ONE CORNEA TWO RECIPIENTS: FEEDING TWO BIRDS WITH ONE SCONE

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Abstract

This paper was to examine the safety and efficacy of the usage of one donor cornea for two recipients who required anterior lamellar and posterior lamellar keratoplasties, respectively in Malaysia where there is a low local donor rate. The donor cornea was divided into anterior and posterior lamellae manually. The anterior lamella was used as a patch graft for anterior lamellar keratoplasty in a 6-year-old patient with limbal dermoid, and the posterior lamella was used for a Descemet stripping endothelial keratoplasty (DSEK) procedure in a 68-year-old patient with corneal decompensation. Both cases were observed for the feasibility of the procedure, intraoperative and postoperative complications, and visual outcome. The procedure was conducted with no intraoperative and postoperative complications and both patients achieved an improvement in their final best-corrected visual acuity. Both patients had a stable visual outcome throughout a 1-year postoperative period. With proper and optimal case selection, our study shows that one donor corneal tissue can be successfully used for two patients as a normal practice. Such procedures may aid in reducing the severity of corneal blindness in impoverished nations where donor corneal tissue is scarce.

Keywords: Donor Cornea, Limbal Dermoid, DSEK, Lamella Keratoplasty

Introduction

Corneal transplantation is the second most common transplant procedure in Malaysia after blood and bone marrow transplant (1). In this country, the most common obstacle for a patient to undergo a corneal transplant is the difficulty in getting a local donor. This current situation has been managed by importing corneal tissues from other countries; however, patients still have to bear the cost of the imported donor corneas. Local eye donors are still scarce despite all the efforts in promoting tissue and organ donation.

Customized component corneal transplant is a surgical strategy that allows selective replacement of the diseased corneal tissue and is becoming increasingly popular (2). These surgical treatments include anterior lamella procedures; deep anterior lamellar (DAL) and posterior lamella procedures; Descemet's stripping with (automated) endothelial keratoplasty (DSEK/DSAEK), and Descemet's membrane endothelial keratoplasty (DMEK) (2,3). These selective replacements of the diseased corneal tissue can decrease graft rejection, avoid devastating complications associated with open sky procedures such as suprachoroidal haemorrhage, and allows the maximum utilization of one donor cornea for multiple recipients (3).

The concept of 'split-cornea' transplantation in which full-thickness donor corneas were divided into anterior and posterior lamellae was discussed by Wu et al., who reported no intra-operative complications, tissue overriding, wound dehiscence, or suture related complications in 8 patients with unilateral limbal dermoid (4).

Herein, we present our experience with this increasingly popular concept of treating two patients with a single donor corneal tissue.

Materials and Methods

Donor preparation was done in OT on the day of surgery

The donor corneoscleral button was mounted on an artificial anterior chamber (AC). A vertical incision was done using a 350 micron blade, and manual lamella dissection was done using a dissector. The posterior lamella was trephined to an 8mm disc and used for Case 1, while the

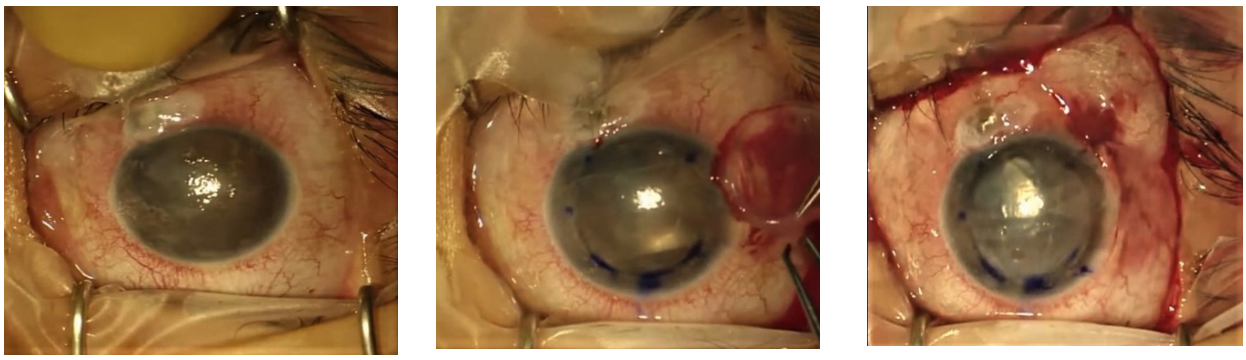
anterior lamella was saved for Case 2. We obtained written informed consent from both of the patients in this case report.

