

# Transorbital Brain Injury By A Metallic Fragment: A Case Report

## ABSTRACT

Because of anatomical configuration of the orbit, the brain can be damaged by penetrating transorbital injuries. At first sight, this type of trauma can be thought of as a solitary eye trauma. In this paper, we report a case who suffered from brain injury by a metallic foreign body which passed into the brain through the orbit. He was operated on urgently at two stages and there was no complication after 14 months of follow-up. Any neurological deficit or deterioration of consciousness would be marked. These types of injuries have to be evaluated systemically. Finally, detailed history, neuroradiological investigations, early surgical exploration and multidisciplinary studies are very important to obtain a good outcome.

**KEY WORDS:** Transorbital injury, Brain, Penetrating, Surgery.

## INTRODUCTION

Trauma is responsible for 4.5% of all orbital pathologies (8). Although a ratio of 4.5% seems insignificant, high morbidity and mortality rates demand immediate and thorough attention, as the orbit provides a vulnerable access to the cranial cavity. Penetrating injuries of the orbit may lead to cerebral injuries when foreign bodies reach the cranial cavity through the orbit (3, 14). Accordingly, a higher mortality rate has been reported than with other types of head trauma (3, 13). Generally, brain injury could be expected by direct trauma with a piece of shrapnel or projectile metallic fragments following firearm injuries and have been rarely reported through the orbit by chopstick, pieces of wooden or a projectile metallic foreign body (4, 6, 12).

Transorbital penetrating injuries include both ocular and cerebral complications in which blindness, hemorrhagic conditions and various kinds of infections such as meningitis, abscess may be seen (1, 10, 12). Because of these complications, orbitocranial injuries must be treated and managed in a multidisciplinary manner.

## CASE REPORT

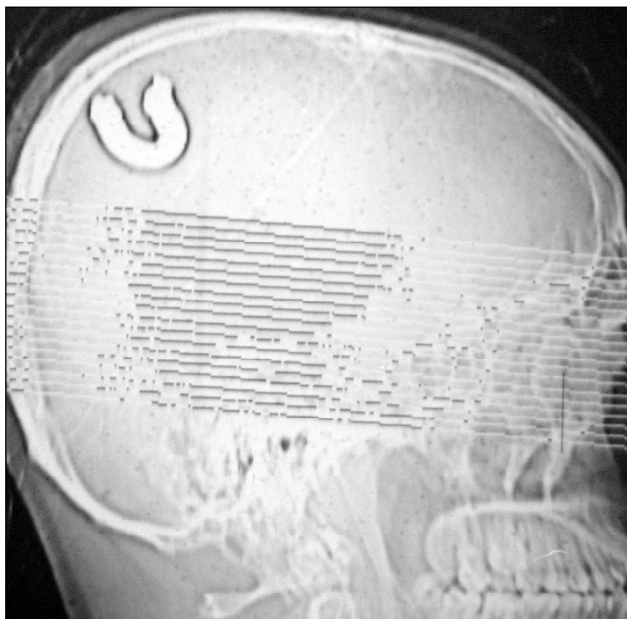
An 18-year-old boy was admitted to emergency service after a working accident. He suffered from edema, ecchymosis, blindness on left eye and deterioration of consciousness. Clinical history revealed the patient had been injured by a chain impact of a winch's cartridge belt used for lifting heavy weights. The GCS score was 8 points with a right hemiparesis. Plain X-rays revealed a metallic foreign body on the left parietal region (Figure 1). Computerized tomography (CT) confirmed a complicated fracture at the left orbit and a metallic foreign body on left parietal lobe with hemorrhages along its trajectory (Figure 2). A two-staged operation was planned. First, a left frontal craniotomy was performed to remove the fragmented bones and repair lacerated dura.

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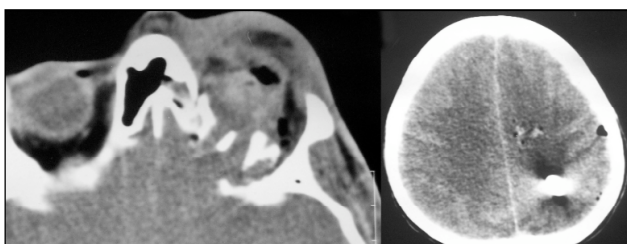
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**Figure 1:** CT scanning of the cranium shows horse-shoe shaped metallic fragment at planning for orbital CT.

