CASE REPORT

Conjunctival pedicle flap in management of open globe injury with corneal tissue loss

Nishant Nawani,¹ Jayesh Vazirani,² Hindukush Ojha,³ Virender S Sangwan⁴

¹Doon Eye Care Centre, Dehradun, Uttarakhand, India
²Cornea and Anterior Segment Service, Maheshwari Eye Care Hospital, Rajkot, Gujarat, India
³Cornea and Anterior Segment Service, Nethra Jivan Eye Hospital, Dehradun, Uttarakhand, India
⁴Centre for Ocular Regeneration, L V Prasad Eye Institute, Hyderabad, Telangana, India

Correspondence to
 Dr Virender S Sangwan,
 vsangwan@lvpei.org

Accepted 28 February 2016

SUMMARY

Accidental injury with scissors led to an open globe injury with iris prolapse and corneal tissue loss in the right eye of a 15-year-old girl. Attempts to suture the laceration normally, led to persistent aqueous leak, and tight suturing was leading to unacceptable distortion of the corneal contour. In the absence of donor tissue or tissue glue, a bulbar conjunctival pedicle flap was used to augment sutures placed without undue tension, and watertight closure of the globe was achieved. Postoperatively, the flap retracted, and excellent tectonic, cosmetic and refractive outcomes were achieved. A conjunctival pedicle flap can be a useful adjunct in the armamentarium of the corneal surgeon while dealing with open globe injuries with corneal tissue loss.

BACKGROUND

Restoration of anatomical integrity is necessary to preserve the visual potential for patients suffering from open globe injuries. Prime objectives of the primary repair surgery are preventing further tissue damage and maintaining corneal contour to minimise the consequent postoperative astigmatism. We describe the use of a conjunctival pedicle flap along with corneal suturing for the management of open globe injury with corneal tissue loss.

CASE PRESENTATION

A 15-year-old girl presented with a history of trauma by scissor blades to her right eye, 36 h after injury. Attendants claimed that she was taking the scissors away from her younger brother, who reluctantly let go of the scissors, and the sudden cessation of a countering force led to accidental trauma to the patient's right eye. On examination, there was a triangular wedge-shaped full thickness defect at the 6 o'clock limbus, extending approximately 2 mm into the cornea. There was iris prolapse from this wound, associated with a shallow anterior chamber (AC) and a fibrinous reaction in the AC (figure 1). The crystalline lens was clear. Examination of the left eye was normal. Unaided Snellen's acuity was 6/18 (OD) and 6/6 (OS), respectively. Posterior segment examination showed no abnormality of the central fundus in either eye.

INVESTIGATIONS

Preoperative plain radiograph of the orbit was normal.

DIFFERENTIAL DIAGNOSIS

The injury was classified according to the system proposed by the Ocular Trauma Classification

Group as—open globe injury, type B, grade 2, zone 1, pupil negative.¹

TREATMENT

The right eye was covered with a plastic eye shield and taped. Injection levofloxacin (250 mg) was administered intravenously and injection tetanus toxoid (0.5 mL) intramuscularly. The patient was taken up for open globe injury repair under general anaesthesia within 3 h of presentation to us.

The salient steps of surgery are shown via a schematic diagram in figure 2. After applying the speculum, non-viable necrotic uveal tissue was excised (figure 2A). A 1.0 mm side port incision was made at the 8 o'clock position at the limbus, and the AC was reformed with viscoelastic injection (sodium hyaluronate 1%). After repositing the viable uveal tissue, it was noticed that there was some tissue loss at the limbus and the laceration was extending 1 mm into the sclera (figure 2B). A tight interrupted 8-0 vicryl suture was placed about 0.5 mm posterior to the limbus (on the scleral side of the laceration). The corneal extension of the laceration was sutured with three interrupted 10-0 monofilament nylon sutures, placing the longest bite at the limbus. While the viscoelastic in the AC was being replaced with balanced salt solution (BSS), it was noticed that the laceration had a microleak, under pressure (figure 2C). Sodium hyaluronate 1% was again injected into the AC and the corneal sutures were revised. Complete wound apposition without AC microleak was achievable with tighter 10-0 nylon sutures, but there was significant distortion and folds in the cornea. This would result in high postoperative astigmatism and poor quality of vision. Other options such as scleral patch graft,

Figure 1 Diffuse illumination examination of the right eye showing zone 1 open globe injury at the 6 o'clock limbus with iris prolapse.

CrossMark

To cite: Nawani N, Vazirani J, Ojha H, et al. *BMJ Case Rep* Published online: [please include Day Month Year] doi:10.1136/bcr-2015-213703

Figure 2 Schematic diagram showing salient steps of surgery. (A) Open globe injury with iris tissue prolapse (brown colour) adjacent to the inferior limbus. (B) After abscission of unviable iris tissue, a full thickness laceration with corneal tissue loss is noted. (C) Despite suturing with 10-0 nylon (black lines) and 6-0 vicryl (purple line), a persistent aqueous leak is noted (light blue colour). An appropriately sized and shaped bulbar conjunctival pedicle flap is fashioned adjacent to the lacerated area (pink area with red dashed outline). (D) The conjunctival pedicle flap is sutured over the cornea using 10-0 nylon sutures (black lines) and to the sclera using 8-0 vicryl (purple lines), leading to a formed anterior chamber with no aqueous leak.

amniotic membrane graft, fibrin glue and cyanoacrylate glue were unavailable in the operating room.

