Can we overcome the challenges of sutures in lamellar keratoplasty?

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Lamellar keratoplasty (LK) is a technique which can be followed for both tectonic and optical purposes. We describe a technique of sutureless anterior LK by fixing the donor lenticule to the recipient bed using fibrin glue. LK was performed in an eye with corneal opacity using the manual dissection method. The donor lenticule was cut with a microkeratome after fixing the corneoscleral rim in an artificial anterior chamber. The size of the donor lenticule was 8.5 mm and fixed to the recipient bed with fibrin glue. The surgical time was reduced significantly with this technique. There was an uneventful postoperative period during the follow-up of 12 months. Best corrected visual acuity improved from hand movement to 20/60. Thus, the use of fibrin glue for fixing the anterior lamellar lenticule is a viable option for both optical and anatomical purposes.

Key words: Fibrin glue, lamellar keratoplasty

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There are numerous suture-induced problems in a corneal graft like postoperative irritation, inflammation, infiltration, infection, and vascularization; all factors can ultimately lead to graft melting/failure. In addition, the application of sutures is also time consuming. Persistent epithelial defects can be caused by persistence of a tight/loose suture. These problems should be better avoided than treated. Currently, fibrin glue, a biological tissue adhesive, has gained its popularity as an alternative to sutures.[1-3]

The present study aims to find out if lamellar corneal lenticule can be safely and adequately attached to the recipient bed using fibrin glue.

**Case Report**

A 7-year-old boy was admitted with a history of diminution of vision in both the eyes following a cracker injury 7 months ago. The acute symptoms had subsided, but there was constant irritation with poor vision. On examination, there were multiple intracorneal foreign bodies, some reaching up to Descemet's with irregularly thinned cornea and leucomatous corneal opacity, in both the eyes [Fig. 1]. Though anterior segment optical coherence tomography (OCT) would have been an ideal tool to identify the depth of involvement precisely, the same could not be performed due to nonavailability. Best corrected visual acuity (BCVA) was counting fingers close to face in both the eyes. Refraction/acceptance was not possible. The peripheral iris was normal, lens was clear, intraocular pressure (IOP) was 18 mmHg and fundus could not be visualized although B-scan was normal. General physical examination and systemic evaluation were within normal limits. The child was posted for anterior lamellar keratoplasty (LK) of the right eye under general anesthesia using a donor cornea from a 62-year-old subject who died of cardiac arrest. The reported death to enucleation time (DET) was 10 h. Although this is more than the accepted 6-h limit, but due to the limitation of availability of donor eyes in our country, we often accept the tissues even after the scheduled DET of 6 h. These eyes are expected to have suboptimal endothelium for which these are either used for therapeutic/tectonic keratoplasty. It was preserved in the McCarey–Kaufman medium for 14 h prior to transplantation.

No specific preoperative medication like lowering of IOP

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**Figure 1:** Clinical photographs with multiple corneal opacities

**Figure 2:** Photograph showing partial thickness anterior lamellar dissection

**Figure 3:** The anterior partial thickness corneal button removed by microkeratome from the donor cornea

**Figure 4:** Partial thickness corneal button glued to the recipient’s cornea
was necessary as required in penetrating keratoplasty. No corneal topography was possible preoperatively.

After presurgical preparation, bridle sutures were passed into both superior and inferior rectus. The center of the cornea was marked with gentian violet. The opacity size was measured by a caliper to decide the trephine size. Accordingly, an 8.5-mm diameter and a 0.3-mm (approximately) depth partial thickness anterior lamellar dissection was carried out [Fig. 2]. The recipient dissection was performed manually, with the help of a crescent blade, due to irregular thinning of the cornea. Guarded trephine was not used due to nonavailability. Automated microkeratome blade was not used because of irregularly thin cornea. However, care was taken to remove maximum number of foreign bodies to make the visual axis and pupillary area clear.

