

Case Report

Traumatic Globe Luxation with Complete Optic Nerve Transection Caused by Heavy Object Compression

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Traumatic eyeball luxation is a rare clinical condition with a dramatic presentation. Here, we describe a unique case of traumatic globe luxation and complete optic nerve transection caused by heavy object compression. A 45-year-old male automobile mechanic was injured when a truck slipped from its supports, crushing his head and face. On arrival, his right eyeball was obviously displaced anteriorly and he had no light perception. Computed tomography revealed complex frontal bone and facial fractures with underlying brain contusion in addition to complete transection of the right optic nerve. The patient was successfully treated using a multidisciplinary approach.

Key words: globe luxation, optic nerve avulsion, traumatic brain injury, facial trauma

Case Presentation

Traumatic eyeball luxation is an extremely uncommon clinical event presenting dramatically and is usually associated with motor vehicle accidents [1, 2]. The condition may occur with complete or incomplete optic nerve transection and may have concomitant intracranial injury [2]. To our knowledge, traumatic globe luxation complicated with intracranial hemorrhage following compression injury has not previously been described. Herein, we report a case of globe luxation with complete optic nerve transection caused by heavy object compression to the head and face successfully treated with a multidisciplinary approach. The patient gave written informed consent for publication of this case report and accompanying images.

A 45-year-old male was transferred from another hospital two hours after being crushed under a truck weighing 2,000 kg. He had been working beneath the truck when it fell from its supports and onto his face and head. He was rescued immediately by his colleagues.

On arrival in the emergency department, he was alert and oriented. His vital signs were as follows: Glasgow Coma Scale score, 15 (E4V5M6); respiratory rate, 20 breaths/min; pulse rate, 80 beats/min; blood pressure, 142/101 mmHg; and oxygen saturation, 100% on room air. His right eye globe was completely displaced anteriorly along with an obvious deformity of his midface, and a large laceration at his left frontal region through which prolapsed cerebral tissue was visible (Fig.1). The patient had no light perception and

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impaired ocular movement in the right eye. The detailed examination of his right extraocular muscles and optic nerve was unclear due to hematoma. The pupil was dilated and the pupillary light reflex was absent bilaterally. In his left eye, eye movement was preserved, the anterior chamber and fundus were observed to be intact and his visual acuity was reflected by his ability to count fingers at 20 cm, which suggested traumatic optic neuropathy.

Computed tomography (CT) scan of the head



Fig. 1 Picture of the patient on arrival showing right luxated globe and large laceration at his left frontal region with prolapsed cerebral tissue.

demonstrated open depressed frontal bone fractures with underlying cerebral contusion (Fig. 2A). Maxillofacial CT scan revealed pyramidal fractures involving the maxilla, nasal bones, and inferior orbital rim, which were classified as Le Fort II (Fig. 2B). Transection of the right optic nerve was also detected (Fig. 2C).

Emergency surgery was performed. Contused brain tissue and safely accessible bone fragments were removed by a neurosurgeon. Subsequently, a plastic surgeon performed cranioplasty using the inner table of the skull obtained from the craniotomy bone flap, since development of significant cerebral edema had not occurred. Finally, his protruding right eye was enucleated by an ophthalmologist after identification of complete transection of his optic nerve and medial rectus muscle.

Tracheostomy was performed on day 3 to allow surgical repair of the maxillofacial fractures and secure the airway. On day 5, surgical repair of the patient's complex facial fractures to mend cosmetic deformities and address masticatory problems (Fig. 3) was completed. A lumbar drain was placed to avoid cerebrospinal fluid leakage on day 3; the drain was removed on day 17. The patient underwent successful tracheostomy decannulation on day 17. Although there was residual traumatic mydriasis, his left visual acuity gradually recovered to 20/33. Wearing a right prosthetic eye was

