Trauma Case Reports 43 (2023) 100747

Contents lists available at ScienceDirect

Trauma Case Reports

journal homepage: www.elsevier.com/locate/tcr

Case Report

Surgical approach to repair of traumatic avulsion and external herniation of the levator palpebrae superioris aponeurosis☆

Samuel D. Browning *, Hamish P. Dunn

The University of New South Wales, Sydney, NSW 2052, Australia

ARTICLE INFO

Keywords:
Ocular surgery
Blepharoptosis
Oculomotor muscles
Levator palpebrae superioris
Eye injuries

ABSTRACT

This report describes the unusual case and surgical repair of avulsion and external herniation of the levator palpebrae superioris (LPS) aponeurosis and attached muscle fibres associated with superior tarsal plate fracture in an 8-year-old Indigenous girl. To the authors' knowledge, isolated and complete levator palpebrae superioris avulsion with external herniation in trauma is previously unreported. Open injury to LPS requires swift surgical repair, and an anterior ptosis repair approach may facilitate identification of anatomical structures to prevent upper eyelid ptosis. Ultimately, the surgical repair in this case prevented further ptosis surgery and complications in a paediatric patient.

Introduction

Isolated levator palpebrae superioris (LPS) avulsion in trauma is rare. There are reports of traumatic rupture to other extraocular muscles, particularly the inferior rectus muscle [1]. We describe a case of LPS avulsion and external herniation in a paediatric patient, of which there are no other reported cases to the authors' knowledge. Injury to LPS aponeurosis requires swift surgical repair to prevent upper eyelid ptosis, as there is reduced efficacy of delayed restorative surgery [2]. This case describes the novel surgical approach to achieve complete restoration of levator function. All surgical procedures followed were in accordance with the Declaration of Helsinki, and the patient's guardian supplied informed consent for publication of the case.

Case presentation

An 8-year-old Indigenous Australian girl presented to the Port Macquarie Base Hospital (PMBH) Emergency Department (ED) following a motor-vehicle accident (MVA). There was no relevant past medical history. Examination revealed an obvious wound to the left upper eyelid (LUL) with some extrusion of pre-septal tissue (Fig. 1).

Surgical review and secondary survey did not identify any additional other injuries. A trauma series CT indicated a potential foreign body penetrating to the left brow, but no bony abnormalities. Ophthalmology review demonstrated a clear cornea, intact globe, normal ocular motility including full supraduction, and a normal fundus. There was a 1.5 cm laceration to the LUL, and a smaller 1 cm laceration located within the central aspect of the left brow. In this MVA, the patient was located on the passenger side door, which was

☆ Meeting presentation: The contents of this report have been presented as a poster at the 52nd annual Royal Australian and New Zealand College of Ophthalmology National Conference in Brisbane, Australia, 2021.Not applicable.

* Corresponding author at: 2 Mareeba Crescent, Port Macquarie, NSW 2444, Australia.
E-mail address: samueldeanbrowning@gmail.com (S.D. Browning).

https://doi.org/10.1016/j.tcr.2022.100747
Accepted 28 December 2022
Available online 30 December 2022

hit by a second vehicle at 80 km/h, shattering the glass window and causing an intrusion into the cabin. The lacerating injuries were likely to have been caused by glass-shards created by shattering of the car window adjacent to the patient.

Under anaesthetic, interrogation of the LUL wound demonstrated a tarsal plate fracture extending along the superior tarsal border (Fig. 2A), and thorough exploration of the brow wound demonstrated a glass foreign body. The herniating tissues were identified as fibres from the muscle belly of LPS (split longitudinally into two distinct muscle bellies) with the aponeurotic potion attached (Fig. 2B). The superior rectus was excluded as the injured structure by globe examination demonstrating a normal insertion point and full pre-operative supraduction. The LPS and its attached aponeurosis were identified after anterior traction on the herniated muscle demonstrated it was fixed to the posterior orbit, indicating that the orbital portion of LPS was intact. The injury was thus clearly identified as avulsion of the LPS aponeurosis from the superior margin of the tarsal plate, with longitudinal splitting of the LPS muscle belly. Exploration of the smaller 1 cm laceration to the central brow demonstrated a superficial wound to the depth of the dermal layer of the skin with no foreign bodies noted.

Surgical repair was conducted in steps, with eversion of the LUL first allowing access to the superior tarsal fracture which was repaired with 6.0 Vicryl using buried simple interrupted sutures (Fig. 2A). A lid-crease incision with horizontal dissection inferior to the wound was subsequently established to facilitate exploration of the injury and repair, identifying rupture of the LPS aponeurosis from the superior tarsal plate across the full extent of the tarsus (Fig. 2C). LPS and attached aponeurosis was irrigated, and minimal amounts of non-viable tissue were resected. The LPS aponeurosis was subsequently passed back through the LUL wound and redirected inferiorly, where the aponeurosis was reinserted to the superior border of the tarsal plate using simple interrupted 6.0 Vicryl sutures.

