Penetrating Brain Injury by Multiple Low-Velocity Objects: Report of Two Rare Cases and Review of Literature

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Abstract

We are reporting two rare cases of multiple penetrating brain injuries by an indigenously made traditional fishing gear used in an Indian village. Although penetrating injury from varied objects (viz., arrow, smear gun, knife, rod, bullets, etc.) have been reported earlier in the literature, but low-velocity penetrating brain injury by multiple objects is the first to our knowledge. In this report, we discuss the surgical management and outcome with relevant review of literature.

Keywords

- fishing gear
- multiple penetrating brain injury
- low velocity

Introduction

Penetrating brain injury (PBI) by means other than gunshot is quite uncommon, and its management is a challenge to a neurosurgeon. This type of injuries can be suicidal,[1] homicidal,[2] accidental,[3] or warfare related. In the literature, we have seen few cases of PBI following suicidal attempts, PBI as part of quack treating psychiatric patient, and also violence-related incidences. Looking at the growing violence in the society, we may frequently encounter such cases. Therefore, we must know how to manage such patients to recover.

Case History

Case 1

A 45-year-old woman was hit by her fisherman husband. The patient was immediately brought to the casualty department where she was resuscitated. There were five rods inside her head (►**Fig. 1a**). She was in a state of altered sensorium with a Glasgow Coma Scale (GCS) of E3V4M6. We immediately took her for computed tomographic (CT) scan of the head (►**Fig. 1b**). Her CT scan showed four rods penetrating the brain parenchyma and one in the scalp. After the routine investigations, we took her to the operation theater where we planned for a craniotomy. First of all we raised the skin flap. Then we did a craniotomy around the entry wounds, and a single bone flap was raised along with the rods with utmost care without injuring the surrounding brain matter. Dura was opened and looked for any active bleeding. After obtaining hemostasis, we irrigated the wound with normal saline before dural closure. Bone flap was then replaced after irrigating with normal saline and antibiotic solution. The wound was then closed in layers.

Broad spectrum antibiotics were given for 7 days, and with adequate antiepileptic, the patient was managed postoperatively. She improved without any neurologic deficit, and her GCS was 15/15 on day 8.

Case 2

A 6-year-old girl presented with penetrating wound of the brain with a similar fishing gear, which was hit accidentally by her father (►**Fig. 2a**). The patient was rushed to our emergency room for resuscitation. Initially she was in a state of altered sensorium with a GCS of E4V4 M6. On CT of the head, we found two rods penetrating the skull reaching the brain parenchyma in the frontal lobe (►**Fig. 2b**), and another two rods, one in the right nostril reaching up to the hard palate and the other one at the root of the nose. After all preoperative investigations, she was planned for an emergency craniotomy. As described in Case 1, we did craniotomy around the entry wounds and could remove the

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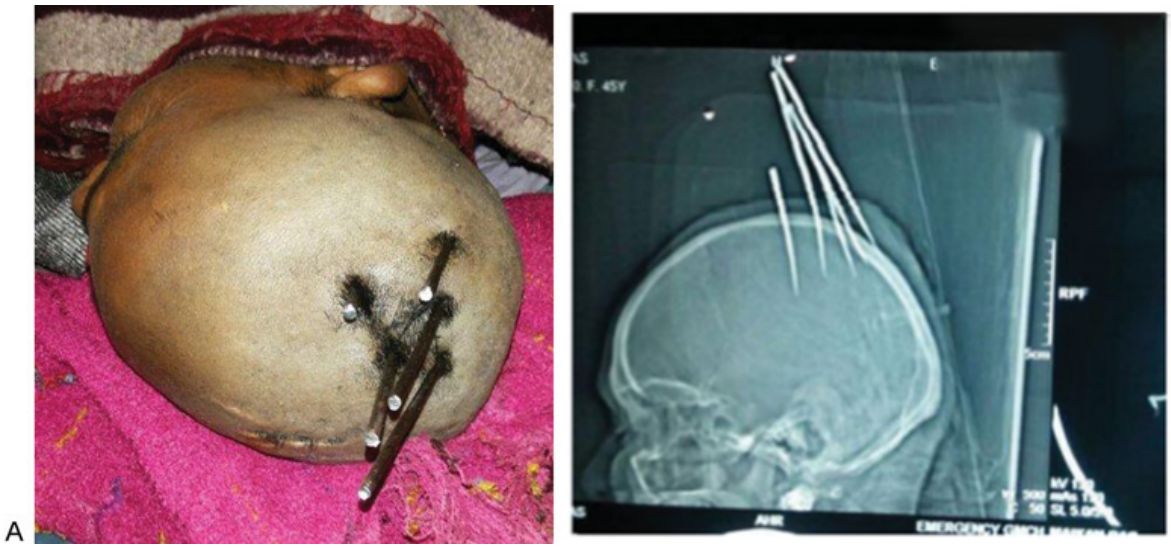

Fig. 1 (a) Clinical photograph of the patient showing five rods inside the skull. (b) CT scan of the brain, bone window showing the iron rods penetrating inside the skull.

rods (►**Figs. 3** and **4**). The patient improved, and on postoperative day 8, she was happily discharged without any neurodeficit.

