Ultra-Thin DSAEK: The Future of Endothelial Keratoplasty?

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Instruction Course ASCRS March 28th 2011, 1300 - 1400

Introduction

As DSAEK gains popularity, we strive towards faster and better visual results. Recent evidence has confirmed suspicions that thinner tissue is compatible with better visual outcome. For this reason, some surgeons prefer to perform DMEK for patients with endothelial failure, however, increased surgical difficulty, higher detachment rate, and limitations in eyes with more complex pathology render DMEK inadvisable for some patients. With Ultra-Thin DSAEK (UT-DSAEK), we aim to achieve the visual results of DMEK, whilst maintaining the surgical ease of DSAEK.

Indications

UT-DSAEK is indicated for any form of endothelial failure, but may be more appropriate than DMEK in the following situations:

- Phakic eyes
- Aphakic eyes
- Aniridic eyes
- After glaucoma filtering procedures
- In long standing or severe corneal edema

Relative Contraindications

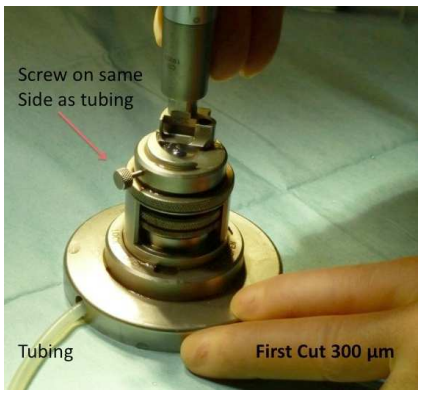
- Eyes with very poor visibility, requiring a fixation suture
- Post-PK eyes likely to require full-thickness relaxing incisions in the future

Instructions

Tissue Preparation

1. **Debulking Step**
    a. Tissue mounted on artificial anterior chamber

    b. Bottle height 120cm above tissue
    c. Thickness of tissue measured
    d. System closed, clamp at approx. 50 cm
    e. Approx. 2/3 of anterior stroma removed, using 300µm or 350 µm cutting head, passed for at least 4 seconds

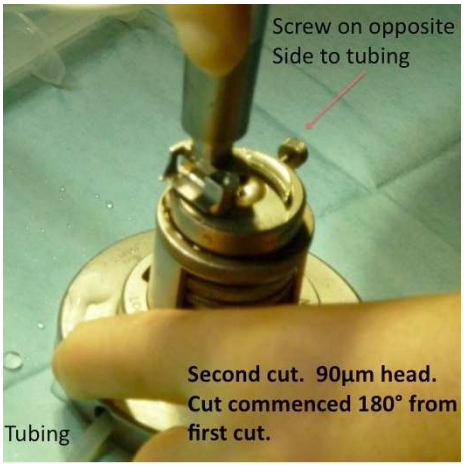


f. Removed lamellar retained for subsequent case
g. Thickness of residual stromal bed measured

2. Refinement Step

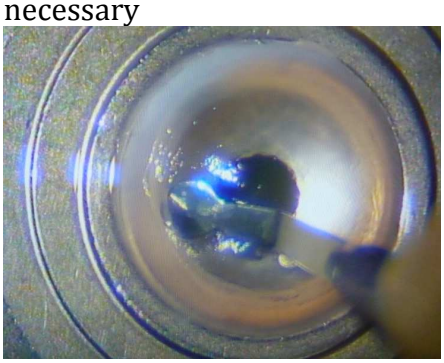
(Further removal of stroma)

a. Tissue remains mounted on artificial anterior chamber
b. Rotate the top of the chamber, or the tissue 180°
c. If pachymetry ≤ 150 µm, use 50 µm head
d. If pachymetry 150 - 200 µm, use 90 µm head
e. Pachymetry > 200 µm, use 130 µm head
f. Bottle height remains same
g. Close system by clamping at 50cm
h. Advance the cutting head, slowly and smoothly (at least 6 seconds)

