CEOTI
Clinical and Experimental Ocular Trauma and Infection

Case Report

Meat Hook–Associated Occupational Eye Injury Presenting with Globe Luxation, Optic Nerve Avulsion, and Open-Globe Rupture

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Abstract

Introduction: Traumatic globe luxation is a rare but vision threatening condition that typically results from high energy orbital trauma and may be accompanied by severe complications such as extraocular muscle rupture, open globe injury, and optic nerve avulsion.

Case presentation: We report a unique case of occupational penetrating trauma caused by a meat hook, resulting in globe subluxation, medial rectus rupture, posterior open globe injury, and complete optic nerve avulsion. Emergency lateral canthotomy and cantholysis were performed, followed by staged surgical exploration, repair of the scleral defect, reattachment of the medial rectus muscle, scleral fixation of the avulsed optic nerve stump, and successful repositioning of the globe into the orbit. Despite the absence of visual recovery due to optic nerve avulsion, postoperative follow up demonstrated restoration of anatomical stability, improvement in ocular motility, and satisfactory cosmetic outcome.

Conclusion: This case represents one of the most severe forms of traumatic globe luxation reported in the literature and highlights the importance of early decompression, systematic exploration, and reconstructive efforts even in the presence of devastating optic nerve injury.

Keywords: Traumatic globe luxation; optic nerve avulsion; open globe injury; extraocular muscle rupture; orbital trauma; penetrating eye injury; meat hook injury; globe repositioning; ocular emergency; occupational injury

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Introduction

Orbital penetrating injuries are uncommon but represent true ophthalmic emergencies that may lead to sudden and irreversible vision loss, often requiring multidisciplinary management. High-energy metallic objects and wooden fragments are among the most frequent causative agents, and such trauma may be accompanied by devastating complications including globe perforation, extraocular muscle injury, and optic nerve avulsion (1). Another rare but potentially blinding consequence of trauma is globe luxation or subluxation (2). Penetrating ocular injuries, extraocular muscle rupture, and optic nerve damage may coexist with subluxation or luxation (3). Although many of these cases ultimately result in enucleation, several reports have demonstrated that reconstruction and repositioning of the globe within the orbit can yield favorable outcomes, particularly in patients without open-globe rupture (4).

In this case report, we present a patient who sustained globe subluxation, extraocular muscle rupture, open-globe injury, and optic nerve avulsion caused by an unusual mechanism—penetration by a meat hook. We describe the successful surgical management, including open-globe repair, muscle reattachment, scleral fixation of the avulsed optic nerve, and orbital repositioning of the globe, and compare the clinical outcome with previously published literature.

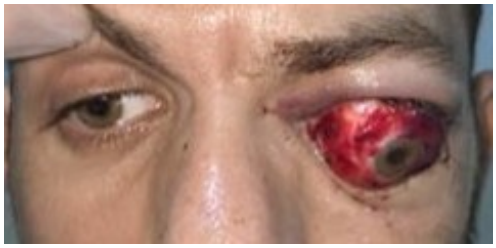

Figure 1. Preoperative external photograph demonstrating anterior luxation of the left globe with marked proptosis, complete ophthalmoplegia, subconjunctival hemorrhage, and exposure-related corneal edema.

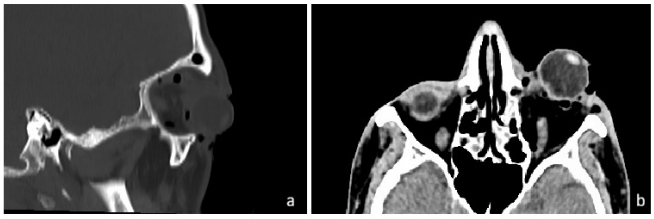

Figure 2. Preoperative sagital (a) and axial (b) computerized tomography scans the patient.

Case Presentation

A 34-year-old male migrant worker employed at a slaughterhouse was referred from another clinic following a meat-hook injury to the left eye. He had no known systemic diseases or regular medication use. Initial inspection revealed anterior luxation of the left globe (Figure 1 and Figure 2). Visual acuity was 1.0 in the right eye, while light perception was absent in the left eye. Ocular motility was full in the right eye; however, the left eye demonstrated complete restriction of movement in all directions accompanied by marked proptosis. Intraocular pressure was normal in the right eye and hypotonic in the left. Slit-lamp examination of the left eye showed corneal edema, Descemet membrane folds, a shallow anterior chamber, a fixed dilated pupil, lens dislocation, and extensive subconjunctival hemorrhage. Fundus examination was normal in the right eye, whereas the fundus could not be visualized in the left.

