



Avulsion of intact globe in bull gore injury - A case report

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Abstract : Avulsion of the globe is a rare event, and there are only a few reports of true total enucleation of the globes in the literature. We report a rare, severe case of traumatic globe avulsion. A 27 year-old man presented with complete avulsion of the intact left globe and intracranial haemorrhage following bull gore injury. The management of brain injury was the priority over preservation of globe structures. We briefly describe the features of this uncommon situation and the proposed evulsion mechanism and the management.

Keyword : globe avulsion, trauma, bullgore injury

Introduction:

Avulsion of the globe is a very rare condition that results from extreme form of trauma ⁽¹⁾. It occurs as result of total disruption of the extraocular muscles and optic nerve, and displacement of these structures out of the orbital cavity. This is a more severe clinical situation, and always results in a total vision loss. Globe avulsions are classified as incomplete, in which the optic nerve is severed only, and complete, where there is disruption of the extraocular muscles and optic nerve resulting in total luxation of the ocular bulb ^(2,3). To our knowledge globe avulsion is almost always traumatic either in RTA or self-induced. Herein we present a case of avulsion of intact globe following Bull gore injury. Case report A 27 year old male was brought with history of bull gore injury to casualty. Patient was conscious, disoriented, irritable GCS 9/15. Ocular examination showed in the Right Eye-normal anterior segment, pupil briskly acting to direct reflex, absent indirect reflex and normal fundus. As the patient was disoriented, visual acuity and visual fields in the right eye could not be tested. Left Eye showed-severe periorbital edema, upper lid laceration, Left globe was found outside the orbital cavity, intact, hanging on the lateral aspect with avulsed optic nerve and severed extraocular muscles. Cornea was hazy with formed anterior chamber, pupils dilated fixed, absent direct and indirect reflexes. There were no stumps of extraocular muscles. The orbital soft tissues and the Tenon's capsule were partially attached to the globe, leaving it suspended out of the orbit.



CT brain showed SAH, frontal ICH, soft tissue shadow in the left maxillary antrum, fracture zygoma, suspicious fracture of posterior part roof of left orbit.



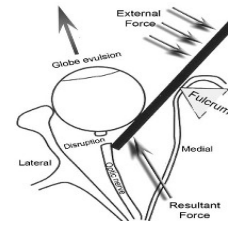
The globe was unsuitable for repositioning. As the patient was not fit for GA, globe was enucleated under local infiltration. Exploration of orbit was not attempted. Patient was transferred to neurosurgery for management of intracranial injuries. Patient got discharged against medical advice and we lost follow-up.

Discussion

The word 'evulsion' stems from the latin 'e' (out) and 'vellere' (to pluck) and the word 'avulsion' is derived from the latin 'a' (away) and 'vellere'. These terms have been used interchangeably by most authors⁽⁴⁾. The optic nerve and the globes are very resistant to mild and moderate trauma⁽⁵⁾. The force affecting this region is partially absorbed by the surrounding bony structures. Ligaments, optic nerve, extraocular muscles, and orbital fat prevent the luxation of the globe. According to the etiology, avulsion of the globe may be divided into⁽⁶⁾:

- 1) Avulsion by forceps during delivery;
- 2) Self-enucleation in psychotic patients;
- 3) Craniofacial trauma;
- 4) Globe luxation- as a result of "gouging" in which a combatant was successful if he would press the adversary's eye ball out with his thumb.

A hypothetical mechanism has been proposed by Morris⁽⁷⁾ to explain how the entire globe (leaving behind the optic nerve) is evulsed from the eye. It is believed that an impact site between the globe and the orbital rim is more likely to result in an evulsion of the globe and/or optic nerve such as that found in our case, whereas a direct blow to the eye is more likely to result in a ruptured globe. In his hypothesis, the forcing of the straight-line edges of the 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.



A bull gore injury may be trivial or fatal depending on the site and extent of the injury. When it involves the face, the eye is very often injured. Trauma to the eye may vary from a simple lid tear to rupture of the globe requiring enucleation⁽⁸⁾. In our case, the bull gore might have entered between the left lateral orbital wall and globe with anterior portion of zygoma as the fulcrum, causing a fracture of zygoma. Although the actual mechanism of globe evulsion in this case is hypothesized, without any real additional evidence to substantiate it, we agree with Morris et al.⁽⁷⁾ that

- (i) variations in the diameter of the optic nerve,
- (ii) the tensile strength of nerves and their sheaths,
- (iii) the thickness of the posterior sclera and optic nerve sheaths,
- (iv) the strength of the attachment of the nerve and sheath around the lamina cribrosa,
- (v) differences in the amount and angulation of the force encountered,

(vi) characteristics of the object entering the orbit and (vii) the orientation of the patient's eye and orbit with respect to the oncoming object will all influence the exact impact point and precise direction of the vector forces that act on the patient's globe and optic nerve, thus determining the type of damage to the eye. Life-threatening neurologic sequelae may result from any type of traumatic enucleation including orbital infection, intra cranial or subarachnoid hemorrhage, cerebrospinal fluid leakage, meningitis, or hypothalamic infarcts. A neurologic examination for signs of meningitis is essential. Brain and orbital CT-scans are required to exclude intracranial bleeding, optic chiasmal injury, and bone fractures. Following a trauma of the orbital region, the rate of optic nerve damage is 1.5%⁽⁴⁾. The optic nerve injury occurs mostly because of hemorrhage dissecting into the tight dural sheath in the optic canal. Edema, contusion, avulsion of the nerve, as well as shredding by posteriorly dislocated fracture edges are the other mechanisms of injury. The avulsion of the nerve at the canicular or more posterior level may demonstrate central nervous system complications resulting in life-threatening conditions such as in our case⁽⁹⁾. The most critical issue in complete globe avulsions with a transected optic nerve is to rescue the vision. Partial recovery could have been achieved only in partially avulsed optic nerves⁽²⁾. In total transected optic nerves, however, the final eyes could only have had cosmetic benefits⁽¹⁾. Kratl et al⁽⁵⁾ have presented a case with avulsion of the optic nerve and all extra ocular muscles except the medial rectus. In the case presented by Lang et al⁽⁶⁾, as there were only a few fibres of the superior and inferior oblique muscles attached to the globe, a surgical enucleation was performed. In our case, the globes were enucleated as there were no muscular attachments to make repositioning possible⁽¹⁰⁾. An interesting feature of our case was the preservation of globe structures. However, in this case the management of brain

oedema and subarachnoid haemorrhage was the priority over globe preservation. When a patient is admitted to a hospital with facilities for, and a surgeon trained in, eye microsurgery, a combined neurosurgical and ophthalmological team could work together to save life and preserve the globe. In conclusion, globe avulsions with a complete optic nerve cut remain a challenging problem. More research is required to better understand the pathophysiology of optic nerve repair.

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