

Case Report

Traumatic eye ball luxation: A stepwise approach to globe salvage



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Abstract

Craniofacial trauma is often associated with orbital and ocular injuries. We report a case of a 21-year-old male with motor vehicular accident, orbital roof blow-in fracture, cerebrospinal fluid (CSF) leak, and left sided globe luxation with corneal abrasion and complete conjunctival denuding. The patient was managed by a multispeciality team and the eyeball was protected by amniotic membrane graft (AMG) biological dressing with novel use of inverted sterile metallic bowl as mechanical protection till the patient stabilized. During surgery, eyeball was repositioned and ocular surface was reconstructed using amniotic membrane and symblepharon ring. Surgical correction and plating of the facial fractures and dural repair with autologous tensor fascia lata was done. Post surgery ocular surface was intact, ocular motility was well preserved and the globe was prephthical. Traumatic eyeball luxation is a rare, but dramatic presentation which may occur in a blow in fracture when the intra orbital volume reduces and expels the eye ball out of the socket. This may be associated with extra ocular muscle rupture or optic nerve avulsion. The visual prognosis is nil in majority cases. However, the management is targeted towards globe preservation in view of psychological benefit and ease of cosmetic or prosthetic rehabilitation. Knowing the mechanism of luxation helps to plan the management. A stepwise approach for globe salvage is recommended. Team efforts to take care of various morbidities with special steps to safeguard the eye help to optimize outcomes.

Keywords: Traumatic eyeball luxation, Blow in orbital fractures, Amniotic membrane graft for ocular surface, Globe reposition

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Introduction

Almost ninety percent of mid facial fractures are associated with some form of ocular trauma.¹

The incidence of moderate to severe ocular injury in patients who sustain facial fracture is approximately 28%.¹ Estimated incidence of blindness associated with mid facial fractures is 20%.²

Orbital blow out fracture is a traumatic deformity of orbital floor or medial wall, typically resulting from impact of blunt

object larger than orbital aperture or eye socket. The orbital volume expands and the eye and soft tissue commonly prolapse into the surrounding maxillary or ethmoidal sinus. This is the most common type of fracture and is postulated to occur due to buckling theory or the hydraulic theory.³ A Blow-in fracture is rare and is defined as an inwardly displaced fracture of the orbital wall resulting in decreased orbital volume. This occurs commonly on the orbital roof with direct impact on to the brow.⁴ The commonest cause of cranio-maxillofacial trauma in India is motor vehicular accidents.⁵

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Case report

A 21-year-old male was brought to the emergency department of our institute, with history of fall from a 2 wheeler bike and direct trauma to the forehead after hitting a roadside boulder. Patient was under the influence of alcohol and was not wearing a helmet. On admission patient's GCS (Glasgow Coma Scale) was 8/15.

Patient had sustained deep lacerated wounds on face, nose, left brow and forehead. There was CSF leak from the forehead wound. Left eye ball was luxated out of the socket beyond the equator (Fig. 1). There was no perception of light. The cornea appeared Edematous and showed a central 7 mm epithelial defect. There was no ocular motility. Pupils and anterior segment details could not be assessed due to corneal haziness. There was complete loss of conjunctiva. Medially a full-thickness lower lid laceration was identified. Both upper and lower lids were pushed behind the globe. The intraocular pressure was felt to be within normal limits digitally and the globe was intact. The contralateral eye was within normal limits. There were lacerated wounds in the occipital region, brow, forehead and on the dorsum of the nose up to the supratip. Clinically there was a floating maxilla with a mid palatal split. The midface was retro-displaced and there was derangement in occlusion. There was history of oral and nasal bleed. Computerized tomography (CT SCAN) imaging showed an intact but stretched optic nerve and hemorrhage behind the globe. A subgaleal hematoma was noted in the right occipital region. There was bifrontal fracture with involvement of both the inner and outer table of the frontal sinus on the left side. The displaced



Fig. 1. Left sided eyeball subluxation and extensive craniofacial injury.

fracture fragment of the frontal bone had migrated intracranially (Fig. 2). Minimal frontal extradural hemorrhage was seen on the left side. Facial fractures included gross comminuted of the midface, nasal bone, lamina papyracea, medial and lateral orbital wall fractures on the right as well as left side.