We decided to fashion and suture an inferior bulbar conjunctival pedicle graft over the area of microleak, for additional tectonic support. The corneal 10-0 monofilament nylon sutures were revised in such a manner as to achieve maximum wound apposition without causing corneal folds. Next, the epithelium around the laceration was removed with a cellulose sponge up to about 2 mm around the wound. The adjacent inferior bulbar conjunctiva was examined and we planned to include at least one prominent blood vessel in the proposed conjunctival pedicle flap. The conjunctiva was ballooned up with an injection of 2% lidocaine hydrochloride and epinephrine (1:100 000 dilution). The initial needle puncture was kept away from the conjunctival site that was going to be incorporated into the pedicle flap.

A crescent-shaped incision, 3–4 mm posterior and parallel to the inferior limbus, was made on the ballooned conjunctiva (figure 2C). The conjunctiva was then undermined, incorporating some Tenon's capsule, so as to achieve a thick flap. The conjunctival incision was then extended further posteriorly so as to mobilise a flap that covered the laceration site without traction. Care was taken to mobilise the flap in such a manner that the advancing edge would overlap the cornea around the laceration site for about 2–3 mm. The base of the conjunctival flap was sutured to the sclera; 1 mm posterior to the limbus, with one interrupted 8-0 vicryl suture on either side. The flap was then secured to the cornea with interrupted 10-0 nylon sutures, each bite passing through half corneal thickness and extending up to 0.5 mm central to the edge of the conjunctival flap (figure 2D). The knots were buried into the cornea. Care was taken not to suture the pedicle flap too tightly or too loosely. BSS was injected to replace the viscoelastic in the AC. No aqueous leak was detected from under the edges of the pedicle flap as the side port was hydrated gently. After drying the ocular surface

Figure 3 (A and B) The bulbar conjunctival pedicle flap covers the area of laceration and a well-formed anterior chamber.

and allowing the flap to adhere for about 5 min, intravitreal injections of vancomycin 1 mg/0.1 mL and ceftazidime 2.25 mg/0.1 mL were given, with no adverse effect on wound integrity. The eye was patched under antibiotic ointment.

OUTCOME AND FOLLOW-UP

On postoperative day one, the flap was in place and the AC well formed (figure 3A, B). The fibrin in the AC had retracted. Seidel's test was negative. Unaided vision was 6/18 in the right eye. The patient was given intravenous antibiotics for a total of 5 days along with oral tablet prednisolone 1 mg/kg body weight, which was tapered over the next 3 weeks. Topically, she was started on 0.1% betamethasone eye drops to be instilled every 2 h, 0.5% moxifloxacin eye drops every 4 h and 1% atropine eye drops twice a day. The patient was examined once a day, every day, for the first 5 days, and visual acuity, flap retraction/dislocation, AC depth and reaction were monitored.

Thereafter, the patient was followed up weekly for the next 2 weeks and each fortnight for the next month. Frequency of administration of topical medications was reduced in subsequent follow-ups according to the clinical response. Sequential 10-0 nylon suture removal was carried out beginning 4 weeks post-operatively. At 10-week follow-up, on examination, the visual acuity in the right eye was 6/6 (−0.75 DC×100), the conjunctival pedicle flap had retracted up to the limbus (figure 4), the eye was un-inflamed, an inferior iridectomy was present and the lens remained clear. There was some scarring at the inferior cornea and limbus, the intraocular pressure was 14 mm Hg and dilated fundus examination was normal. Despite the iris defect, the patient had no photic symptoms.

Figure 4 At 10-week follow-up we see a retracted conjunctival flap and a quiet eye with restored ocular integrity.

DISCUSSION

With this case report, we highlight a simple, effective and inexpensive technique for managing traumatic corneal perforations with tissue loss, in the emergency setting. We managed to restore both, the ocular integrity and good vision. Often, corneal lacerations that seem relatively simple on slit-lamp examination turn out to be complicated on the operating room table. However, each case being unique, flexibility and creativity from the part of the surgeon is often called for.

Sandinha *et al*² performed superior forniceal conjunctival advancement pedicle flaps in 20 eyes, most of which had non-traumatic corneal perforations, with aetiologies including acne rosacea, advanced bacterial keratitis, corneal anaesthesia, multiple retinal procedures, advanced Mooren's ulcers and failed corneal grafts. In all cases, the flap stabilised and the globe was preserved. Various authors state that a conjunctival flap acts as a biological patch and that it has tropic, protective and analgesic properties.^{3–5}

In another large retrospective case series, Khodadoust *et al*⁶ performed conjunctival pedicle flaps in 50 eyes of 50 patients for the treatment of chronic corneal ulcers. Thirty-one eyes had non-perforated corneal ulcers and 19 had perforations. The reported success rate in the immediate postoperative period was 97% for the globes having formed anterior chambers, healed ulcer and a quiet anterior segment. Three patients in their series had a failed conjunctival flap because of flap retraction or non-healing lesion.