Discussion

PBI is a life-threatening condition accounting for 0.4% of all cases with head injury.[4] It may be due to high-, medium-, or low-energy projectiles. The tissue damage is the energy transferred by the projectile to the brain and its kinetics is measured by ($E = 1/2\ MV^2$). High-velocity projectiles are defined as traveling greater than 2,000 ft (609.6 m) per second, whereas information on the exact cutoff between medium- and low-velocity projectiles is not as clearly defined.[5,6] It requires a significant force for a penetrating injury by a handheld object as in our cases. Penetrating injuries by rod, knife, and smear guns are reported earlier.[1–3] Few reported cases of scissors in the brain to treat psychiatric problems[4]; self-inflicted rods in psychiatric patients were seen.[1] Our cases are rare as there were multiple penetrations with low-velocity rods. Indigenously made fishing gears are impaling gears called *Jongar* or *Joar* that consists of a tapering bundle of 10 or more split bamboo spears, shod with sharp conical iron points. It is heavy and hurled with considerable force at the fish, which is pointed to the ground for catching of fish by wounding, grapping, and killing in the beels, which are water bodies and rivers seen in some villages of Assam.[7] It is indigenously made to catch fish. In both the cases, the victims were hurt by such a fishing implement having multiple rods. It is advised not to cut those rods as it may further injure the brain due to the vibratory motion during cutting. In our cases, the rods were made short before attending to our casualty department with a rod-cutting instrument by the villagers. Immediate

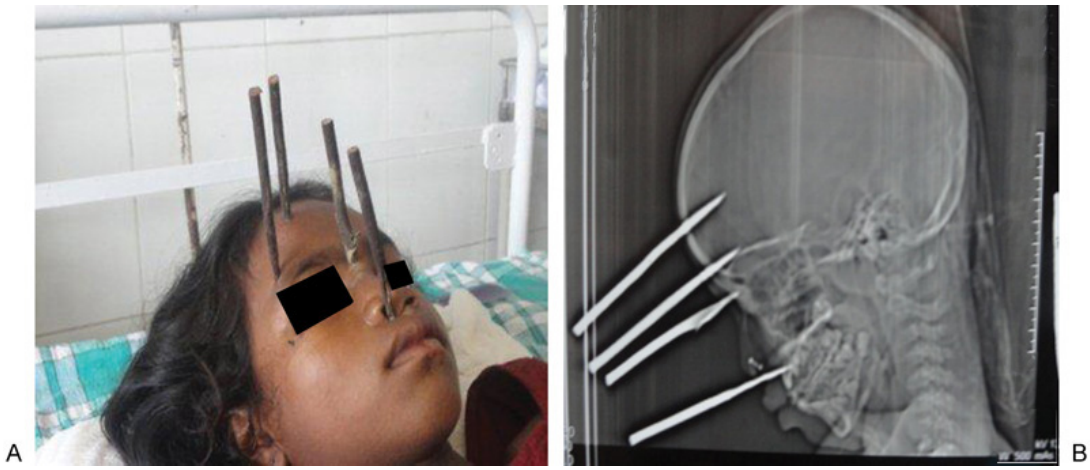

Fig. 2 (a) Clinical photograph showing two rods inside the skull, one in the nostril and the other at the root of the nose. (b) Preoperative CT scan showing the rods penetrating the skull.

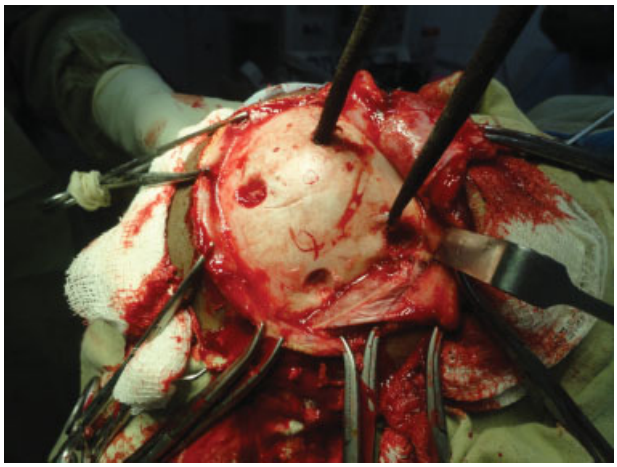

Fig. 3 Intraoperative photograph showing the craniotomy around the entry wounds.

CT scan should be recommended for better information on the brain matter injury along its trajectory.[3] If there is a hematoma or any subarachnoid hemorrhage, there is possibility of vascular injury. In that case, cerebral angiography is recommended preoperatively. Vascular complications have been reported to range from 5 to 40%[8,9] in both high- and low-velocity penetrating injury, with traumatic pseudoaneurysm formation being the most commonly reported complication of vascular injury.[8,10] Accordingly, the craniotomy bone flap has to be planned. Abarca-Olivas et al in their case report have suggested craniotomy around the entry and exit wound, and we have also followed the same by doing a craniotomy bone flap around the entry wounds . This makes easier removal of the objects without further injuring the brain. Also, we have full control over the wound site. Postoperatively, antibiotics should be given for at least 7 to 14 days to prevent infection. Recent pan-PBI guidelines have suggested a course of ceftriaxone, metronidazole, and vancomycin for 7 to 14 days.[11] Posttraumatic epilepsy following PBI is common. PBI has a seizure incidence of approximately 30 to 50%.[10] Cortical damage leads to gliosis and delayed scar formation that predispose to seizure. Increased severity of injury as determined by the Glasgow Outcome Scale grade is associated with increased risk of seizure.[11–13] Antiepileptics should be given in proper dose in the pre- and postoperative period.[3,12,13] Some delayed complications may be anticipated in such penetrating injuries such as pneumocephalus, cerebrospinal fluid leak, sepsis, and pseudoaneurysms.[14] There was no neurodeficit in our cases postoperatively, and similar cases without any deficit following PBI have been reported earlier.

Fig. 4 Postoperatively the penetrating rods are shown in the picture.

Conclusion

PBI with multiple low-velocity rods should be managed with a craniotomy around the entry wounds. Broad-spectrum antibiotics and antiepileptics in adequate doses help in preventing from postoperative infection and seizure.

Conflict of Interest
None declared.

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