

Chapter 12

IntraLase-Enabled Deep Anterior Lamellar Keratoplasty (IEDALK)

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Abstract Deep anterior lamellar keratoplasty is a partial thickness corneal graft technique void of endothelium. DALK technique offers several advantages over penetrating keratoplasty such as it being an extraocular procedure, never entering into the anterior chamber. Additionally, there is no risk of endothelial rejection, and no need for immunosuppressive medications. DALK has shown similar VA outcomes when compared to PKP. IntraLase-enabled DALK offers a more accurately prepared and matched transplant. Patients should have been evaluated and deemed appropriate for such surgical intervention. Patients should have been educated about the risks and benefits of the procedure, including alternatives.

Keywords IntraLase-enabled deep anterior lamellar keratoplasty • IEDALK • DALK • Femtosecond laser • Cornea • Transplant • Corneal dystrophy • Keratoconus

Indications

Corneal scarring and other stromal opacities, keratoconus, corneal ectasia, stromal dystrophy, and superficial recurrence of corneal dystrophy.

Essential Steps

1. Measurement of patient's cornea at slit lamp (diameter).
2. Pachymetry of host cornea with ultrasound or optical coherence tomography.
3. Selection of graft size and cut pattern: standard sizes include ((a) 8.0 mm, (b) 8.5 mm, and (c) 9.0 mm). Standard cut patterns include zigzag, top hat, and mushroom. (*Note: donor tissue is frequently cut at the eye bank to same size specifications in advance.*)

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4. IntraLase-assisted cut performed on the patient: a partial thickness trephination based on predetermined corneal thickness. Sparing 70–100 μm of the posterior cornea. (*Optional, 30 (angled) \times 15° (arc) channel for a pneumodissection cannula which can be placed inside the trephination area at <8.0 mm diameter, sparing 40–70 μm of posterior stroma.*)
5. Patient transferred to OR.
6. Prep and drape.
7. Previously obtained IntraLase cut donor cornea from the eye bank was placed onto the sterile field and prepared for transplantation.
8. Paracentesis.
9. Small air bubble placed into the AC.
10. Host partial trephination cut opened with sinsky hook.
11. Insertion of pneumodissection cannula into deep stroma (*using the preplaced channel if available*) and rapid infusion of air to generate a big bubble with Descemet's barring.
12. Lamellar dissection and removal of stroma over big bubble.
13. Stromal stab to decompress the big bubble.
14. Big bubble refilled with cohesive viscoelastic.
15. Sequential removal of remaining stroma in a divide-and-conquer fashion.
16. Wash off any remaining viscoelastic barred on to Descemet's membrane.
17. Strip Descemet's membrane from donor cornea under microscope with Trypan Blue staining to assist in visualization.
18. Suturing of donor cornea to recipient bed.
19. Suture knot burial.
20. Reduce air bubble in the AC to ~30 % in order to prevent pupillary block. (*Note: bubble will also promote Descemet reattachment to the graft.*)
21. Injection of subconjunctival antibiotics and steroid.

Complications

- Graft rejection (stromal or epithelial)
- Interface haze
- Descemet's perforation/rupture
- Wound leakage
- Graft dehiscence
- Double anterior chamber (failure of Descemet to reattach to donor cornea)
- Infectious keratitis
- Recurrence of pathology in donor graft

Template Operative Dictation

Preoperative diagnosis: *Corneal dystrophy (OD/OS)*

Procedure: *IntraLase-enabled deep anterior lamellar keratoplasty (OD/OS)*

Postoperative diagnosis: *Same*

Indication: This _____-year-old (*male/female*) with a well-known and documented history of (*pellucid marginal degeneration/post-LASIK ectasia/lattice stromal dystrophy/granular stromal dystrophy/macular stromal dystrophy/superficial recurrence of corneal dystrophy in corneal graft/superficial corneal opacity/keratoconus/corneal degeneration*) complained of decreased vision despite the use of spectacles/contact lenses and medical management. The visual impairment was affecting activities of daily living, and after a detailed review of risks and benefits, the patient elected to undergo the procedure.

