Globe Avulsion Secondary to Maxillofacial Trauma

A R Norazah, MS Ophthal*, H Z Akmal, MSOphthal*, H Hashima, MBBS*, T Vasantha, FRCS (Ed)*, A Samsudin, MSOphthal**

*Department of Ophthalmology, Hospital Tengku Ampuan Afzan (HTAA), Kuantan, Pahang, **Department of Ophthalmology, University Malaya Medical Centre, Kuala Lumpur

SUMMARY

We report a case of globe avulsion secondary to maxillofacial trauma and propose potential mechanisms of injury. This case highlights the importance of wearing proper safety attire, especially during motorcycling.

KEY WORDS:
Eye, globe, Avulsion, Evulsion, Maxillofacial, Trauma

INTRODUCTION

Injuries to the globe should be suspected in maxillofacial trauma, with increasing probability and severity as more energetic and complex fractures of the mid-face occur. The spectrum of globe injuries is wide but true total avulsion of the globe is rare (1-3). A PubMed search has not revealed any reports from Malaysia. We report a case of traumatic avulsion of a globe with associated maxillofacial trauma (fractures of nasal bone and septum, ethmoid bone and sinus, sphenoid, zygomatic and frontal bones) due to a motor vehicle accident. The mechanism of injury is also proposed. This case highlights the importance of wearing proper safety attire, especially during motorcycling.

CASE REPORT

An 18-year old man was sent to the emergency room of HTAA. He had earlier participated in an illegal motorcycle race during which he skidded, fell and hit a plant box by the roadside. When he was found, his motorcycle helmet was lying a few metres away from him. At the emergency room, he was semi-conscious with a GCS of 12/15. On physical examination the right eye was positioned outside the eyelid fissure on the malar eminence, hanging by a thin thread of tissue which appeared to be the lateral rectus muscle. There was minimal lid margin laceration.

Clinically, he also had a comminuted fracture of the frontal bone as well as right orbital wall, rim and maxillary fractures. A CT scan showed extensive comminuted fractures of the facial bones (nasal bone and septum, ethmoid bone and sinus, sphenoid, zygomatic and frontal), frontal lobe contusion and subdural haemorrhage, and generalized cerebral oedema. The right globe was situated outside the orbit with evidence of haemorrhage within. The left globe was preserved (Figure 1).

He was admitted to the Intensive Care Unit for management of his cerebral oedema. He underwent frontal bone elevation and maxillofacial repair 48 hours later. At the same time, the eye was removed because of the improbability of recovering visual function. Intra-operatively, the remaining strand of tissue attached to the globe and orbit was cut and the eye was submitted for pathological examination. The eyeball measured 20x20x20mm with the attached optic nerve measuring 20mm. Apart from a vitreous haemorrhage, it was otherwise intact. No extra-ocular muscle remnants could be identified.

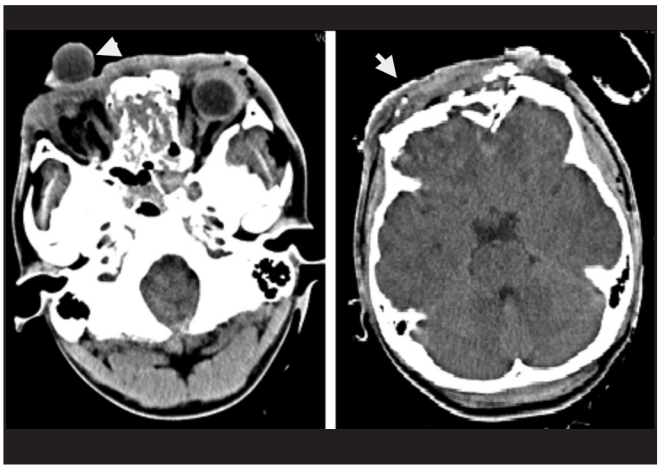

Fig. 1: (a) axial CT scan at mid-orbit level depicting the avulsed right globe (white arrow). (b) axial CT scan at higher level showing extensive frontal bone comminuted fracture (white arrow) and generalised cerebral oedema.

