Chapter 11
Manual Deep Anterior Lamellar Keratoplasty (Manual DALK)

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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 a partial thickness procedure, and decreased risk of endothelial graft rejection. DALK has shown similar VA outcomes when compared to PKP. 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 Manual deep anterior lamellar keratoplasty • MDALK • DALK • Cornea • Transplant • Corneal dystrophy • Keratoconus

Indications

Corneal scaring, keratoconus, corneal ectasia, stromal dystrophy, stromal opacities, and superficial recurrence of corneal dystrophy post-corneal transplant.

Essential Steps

1. Measurement of donor graft/cornea punch size
2. Lamellar dissection
3. Preparation of donor cornea
4. Suturing of donor cornea to recipient bed
5. Suture knot burial
6. Injection of subconjunctival antibiotics and steroid

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Complications

- Graft rejection
- Opacification at the graft-donor interface
- Interface haze
- Corneal perforation
- Wound leakage
- Graft dehiscence
- Pseudoanterior chamber
- Keratitis

Template Operative Dictation

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

Procedure: *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*) complained of decreased vision despite the use of spectacles/contact lenses. 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 (*right/left*) eye was marked with a marking pen. The patient was brought into the OR on an eye stretcher in the supine position. A 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. After examination under anesthesia, it was determined that a ____-mm excision with an _____-mm donor size would be appropriate. A marking pen was used to outline the site of trephination on the cornea. A partial thickness trephination of approximately two-thirds corneal thickness (up to 350 μm) was performed using a ____-mm trephination blade into the lamellar bed.

Attention was turned toward the donor cornea 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 and placed on the ____-mm Barron corneal punch with special attention paid to

keeping the endothelial side up. The donor cornea was then dried using a Weck-Cel sponge and placed under the operating microscope where an anterior lamellar dissection was performed using a crescent blade. The anterior layer of the donor cornea was stored back into the Optisol media, while the posterior layer was discarded.

[Choose one]

If layer by layer technique*—Using a series of successively larger bevel-up crescent lamellar dissectors, attention was turned back toward the dissection into the deep stroma of the patient's cornea. The cornea was then excised layer by layer using right and left corneal scissors. The excised recipient cornea was sent for histopathological analysis.*

If air-guided deep stromal technique (Melles')*—Attention was turned back toward the lamellar dissection into the deep stroma of the patient's cornea. Using a guarded diamond blade, a 50% depth scleral incision approximately ___mm in width was made ___mm from the limbus. A sclerocorneal tunnel was then dissected extending ___mm into the clear cornea. A paracentesis incision was created at ___o'clock, and anterior chamber aqueous was exchanged for a sufficient amount of air. The air to endothelium interface was used as a reference plane to visualize the corneal thickness and ensure adequate depth of dissection. Through the scleral pocket, a bevel-up crescent blade was inserted and gradually advanced. Using the mirror reflex, the deep stroma was dissected until a corneal depth of 95% was attained. A blunt spatula was used to create a continuous dissection plane at the correct depth. The air bubble was partially evacuated, so as to reduce IOP, and viscoelastic injected within the dissection bed in order to displace the posterior layers toward. The excision of the anterior stroma is completed by trephination.*

If big bubble technique (Anwar's)*—Using a crescent blade, attention was turned back toward the lamellar dissection into the deep stroma of the patient's cornea. ___% of the patient's anterior stromal tissue was removed. A pointed dissector was then used to create a peripheral pocket in the residual deep stromal tissue (located at a depth of approximately ___microns from the endothelium). A bottom port, blunt-tipped, air injection cannula was then placed into the pocket, where air was injected with sufficient pressure. A large pneumatic dissection plane was noted. (A paracentesis incision was created to reduce aqueous and intraocular pressure.) The pneumatic pressure was released using a sharp mini-diamond blade. A spatula was introduced into the plane, and the anterior stromal tissue incised over the spatula using a sharp knife. Four quadrants were created in this fashion. The anterior stromal tissue was then excised using right and left corneal scissors. The excised recipient cornea was sent for histopathological analysis.*

If viscoelastic dissection technique*—Using a crescent blade, attention was turned back toward the lamellar dissection into the deep stroma of the patient's cornea. ___% of the patient's anterior stromal tissue was removed. A pointed dissector was then used to create a peripheral pocket in the residual deep stromal tissue (located*

at a depth of approximately ___microns from the endothelium). A bottom port, blunt-tipped, viscoelastic injection cannula was then placed into the pocket, where viscoelastic was injected with sufficient pressure to create a dissection plane. (A paracentesis incision was created to reduce aqueous and intraocular pressure. Air was then injected into the anterior chamber) The viscoelastic bubble was deflated using a sharp mini-diamond blade. Corneal scissors were used to carry out the remainder of the incision, and four quadrants were created in this fashion. The anterior stromal tissue was then excised using right and left corneal scissors. The excised recipient cornea was sent for histopathological analysis. Air was exchanged for BSS, and the wound checked for leaks.

***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 incision was created to reduce aqueous and intraocular pressure.) As the stoma swelled, layers were removed using a spatula and right and left 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 donor cornea was then taken and placed in position on the recipient cornea using four cardinal interrupted *9-0 nylon* sutures. The wound was then closed with multiple interrupted sutures of *10-0 nylon*. The cardinal sutures were cut and replaced with *10-0 nylon*. All the suture knots were trimmed and buried. Subconjunctival injections of antibiotic and steroid were given. Antibiotic ointment was placed on the eye, and the eyelid speculum was removed. The eye was closed with a patch and shield. The patient tolerated the procedure well and left the operating room in good condition.