Closure of the LUL wound and skin-crease incision was performed in-layers with 6.0 Vicryl to protect LPS and the aponeurosis repair. The wounds were dressed and the patient was discharged with prescriptions of 0.5 % chloramphenicol eye drops four-times daily and 0.1 % dexamethasone eye drops three-times daily. Simple analgesia was prescribed on a *pro re nata* basis with instructions for follow-up in the ophthalmology clinic one week post-operatively. Follow-up at one week noted well-healed LUL wounds, and a mild ptosis of the LUL (Fig. 3A). Post-operative review at six-months revealed a well-healed scar and intact visual acuities. Importantly, no residual ptosis was noted (Fig. 3B), and the patient was discharged from follow-up.

Discussion

Trauma is a relatively common cause of acquired blepharoptosis, accounting for a varying international incidence of 8.5 to 12%

Fig. 1. Initial examination demonstrating a left upper lid laceration with tissue herniation.

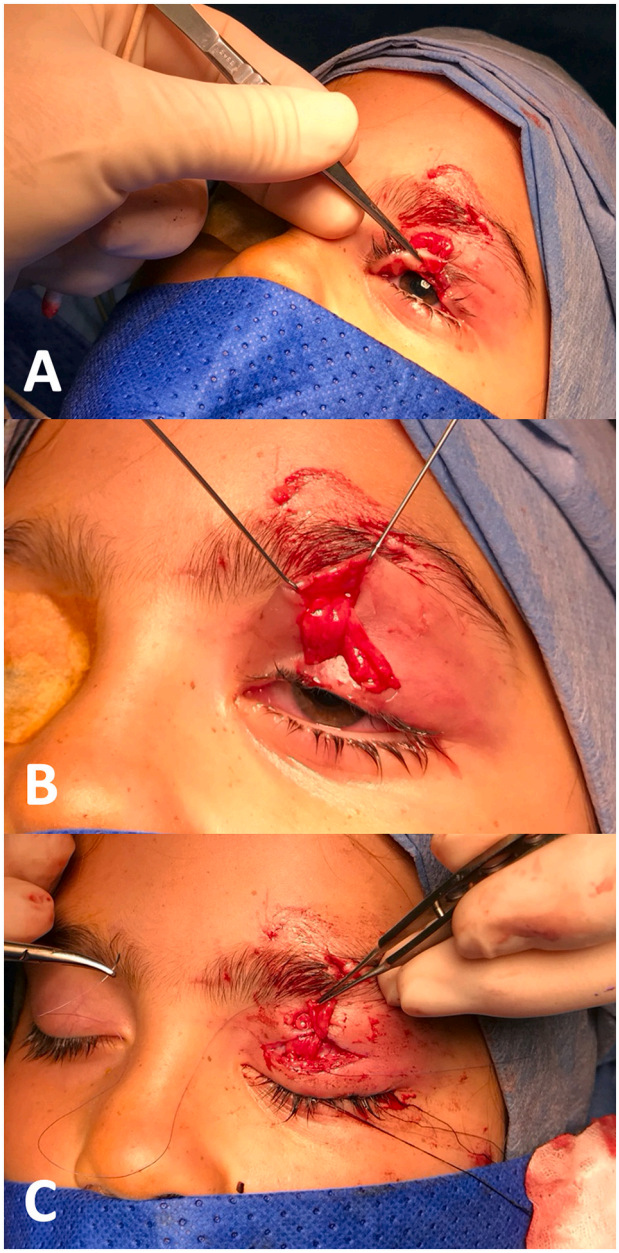

Fig. 2. Intraoperative images of the LUL injuries. A, demonstration of the tarsal plate fracture; B, demonstration of the herniating LPS fibres with the muscle belly split in two, through the LUL laceration; C, lid crease incision with identification and re-positioning of LPS aponeurosis to the tarsal plate.

[3,4]. However, these studies report 'traumatic' blepharoptosis as a single category, in which there exists a heterogeneous variety of aetiologies including myogenic, neurogenic, mechanical and aponeurotic traumatic ptosis [4]. Our case describes traumatic aponeurotic ptosis given the complete disinsertion of LPS aponeurosis from the superior tarsus in the context of blunt trauma. It is important to consider the ptotic mechanism in surgical management, as tailored approaches have been shown to improve ptosis outcomes [5].