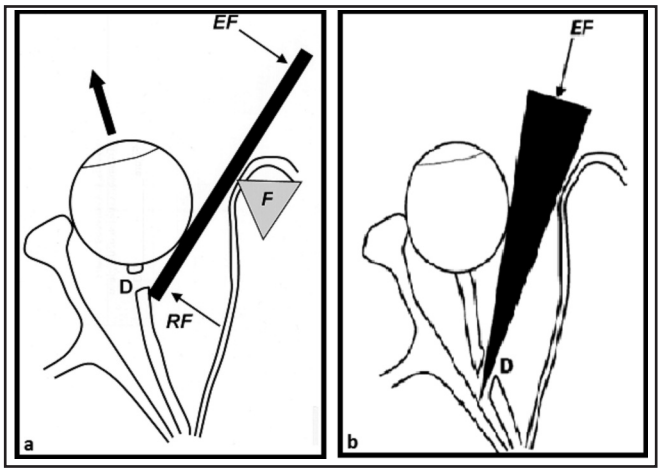

Fig. 2: (a) Mechanism of injury caused by elongated object entering orbit medial to globe. EF, external force; RF, resultant force; F, fulcrum; D, disrupted optic nerve. (b) Mechanism of injury caused by direct transection of optic nerve (modified from Morris et al [1]).

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Corresponding Author: Norazah Abdul Rahman, Department of Ophthalmology, Hospital Tengku Ampuan Afzan (HTAA), 25100, Kuantan, Pahang
Email: azahx5@gmail.com

He survived the period of ICU care and was later discharged. We are planning to insert an orbital Medpore implant and ocular prosthesis for him.

DISCUSSION

The words avulsion and evulsion are very similar. Avulsion stems from the Latin 'a' (away) and 'vellere' (to pluck) while evulsion is derived from the Latin 'e' (out) and 'vellere'. These terms have been used interchangeably by most authors [1,4].

Our patient sustained a severe concussive injury to the frontal region. In his case, the precise direction and amount of force applied to and the exact object striking his head could not be determined. However, possible ways in which this type of injury might cause the damage seen have been described by Morris *et al* [1]. The forcing of an object into the medial orbit creates a lever effect with the fulcrum at the anterior portion of the nasal bone. The posteriorly directed force vector created by the external force medial to this fulcrum is transformed into an anteriorly directed force vector behind the eye at the temporal end of the lever, forcing the globe anteriorly out of the orbit and disrupting the optic nerve in the manner depicted (figure 2). The medial wall fracture demonstrated in this case lends support to this mechanism.

Other possible mechanisms include direct transection by the orbital bones or other objects, or forward propulsion of the globe (caused by the sudden deceleration) pulling off the nerve at the attachment site of the dura to the canalicular periosteum.

In this case, the management of cerebral oedema took priority over globe management. Since the patient had head and maxillofacial injuries, careful monitoring was done for any complications such as cerebral fluid leakage and meningitis, and the patient recovered completely without any complications.

The management of an avulsed but intact globe is controversial. In most reports, the eyes were enucleated. However, in one case, the globe was initially positioned back into the orbit and had a covering tarrsorrhaphy. However, it was subsequently enucleated as well [4]. In two cases, the globes were replaced within the orbit without enucleation. The authors believed that although the visual prognoses were poor, preservation of the globe would help patients recover psychologically from the trauma and allow better cosmesis [3,5].

For traumatic globe avulsions, the following surgical management is suggested. After the patient's condition has been stabilised, complete examination of the orbital area should be done. The goals are to assess viability of the globe, isolate all extraocular muscles and then perform cleaning and debridement of the orbit. If infection is a concern, cultures should be taken from the orbit before irrigation with antibiotic solution. If possible, fitting an orbital implant may be performed at this time.

As a final comment, we cannot emphasise enough the importance of wearing proper safety attire (in this case a properly secured, full-face helmet) especially when riding motorcycles.

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