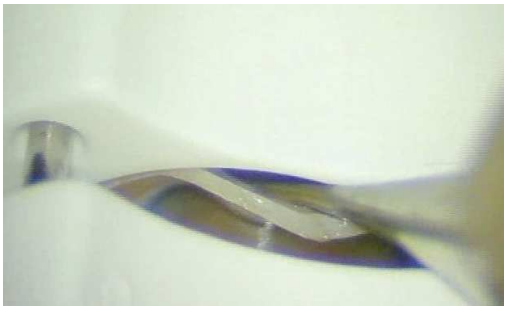


3. Mark Stromal side
   a. Using trypan blue, mark circumference of cut
   b. Mark 'F' on anterior surface

4. Enlarge the Diameter of the cut, if necessary

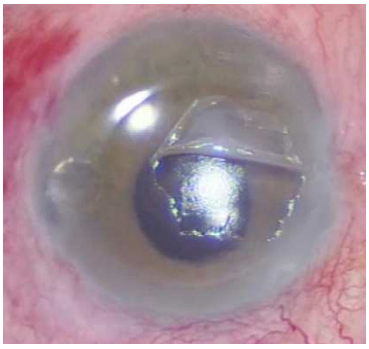


5. Remove the tissue
   a. Bend tubing and open plunger (to prevent collapse, and endothelial damage)
   b. Remove tissue from front
6. Punch tissue to desired diameter
   a. Approximately 1mm less than vertical corneal diameter
   b. Usually 8.5 – 9mm
   c. To prevent incomplete punch, pull rim upwards, prior to removing trephine



Surgery

1. Remove epithelium, if necessary, to improve visibility



2. Insert 25G needle at 12 o'clock (short, steep tunnel)
3. Remove some aqueous
4. Inject air
5. Bend needle (reverse cystotome), or use 'scorer'
6. Score DM and endothelium, to desired diameter (actual diameter not important, make sure visual axis clear)

7. Using blunt cannula or 'scorer' at 12 o'clock, or 'stripper' via a temporal paracentesis, mobilise endothelium and DM, and place near nasal limbus

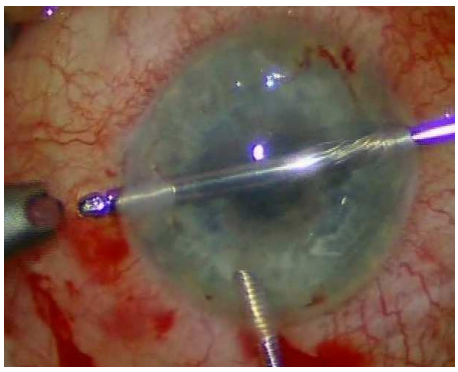
8. Create steep, short (1mm) clear corneal wound nasally (3.2mm) and temporally (1mm)
9. Remove stripped DM and endothelium using forceps
10. Enlarge superior wound to 1mm with 15° blade.
11. Place AC maintainer, with bottle placed at approx. 50 cm above eye
12. Create inferior iridotomy (vitreoretinal scissors)

13. Mount tissue onto glide
    a. Difficult to lift thin tissue
    b. Using a glide, modified to 'scoop' the tissue, place the tissue on the glide

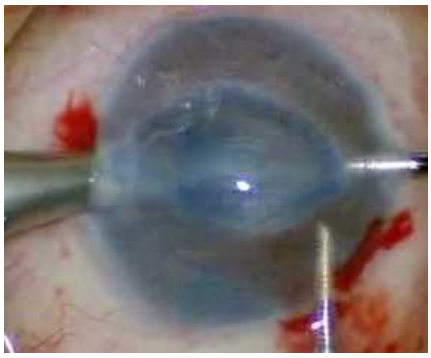
    c. Very thin tissue will drape over the edge of glide

d. Center the tissue on glide, remove fluid, and advance to the tip

14. Insert tissue
    a. Have AC maintainer on
    b. Advance forceps through the temporal wound, across eye, and out of the nasal wound



    c. Grasp tissue
    d. Move both instruments nasally, until the tip of the glide enters the nasal wound
    e. Draw tissue into the eye



