Transorbital Orbitocranial Penetrating Injury with an Iron Rod

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Abstract

Keywords

- transorbital penetrating intracranial injury
- iron rod
- metal bar

Transorbital orbitocranial penetrating injuries (TOPIs) are relatively rare, can be caused by high-speed projectile foreign bodies to low-energy trauma (which is rarer), and account for 24% of penetrating head injuries in adults and approximately 45% in children. We report an uncommon nonfatal case of TOPI where a 16-year-old male child sustained injury due to accidental penetration of metal bar into the forehead. A bicoronal flap was raised to remove the metal bar. The patient recovered well, had normal vision, and doing well at follow-up.

Transorbital orbitocranial penetrating injuries (TOPIs) are relatively rare, have controversial management, and can be caused by several unusual objects.^{1–5} These injuries account for 24% of penetrating head injuries in adults and approximately 45% in children.^{6,7} TOPIs can be caused by high-speed projectile foreign bodies to low-energy trauma (which is rarer).² We report an uncommon nonfatal case of TOPI where child sustained injury due to accidental penetration of metal bar into the forehead.

Case Report

A 16-year-old male presented accidentally sustained injuries with an iron bar to his left orbit. The iron rod entered through the upper eyelid and was driven into the skull (► Fig. 1). There was no history of loss of consciousness, vomiting, or seizures. There was mild swelling and bruising around the entry wound. On neurological examination, his Glasgow Coma Scale score was 15/15 (E4M6V5). The right pupil was normal in size and reacting; the left pupil could not be tested. There were no motor or sensory deficits. His general and systemic examination was normal. Blood investigations were normal. Plain skull radiographs showed the bar crossing the skull from the left orbit to the anterior part of the frontal bone (► Fig. 2).

Computed tomography (CT) demonstrated that the bar was passing through the upper rim of the left orbit, through the frontal sinus (but not breaching the posterior wall of the frontal sinus), and coming out through the skull anteriorly from the frontal bone (► Figs. 3 and 4). The underlying brain parenchyma could not be evaluated because of artifact. The patient was taken for emergency surgery. A bicoronal flap was raised and the frontal bone was exposed till supraorbital rim on left side. Protruding end of metal was exposed and it could be dislodged easily. During surgery, it was noted that the posterior wall of the frontal sinus was intact. This finding was noted on preoperative imaging as well. There was only small defect in the orbital plate of frontal bone. The supraorbital rim was intact without any obvious cosmetic deformity. There was no need for craniotomy. The patient recovered well. Vision and lid function was normal in left eye. Patient is doing well at follow-up (► Fig. 5).

Discussion

Orbital roof is relatively thinner part of the skull that can provide easy access to projectile objects, which can penetrate into cranial cavity and damaging the brain parenchyma, meninges, and vascular structures.^{8–14} Unless the injuries

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Fig. 1 Clinical photograph showing curved iron rod entering just below the left supraorbital ridge and the distal is protruding over the left side of forehead with intact skin over it.

are of high velocity, most of the patients with penetrating injuries are well preserved neurologically.^{1-4,8,15,16} In most of the cases, penetrating wounds can easily be identified as the foreign bodies are easily visible or an entry wound can be seen.^{1,17} All the imaging modalities including radiographs, CT, magnetic resonance imaging, and ultrasonography have been investigated and the decision to select an imaging modality depends on the clinical suspicion and type of foreign body (metal, wood, etc.).^{14,18-20} When a metallic foreign body is suspected (as it was obvious in our case), CT scan is the investigation of choice to determine the course of the foreign body and any associated intracranial damage.¹⁸⁻²² If left untreated, these injuries can result in life-threatening intracranial complications which include brain abscess, meningi-

Fig. 2 Radiograph of the skull lateral view showing the entry of the iron rod just below the orbital ridge and because of the "u" shape of the rod, it was apparently glided along the posterior wall of the frontal sinus and exited through the anterior frontal wall.

itis, cerebrospinal fluid leakage, hemorrhage, neurological deficit, and subsequent high mortality.^{14,23-27} In addition, many vascular complications (including hemorrhage, thrombosis, and occlusion) and ocular complications (including ocular laceration, retrobulbar hematoma, proptosis, and optic nerve damage) have been reported in the literature.^{19,28,29} The goal of management is initial resuscitation, safe removal

Fig. 3 (a-f) The radiographic findings were confirmed on CT scan and also it revealed that there were no intracranial injuries (please note the integrity of the posterior wall of the frontal sinus).

Fig. 4 (a, b) Sagittal and volume rendered images showing greater details of the trajectory of the iron rod and confirming the integrity of the posterior wall of the frontal sinus.

Fig. 5 Follow-up clinical photograph showing good cosmetic and functional results.

of offending foreign body, and any devitalized tissue.^{2,11} Surgical management depends on the extent of intracranial- and intraorbital-associated injuries and associated complications.^{5,14} The rule is to control persistent bleeding, minimize brain damage, and the removal of the metal object under direct visualization.^{1,3,18} Depending on the entry wound and intracranial extension of the foreign object, a transorbital or transcranial approach can be selected.^{1,2,27} The outcome of patients with TOPI depends on the extent of the damage to the neural and vascular structures and secondary complication particularly intracranial infection (i.e., meningitis).^{3,9,14,24}

Conclusion

In summary, in case of TOPI, even a trivial looking external wound can be associated with extensive intracranial injury or injury to the internal vital vascular structures as well as infectious complications.^{2,30} Also, in patients with TOPI, initial Glasgow Coma Scale score may not always reflect the severity of the injury, a high index of suspicion toward every case and an immediate CT are recommended.^{2,3,31,32}

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