The only case report of traumatic and complete aponeurotic LPS rupture that the authors are aware of is from Pamukcu et al. [6]. In this case, the diagnosis of LPS aponeurosis rupture with superior tarsal muscle damage was initially made on the basis of clinical findings with loss of the upper-lid skin crease. Surgical repair was undertaken in the acute setting with a posterior approach where the LPS aponeurosis was sutured from both edges of the tarsus, following conjunctival closure. Subsequent levator resection surgery to correct persistent and non-improving ptosis at postoperative month six was required in this case. This differs from our case, where an anterior approach utilising a lid-crease incision was successfully taken.

Fig. 3. Post-operative images taken; A, at postoperative week one, demonstrating a mild ptosis of the LUL; B, at six-months post-operation, demonstrating resolution.

There are several surgical techniques described for ptosis surgery, and it remains an individualised procedure highly dependent on the ptotic etiology present [7]. Betharia and Kumar describe an approach to traumatic blepharoptosis repair involving LPS resection to achieve optimal cosmetic positioning of the upper lid [8], however this description is more pertinent to non-acute instances of aponeurotic ptosis. The anterior approach to surgical repair taken in this case also involved a lid-crease incision. Normally, LPS is identifiable by its uniquely vertical muscle fibres, contraction upon vertical movements of the eyelid, and posterior course proximal to the superior transverse ligament. In this case, identification of the injured structure was complicated by the traumatic tissue planes, external tissue herniation, and the lack of contraction on vertical eye-lid movement due to its complete disinsertion from the superior tarsus. Furthermore, the LPS aponeurosis had retained muscle fibres related to the patient's younger age, with no clear distinction between LPS and aponeurosis. Notably, the superior tarsal muscle was intact in this case, aiding identification of LPS as the herniating structure. LPS resection was restricted to non-viable regions of tissue damage to avoid late lid retraction as neuro-myopathic damage resolved.

Early surgical intervention for LPS rupture is not without challenges, as lid-oedema may mask the extent of LPS damage and restrict appropriate re-fixation to the tarsal plate. Several authors advise a minimum waiting period of six months prior to surgical repair to facilitate appropriate surgical assessment and to reduce the risk of overcorrection following surgical repair [8] given spontaneous recovery of levator function may occur [9,10], however this is not applicable in the setting of acute trauma with open soft tissue injury [2]. Traumatic ptosis and surgical repair carry important complications including asymmetry, lagophthalmos, infection, bleeding, and persistent ptosis. Accordingly, prompt surgical correction is required for instances of complete LPS aponeurosis avulsion, or unlikely spontaneous resolution as in this case. This report highlights a rare ocular trauma and the difficulties associated with its clinical assessment and management. Excellent functional and aesthetic outcomes can be achieved with primary surgical repair *via* an anterior approach.

References

[1] D. Tynan, H. Dunn, T. Roberts, Complete inferior rectus transection following blunt trauma: a case report and novel approach to surgical repair, Ophthal. Plast. Reconstr. Surg. 2019/03/26 (2019).
[2] R.Z. Silkiss, H.I. Baylis, Management of traumatic ptosis, Adv. Ophthalmic Plast. Reconstr. Surg. 7 (1987) 149–155.
[3] R. Thapa, P.C. Karmacharya, B.P. Nepal, Etiological pattern of blepharoptosis among patients presenting in teaching hospital, J. Nepal Med. Assoc. 45 (162) (2006) 218–222.
[4] S.M. Jacobs, A.J. Tyring, A.J. Amadi, Traumatic ptosis: evaluation of etiology, management and prognosis, J. Ophthalmic Vis. Res. 13 (2018) 447–452.
[5] M.-H. Gao, X. Xu, J. Yu, H. Yu, Y.-X. Chen, Surgical management of blepharoptosis: a report of 500 cases, Zhonghua Zheng Xing Wai Ke Za Zhi 23 (2007) 398–401.

[6] C. Pamukcu, S. Kimyon, A. Mete, G. Açış, H.H. Çağatay, Traumatic isolated levator palpebrae superioris muscle laceration: a case report, Kafkas J. Med. Sci. 5 (2015) 28–30.
[7] J. Finsterer, Ptosis: causes, presentation, and management, Aesthet. Plast. Surg. 27 (2003) 193–204.
[8] S.M. Betharia, S. Kumar, Levator surgery in post traumatic ptosis, Indian J. Ophthalmol. 35 (1987) 132–135.
[9] C. Czyz, K. Blair, Spontaneous improvement of levator palpebrae superioris function after traumatic transection, Trauma Case Rep 30 (2020), 100375.
[10] R.L. Arden, G.K. Moore, Complete post-traumatic ptosis: a mechanism for recovery? Laryngoscope 99 (1989) 1175–1179.