After stabilizing vitals, initial suturing and dressing was done under local anesthesia. The lacerated wounds on the glabella and forehead were sutured. Lateral canthotomy and cantholysis was done to release intraorbital pressure and drain the retro orbital hemorrhage. An attempt to close the lids and repost the eyeball was made. Failing this, the protruded eyeball was protected by wet preserved amniotic membrane graft as a biological dressing till definitive surgery was undertaken. Sterile stainless steel surgical bowls were taped across the eye to offer protection from mechanical injury and contamination during oro-facial wound handling and dressing. Local antibiotics, steroids and lubricant drops were instilled.

Forty-eight hours later, patient was taken up for surgery with a multispeciality team comprising of maxillofacial, oculo-plasty and neuro- surgeons.

The orbit was examined and the old semi dissolved amniotic membrane dressing was removed. All four recti muscles were hooked and tagged (Fig. 3a). The lateral canthotomy and cantholysis was extended and retro orbital contents palpated (Fig. 3b and c). After localizing and safeguarding the optic nerve, a suction catheter was introduced to evacuate the hemorrhage. However, it was found to be a well organized hematoma so the blood clots were removed piecemeal (Fig. 3d). There after, the ocular surface was covered by a fresh wet amniotic membrane (Fig. 4a). Lid crease incision and upper lid partial blepharotomy was performed to facilitate easy mobilizing of eyelid over the globe (Fig. 4b). A symblepharon ring was placed and the eyeball was gently slid under upper lid, followed by lower lid (Fig. 4c and d). Suture tarsorrhaphy was done maintain the position of the globe. The lower lid laceration was then addressed and layered closure was done. The maxillofacial repair was then carried out (Fig. 5a).

Bilateral vestibular incision given, 2 L shaped plates fixed in right and left zygomatic buttress after reducing the mid-palatal split and fixation of split with plate. Bilateral fronto zygomatic fracture and frontonasal fractures were exposed and plated. The frontal fracture was tackled in conjunction with the neurosurgical team. Minimal handling of the dorsum of nose and displaced frontal bone was done since the upper central block (frontal bone fragment) was deeply impacted with fractures extending up to the sphenoidal sinus. Considering the fact that gross mobilization may worsen the brain injury, minimal mobilization was done and CSF leak sealed with autologous harvested tensor fascia lata (Fig. 5b and c). Wound explored through extended supra orbital lacerations and bony fragments were debrided, The leak was repaired with fascia lata and fibrin glue, gel foam packing was given and wound was closed in layers (Fig. 5d)

Post operatively, patient's general condition improved and CSF leak stopped 48 h after the surgery. Two months post trauma, the right eye was within normal limits. The left eye had nil perception of light, the cornea continued to be avascular and hazy, and the eye was pre phthisical. The conjunctiva re epithelized and the ocular motility was restored in

