Anterior lamellar keratoplasty (ALK) involves selective removal of superficial layers of the corneal stroma sparing the healthy host endothelium. Avoiding the removal of the endothelial layer circumvented the risk of endothelial graft rejection, which is the most common cause for posterior keratoplasty (PK) failure.[1,2] Traditionally, the ALK procedure encompasses surgical dissection of anterior stromal layers by means of various lamellar knives/dissectors making the procedure more susceptible to trephination catastrophes causing forfeiture of the valuable donor tissue.

Here, we report a salvation technique of manual ALK to circumvent the undetermined errors during the intra-operative procedure in addition to highlight the growth of the corneal epithelium over pre-Descemet's membrane/Dua's layer. To the best of our knowledge, there is scarcity of available literature to elicit any alike procedure in the past, making this case report a significant salvation breakthrough in the field of ALK.

**Surgical Technique**

A 56-year-old female presented with a history of painless progressive diminution of vision in both eyes (BE) for 2 years. On further elaboration of the past history, the patient complained of recurrent episodes of painful redness and watering in BE since childhood and getting relieved temporarily with some topical medications.

On detailed ocular examination, the uncorrected visual acuity in the right eye (RE) was found to be 4/60 improving to 6/60 with a pin hole in RE and 1/60 improving to 3/60 with a pin hole in the left eye (LE). Slit-lamp examination showed multiple whitish granular corneal opacities involving the Bowman membrane and superficial stroma with normal fundus finding in BE [Fig. 1a]. LE, in addition, had NS2+ cataract. Anterior segment optical coherence tomography revealed a dense hyper-reflective material at the level of the basement membrane and superficial stroma in BE. She was diagnosed as a case of stromal corneal dystrophy in BE and was planned for superficial ALK (SALK) with phacoemulsification and posterior chamber intra-ocular lens (IOL) implantation in LE after a complete pre-anesthetic check-up.

After clean and drape of the LE, the recipient corneal center was marked using the tip of a dialor and the dimensions of the corneal lesion were measured using a calliper. Following this, the donor cornea was mounted over the artificial chamber, and lamellar dissection was started using a 300 micrometer blade and lamellar dissectors [Fig. 2a]. After uniform dissection of the desired depth, the donor cornea was trephined with a 7.75 mm trephine [Fig. 2b]. Subsequently, the recipient cornea was trephined till the desired depth using a 7.50 mm trephine and was then smoothly dissected using the lamellar dissector [Fig. 2c]. Phacoemulsification was then performed.
and IOL was implanted using the routine technique. Till this stage, the procedure was uneventful, but when the donor tissue was mounted over the recipient cornea, it was of a larger diameter than the dissected host cornea from 11 o'clock to 5 o'clock hours [Fig. 2d]. The surgeon re-trephined the donor graft with the 7.50 mm trephine, but this time, it was smaller from 1 o'clock to 5 o'clock hours than the host cornea [Fig. 2e]. In such an unintended event, an unconventional surgical technique was adapted by the surgeon as the last opportunity to complete the procedure. Taking into consideration that the residual donor cornea was around 250 μm thick, the surgeon used the deep stromal lenticule over the recipient cornea after removing the Descemet's membrane [Fig. 2f]. The graft was manually trimmed to an appropriate size [Fig. 2g] and glued to the host cornea, and finally, Bandage Contact Lens (BCL) was placed [Fig. 2h]. Although the procedure was complete, the only uncertainty was the growth of the host epithelium over the pre-Descemet's membrane.

Post-operatively, the topical antibiotic (0.3% ofloxacin) four times per day, the topical lubricant (CMC 0.5%) six times per day, and the topical steroid medication (1% predacetate) three times per day were prescribed. On post-operative day 1, the patient was comfortable, and the uncorrected visual acuity in LE was 3/60; slit-lamp examination showed mild conjunctival congestion, and the graft was well opposed to the host cornea [Fig. 1b]. Miraculously, complete epithelialization was achieved during the first post-operative week [Fig. 1c], so the topical steroid was increased in frequency. Post-op follow-up was performed at day 1, day 7, 4 weeks, and then monthly till 9 months. At 9 months post-op, the visual acuity in LE was 6/12 with -1.5 D Cyl @ 130°.

Discussion

ALK aims at replacement of the unhealthy anterior cornea preserving the healthy host endothelium. Regardless of the distinct advantages of ALK, PK is still the most common
keratoplasty procedure as lamellar surgery is technically more demanding and time-consuming with sub-optimal visual outcomes.[3] Recently, ALK has re-established its status because of several prospective long-term studies revealing poor long-term graft survival rates as a consequence of continued endothelial cell attrition following PK. The corneal donor study has shown that there is a 70% endothelial cell loss in 5 years following PK.[4] Also, the Australian Corneal Graft Registry has shown a 1-year graft survival rate of 90% that reduces to 59% at 10 years in eyes that undergo PK.[5] The added advantage of ALK is a lesser chance of wound dehiscence with any trauma to the operated eye. Singapore Corneal Transplant Study showed that graft survival at 1 (PK, 88.6%; ALK, 93.7%), 3 (PK, 69.2%; ALK, 79.0%), and 5 years (PK, 59.2%; ALK, 67.8%; \( P = 0.001 \)) was significantly better in the ALK group.[6]

ALK techniques diverge from basic manual dissection to expensive femtosecond laser-assisted anterior lamellar keratoplasty (FALK) and microkeratome-assisted ALK (MALK). In spite of favorable visual outcomes and minimal interface irregularities with FALK and MALK,[7‑10] manual SALK remains the main surgical technique in developing countries because of financial obilges and limitation of resources. Moreover, this manual dissection technique exposes the valuable cornea to added disastrous trephination errors.

Routiney, the epithelium and superficial stroma of the donor cornea are used to replace the recipient cornea, but in the reported case, because of the unintentional error in trephination, the surgeon was obliged to use the deep stromal lenticule instead. This case report highlights that even the pre-Descemet’s membrane can act as a suitable matrix for epithelial cells to migrate, adhere, and proliferate by forming hemi-desmosomes. As per our knowledge, there is no surgical literature supporting the pre-Descemet’s membrane as a suitable scaffold. This technique incorporates all the benefits of the traditional ALK technique with the additional benefit of utilizing the remnant donor tissue in situations where primary graft harvesting was not efficacious because of unavoidable intra-operative consequences of trephination.

**Conclusion**

This alternative technique can be more beneficial in developing countries where manual dissection is still the chief mode of graft-harvesting the donor cornea and the major clientele is poor. This technique will also curtail loss of the precious corneal tissue occurring frequently because of dissection or trephination errors.

**Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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**Conflicts of interest**

There are no conflicts of interest.

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