

## The Unusual Transorbital Penetrating Cranial Injury by a Metal Foreign Body

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**Abstract:** Transorbital penetrating cranial injury is relatively unusual. It tends to take a direction into the orbital apex, with access to the cranial cavity and potential risk of cerebral lesion and mortality. We report a case of a 23-year-old man who fell nearby a construction site. Two metal foreign bodies penetrated the orbital region into the middle cranial fossa. A combined surgery between the ophthalmologists and the neurosurgeons was done for the removal of foreign bodies (FB). Patient had poor visual outcome but with no neurological deficit.

**Keywords:** Transorbital penetrating cranial injury, orbital foreign body, penetrating brain injury.

**INTRODUCTION**

Orbital trauma usually affects the bony parts of the orbit, however transorbital penetrating brain injury is an unusual occurrence in general ophthalmology practice. A variety of mechanisms may be responsible for the traumatic orbital cranial penetrating injury ranging from high to low velocity projectiles. We report an unusual case of transorbital penetrating cranial injury by a huge metal FB following a fall. We discuss the strategies available for the best possible treatment of this traumatic pathology in the light of the published data.

**CASE HISTORY**

A 23-year-old man was referred to Hospital Kuala Lumpur for penetrating cranial injury by metal foreign bodies through the infra orbital region following an alleged fall. On examination, the Glasgow Coma Scale (GCS) was full with stable hemodynamic. There was a huge metal foreign body at the right eye. Part of the metal rod was protruding out and obscured the orbital structures. The left eye was otherwise normal. There was no neurological deficit.

Computed tomography (CT) of the orbit revealed two metallic foreign bodies. The first bolt like FB penetrating through the right inferior orbital wall towards the right infratemporal region with its tip at the temporo-mandibular joint region. The other U shape metal rod foreign body seen in the right temporo-parietal region. There was comminuted fracture of right medial, lateral and inferior orbital walls. Comminuted fracture of the maxillary sinus wall and right zygoma were also seen. It was difficult to comment on the right globe and the orbital contents due to excessive streak artefact from the foreign body. CT brain showed intraparenchymal bleed in the right parietal lobe. There was subdural and subarachnoid bleed seen at the temporal region. Visualised cervical alignment was preserved.

Neurosurgery team and Ophthalmology team were together performed the surgery of the removal of the foreign bodies. A frontal-temporal-parietal flap craniotomy was done, in order to remove the foreign body in the temporal lobe. The bolt like metallic FB was removed manually from the right eye under direct visualization and minimal manipulation. The dura was repaired, and insertion of extra ventricular drain for intracranial pressure monitoring was done.

Examination of the eye after removal of the FB showed that there were upper lid and lateral canthal laceration wound. There was a conjunctival and partial thickness corneal laceration inferiorly. The lens was dislocated posteriorly. The eyelid wound was repaired. Open reduction internal fixation (ORIF) for the maxillary fracture was done later by the maxillofacial team. Broad spectrum intravenous antibiotic was given to patient. The post-operative CT showed minimal subdural and intracranial bleeding. However there was no neurological deficit.

Post operatively there was persistent lagophthalmos of the left eye, hence temporary tarsorrhaphy was performed. His visual acuity before he was transferred to the original hospital was hand movement (HM). There was no view of the fundus, however the B scan showed a flat retina. Relative

Afferent Pupillary Defect (RAPD) was present over the right eye which could be the sign of traumatic optic

neuropathy.



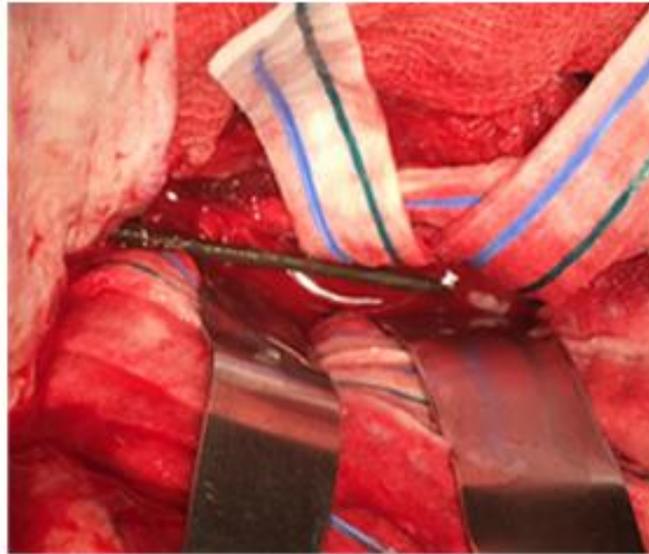
Fig-1a and 1b show the anterior and lateral view of the bolt like metal FB