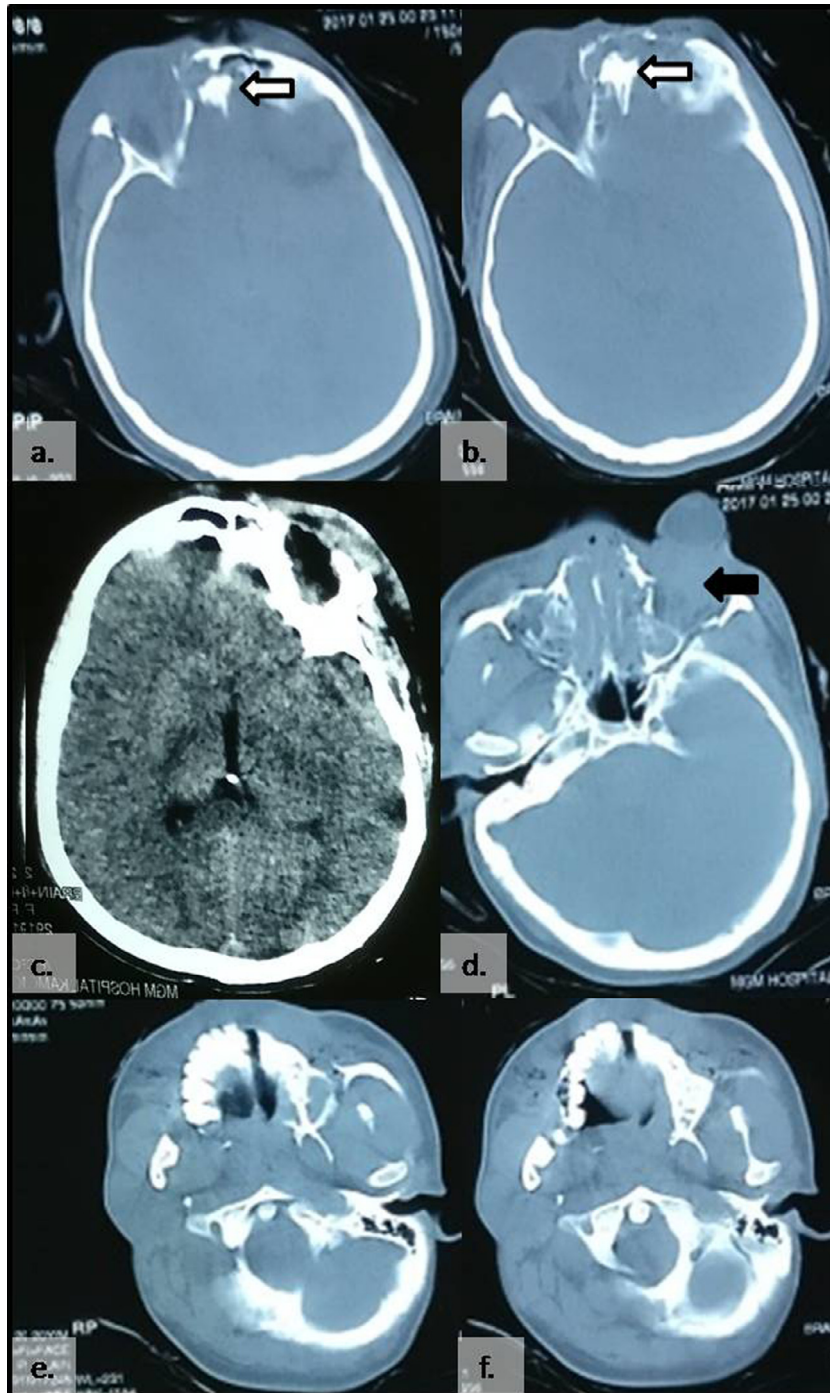


Fig. 2. Computed Tomography (CT) Imaging (a, b) Fractured frontal bone piece impacted in brain parenchyma (White arrow). Right sided lateral wall of orbit fracture. (c) Blow in fracture of frontal bone at orbital roof. (d) Globe subluxation with retrobulbar hemorrhage (black arrow). (e, f) Palatal split and extensive mid facial fractures.

all quadrants except abduction. Left lower lid laceration had a wound dehiscence and the patient was scheduled for a secondary correction (Fig. 6a and b).

Discussion

Traumatic eyeball luxation is a rare, but dramatic vision threatening presentation. It may be isolated luxation or associated with optic nerve or extra ocular muscle avulsion.⁶

Avulsion occurs if the trauma is due to a sharp object or a bony fracture fragment transects the nerve. It is important to know the mechanism of injury in order to plan the management and take preventive measures. Isolated anterior luxation of eye ball without optic nerve avulsion occurs when a blunt wedge insinuates between the supero medial orbit and the eye ball, causing the eye to 'pop' out and the eyelids to squeeze shut behind the globe. These objects are encountered in daily life like as bike handle,⁷ gift wrapping tube,⁸ door handle, etc.⁹ The second mechanism is a coup- contre