Description of the procedure: The patient was identified in the holding area, and the patient's (*right/left*) eye was initially marked at the slit lamp for corneal centration. (*He/she*) was then taken into the refractive suite where a time-out was performed verifying correct patient, procedure, and site. Settings for a 9.0 mm (*mushroom/zig-square/zigzag*) C IntraLase-assisted cut was performed leaving residual stromal bed of 70 μ m based on the previously taken pachymetry map. An additional 15 $^{\circ}$ channel was cut at 30 $^{\circ}$ at an approximately 8.0 mm diameter to a depth of 530 μ m based on pachymetry measurements to assist in the formation of a dissection plane. The patient was then patched and transported to the OR on an eye stretcher in the supine position. A second proper time-out was performed verifying the correct patient, procedure, site, position, and special equipment prior to starting the case. General anesthesia was induced. The (*right/left*) eye was prepped and draped in the usual sterile fashion. The operating microscope was centered over the (*right/left*) eye. Following anesthesia and ophthalmic akinesia, a wire lid speculum was placed into the patient's (*right/left*) eye.

[Choose one]

If big bubble technique (Anwar's)—Using a sinsky hook, attention was turned toward the lamellar dissection and separation of the precut host corneal button. A paracentesis wound was fashioned over the temporal quadrant, and a small air bubble was placed into the anterior chamber. A bottom port, blunt-tipped, air injection cannula was then introduced into the lamellar pocket to the appropriate depth, where air was injected with sufficient pressure. A large pneumatic dissection plane was noted. Approximately 50% of the anterior stroma was removed with a crescent blade. The pneumatic pressure was released using a sharp mini-diamond blade. The big bubble space was re-inflated with cohesive viscoelastic. A spatula was introduced into the plane, and the remaining portions of anterior stromal tissue were incised using blunt-tipped Fogla curved cornea scissors and viscodissection. The excised recipient cornea was sent for histopathological analysis.

If viscoelastic dissection technique—Using a sinsky hook, attention was turned toward the lamellar dissection and separation of the precut host corneal button. A paracentesis wound was fashioned over the temporal quadrant, and a small air bubble was placed into the anterior chamber. A bottom port, blunt-tipped, viscoelastic injection cannula was then placed into the lamellar pocket to the appropriate depth, where viscoelastic was injected with sufficient pressure to create a dissection

plane. The viscoelastic bubble was deflated using a sharp mini-diamond blade. A spatula was introduced into the plane, and the remaining portions of anterior stromal tissue were incised using blunt-tipped Fogla curved cornea scissors. The excised recipient cornea was sent for histopathological analysis.

If hydrodelamination technique—Balanced saline solution (BSS) was injected intrastromally in all four quadrants of the partially trephined central disk using a ____-gauge needle. The central disk was noted to be completely opaque and swollen when compared to the peripheral cornea. A paracentesis wound was fashioned over the temporal quadrant, and a small air bubble was placed into the anterior chamber. As the stoma swelled, layers were removed using a lamellar blade and right and left blunt-tipped Fogla corneal scissors. Upon deeper stromal manipulation, Descemet's membrane was noted to detach from the anterior lamina, and at this point dissection was stopped. The excised recipient cornea was sent for histopathological analysis.

The previously IntraLase cut donor cornea was obtained from the eye bank which had come from a ____-year-old (M/F) that died of ____ on (date) that was rated in (good/very good/excellent) condition with a ____-cell count. The cornea was removed from the Optisol media, stained with Trypan Blue and stripped with forceps under the operating microscope in media. The anterior layer of the donor cornea was stored back into the Optisol media, while the posterior layer was discarded.

The donor cornea was then taken and placed into position on the recipient cornea. Radial alignment marks were used to guide # interrupted cardinal sutures that were placed with 10-0 nylon sutures, and knots were buried. A 16-bite running 10-0 nylon suture was placed around the donor cornea and adjusted to provide even tension. The corneal running suture knot was buried at the graft host interface. The existing anterior chamber air bubble was adjusted to ~30–50% volume in order to tamponade Descemet's membrane against the DALK graft at a physiologic pressure. The air bubble was reduced to an approximately 8.0 mm size, and the AC was brought to physiologic pressure with BSS on a cannula. Subconjunctival injections of antibiotics and steroid were given. Drapes were removed, an eye patch and shield were placed, and the patient was taken from the operating room in good condition.