CASE REPORT

ANAESTHETIC CHALLENGES IN A CASE OF TRANS-ORBITAL PENETRATING BRAIN INJURY BY A TREE TWIG
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ABSTRACT: Penetrating injury of the skull and brain are relatively uncommon wounds, representing about 0.4% of all head injuries. The orbit forms an easy path for low-velocity foreign bodies into the intracranial space. Often the severity of the injury is masked by unobtrusive superficial wounds and lack of primary neurological deficits. Appropriate management can lead to optimal outcomes and limit secondary brain injury. We present an unusual and interesting case of trans-orbital penetrating brain injury by a tree twig which was successfully managed with no neurological or visual deficits.

KEYWORDS: Anaesthetic management, trans-orbital penetrating brain injury, intra-cranial pressure, Tree Twig.

INTRODUCTION: Penetrating brain injury (PBI), includes all traumatic brain injuries which are not the result of a blunt mechanism. Although less prevalent than closed head trauma, PBI carries a worse prognosis. We report here an unusual and interesting case of a 22yrs old male with history of fall from a tree, presented to the emergency department with a tree twig of 5cm in diameter, penetrating the brain through the left orbit which was successfully managed with no neurological or visual deficits.

CASE REPORT: A 22yrs old male with history of fall from a tree, presented to the emergency department with a tree twig of 5cm in diameter, penetrating the brain through the left orbit. On examination there was oedema, ecchymosis, bleeding from left orbit and bleeding from left nasal cavity. Pulse Rate was 120/min, Blood Pressure was 90/60 mm Hg and GCS was 12/15. No other major injuries were detected. There were no neurological deficits. Systemic examination revealed no abnormalities. All laboratory investigations were within normal limits. Computed Tomography (CT) scan revealed a tree twig of 5cm diameter penetrating the orbit and entering the frontal lobe on left side with pneumocephalus. A 3D reconstruction was performed which clearly demarcated the trajectory. Chest X-ray was normal. The patient was shifted to the operating room within 2 hours post trauma for removal of the foreign body by a fronto-orbital craniectomy.

General anaesthesia was planned. An 18G IV cannula was secured. Monitors like non-invasive blood pressure (NIBP), heart rate (HR), electrocardiography (ECG), pulse oximetry (SpO2) were connected and baseline readings were noted. Pre-oxygenation was started with nasal prongs with 3L/min and Premedication was given with Inj. Glycopyrrlate 0.2mg IV, Inj. Fentanyl 2μg/kg IV. The twig was cut a few centimeters away from the skin by the surgeon with a small saw taking care not to injure the nearby vital structures. Then rapid sequence induction was done using Inj. Thiopentone sodium 5 mg/kg and Inj. Rocuronium 1.2mg/kg IV, intubated with 8.5mm ET tube and secured after confirming bilateral equal air entry. Care was taken not to move or disturb the tree twig. Right subclavian vein was cannulated with a triple lumen central venous catheter. Right radial artery was
The major goals of anaesthetic management are:

a. Optimize cerebral perfusion and oxygenation,

b. Avoid secondary neurological damage,
c. Provide adequate surgical conditions for the neurosurgeons,
d. Maintain normal ICP by the following measures:
   1. Hyperventilation to maintain Paco₂ of ≤ 30 mm Hg.
   2. Diuretic therapy: Inj. Mannitol 1g/kg IV infused over 10 minutes.
   3. Posture: a head-up tilt of 10° to 30° facilitates cerebral venous and CSF drainage.
   4. Barbiturates are known to exert cerebral protective and ICP lowering effects.

General guidelines for ICP management in non-penetrating TBI have been applied to PBI patients as well i.e., hyperventilation, mannitol, CSF drainage, high-dose barbiturates, and more recently, decompressive craniectomy.³⁸

Vascular complications after PBI range from under 5%–40% in various reports. The common vascular complications after PBI include traumatic intracranial aneurysms (TICAs) or arterio-venous fistulas (AVFs), SAH, and vasospasm.⁹

Cerebrospinal fluid leakage is a common complication of PBI. Arendall and Meirowsky reported a 28% instance of CSF leaks.¹⁰ Cerebrospinal fluid leaks after PBI have been documented to be highly predictive of infectious complications.¹¹

Infectious complications are common after PBI, and they are also associated with higher morbidity and mortality rates.¹² The risk of local wound infections, meningitis, ventriculitis, or cerebral abscess are particularly high among PBI patients because of the presence of contaminated foreign objects, skin, hair, and bone fragments driven into the brain tissue along the projectile track.¹¹

The risk of posttraumatic epilepsy after PBI is high probably due to direct traumatic injury to the cerebral cortex with subsequent cerebral scarring. It is reported that the more severe the injury to the brain according to the Glasgow outcome scale (GOS) grade, the higher the risk for the development of posttraumatic epilepsy.¹¹¹³¹⁴ About 30%–50% of patients suffering a PBI will develop seizures.¹⁴

Advanced age, suicide attempts, associated coagulopathy, Glasgow coma scale score of 3 with bilaterally fixed and dilated pupils, and high initial intracranial pressure have been correlated with worse outcomes in PBI patients.

CONCLUSION: This case posed challenges on anaesthetic management faced in cases of penetrating brain injuries such as difficulties in intubation, patient positioning, maintaining hemodynamic stability, normal ICP and cerebral blood flow. It also presented challenges in prevention of secondary cerebral injury from hypoxia, hypercapnia, hypo tension and raised ICP. With a multidisciplinary approach and proper anaesthetic management, we were able to obtain a successful and good outcome.

REFERENCES:
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Figure 1: Front view showing tree twig entering the left orbit

Figure 2: Tree twig cut just outside the orbit to facilitate intubation
Figure 3: 3D reconstruction of CT Scan tracing the trajectory of Tree Twig in the fronto-orbital region

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