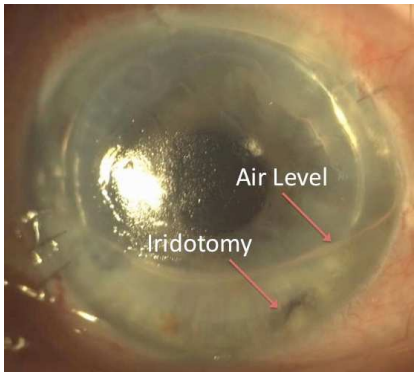
    f. Allow tissue to open
    g. Remove AC maintainer
15. Center tissue
    a. Ballot cornea from surface
16. Inject air beneath tissue

17. Suture all wounds, air tight with 10-0 Nylon
18. Take a 30 G needle, via a long, peripheral tunnel, inject air beneath donor tissue, taking care to be in front of the iris, until complete fill is achieved

19. Peribulbar steroid and antibioti

Post-operative management

1. Posture patient supine for 2 hours
2. Assess patient at slit lamp
    a. Remove some air if air level fails to lie above the level of the iridotomy



3. Commence topical steroid and antibiotic
    a. 2 hourly for 2 weeks
    b. 3 hourly for 2 weeks
    c. 4 x a day for 2 weeks
    d. 3 x a day for 1 month
    e. 2 x a day for 1 month
    f. 1 x a day for life, unless phakic/steroid responder
4. Review
    a. Day 1
    b. Day 2
    c. Week 1
    d. Month 1
    e. 3 monthly

Results

Visual Results (Our first 86 eyes)

- Thinner grafts result in improved BCVA:
    - ≥20/20 14%
    - ≥20/25 46.5%
    - ≥20/40 81.4%
    - ≥20/70 88.4% (95% if exclude those with severely limiting comorbidities)
- Refractive change: Slight hyperopic shift for normal thickness DSAEK, UT-DSAEK and DMEK closer to refractive neutrality.

Endothelial Cell loss

- Minimal loss with preparation DSAEK = UT-DSAEK = DMEK
- No cell loss as a result of second cut
- Endothelial cell loss mean 35.4% (range 4.2 – 76.0%) at mean 5.8 months (range 2-12 months).

Complications

- Primary graft failure: almost absent (0 of 86 cases)
- Graft detachment: rare (circa 5%) with UT-DSAEK, more often (up to >50%) with DMEK.
- Pupillary block almost abolished by inferior PI
- Cataract formation: rarely seen to date in phakic eyes
- No increased risk of complications in glaucomatous eyes

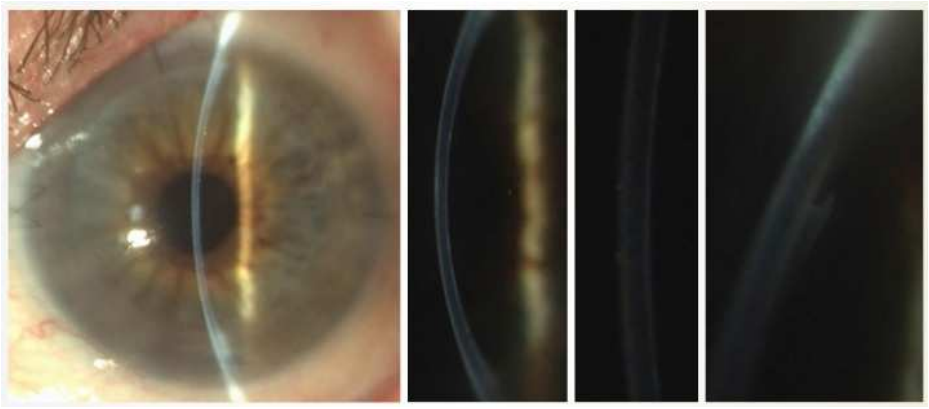


Figure. 1 month and 3 month Post-operative appearance