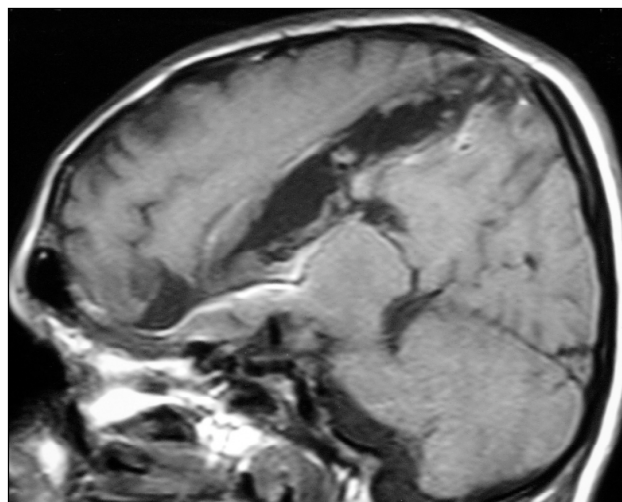


**Figure 2:** 2 Axial CT scan shows fracture lines of orbital cone and lacerated eyeball.

Then, the ruptured left eyeball was eviscerated by an ophthalmologist. At the second stage, the patient was repositioned and a parietooccipital craniotomy was performed to remove the metallic body and contused cerebral tissue. Combined antibiotic was administered intravenously for four weeks postoperatively. After one year of follow-up, he was able to walk unaided but had sequel dysphasia. Magnetic resonance imaging (MRI) revealed only a region of encephalomalasia at the trajectory (Figure 3).

### DISCUSSION

The orbit is shaped like a horizontal pyramid, and penetrating objects are directed toward the apex and pass through the optic canal and superior orbital fissure, providing ready passage into the intracranial cavity (1, 12). Hansen points out that the structural characteristics of the orbit play an important role in the pathogenesis of the intracranial extension of



**Figure 3:** Postoperative sagittal MRI shows region of encephalomalasia at the foreign body trajectory.

trauma (1, 5). The initial evaluation must always consist of appropriate comprehensive physical examination and a multisystem evaluation of trauma. Projectile injuries to the orbit may also be associated with a neurosurgical trauma. A team approach to the patient may therefore be necessary (6). Early neurological symptoms may be manifested by projectile metallic foreign bodies that reach deep within the cranial cavity, as reported here.

It is stressed in the literature that the diagnosis and management of penetrating orbital injuries with retained foreign bodies may present diagnostic and therapeutic challenges (1, 2). Diagnostic methods that aid in the detection and localization of intraorbital foreign bodies include plain radiographs, ultrasonography, CT, and MRI. CT is excellent for identifying high-density foreign material, such as metal or glass, but not suitable for organic objects of comparable size (1, 7). MRI allows an accurate localization and better distinction of organic foreign bodies from soft tissue, however it is contraindicated when a ferromagnetic foreign body is present (4, 11).

Immediate complications include intracerebral haematoma, cerebral contusion, intraventricular hemorrhage, pneumocephalus, brain stem injury, and cerebrovascular injuries (10, 12). These patients should be carefully followed for ophthalmological and neurological deficits, and imaging procedures should be performed to rule out any orbital or orbitocranial foreign body. Injury to the brain or paranasal sinuses with or without secondary

infections must be evaluated with appropriate consultations, such as otolaryngology, ophthalmology and particularly neurosurgery. Neurosurgeons consider all orbital penetrating wounds as potential intracranial injuries (1).

Some foreign bodies, such as metal fragments and glasses, cause little inflammatory reaction, whereas those with an organic nature are capable of causing purulent inflammation, abscess formation, gangrene, tetanus as well as chronic pathologies including granulomatous tissue reaction, fistula formation and osteomyelitis (1, 9).

### CONCLUSION

Broad-spectrum antibiotic prophylaxis and tetanus immunization must be started immediately following penetrating transorbital injury cases. Transorbital, transcranial or combined approaches can be chosen depending on the location of foreign body and bone and neurovascular injury. A detailed history, comprehensive neuroradiological investigations, urgent surgical exploration and multidisciplinary studies are essential to obtain a successful outcome.

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