The clinical state was consistent with retrobulbar hemorrhage, and emergent lateral canthotomy and cantholysis were performed for decompression. Subsequent exploration in the operating room revealed significant tissue edema; the hematoma was evacuated, the globe was repositioned, and temporary blepharorrhaphy was performed. Extensive exploration was deferred to a second session (Figure 3). Comprehensive surgical exploration was deferred during the initial intervention because pronounced orbital soft tissue edema and extreme eyelid tightness severely restricted surgical exposure, precluding safe and thorough inspection of the posterior globe and optic nerve.

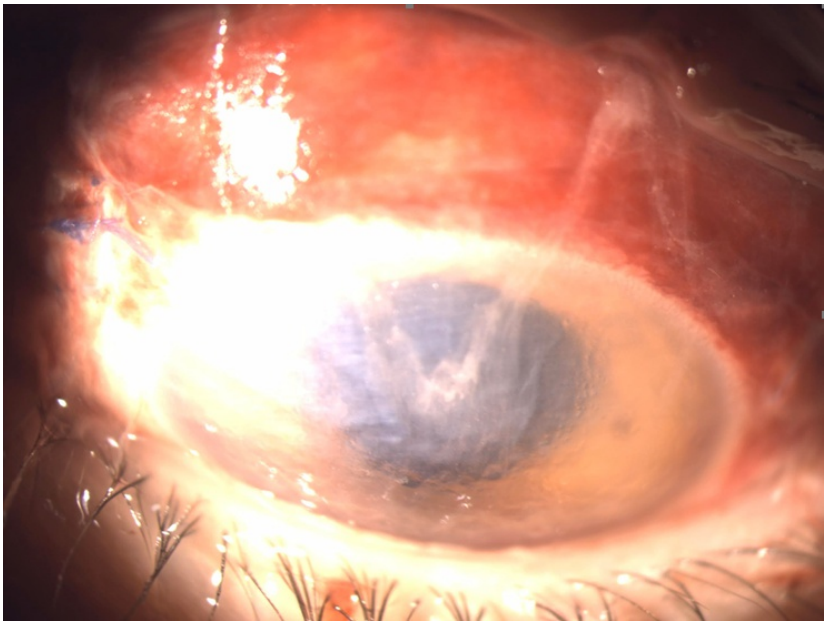

Figure 3. Anterior segment photograph of the left eye demonstrating marked corneal stromal edema, prominent Descemet membrane folds, a shallow anterior chamber, and a fixed dilated pupil. The globe appears hypotonous, consistent with the severity of the posterior scleral injury and orbital trauma.

Due to the depth of the injury and persistent clinical findings, a secondary exploration was planned one week after the initial surgery. During this period, the patient received prophylactic intravenous antibiotics and intravenous methylprednisolone. In the operating room, following a 360° peritomy, the extraocular muscles were systematically evaluated. The superior rectus was hemorrhagic and edematous, while the inferior rectus appeared intact. Exploration of the medial rectus revealed complete muscle disruption extending toward the orbital apex. A full-thickness scleral defect was identified posteriorly and repaired with 6-0 polyglactin 910 suture. The optic nerve was found to be avulsed. All foreign bodies within the orbit were removed.

Given the extensive extraocular muscle damage and orbital pressure, the optic nerve stump was sutured back to the sclera using 6-0 Vicryl to reduce the risk of recurrent subluxation. The torn segments of the medial rectus muscle were approximated and reattached to their original scleral insertion with 6-0 Vicryl. Globe luxation was noted to have resolved. Eyelid and canthoplasty reconstruction were completed, and the procedure was concluded.

Postoperatively, the patient received intravenous antibiotics, intravenous methylprednisolone (1 mg/kg), and topical antibiotic-steroid therapy. On postoperative day 1, 40 mg IV methylprednisolone was administered, followed by 20 mg on day 2. Topical moxifloxacin, dexamethasone drops (4×1), and chloramphenicol ointment (1×1) were continued. On postoperative day 5, the patient expressed a desire to return to his home country. Examination at that time showed a normotonic globe, partial recovery of ocular motility, and preservation of anatomical stability following reconstruction. Initial corneal findings had improved (Figure 4). Sutures were removed, and steroid therapy was tapered from 1 mg/kg.

