Published online: 2019-07-25

An Interesting Case of Penetrating Brain Injury by a Self-Hammered Nail

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Indian J Neurotrauma 2018;15:62–66

Abstract

Penetrating brain injuries by nails are rare. These usually have been reported as work-related accidents such as from falls or nail gun misfires and in cases of assault. The authors present a case of a 38-year-old psychiatric patient who attempted suicide by self-impalement of nail in the vertex near the midline of the head. Surprisingly, he was asymptomatic after a brief loss of consciousness, and with a Glasgow Coma Scale of 15. There was no history of vomiting or seizures. Intraoperative and postoperative periods were uneventful. Many unusual intracranial foreign bodies have been reported in medical literature, but one of a self-inflicted intracranial injury by hammering a nail is rare. In this article, the authors describe their case report and discuss the challenges encountered in the management of a patient with intracranial injuries by nail, along with a brief review of literature.

Keywords
- penetrating brain injury
- traumatic brain injury
- nail injury

Introduction

Traumatic brain injuries which do not result from any blunt force are classified under penetrating brain injuries (PBI).[1] They usually have a worse prognosis than closed head injuries[2] and are acquired by accidents either at workplace or from suicidal attempts.[3,4]

The incidence of PBIs has risen three times over the past decade,[5] since pneumatic nail guns have become common. Most of the cases previously reported involved the use of nail guns[6,7,8] unlike our report in which the patient hammered a nail in his head.

After PBI, immediate complications occur from vascular or neurological damage and late complications from infection and vascular malformations. However, reports of substantial cerebrovascular damage in published case reports so far have been fairly low.[6]

Although radiological examination might appear substantial in PBI due to nails, the damage is usually limited local brain injury and minor neurological deficit[9]; hence, a well-planned management strategy can allow full recovery with minimal side effects in such patients.[6]

Case Report

A 38-year-old man was brought to our department with a nail penetrating his head. His wife informed about his psychotic behavior and that he was trying to hammer the nail into her head during their fight, but after several failed attempts, hammered the nail into his own head in two strikes. There was a brief history of unconsciousness for approximately 5 minutes following which the patient was free from any symptoms. No history of convulsions, ear–nose bleed, and vomiting were noted.

The patient was conscious but disoriented (GCS-E4 V4 M6). The blood tests and surgical profile reports were within normal limits. Local examination of the head revealed one nail head near the vertex (►**Fig. 1**). There was no active bleeding. The skull radiograph revealed a straight nail piercing the skull on the right high parietal region near vertex (►**Fig. 2**). The computed tomography (CT) (axial, coronal, and sagittal sections) showed an object of metallic density which penetrated the skull and pierced the brain parenchyma in the right parietal region just lateral to the superior sagittal sinus near the vertex (►**Fig. 3**).

Surgical removal of the nail was offered to the patient and his family to which they agreed. An informed consent

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received
July 28, 2018
accepted
September 7, 2018
published online
July 25, 2019

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DOI https://doi.org/10.1055/s-0038-1676553
ISSN 0973-0508.

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Fig. 1 Nail head seen over the patient's vertex.