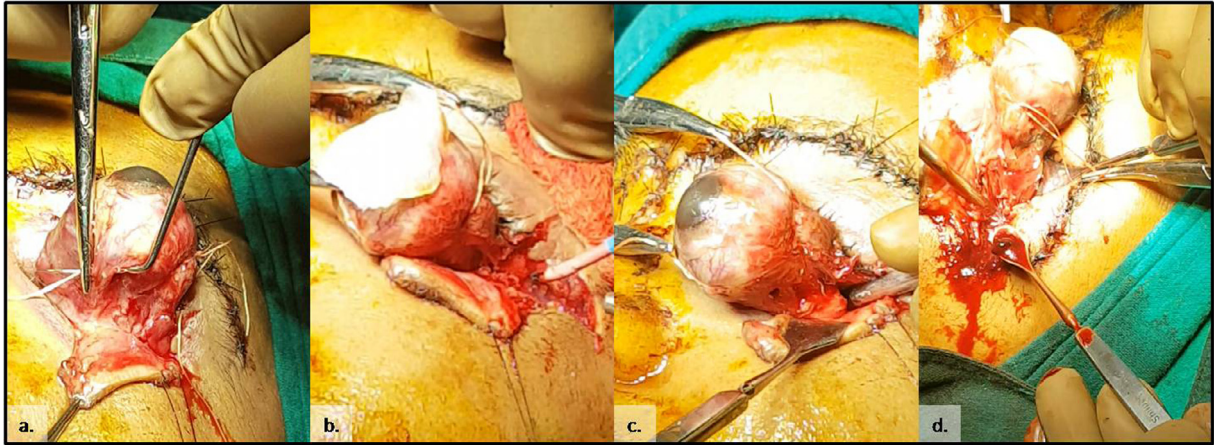


Fig. 3. Stepwise evacuation of retro-orbital hematoma. (a) Muscle identification and tagging. (b) Lateral canthotomy and inferior cantholysis. (c) Palpating optic nerve and orbital contents. (d) Orbital hematoma removal.

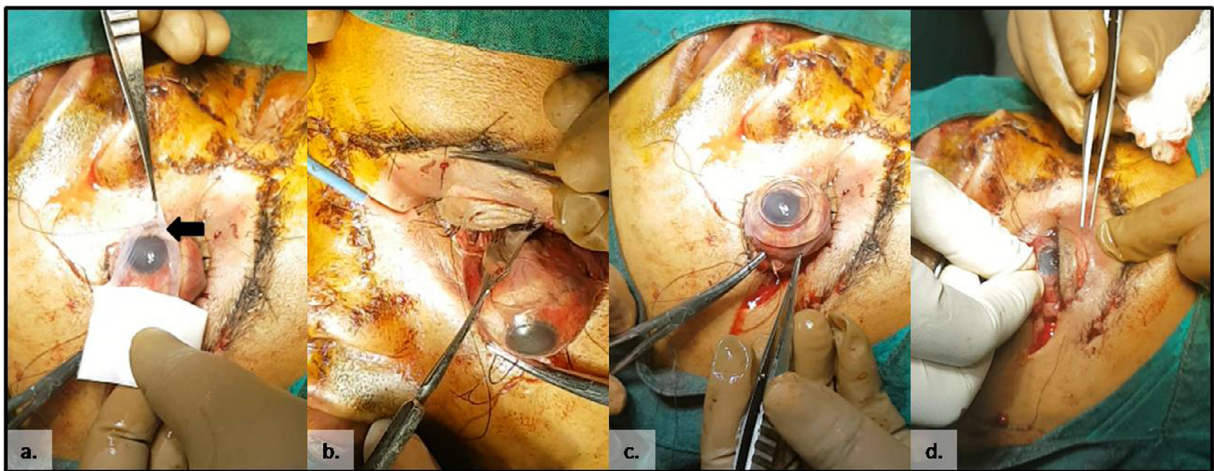


Fig. 4. Steps for globe reposition. (a) Ocular surface covered with amniotic membrane graft. Upper lid blepharotomy to lengthen anterior lamella and facilitate lid closure. (c) Placing Symblepharon ring. (d) Using symblepharon ring to mobilize globe and slip it under the upper lid.



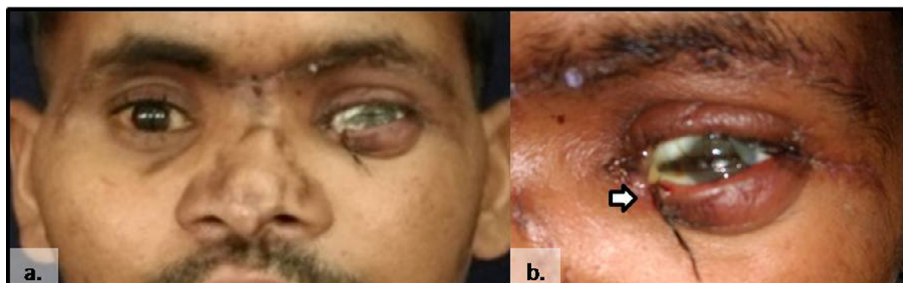
Fig. 5. Surgical repair of craniofacial trauma. (a) Fixing palatal split. (b) Frontal fracture with CSF. (c) Harvesting Tensor fascia lata for dural repair. (d) On table outcome after tarsorrhaphy and wound closure.