Fig-2: Lateral view of the brain shows the two FBs. The bolt like and U shape metal FB



Fig-3: Tip of the bolt-like FB at the temporo - mandibular junction area



**Fig-4:** The U shape metal FB seen after frontal-temporal-parietal flap done



**Fig-5:** Photo of the 2 FBs after surgical removal



**Fig-6:** The condition of the right eye after removal of FB

## DISCUSSION

Transorbital penetrating cranial injury is relatively rare. A few cases of transorbital penetrating cranial injury were reported which the injuries were caused by metal bar, bicycle brake handle, bamboo stick and door key [1,2,5,6]. Transorbital cranial trauma associated with severe injuries leading to loss of vision or may lead to sight-threatening complications [2]. The loss of vision is usually due to the initial trauma and is generally not influenced by surgical intervention. They can also associate with severe intracranial complications [3].

Inorganic FB usually cause visual loss or orbital complications from direct trauma, whereas organic FB has a higher incidence of developing severe orbital infections [1,2]. Metallic FB is the most common nature [3]. Most penetrating cranial injuries, regardless of the size of the penetrating objects, are rarely associated with major neurological symptoms [1]. Most of the injuries are caused by low velocity injury [4], which is similar to our case. It produces a track of primary tissue damage, resulting in a focal, localized brain parenchymal injury without diffuse or global effect [4]. In contrast, high velocity injuries would lead to major neurological symptoms [1]. Higher velocity objects result in more extensive brain injury caused by cavitation and the rapid transfer of kinetic energy into the surrounding tissues [4]. Diffuse closed head injuries will also lead to more neurological deficit [1]. It is crucial to prevent involuntary movement of the FB as it can cause more damage to the brain tissue.

CT scan is the standard diagnostic test, because it demonstrates most FB, and it is safe in the presence of metallic FB [2]. Non-metallic FB may be missed on CT scan or may be misdiagnosed as intraorbital air. Non-metallic FB is best revealed with MRI or ultrasound [2]. Scanning artifacts from metal objects can sometimes limit visualization of brain tissue and brain damage along the trajectory of the penetrating object [6]. Thus, corresponding brain contusion hemorrhages with great mass effect may be obscured in the initial CT scan. However a complete neurological assessment can be a predictor of the severity of the brain injury. Angiography is advocated by some authors for possible cerebral vascular injuries in patients following penetrating head injuries [5]. However prompt craniotomy for decompression and direct hemostasis for vascular injuries is a better option than cerebral angiography in patients with extended transorbital brain injuries as patient may deteriorating rapidly during prolonged radiological intervention procedure [6].

Management of the patients with transorbital brain injuries and foreign bodies in situ should follow basic surgical principles, including removal of the object under direct visualization in order to reduce further brain tissue damage by the foreign bodies. A transorbital or transcranial approach of removal of the

FB can be chosen depending on the location of the fragment [1].

Complications due to transorbital cranial injury include worsening intracranial hemorrhage, major vessel injury, visual disturbances, globe injuries, cranial nerve injuries, seizures and cerebrospinal fluid (CSF) fistulas. Brain abscess, encephalitis, meningitis and scalp abscess are among the infectious complications that can happen following any intracranial injury.

## CONCLUSION

Transorbital penetrating cranial injury can be associated with severe orbital injuries leading to loss of vision and even death. The management of such injuries are often complex which require multidisciplinary management approach. The survival outcome has improved with the modern diagnostic tests.

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