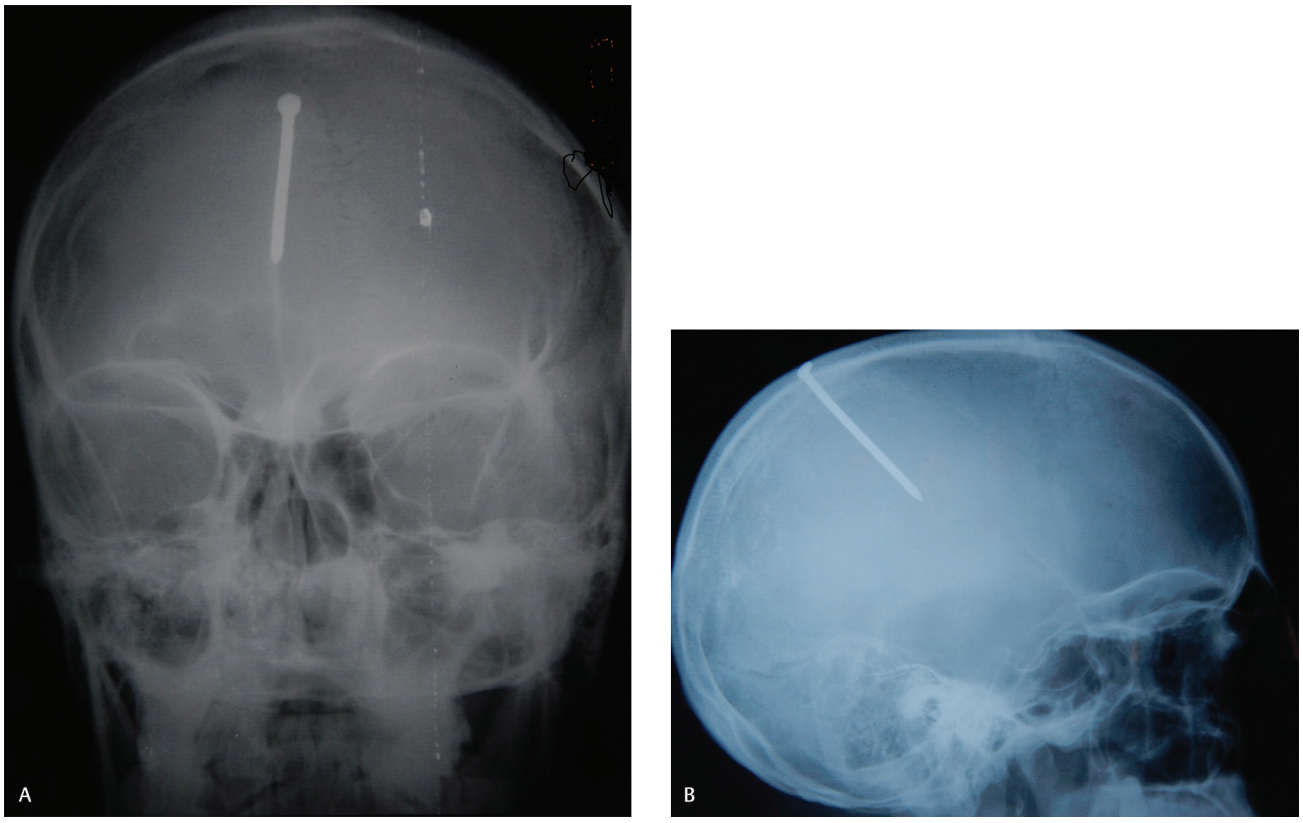

Fig. 2 (**A**) X-ray skull anteroposterior view view showing the nail inside. (**B**) X-ray skull lateral view view showing the nail inside.

was obtained from the wife. The patient was administered general anesthesia and a right parietal transverse elliptical skin incision was made around the nail. The nail was then removed slowly and gently with the help of a nail extractor/puller (►**Fig. 4**). The nail was 6 cm long and after its removal (►**Fig. 5**), the wound cavity was washed with normal saline and antibiotic. The wound was then closed.

Postoperatively, the patient was prescribed broad-spectrum antibiotics and prophylactic antiepileptics. The surgical skin scar has remained good with no sign of infection.

Discussion

Vascular complications post-PBI have been found to vary between 5 and 40%.[10,11] Vascular injury[5] along with intracranial hemorrhage[12] presents as the most common complication arising from penetrating nail injuries to the head. Damage to a major intracranial artery may result in massive subarachnoid and intraventricular hemorrhage and subsequently lead to hydrocephalus, ischemia, and even death.[13] Subarachnoid hemorrhages may also cause

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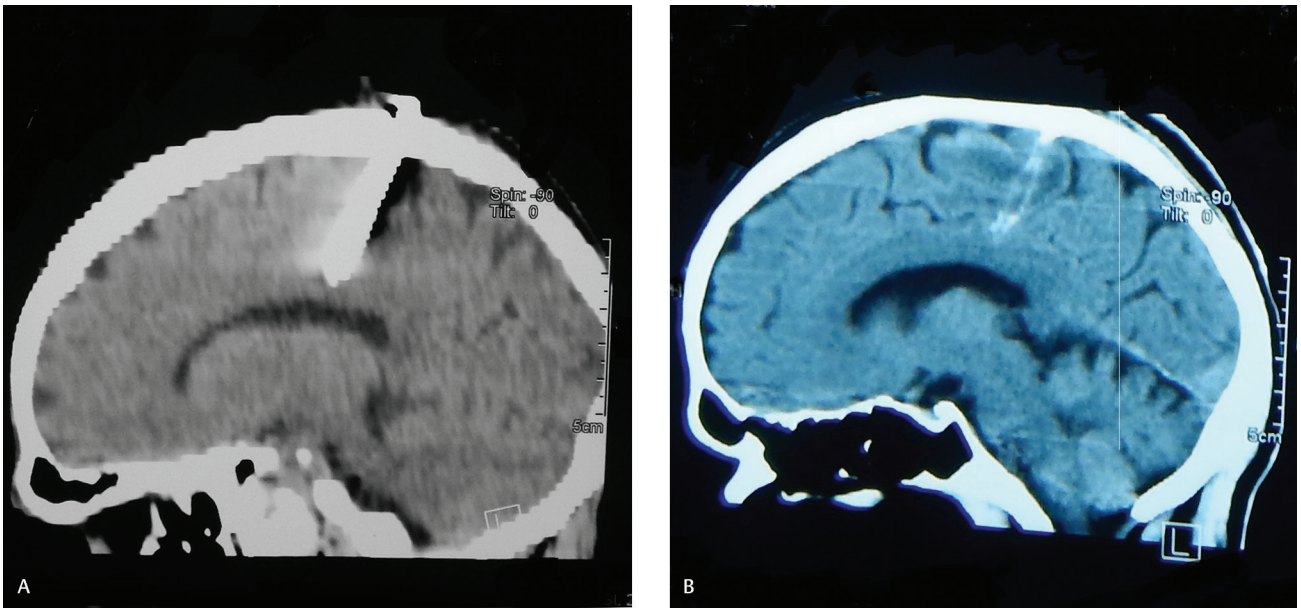

