



CASE REPORT

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Traumatic Corneo-Limbal Defect closed with a Hinged Partial Thickness Scleral flap: A report of an Overlooked Option

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Abstract

Corneal injury associated with loss of tissue is difficult to approximate without causing distortion of the corneal shape. Such injuries to the cornea requiring surgical closure, when not repaired early in the healing phase becomes challenging owing to tissue contracture. The resulting irregular astigmatism can decrease the quality of vision significantly. Donor cornea or scleral collagen tissue having close resemblance to corneal tissue acts as a good substitute to cover such defects. We report a six year old child with a corneal perforating injury managed surgically with a partial thickness autologous scleral flap, with an optimal anatomical, structural and visual outcome.

Keywords: Cornea, Defects, Grafts, Perforations, Trauma

Introduction

Surgical closure of a full thickness corneal injury involving the limbus should be done at the earliest to decrease the risk of endophthalmitis, avoid tissue necrosis with contracture, prevent fibrous/epithelial ingrowth and decrease patient discomfort.(1-4) The repair is not just aimed to restore structural integrity and anatomy, but also to achieve optimal visual function and prevent complications. (5-8) Perforating injuries of the cornea are challenging to manage given its inherent

lack of elasticity. The surgical plan should be reviewed at every stage of the surgery as required to provide the best outcome for the patient.(1,2)

Corneal defects that are more than 2 mm in size require an external graft to give a water-tight closure without compromising on the astigmatic outcome. In the last two decades, corneal wounds that are required to be closed surgically with grafts have used an ever expanding list of reconstructive materials. Common tissues grafts that are used are, amniotic membrane, Gunderson (conjunctival) flap, corneal or corneo-scleral graft and the Tenon's graft.(2,9-13) A scleral graft has the intrinsic advantages of being strong and flexible with the added ease of handling and its ability to blend with the host tissue. Being avascular, it is well tolerated with minimal inflammatory reaction. Technique of using an autologous hinged partial thickness scleral graft is a useful option which can be employed in closure of scleral or peripheral corneal defects owing to its similar architecture. (14,15) In addition there is no risk of transmitted infection or rejection.

We present a child with an injury to peripheral cornea and a full thickness corneal defect managed with a partial thickness hinged scleral flap with a good clinical outcome.

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Case Report

A six year old girl, was brought one month after an injury to the right eye with a piece of tile thrown at her. Though the topical medications prescribed by her primary treating physician provided temporary relief, she continued to have discomfort with persisting pain and redness. She was referred to our centre for further management. On examination her best corrected visual acuity was 6/9 (Snellen Chart), in the injured eye and 6/6 in the fellow eye. The injured right eye showed circum-corneal congestion with a grade 1+ cells & 2+ flare (Standardization of the Uveitis Nomenclature (SUN) Working Group Classification), and a corneal limbal tear with iris tissue incarcerated at the 3 O'clock limbus. The anterior chamber was formed but shallow nasally. Posterior segment evaluation showed a hyperemic disc. Evaluation of the other ocular structures and the left eye were within normal limits. Computerized tomographic imaging ruled out any intra-ocular or intra-orbital foreign body.

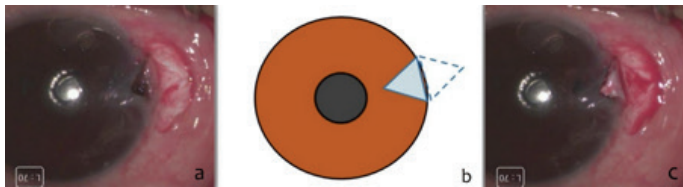


Fig 1: (a) Photograph of the corneal defect after exploration and the peritomy, (b) a line diagram of the planned hinged scleral flap and (c) the flap positioned before suturing

The child was planned for an exploration and corneal perforation repair under general anaesthesia. Examination under anaesthesia confirmed a limbal corneal defect that measured about 3 mm in diameter with iris and exudates plugging it. After making an initial paracentesis at 1 O'clock, the anterior chamber was formed with an air bubble and the incarcerated iris was repositioned using an iris repositor. No iris excision was done. There was a pseudo-membrane plugging the corneal defect. A localized peritomy was done to rule out scleral extension of the tear. On removing the pseudo-membrane plugging the site of injury a triangular defect of the cornea was evident with loss of corneal tissue (Fig 1a). The limbs of the triangular defect measured 2.5 x 2.5 x 2.0 mm and the edges could not be opposed for a direct closure. After removing the limbal stems cells and fibrous tissue in the region of the corneal tear a hinged limbus based partial thickness triangular scleral flap was fashioned to mirror-match the corneal defect (Fig 1b and 1c). A half thickness scleral flap was made so that there is enough tensile strength on either side of the limbus to withstand the intra-ocular pressure. A guarded knife was used to ensure right thickness of the flap edges all around. Care was taken to ensure that the flap was uniformly thick and there is no button holing of the flap. The dissected flap was turned over so that the dissected under surface of sclera faces anteriorly

and sutured to the cornea using a 10-0 nylon suture (Auro-olon, Aurolab, Madurai, India). The conjunctiva was mobilized and sutured at the limbus to cover the donor scleral bed. No contact lens or glue was required.