Case 1: Posterior lamella

A 68-year-old Chinese lady with underlying Fuchs endothelial dystrophy underwent left cataract surgery in 2013. Her surgery was complicated with a posterior capsule rent requiring an anterior chamber intraocular lens (ACIOL) insertion. Post-operatively, the patient started to develop corneal edema and superficial vascularization with Descemet striae centrally. Her vision deteriorated over the years, and she was thus selected for a posterior lamella DSEK procedure. Her pre-operative best-corrected visual acuity for the left eye was counting fingers.

Intra-operatively, the recipient Descemet membrane was stripped, followed by transplantation of an 8.0 mm trephined donor posterior corneal lamella.

The post-operative eyedrops included 1% prednisolone acetate eye drops and 0.5% chloramphenicol eye drops every 2 hours which were gradually tapered accordingly over a few weeks. At six months post-procedure, refraction was plano /-1.00 x 100 with a best-corrected visual acuity of 6/21. The patient did not achieve a perfect vision of 6/6 as she also had a concurrent presence of epiretinal membrane on her macula on fundus examination. The patient has remained stable in the follow-ups.



(a) (b) (c)

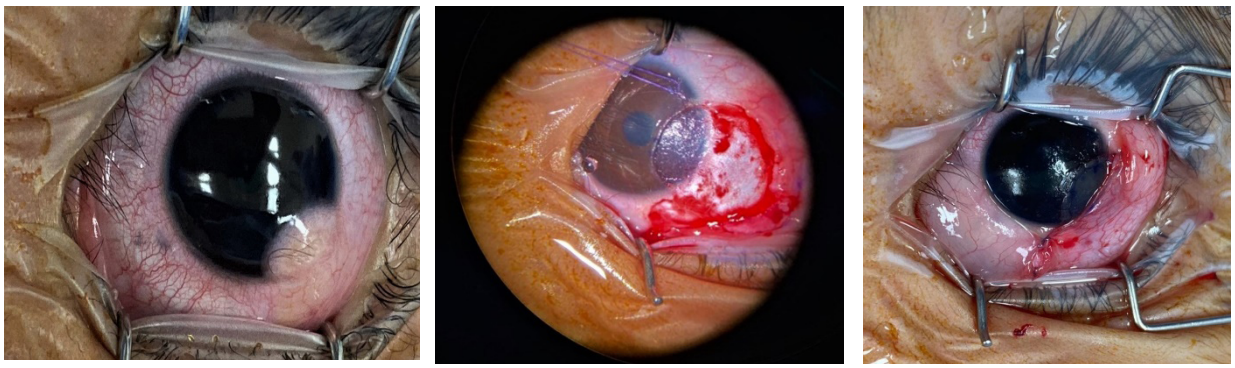
Figure 1: Case 1: Posterior lamella (a) pre-operative (b) intra-operative (c) post-operative photographs

Case 2: Anterior lamella

A 5-year-old Malay boy was referred for left inferotemporal cornea limbal dermoid. The growth had been there since the child was one year of age and had gradually increased in size over the years. Ocular examination revealed a corneoscleral lesion located in the inferotemporal quadrant with a cornea involvement of 0.5mm from the limbus. His pre-operative refraction was +2.75 DS /-3.50 x 160 with a best-corrected visual acuity of 6/15.

Intra-operatively, conjunctival peritomy was performed in the inferotemporal quadrant. The dermoid was then excised using a crescent blade after partial corneal trephination. The anterior donor corneal button of 8 mm was transplanted onto the recipient. Twelve sutures using nylon 10-0 were placed.

The post-operative eyedrops were 1% prednisolone acetate and 0.5% moxifloxacin every 2 hours which were gradually tapered. At six months post-procedure, all corneal sutures were removed, and the final refraction was +2.75 DS /-3.75 x 155 with best-corrected visual acuity 6/15. Glasses were prescribed for visual rehabilitation.