Fig. 3 (**A**) Preoperative computed tomography (CT) sagittal section showing nail. (**B**) Postoperative CT sagittal section with nail removed.

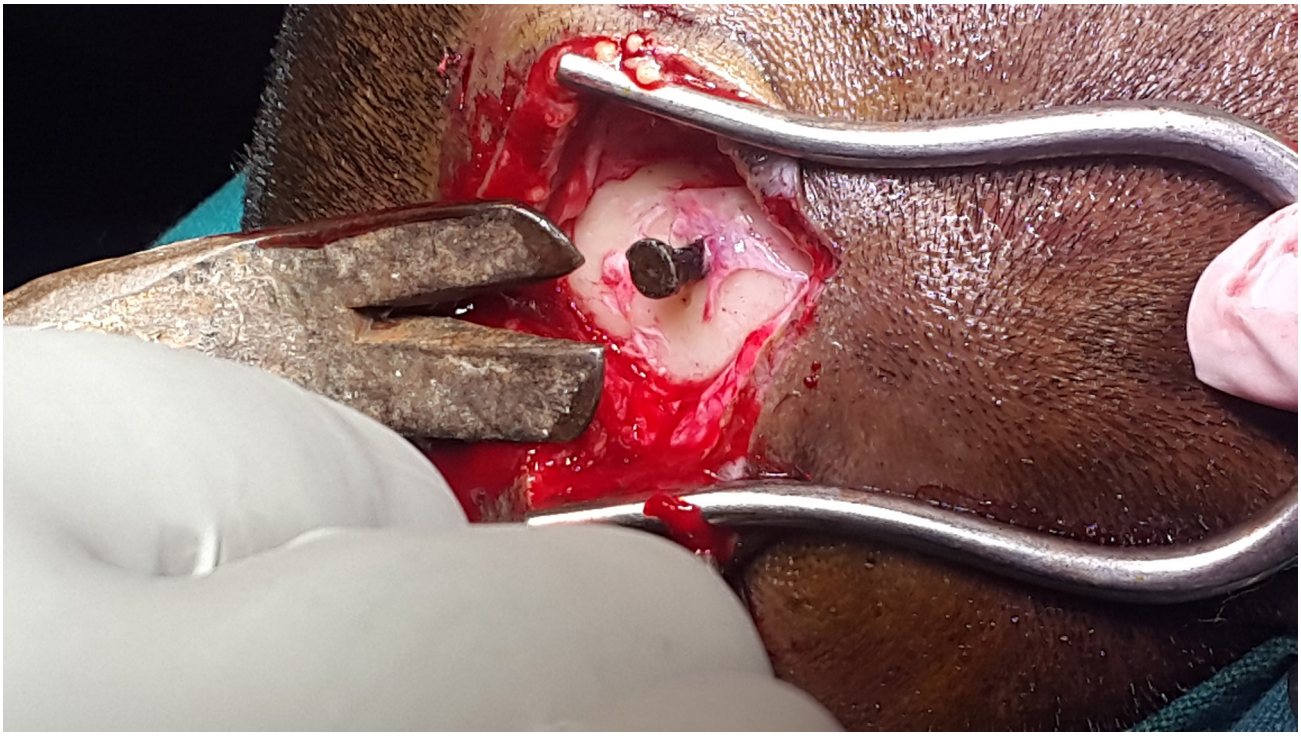

Fig. 4 Nail being pulled out with help of nail extractor.