A retrospective review of 235 patients with open globe injuries at the Massachusetts Eye and Ear Infirmary showed that traumatic cataracts and corneal scarring were the most common vision-limiting complications in patients with zone 1 lacerations.⁷ Twelve patients (14.6%) with zone 1 injuries had astigmatism of at least 1.25 dioptres at the 2–3-month follow-up. Our patient also had a zone 1 injury. At 10-week follow-up, post conjunctival pedicle graft, vision in the right eye was 20/20 with minimal astigmatism. There was minimal scarring at the limbus and the visual axis remained clear. The gradual flap retraction over 10 weeks resulted in a reasonable and acceptable cosmetic outcome for our patient.

Pedicle conjunctival flaps purportedly not only transport nutrients and growth factors to the cornea and increase its resistance to infection, but also wash away proinflammatory mediators from the microenvironment, hence promoting wound healing.⁸ A pedicle conjunctival flap can be a useful option for the corneal surgeon, as an alternative to tissue adhesives such as cyanoacrylate and fibrin glue. An abundance of conjunctival tissue, and the ease of creation of these flaps from almost any site around the cornea, have proven to be useful in management of non-traumatic corneal ulcerations.^{2–6} We propose the use of this technique, in appropriate situations, for cases of traumatic globe perforations as well. This technique is probably best suited to situations where the area of corneal tissue loss from

the laceration is adjacent to the limbus. Attempting a similar procedure for the centrally cornea may be surgically challenging, and may adversely affect the cosmetic outcome in the long term. Conventional teaching advocates the use of cyanoacrylate glue or keratoplasty, rather than the use of a conjunctival flap, in cases of tissue loss.⁹ However, the outcome in this case demonstrates that a surgeon may make a carefully considered choice to use a conjunctival flap as an adjunctive modality in addition to carefully placed sutures to achieve watertight closure without globe distortion.

Learning points

- ▶ Open globe injuries with corneal tissue loss are challenging cases to manage surgically.
- ▶ Primary repair with tight sutures in such cases may lead to distortion of the corneal contour and unacceptably high postoperative astigmatism.
- ▶ A conjunctival pedicle flap can be a useful adjunct to sutures in such cases.
- ▶ Use of a conjunctival flap to cover areas of corneal tissue loss during the primary repair in appropriate situations can lead to excellent tectonic, cosmetic and refractive outcomes.

Contributors NN was responsible for conceiving the study. NN JV and HO were responsible for drafting the manuscript. JV participated in artwork. NN, HO, JV and VSS were responsible for critical revision and final approval of the manuscript.

Competing interests None declared.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

REFERENCES

- 1 Pieramici DJ, Sternberg P, Aaberg TM, *et al*. A system for classifying mechanical injuries of the eye (globe). The Ocular Trauma Classification Group. *Am J Ophthalmol* 1997;123:820–31.
- 2 Sandinha T, Zaher SS, Roberts F, *et al*. Superior forniceal conjunctival advancement pedicles (SFCAP) in the management of acute and impending corneal perforations. *Eye (Lond)* 2006;20:84–9.
- 3 Saini JS, Sharma A, Grewal SP. Chronic corneal perforations. *Ophthalmic Surg* 1992;23:399–402.
- 4 Gundersen T, Pearson HR. Conjunctival flaps for corneal disease: their usefulness and complications. *Trans Am Ophthalmol Soc* 1969;67:78–95.
- 5 Gundersen T. Conjunctival flaps in the treatment of corneal disease with reference to a new technique of application. *Arch Ophthalmol* 1958;60:880–8.
- 6 Khodadoust A, Quinter AP. Microsurgical approach to the conjunctival flap. *Arch Ophthalmol* 2003;121:1189–93.
- 7 Thakker MM, Ray S. Vision-limiting complications in open-globe injuries. *Can J Ophthalmol* 2006;41:86–92.
- 8 Sharma A, Mohan K, Sharma R, *et al*. Repositioning of pedicle conjunctival flap performed for refractory corneal ulcer. *Middle East Afr J Ophthalmol* 2014;21:89–91.
- 9 American Academy of Ophthalmology. Basic and Clinical Science Course 2014–2015. American Academy of Ophthalmology, 2014.

Copyright 2016 BMJ Publishing Group. All rights reserved. For permission to reuse any of this content visit <http://group.bmj.com/group/rights-licensing/permissions>.
BMJ Case Report Fellows may re-use this article for personal use and teaching without any further permission.

Become a Fellow of BMJ Case Reports today and you can:

- ▶ Submit as many cases as you like
- ▶ Enjoy fast sympathetic peer review and rapid publication of accepted articles
- ▶ Access all the published articles
- ▶ Re-use any of the published material for personal use and teaching without further permission

For information on Institutional Fellowships contact consortiasales@bmjgroup.com

Visit casereports.bmj.com for more articles like this and to become a Fellow