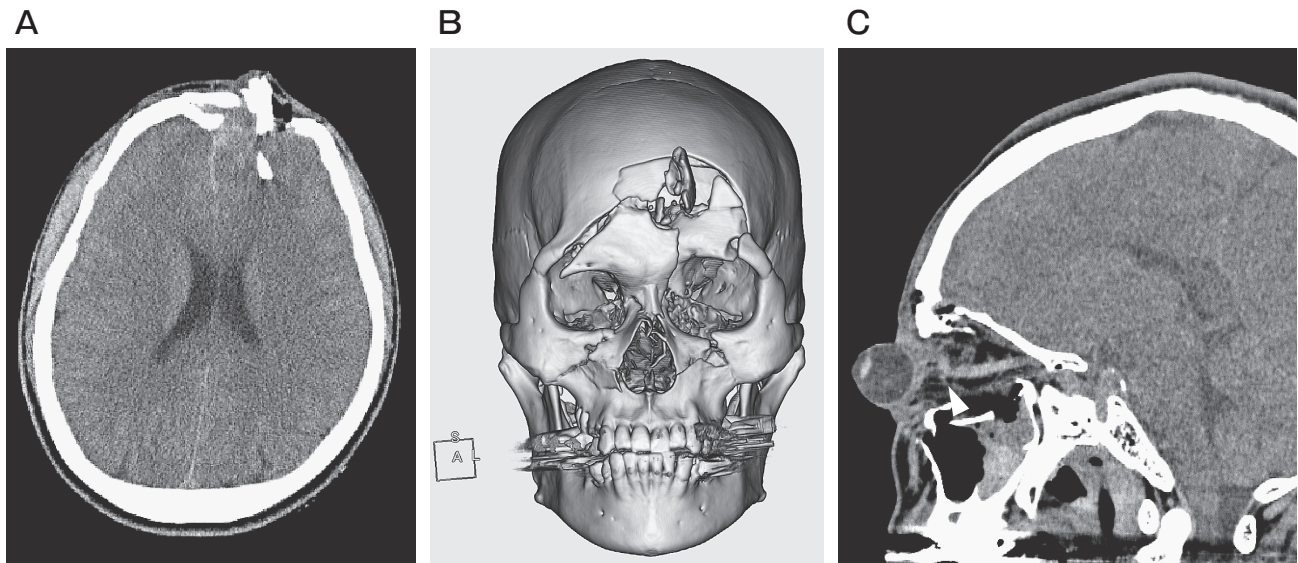


Fig. 2 Computed tomography scan showing depressed frontal bone fractures with underlying cerebral contusion (A), pyramidal fractures involving the maxilla, nasal bones, and inferior orbital rim, which were classified as Le Fort II (B), and right optic nerve transection in the sagittal view (C, arrow head).

planned for 2 months after the injury. Regarding frontal lobe damage, the patient was initially agitated, restless, and easily distracted, but these symptoms had improved by three weeks after the injury. The patient was transferred to another hospital for additional rehabilitation on the 28th hospital day. Fig. 4 shows a picture of the patient at discharge.

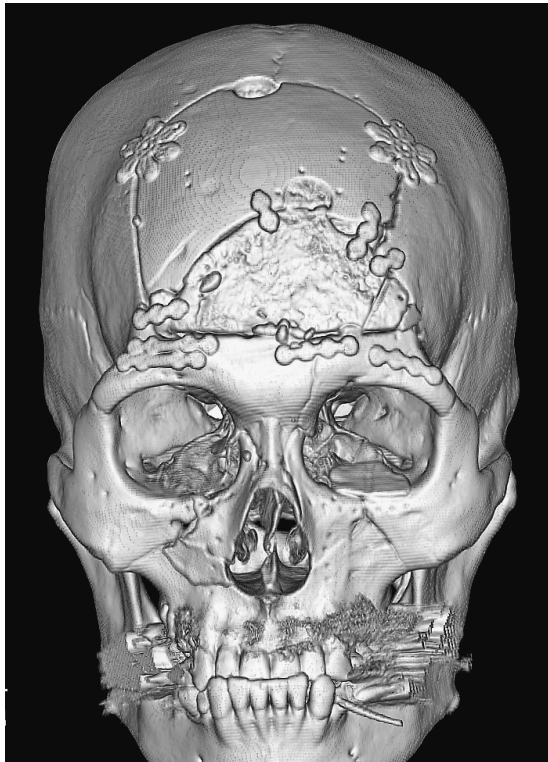


Fig. 3 Three-dimensional computed tomography postoperative repair of the complex craniofacial fractures.



Fig. 4 Patient's appearance at discharge.

Discussion

This is the first report of globe luxation with complete optic nerve avulsion, which is a rare and dramatic condition, induced by heavy-object compression to the craniofacial region. As the patient also had complex injuries including brain contusion and Le Fort II fractures, an integrated multidisciplinary team approach was used to minimize the patient's disability.

Globe luxation can be caused by manipulation of the lid, blunt trauma, the Valsalva maneuver, insertion of contact lenses, and general anesthesia [3]. Traumatic globe luxation has been reported following blunt trauma involving situations including motor vehicle accidents, falls, and door handles [1,2,4-6]. No case reports of globe luxation associated with heavy object compression complicated with optic nerve avulsion and brain contusion have been previously published. Morris *et al.* and Amaral *et al.* attribute several different mechanisms to the event of globe luxation [7,8]: a wedge-shaped or elongated object invading the medial orbit and displacing the globe forward; orbital volume reduction by multiple orbital and facial fractures, leading to displacement of the globe from its socket; sudden marked elevation of intraorbital pressure; and deceleration force. In the present case, the mechanism of injury was considered narrowing of the orbital space by multiple facial and orbital fractures that led to a sudden rise in intraorbital pressure, which resulted in globe luxation anteriorly.

Optic nerve avulsion represents the most severe complication related to traumatic globe luxation [1,2,8]. According to Amaral *et al.*, either complete or incomplete optic nerve avulsion occurred in 38.2% of patients with traumatic globe luxation [8]. The globe can be repositioned into the orbit if the globe is intact; this is the preferred initial approach to preserve visual function; however, subsequent enucleation may be required due to pain, prolonged ocular inflammation, and an unsatisfying cosmetic result [1,2,8]. In cases of complete optic nerve transection, there is no definite treatment that can consistently restore visual loss. Due to permanent visual loss, cosmetic and psychological concerns should be considered [1,2,5]. There have also been reports of primary enucleation being performed due to ocular necrosis, infection, or concomitant severe traumatic brain injury, as in the case presented here [2,8].

We describe a dramatic case of globe luxation complicated with complete optic nerve transection and brain injury caused by a truck crushing a patient's head and face. Although enucleating the dislocated globe was considered unavoidable since the patient also had complete optic nerve avulsion and brain contusion, he was successfully treated using a comprehensive multidisciplinary approach. In terms of injury prevention, no specific cause of the incident has been determined; however, people working beneath vehicles and their supervisors should take extra precautions to avoid serious and fatal accidents.

In conclusion, we report a case of globe luxation with complete optic nerve transection and severe craniofacial trauma induced by heavy object compression. A comprehensive multidisciplinary approach is essential to minimize patients' disability.

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