One month later, the patient contacted the clinic via social media, reporting that the globe remained in place, horizontal ocular movements had significantly improved, and both proptosis and ptosis had resolved. He noted, however, no light perception in the affected eye. Long-term postoperative photographic documentation could not be obtained, as the patient voluntarily returned to his home country in the early postoperative period and could not be reached for further follow-up despite multiple attempts.

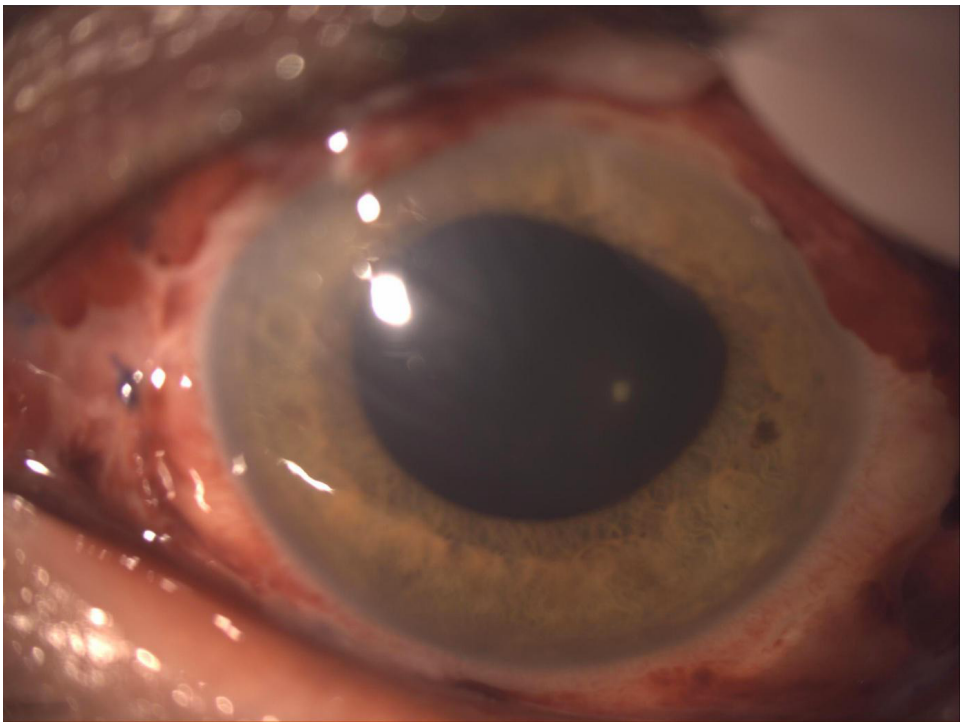

Figure 4. Postoperative day 5 appearance demonstrating restored anatomical globe position, improved corneal clarity, and partial recovery of ocular motility. The globe is normotonic, and early return of extraocular movements is evident following scleral repair, medial rectus reattachment, and orbital reconstruction.

Discussion

Traumatic globe luxation is a rare but potentially devastating clinical condition characterized by partial or complete displacement of the globe outside the orbital cavity following high-energy orbital trauma. Most cases reported in the literature consist of isolated case reports or small series, demonstrating considerable heterogeneity in trauma mechanisms, associated orbital injuries, and surgical management strategies (2–21).

A review of published cases shows that the majority occur following motor vehicle accidents or head trauma, with a smaller number resulting from assault (2–21). High-energy blunt trauma is the most common mechanism, with motor vehicle collisions representing the leading cause (3,4,9,11,14,16,19). Falls from bicycles (2) and animal-related injuries (12,13) have also been reported as relevant etiologic factors. Penetrating trauma is a less frequent but documented cause of globe luxation (8). To the best of our knowledge, no previously published case has described traumatic globe luxation resulting from an occupational accident involving a meat hook.

Extraocular muscle injury is another common finding accompanying globe luxation. Trauma directed toward the medial orbital region frequently results in avulsion or rupture of multiple extraocular muscles, particularly the medial rectus (3,4,9,13,14,16,18,19). This underscores the importance of not only globe repositioning but also careful assessment and reconstruction of extraocular muscle integrity whenever feasible.

