Magnetic resonance imaging of intact globe superior subluxation into the intracranium

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A 67-year-old man with right-sided blunt ocular trauma is reported here. Despite having received primary medical care, the patient complained of severe headache for 14 days. Initial computed tomography (CT) indicated hematoma in the right frontal lobe. However, magnetic resonance imaging (MRI) indicated that the right globe along with its optic nerve had been intactly dislocated into the intracranium and differentiated from hematoma. In this case, the significance of MRI, in blunt ocular trauma work-up, and also regaining successful ocular function are highlighted.

Key words: Magnetic resonance imaging, ocular, orbital, trauma

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Ocular trauma, as an important and a preventable public health problem, causes approximately 1.6 million blindness problems every year around the world. An additional 2.3 million people have bilateral low vision from this cause, and almost 19 million get unilateral blindness or low vision.[1,2] In this type of trauma, high economic costs including hospitalization, specialist treatment, prolonged follow-up time, and later visual rehabilitation may be followed by visual impairment causing more physical and psychological complications.[2-4]

We report a 67-year-old male with blunt ocular trauma whose globe and its function were saved by magnetic resonance imaging (MRI) studies. To the best of our knowledge, such trauma-induced intracranial luxation of an intact globe and, then, regaining ocular function have not been reported yet.

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Case Report

A 67-year-old male fell accidentally down from an agricultural vehicle a protruding part of which crashed into his right eye. He experienced massive bleeding with a 3- to 5-min period of unconsciousness as the immediate consequence of the trauma. Eight hours later, the patient was brought to the emergency unit of the ophthalmology hospital. On physical examination, the left eye had a normal appearance with a normal range of motion and 17/20 visual acuity, while the right orbit was empty and filled in with a lot of clots. Considering these findings, the primary diagnosis of orbital destruction was made, following which the orbit was irrigated and the upper eyelid repaired. Throughout the 7 days of hospitalization as well as for a further 7 days of partial bed rest at home, the patient complained of severe headache, especially prominent in the area corresponding to the frontoparietal lobe.

As a work-up for headache, an initial computed tomography (CT) scan was performed which demonstrated hyperdense foci of the right frontoparietal lobe, typical signs of a right orbital anterior wall fracture implying right globe destruction. Then, a brain MRI with intravenous contrast was done. The MRI study revealed the intact right globe; its related optical nerve possessed normal diameter and signal also. The globe had only herniated through the bony defect of the right orbit roof into the floor of the anterior fossa and caused hematoma and edema in the right frontal lobe, surrounding the displaced globe [Fig. 1a-c].

Consequently, diagnostic and interventional surgery was carried out to save the intact globe cosmetically and functionally.[5] Orbital exploration was performed under general anesthesia. The eyelids were opened using Desmarres retractors, and a wide opening in the fracture in the roof of the orbit and frontal bone was discovered. The orbit was examined

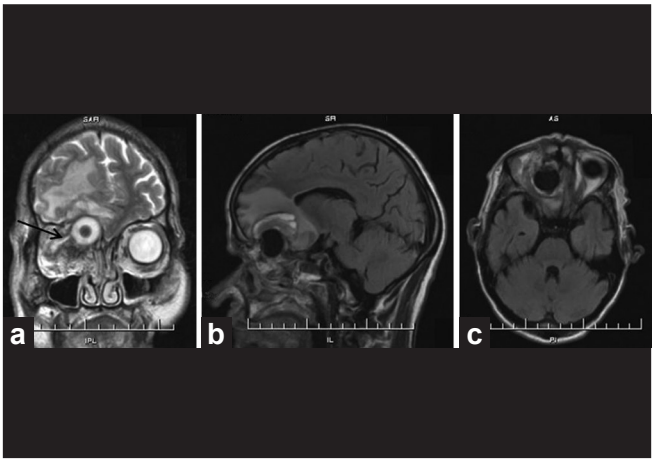

Figure 1: Magnetic resonance imaging (MRI) views. (a) Coronal view. Right globe is dislocated from its normal location in orbit toward the upper medial skull, adjacent to the right frontal lobe. The intact right globe with its lens and nerve (arrow) which are dislocated on the cribriform plate have a normal signal. (b) Sagittal view. A contusion has occurred in the right frontal lobe. The globe is dislocated upward to the base of the anterior fossa. (c) Transverse view. Globe dislocation toward the upper medial side on the cribriform plate of the ethmoid is seen

to confirm its normal integrity. Blunt dissection was performed until the whole eyeball was clearly visible. A squint hook was passed under the insertion of the inferior rectus muscle, and the globe was gently restored to its normal anatomical location using a blunt dissector inserted into the hole. The normal attachments of the all extraocular muscles were checked one by one, passing a squint hook under each scleral insertion. Serendipitously, the four rectus muscles and inferior oblique tendon were still intact, whereas the superior oblique muscle body was partially lacerated. The globe returned into its normal anatomic site and then the hole was considered to be repaired in a way to place the separated bony parts in association with each other.

The patient, after 2 days, was discharged and asked to get back for out-patient visit 1 week later. However, the patient was poorly cooperative and came to follow-up visit with 1-week delay. Patient's headache came back and on eye movement examination, extraocular movements were restricted in all directions; blepharoptosis was present, without enophthalmosis. The patient complained double vision (diplopia) when the affected eyelid was elevated manually, despite 8/20 visual acuity and reactive pupil on his right eye exam. Patient's ocular motility evaluation revealed 12 prism diopter hypertropia in the primary position, in the affected eye. A temporary glass was prescribed and a follow-up visit was scheduled for reexamination and possible surgical correction for blepharoptosis and ocular realignment. In addition, the patient was advised for rehabilitation and repeat MRI examination. However, the patient unfortunately never referred again for further clinical follow-up.

Discussion

Ocular injuries constitute a major cause of visual morbidity worldwide. To date, there has not been any case report demonstrating trauma-induced intracranial dislocation of an intact globe; this is the first report of its kind. This issue, once again, emphasizes the importance of imaging in ocular trauma, especially the MRI technique in the detection of an intact globe and its related anatomic components. Furthermore, apart from a neurosurgeon's skills, the meticulous evaluation of imaging findings such as CT and MRI may be of great importance in clinical neurosurgery. In the case of the present patient, the globe and its function were saved simply by a further MRI study.

Although there are limited case reports of intact globe dislocation into the ethmoid and maxillary sinuses,[6-9] this is the first case of the traumatic displacement of the globe into the intracranial space. In all of earlier reported cases, the prolapse of the intact globe occurred following the fracture of lateral sinuses' wall constructing the orbital fossa, while in the present case, the intact globe luxated into the intracranium space as a consequence of a fracture in the right orbit roof. Surgical intervention performed in only one case (with ethmoid luxation) has been associated with partially good outcomes,[7] consistent with our final outcome. Conventional surgical treatment, repairing the orbital floor only, seems to have lost its theoretical foundation and a conservative approach is advocated until microsurgical techniques become more readily available to treat the sequelae of blow-out fractures at their origin.[5,10]

In particular, these unique cases are the ones with the satisfactory restoration of globe to its normal position and the preservation of patient's vision. In such cases, performing further imaging studies including MRI saves the globe and its function, preventing the inappropriate consequences of globe resection. In addition, favorable cosmetic and functional results may be highly appreciated by these trauma patients.

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