coup injury which is commonly associated with craniofacial trauma. An impact on the occiput causes a counter coup which hurls the eyeball out of the socket anteriorly. The third

mechanism is direct reduction in orbital volume as occurs in a blow-in fracture of the orbital roof due to direct impact. The visual prognosis is poor in majority cases. Prompt reposition

Table 1. Step wise approach for traumatic eyeball luxation.

Time line	Approach	Remarks
At Presentation In Emergency department	<i>Assessment for-</i> Severity of craniofacial injury and risk to life Globe perforation Muscle avulsion Optic nerve avulsion Blow in versus blow out fracture of orbit Presence of retro orbital hemorrhage	Decides the time frame when surgical intervention would be done Perforation may influence decision of globe salvage Muscle avulsion contributes to worsened globe ischemia and viability Optic nerve avulsion ascertains nil vision prognosis Blow in fracture may need concomitant repair to enable globe repositing Drainage indicated to relieve retro orbital pressure
Pre operative (Bedside, or in minor procedure room under local anesthesia)	<i>Intervention -</i> Lateral canthotomy and cantholysis for retro orbital hemorrhage drainage Globe protection till definitive surgery with biological dressing of AMG Customised eye shield using inverted sterilized stainless steel surgical bowls	May facilitate successful bedside repositioning of globe AMG has anti-inflammatory properties and serves to protect the ocular surface from desiccation, infection These prevent direct pressure on globe. Can be sterilized and changed regularly and provide effective barrier protection to the exposed eye especially when rest of the face and oral cavity need handling for repair/wound dressing
Intra operative	<i>Steps-</i> Explore and tag the extra ocular muscles Increase intra orbital space Eye lid preparation with blepharotomy and pre placing tarsorrhaphy sutures Symblepharon ring over the eyeball (+/-AMG)	Identifies muscle avulsion or (occult) globe rupture. Helps to mobilize eye ball if needed. Can repair if muscle avulsion present Lateral canthotomy/Orbital hematoma evacuation/Blow in fracture repair Enables easy closure of lid over the globe especially in case of tissue edema Prevents direct handling of eyeball or pressure on cornea/anterior chamber. Safeguards against adhesions in case of damaged ocular surface

**Fig. 6.** (a) Post operative appearance after 2 months. (b) Left eye prephthical. Wound dehiscence of lower lid laceration repair.

using desmarres retractor¹⁰ have been recommended for better visual outcomes.¹¹ In the current case all three mechanisms came into play to cause anterior luxation. Lateral canthotomy and globe repositioning was attempted immediately, however, tissue edema and orbital hematoma prevented it. Due to extensive brain injury, the patient could not be taken up for definitive surgery under general anesthesia immediately. Management of luxation is always targeted towards globe preservation in view of psychological benefit and ease of cosmetic or prosthetic rehabilitation. Protecting the eye ball till definitive repositioning is a challenge. We used a novel technique of biological dressing (AMG) and mechanical barrier to overcome this challenge. Sterilized stainless steel surgical bowls were utilized to cover the eye ball and then taped across the face to protect the globe from

mechanical trauma and contamination during handling and dressing of the orofacial wound. A stepwise approach towards traumatic globe luxation in emergency, pre operative and intra operative period is depicted in Table 1 to maximise outcomes (Table 1). Team efforts to take care of various morbidities with special steps to safeguard the eye help to optimize outcomes.

Conclusion

Traumatic globe subluxations may occur along with extensive craniofacial trauma. Eye ball conservation is preferred even if the visual prognosis is absent.

A step wise approach to reposit the globe is recommended. Pre-operative globe protection techniques can be

employed if there is an anticipated delay in definitive surgery. Knowing the mechanism and extent of injury is of utmost importance as it helps to prioritize treatment goals and prognosticate outcomes.

Conflicts of interest

The authors declared that there is no conflict of interest.

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