(a) (b) (c)

Figure 2: Case 2: Anterior lamella (a) pre-operative (b) intra-operative (c) post-operative photographs

Discussion

Blindness and visual impairment caused by corneal diseases are significant, especially in developing countries (3). Corneal transplantation is the viable option for visual rehabilitation in corneal blindness. The availability of donor corneas is quite scarce in Malaysia, causing a huge gap between demand and supply. This situation has led to attempts to import donor corneas from other regions such as Nepal, Sri Lanka, and the United States of America. A more focused approach using a customized corneal transplantation technique has the potential to reduce the demand by a three-fold magnitude (3).

Anterior and posterior lamellar keratoplasty are two different surgical techniques used for different indications of corneal blindness. Anterior lamellar keratoplasty is done for cases where the disease involves the anterior layers of stroma and posterior lamellar keratoplasty is done when the disease involves the Descemet's membrane and endothelium. Hence, using one cornea for two pathologies in different layers of the cornea can increase the utilization of tissues especially when there is a scarcity of corneal donors. In this process, the cornea is divided into two lamellae and each lamella is used for different pathology in two different patients. The division of the cornea can be done manually, or it can be automated using a microkeratome (1-3). The usage of corneal tissue has been investigated further, with ophthalmologists demonstrating the successful use of donor corneas for three separate patients; for example, with the usage of the corneoscleral rim as a patch graft (3, 4) and limbal stem cell transplant from the periphery of the same donor cornea in a case of limbal stem cell failure (2).

Eye banks may play a key role in allowing a single cornea to be used for several patients. In recent years, the evolution of eye bank activities has shifted from basic collection, processing, and distribution to a fully functional unit that provides pre-cut and preloaded tissues (5). They can provide information such as donor medical history, graft thickness profile, and endothelial cell count, as well as prepping tissue for transplantation, which cuts down on operating room time and surgical stress (5). There are additional benefits to using eye banks; for pre-cut corneas for DSAEK and anterior lamella keratoplasty (ALK), there is no need to invest in an expensive microkeratome, and for pre-stripped corneas for DMEK, there is no need to go through the lengthy process of gaining sufficient expertise in tissue preparation, which often deters surgeons from trying this technique (6).

In areas where eye banks are not available, the next option would be for the surgeon to invest in a microkeratome. When the donor tissue is prepared with a microkeratome instead of manually, the procedure has been termed Descemet's stripping automated endothelial keratoplasty (DSAEK). The advantage of automated dissection is that it gives a smooth stromal cut surface while in manual dissection there may be irregularity of the stromal surface. Also, the thickness of the lenticule is more predictable in automated dissection. However, the cost of microkeratome can be a burden.

Both surgical cases reported above were performed on the same day. Both cases reported a symptomatic improvement with better clinical and visual outcomes. There are, however, obstacles to this approach, Firstly, it may not always be possible to schedule both patients on the same day concurrently. This was further investigated by Chu et al., who reported that the remnant anterior corneal button could be well preserved in Optisol GS solution at four °C for as long as four weeks (7). This inadvertently allows the use of a remnant corneal button at a much later date for the recipients. Thus, this approach requires the careful scheduling of the donors on the same day and the centre involved must ensure that Optisol GS medium is readily available to preserve the donor cornea. Secondly, the donor corneal tissue needs to be split either using an automated microkeratome or manually. Hence it involves an additional step in transplant procedure for the corneal surgeons, especially where eye banks are not involved in the corneal dissection like in our institution.

Despite the technical and logistic difficulties, this successful attempt of using one cornea for two recipients is undeniably an important step toward the solution of the shortage of cornea donor tissue in our institution and in Malaysia. We have treated two separate patients using one corneoscleral button, and this was the first successful attempt at our institution.

Currently, the SARS-CoV-2 is impacting the number of tissues procured, and eye banks are predicting a significant shortage of corneas as soon as constraints limiting elective surgical interventions are lifted (8). This successful attempt of using one cornea for two recipients is undeniably an important step towards the solution to the shortage of cornea donor tissue in our institution and Malaysia, especially during this pandemic and this is a crucial take-home message for all of us.

Competing Interests

The authors declare that they have no conflict of interest.

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Nil

Informed Consent

A written informed consent was obtained from both patients in this case report.

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