She was prescribed topical prednisolone acetate 1% (Pred Forte, Allergan, Pithampur, India) hourly, chloramphenicol 0.5% (Dexoren, Indoco Remedies, Ahmedabad, India) four times a day and cyclopentolate 0.5% (Pentolate, Sunways, Mumbai, India) twice daily. The postoperative period was uneventful (Fig 2a and 2b) and she had her sutures removed at 6 weeks. The drops were thereafter tapered and stopped. Her vision was 6/12 (unaided) and improved with an optical correction of -1.50 D Cyl at 180° to 6/6 N6 at the end of 2 months. The healing process was optimal with minimal scarring and a good structural integrity (Fig 2c and 2d).

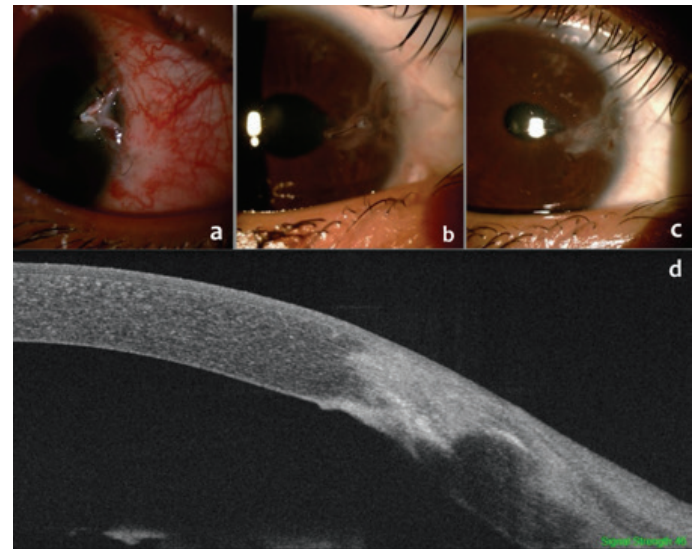


Fig 2: (a) Photograph of the patient on the third post-operative day with a good opposition, (b) follow up at 4 weeks, (c) after the suture removal at 6 weeks and (d) anterior segment OCT picture of the cornea showing a good outcome of the contour and the integration of scleral tissue into the host bed.

Discussion

Corneal defects require prompt closure and if not satisfactorily managed could lead to serious intraocular complications and end up with irreversible loss of the vision. Direct closure of the corneal wound if possible is ideal. Small corneal defects are amenable to be sealed with tissue glue (eg, n-butyl cyanoacrylate), however large perforations (> 2 mm) requires additional grafts to seal the defect and to promote healing. (2,13) The location of the defect and the tissues involved along with the expected visual outcome will determine the choice of graft while planning the surgery. Tissue contracture of the lacerated edges should be anticipated when patients present late after an ocular surface injury (> 10 to 14 days). Though incarcerated uveal tissue may seal the wound and maintain in-

traocular pressure, it cannot be left alone to heal due to the possibility of late endophthalmitis and tissue ingrowth. The surgeon should not hesitate to explore and seal the defect if required.(1,2,16) Minimal astigmatism with good visual outcome is the ultimate goal, especially for children in the amblyogenic age group.(17,18) In corneal tears when there is tissue deficiency, a tissue graft provides not just the tectonic support but also contributes to the extra surface area needed to maintain the corneal contour and to achieve wound apposition without any undue wound tension.

Autologous grafts are preferred to allogenic grafts to avoid the risk of rejection and transmitted infections. Scleral collagen tissue has a close resemblance to corneal tissue and is a good substitute to cover peripheral defects of the cornea. (9,14) Besides being autologous, in a situation like described here, a scleral hinged flap has other advantages. Since the flap is attached to one side, suturing is easier than a free graft and loss of graft tissue does not occur. Although occurrence of a button hole or a torn flap during the dissection is a possibility, a careful and meticulous dissection will avert such complications. However, in cases of inadvertent tears where it cannot be used to close the defects, a free scleral or a corneal allograft can be used. For smaller defects upto 2 mm a tenon graft with tissue glue would suffice.(13) Availability of the donor cornea or a harvested amniotic membrane may not be available in every clinical set up and using an autologous sclera in select situations could prove useful. Additionally, if the examination is difficult especially in pediatric patients and does not provide clues for the need of additional tissue for repair, this technique could come in handy. Before fashioning the flap, the limbal stem cells and its niche are removed, to ensure prevention of epithelial or fibrous ingrowth into the eye.(19) Though follow up of our patient by us was only 2 months, such patients require lifelong follow ups by their local Ophthalmologists to look for thinning or staphyloma at the site of the injury and the donor site. Worsening or a change of axis of the astigmatism can be an indication of staphyloma formation. An added advantage of this technique is that the autologous tissues integrate better with the host tissue and maintain better tensile strength compared to the alloplastic materials.(14,20) The anterior segment OCT in our patient showed a thick scar at the limbus (Fig 2d) with no evidence of staphyloma formation. The chances of rejection or chronic recurrent inflammation is less with autografts.

Theoretical limitations of the procedure includes scleral melt and staphyloma, the risks of which are outweighed by the benefits and can be picked up with periodic follow up. This is a technique easy to perform with minimal instrumentation,

offers optimal outcome and may be recommended for the treatment of peripheral corneal defects.

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