vasospasm and subsequently, decreased cerebral blood flow, resulting in ischemia and infarction in brain parenchyma.[14] Traumatic intracranial pseudoaneurysm is the most commonly reported vascular injury[15] which generally appears clinically after 3 weeks of injury and has a 50% mortality rate.[15] Consequently, cerebral angiography is considered necessary preoperatively as well as during follow-up in the management of these cases.[15]

Although nails have been reported to be removed without the administration of prophylactic antibiotics, it is recommended to administer the same because PBIs in general are associated with infections, and have been seen to be associated with meningitis, cerebral abscess formation, ventriculitis, and infection of the local wound.[9,12,16] Associated injuries of the air sinuses or those causing cerebrospinal fluid (CSF) leaks have been seen to be associated with higher incidence of infections.

About 30 to 50% of traumatic brain injury patients are prone to risks of seizures,[17] with even higher incidence in PBI.[7] Psychological assessment of the patients with PBI is essential who have attempted suicide or homicide as they may have psychiatric illnesses.[18]

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Fig. 5 Removed nail.

The guidelines for medical and surgical management of PBI have been laid down in the Guidelines for the Management of Penetrating Brain Injury.[2]

In patients with PBI, an assessment followed by correction of airway, breathing, and circulation should be performed by the attending physician.[19] Post-resuscitation, a thorough examination of the superficial wound, identification, and record of its entrance and exit, if present, should be completed. Any leakage of CSF, bleeding, or cerebral herniation should be noted and the location and size of deficit recorded. When the wound has been examined, the physician must conduct a neurological examination of the patient and find out the Glasgow Coma Scale.[1] As these injuries are mostly associated with accidental or suicidal events, a chronology of events from a witness and a medical history from the family and friends is duly required.[7] The patient must be evaluated on the basis of laboratory results for arterial blood gas, coagulation profile, complete blood counts, electrolytes, blood typing and cross matching, and an alcohol and drug screen. On completion of all these tests, the patient must be subject to neuroimaging for further management.[7]

Rapid and accurate imaging of penetrating nail injuries to the brain is of great importance in deciding upon the management strategy for a patient. CT scan is the neuroradiologic modality of choice for patients with PBI, and those who are suspected to have vascular injury should be sent for cerebral CT angiography for precise results.[7]

Surgery done within 12 hours of injury lowers risks of infections.[20] Shenoy and Raja describe blind removal of the nail using gentle traction and rotatory movement.[21] However, reports of subdural or intraparenchymal hematoma upon blind removal of foreign bodies which had penetrated the dura mater suggest otherwise.[22,23] The approach to surgical management of such injuries involves the inspection of the wound under direct vision, which can be done by exposing the nail through craniotomy. Spennato et al[22]suggest double concentric craniotomy which protects the underlying tissue and facilitates homeostasis. Special care should be taken to avoid additional injury during extraction, following which the site should be thoroughly debrided, irrigated, and examined for hemorrhages. During extraction, the nail heads can be controlled by using a vice grip, limiting any further injury to the surrounding tissue. Despite impressive clinical and radiological presentations, this type of low-velocity/energy trauma usually produces very limited collateral injury.

Conclusion

Nail injuries are often self-inflicted and associated with a background of a psychiatric disorder. Involvement of the appropriate services during hospital care, including psychiatric evaluation, is indicated in these settings. These patients need special care and evaluation to prevent the repetitive self-mutilating injuries. Although presentation is variable among patients, most present with minimal neurological deficits. A careful clinical and radiologic examination is needed followed by extraction of the foreign body. Most patients survive with good neurological outcome despite the dramatic appearance of the radiographic images.[9]

Conflict of Interest
None.

References

1 Kazim SF, Shamim MS, Tahir MZ, Enam SA, Waheed S. Management of penetrating brain injury. J Emerg Trauma Shock 2011;4(3):395–402
2 Part 2: Prognosis in penetrating brain injury. J Trauma 2001;51(2, Suppl):S44–S86

This document was downloaded for personal use only. Unauthorized distribution is strictly prohibited.