Because blunt trauma is the predominant mechanism, open-globe injury is less commonly associated with traumatic globe luxation. In studies reporting successful repositioning, cases with open-globe rupture were typically excluded. In the majority of cases summarized in the literature, open-globe injury was either absent or not reported. In the series by Thrishulamurthy et al., which included patients with spontaneous and traumatic globe subluxation who underwent repositioning, open-globe injury was not described (6). The authors emphasized that repositioning should be the first-line approach

particularly when the globe remains anatomically intact (6,7,21).

In our case, despite the presence of a posterior open-globe injury, the rupture was successfully repaired and the globe was repositioned. Although open-globe injury may increase the risk of phthisis bulbi and the subsequent need for evisceration or enucleation, the literature consistently demonstrates that optic nerve injury—rather than globe integrity—is the most critical determinant of visual prognosis in traumatic globe luxation (3,9,18,19). As illustrated in the bilateral case reported by Razmjua and Masjedi (16), the combination of open-globe injury and optic nerve avulsion is associated with an even poorer prognosis.

A 2024 systematic review by Kim et al. examined cases of globe luxation reported between 1970 and 2022. Inclusion criteria required clear transection of the optic nerve, partial subluxation of an otherwise intact globe with at least one remaining extraocular muscle attachment (i.e., incomplete enucleation), and documented severance of at least one extraocular muscle. Cases involving globe rupture or complete displacement equivalent to enucleation were excluded. In this review, 27% of patients underwent enucleation during the initial surgery. Among cases initially managed with repositioning, one-fifth ultimately required secondary enucleation or evisceration, despite the exclusion of open-globe injuries from the analysis (21).

Permanent vision loss has been reported in cases involving optic nerve avulsion or transection (3,4,9,16,18,19). In contrast, limited functional visual recovery has been documented in patients without avulsion but with optic nerve elongation or contusion (15). As emphasized throughout the literature, optic nerve avulsion is associated with an extremely poor visual prognosis, and the primary goals of surgical intervention shift toward restoring anatomical stability and achieving acceptable cosmetic outcomes (5).Thrishulamurthy et al. (6) described traumatic globe luxation as an ophthalmic emergency, highlighting the importance of prompt repositioning to reduce the risk of ocular ischemia and exposure keratopathy. While early repositioning may preserve ocular structures, functional visual recovery depends almost entirely on optic nerve integrity. In cases without optic nerve avulsion, partial or functional visual improvement may be possible; however, when avulsion is present, surgical management focuses on anatomical preservation and cosmesis. The authors also noted that enucleation should be reserved for cases in which globe integrity cannot be restored or in severe, delayed-presentation injuries. Similarly, Kim et al. recommended that in cases of traumatic globe subluxation with optic nerve transection but preservation of at least one extraocular muscle (i.e., incomplete enucleation), primary reduction should be attempted within 24 hours, provided the patient is hemodynamically stable and appropriate surgical conditions are available. Muscle repair should be attempted during the initial procedure, with the option for secondary revision if necessary. Patients should be informed that although visual recovery is not expected, secondary enucleation or evisceration for pain control may occasionally be required, though this is uncommon (21).

Recent studies increasingly advocate for attempting globe repositioning whenever feasible (7). In nearly all cases summarized in our review table, repositioning was preferred, and the need for enucleation remained limited (2–17). This approach aligns with contemporary conservative surgical strategies, which prioritize globe preservation when possible. As emphasized in the literature, primary enucleation is not recommended when the globe is salvageable; instead, repositioning and reconstruction should be the primary goals (6).

Our case differs from many previously reported cases in that it involved a severe penetrating injury with concurrent open-globe rupture, medial rectus muscle transection, and optic nerve avulsion—representing a more severe end of the clinical spectrum. Following the management algorithm proposed by Thrishulamurthy et al. (6), early decompression, staged surgical exploration, and reconstruction allowed preservation of

anatomical integrity. However, consistent with the literature, optic nerve injury remained the key determinant of functional prognosis (3,9,18,19).

Conclusion

In severe orbital penetrating trauma, early diagnosis, emergent decompression, and staged surgical exploration are critical for preserving structural integrity and optimizing cosmetic outcomes. Nevertheless, devastating injuries such as optic nerve avulsion remain the most important determinants of functional prognosis. The present case represents a rare scenario involving medial rectus rupture, optic nerve avulsion, and open6globe injury, in which successful globe repositioning was achieved despite the severity of the trauma.

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