Moria automated lamellar therapeutic keratoplasty (ALTK) artificial anterior chamber (Moria/Microtek Inc. Doylestown, PA, USA) was used to mount the donor corneoscleral tissue button. A plate with a central opening and a sliding platform was fixed. The microkeratome head (350 µ) was used to obtain an anterior partial thickness corneal button of 8.75 mm diameter to be used for LK [Fig. 3].

After giving a thorough wash to the recipient bed to remove the tissue debris, blood clot if any, or any other foreign bodies, the field was dried with a cellulose acetate sponge. Few superficial blood vessels were also present. Freshly prepared fibrin glue solution (ReliSeal, Relinace Life Sciences, India) was spread uniformly over the recipient bed and the donor button was placed over the recipient bed. A Duplojet injector was used to apply the two components of the fibrin glue. Uniform and firm pressure was applied from the center to the periphery and more toward the edge [Fig. 4]. The subconjunctival injection of gentamycin (20 mg in 0.5 ml) and dexamethasone (2 mg in 0.5 ml) was given and a firm pad and bandage was applied to complete the surgery.

The bandage was opened after 24 h and the eye received 1% prednisolone acetate eye drops every 2 h in the first week, every 4 h for the next 2 weeks, four times a day up to 12 weeks, twice a day up to 6 months, and then it was stopped. Similarly, 0.3% gatifloxacin eye drops were instilled four times a day up to 12 weeks, four times a day up to 12 months, and then it was stopped. Similarly, 1% prednisolone acetate eye drops every 2 h in the first week, every 4 h for the first 2 weeks, twice a day up to 12 weeks, four times a day up to 12 months, and then it was stopped. After 2 weeks, topical lubricants were given at 4-h intervals. The patient was followed up everyday for 3 days, every week for 2 weeks, every month for 3 months, and every 3 months thereafter. Follow-up was of 12 months.

6 months post-operatively, the patient was symptom free with a graft clarity of +3 and BCVA of 20/60 with -1 D sphere and -1D Cylinder 120°. On slit-lamp examination, there was a mild interface haze but no vascularization at the graft-host junction, despite there being a few preexisting superficial vessels in the recipient eye.

Discussion

Fibrin glue has a long history of use in ophthalmology. It is well tolerated by the patients, nontoxic to the tissue wherever it is applied and has some antiinfectious activity. It sets well in a comparatively wet field area as compared to cyanoacyrlate glue. It allows a smooth seal along the entire length of the wound edge and because of the shear adhesive strength, it maintains the tissue fixed to the surface.

In corneal surgery it has been used for varied applications such as amniotic membrane transplantation for ocular surface reconstruction, limbal stem cell transplantation, epitheliochorioretinal dystrophy and as an aid to stabilize temporally sutured keratoprosthesis. Its use was also advocated for corneal graft.

Rosenthal et al. used a platelet/fibrinogen/thrombin mixture to fixate the lamellar corneal graft in experimental animals. The average incisional bursting pressure was 185 mmHg (range 90–300 mmHg) for testing stability. Narendran et al. carried out deep LK using fibrin glue supported with overlay sutures. They found it to be a time-efficient and effective technique. A laboratory study was carried out by Bahar et al. in 2007 in “top hat” keratoplasty and they found fibrin glue mechanically more stable than suturing.

In the present communication, we evaluated the efficacy of fibrin glue in graft fixation in anterior LK. As the recipient cornea was of irregular thickness, manual dissection was performed. However, the donor lenticule was obtained by using a microkeratome. We found the technique as a safe and an effective one in terms of less surgical time and negligible postoperative reaction. Furthermore, postoperative graft vascularization, a leading cause of graft failure, was also not seen. The graft was stable.

Thus, we recommend that suturing should no more be an automatic choice during LK. However, more number of cases with longer follow-ups in years should be performed to find out the postoperative problems and wound stability. It would be more appropriate if the technique can be performed and compared by more number of experienced corneal surgeons (preferably on LK) to highlight its efficacy.

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