3 Aghabiklooei A, Molahoseini R, Khajoo A, Shiva H. Multiple nails in the brain: an unusual suicidal attempt. Am J Forensic Med Pathol 2012;33(1):88–89
4 Chalupka S, Moynihan MJ. Traumatic nail gun injuries in the workplace. Workplace Health Saf 2012;60(2):92–92
5 Englot DJ, Laurans MS, Abbed K, Bulsara KR. Removal of nail penetrating the basilar artery. Neurosurg Rev 2010;33(4):501–504
6 Isaacs AM, Yuh S-J, Hurlbert RJ, Mitha AP. Penetrating intracranial nail-gun injury to the middle cerebral artery: a successful primary repair. Surg Neurol Int 2015;6(1):152
7 Posthuma LM, Broekman ML, van der Sprenkel JW. Thirteen intracranial nails: no neurological and neuropsychological disabilities. Acta Neurochir (Wien) 2014;156(5):1021–1023
8 Knott JC, Meyer AD, Kas P. Nail gun-related injuries presenting to the emergency department. Emerg Med Australas 2004;16(3):254–255
9 Yuh S-J, Alaqeel A. Ten self-inflicted intracranial penetrating nail gun injuries. Neurosciences (Riyadh) 2015;20(3):267–270
10 Nathoo N, Boodhoo H, Nadvi SS, Naidoo SR, Gouws E. Transcranial brainstem stab injuries: a retrospective analysis of 17 patients. Neurosurgery 2000;47(5):1117–1122, discussion 1123 http://www.ncbi.nlm.nih.gov/pubmed/11063104 Accessed July 25, 2018
11 Levy ML, Rezai A, Masri LS, et al. The significance of subarachnoid hemorrhage after penetrating craniocerebral injury: correlations with angiography and outcome in a civilian population. Neurosurgery 1993;32(4):532–540 http://www.ncbi.nlm.nih.gov/pubmed/8474643 Accessed July 25, 2018
12 Schaller BJ, Kleindienst A, Kruschat T, Schliephake H, Buchfelder M, Merten HA. Industrial nail gun injury to the anterior skull base: a case report and review of the literature. J Trauma 2008;64(3):E29–E32
13 Rezai AR, Lee M, Kite C, Smyth D, Jafar J. Traumatic posterior cerebral artery aneurysm secondary to an intracranial nail: case report. Surg Neurol 1994;42(4):312–315 http://www.ncbi.nlm.nih.gov/pubmed/7974126 Accessed July 25, 2018
14 Shimura T, Mukai T, Teramoto A, et al. [Clinicopathological studies of craniocerebral gunshot injuries] No Shinkei Geka 1997;25(7):607–612 http://www.ncbi.nlm.nih.gov/pubmed/9218254 Accessed July 24, 2018
15 Larson PS, Reisner A, Morassutti DJ, Abdulhadi B, Harpring JE. Traumatic intracranial aneurysms. Neurosurg Focus 2000;8(1):e4 http://www.ncbi.nlm.nih.gov/pubmed/16906700 Accessed July 25, 2018
16 Antibiotic prophylaxis for penetrating brain injury. J Trauma 2001;51(2 Suppl :S34–S40 http://www.ncbi.nlm.nih.gov/pubmed/11505198 Accessed July 24, 2018
17 Cemil B, Tun K, Yiğenoğlu O, Kaptanoğlu E. Attempted suicide with screw penetration into the cranium. Ulus Travma Acil Cerrahi Derg 2009;15(6):624–627 http://www.ncbi.nlm.nih.gov/pubmed/20037886 Accessed July 24, 2018
18 Son S, Kang D-H, Kim B-H, Choi N-C. Incidentally discovered a self-inflicted a nail in the brain of schizophrenia patient. Psychiatry Investig 2011;8(3):272–274
19 Blissitt PA. Care of the critically ill patient with penetrating head injury. Crit Care Nurs Clin North Am 2006;18(3):321–332
20 Helling TS, McNabney WK, Whittaker CK, Schultz CC, Watkins M. The role of early surgical intervention in civilian gunshot wounds to the head. J Trauma 1992;32(3):398–400 http://www.ncbi.nlm.nih.gov/pubmed/1548730 Accessed July 25, 2018
21 Shenoy SN, Raja A. Unusual self-inflicted penetrating craniocerebral injury by a nail. Neurol India 2003;51(3):411–413 http://www.ncbi.nlm.nih.gov/pubmed/14652458 Accessed July 24, 2018
22 Spennato P, Bocchetti A, Mirone G, et al. Double concentric craniotomy for a craniocerebral penetrating nail. Case report and technical note. Surg Neurol 2005;64(4):368–371, discussion 371 http://www.ncbi.nlm.nih.gov/pubmed/16231428 Accessed July 25, 2018
23 Ravelli V, Forli C, Parenti G. Unusual penetrating craniocerebral injuries. Report of three cases. J Neurosurg Sci 31(3):153–156. http://www.ncbi.nlm.nih.gov/pubmed/3449608. Accessed July 24, 2018

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