intervention to restore pupil
• Post-Vitrectomy DMEK – Success Corner
• Lack of vitreous pressure
• Corner Success – don’t let it get away!
• Unroll donor in the angle ... use the angle to hold the donor
• Other techniques
  • Use larger donor
  • Flatten cornea digitally
• Post-Vitrectomy DMEK – Centering donor
• Use the centering techniques as before, but
  • Initial large bubble may be useful ...
    • Large bubble to cover donor
    • Rotate eye to get bubble centered under “angle’d donor” ... and hold it there while ...
      • Shrink bubble, to cover only a correctly flattened out donor
      • Tap/massage/stroke other parts to unroll/flatten them out
      • Minimize bubble further to minimize donor/host friction
      • Tap/stroke the donor into centration ... letting it fall off the bubble towards center
    • Level eye and place air/gas
**Lamis Baydoun, MD/Gerrit Melles, MD**
Head NIIOS Academy, Corneal Surgeon at Netherlands Institute for Innovative Ocular Surgery (NIIOS) and Melles Cornea Clinic Rotterdam, The Netherlands

Tips for DMEK and Advanced DMEK

Overview:

1- Video: DMEK surgery on first DMEK patient worldwide by Dr. Gerrit Melles: beginners ´mistakes´?
2- Video: ´beginners mistakes´ are there to be repeated?
3- Video: `Standardized no touch DMEK technique´: beginners mistakes ´solved´?
4- Video: Smooth graft injection
5- Alternative DMEK unfolding techniques
6-Video: Failed unfolding maneuver
7- Videos: DMEK in challenging eyes (DMEK after DSEK; DMEK after PK; in aphakia, etc.): managing advanced DMEK cases

**Francis Price, MD**

Slide 1
**Financial Disclosure**

I have the following financial interests or relationships to disclose:

- Alcon – C
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- Haag Streit – C
- Interactive Medical Publishing – D
- Retinal Vision – D
- Shaw – C
- Strathspey Crown – O
- TearLab – O

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**DMEK Advantages**

- Better visual recovery
- More rapid visual recovery
- Less rejection risk
- Ability to treat second eye 1 to 2 weeks after the first eye
- Less expensive donor preps

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**DMEK**

- Only Descemet’s and endothelial cells
- Best visual recovery
- Least risk of rejection
- Still unpredictable refractive changes:
  - Posterior surface elevation from edema
  - Guttae may distort imaging
  - Small areas of epithelial edema lead to either hyperopic or myopic shifts
Slide 5

>2800 DMEK cases at PVG: 2008-2017
Rejections <1% if on steroids
Stopping steroids at one year up to 6%
- 3 weeks to 4 years after surgery

Keratic precipitates


Slide 6

What's New In DMEK

- More surgeons – so more innovations
  - Trifold technique
  - AC maintenance with side port
  - New punches
  - Unique hooks to score and strip
  - Scleral tunnel
  - Sealant to close conjunctiva
  - Technology - intraoperative OCT

Slide 7

DMEK Guarded Trephine Punch Prevents full thickness punch
Slide 17

New glass tubes to inject donors

Slide 18

Intra-operative OCT
Cataract surgery 10 years ago, cloudy vision since

Slide 19

Summary: management of cataract with cornea problems
- Cataract and minimal guttae
- Cataract and significant guttae or corneal decompensation
- Age <50y
  - Phaco alone
  - Phaco+ DMEK alone
  - Phaco+ DMEK
- Age >50y
  - Phaco alone
  - Phaco+ DMEK alone
  - Phaco+ DMEK

*Impact of guttae on vision frequently underestimated

www.Cornea.org
So What is downside of either phaco first or combined phaco and DMEK?
Mark Terry, MD

- Unscrolling tight scrolls
- Centering tissue after it’s already up in place
- Using pre-loaded and pre-stained DMEK tissue
- Making re-bubbles at the slit lamp easier and faster and safer
Thomas John, MD

- Video presentation that highlights difficult intra-operative management of very cloudy cornea that presents a surgical challenge to perform DMEK surgery. Significantly cloudy cornea interferes with adequate visualization of the recipient anterior chamber and hence causes difficulty in both removing the recipient Descemet’s membrane and unscrolling and attaching the donor Descemet’s membrane with healthy donor endothelium to the inner surface of the recipient cornea.

- Use of intra-operative OCT and intra-operative slit lamp provides added assistance in performing safe DMEK in the presence of very cloudy cornea.

- Donor recipient membrane preparation using the water-pillow technique will be demonstrated using intra-operative OCT imaging technique.

- Intra-operative OCT and intra-operative slit lamp usage are welcome addition to DMEK surgery.

- Factors to consider in performing safe DMEK surgery

- DMEK surgical instruments to simplify the surgical procedure

- EK versus PK

- “Magnetic” sub-optimal pupil
• Upside-down phaco in DMEK
• Ideal work zone
• Not all anterior chambers are the same
• Attaching DM in deep AC
• Patterns of DM folds
• Less fluidics and gentle unfolding of donor DM
• Effect of trypan blue on descemet’s membrane elasticity
• DMEK Smoother
• Bubble size in DMEK
• Case of “blue IOL”
• Resolve synechiae in DMEK surgery
• Optimal goal is to perform safe DMEK surgery