

Intracranial Foreign Body

ABSTRACT

Intracranial foreign bodies due to nonmissile intracranial penetrations occur rarely. Most of these penetrating injuries result from industrial accidents or criminal assaults. The complications which cause mortality in early stage are intracerebral hemorrhage, contusion, major vascular injury and meningitis. In case of such injuries, foreign bodies near the major vascular structures should not be attempted to taken out. Total excision of the foreign body via craniotomy should be planned and possible dural and vascular injuries should be repaired during surgery. Urgent surgery should be performed as there is 53% morbidity in case of late surgery and 62% morbidity in nonoperated cases. We herein report a 20-year old man who attempted suicide by introducing a nail into his brain and review the related literature.

KEY WORDS: Intracranial, Trauma, Penetrating, Foreign body

INTRODUCTION

The human race has gained a great capacity for introducing foreign bodies into body cavities via many body orifices. The cranium which is a "closed box" surrounded by a bony structure has not been immune from such attempts (1).

Craniocerebral penetrating injuries due to foreign bodies other than bullets are relatively rare (4,6,9,15). These injuries in clinical practice have been mostly due to industrial accidents in industry or criminal activities (2-4,7,8,10). Review of the literature documented the occasional penetrating injuries due to suicide attempts and self-mutilation in psychiatric patients (1,6,9,13,15). We describe a patient with a bizarre method of suicide attempt who placed a nail in his head.

CASE REPORT

A 20-year-old man was brought to our emergency department by his relatives stating that he had hammered a nail into his brain the day before yesterday. His only complaint was vomiting. Physical examination was unremarkable except for a 1 cm portion of a nail located on the frontal region. Neurological examination was normal.

Skull X-ray demonstrated a 7 cm metal linear foreign body (nail) passing through the midfrontal region vertically to a depth of 6 cm.

Cranial computed tomography (CT) showed a metallic density foreign body piercing the brain down to the frontal horn of the left lateral ventricle (Figure-1,2 A,B).

A combination of penicillin-G, chloramphenicol and metronidazole treatment was initiated and tetanus immunization was administered. The patient was taken into the operation room immediately and bifrontal scalp incision was performed. The scalp flap was converted anteriorly while carefully dissecting from the nail. Before anterior parasagittal craniotomy was performed by four burr holes, another burr

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Figure 1: Preoperative lateral cranial scanogram showing the nail passing through midfrontal calvarium deep to the frontal lobe of the brain.

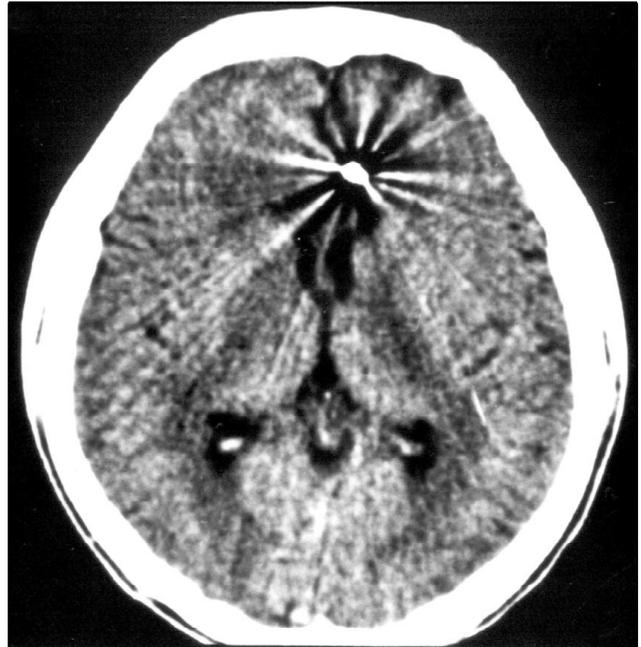


Figure 2B: Preoperative axial CT scan showing the metallic foreign body with its artifacts, in close proximity to the frontal horn of the left lateral ventricle.

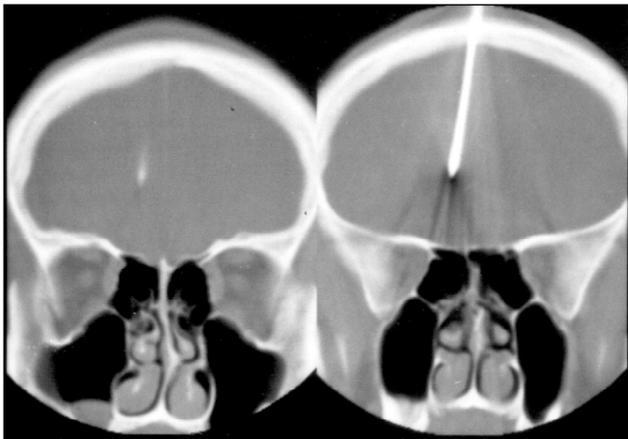


Figure 2A: Preoperative CT scan. Coronal plain. Bone window image showing vertical alignment of the nail.

hole was opened around the nail to perform craniectomy around it. After the dura was opened, the nail was removed without any difficulty. The bleeding from the superior sagittal sinus was controlled with surgical.

The early postoperative period was uneventful. The follow-up cranial CT revealed a hypodense lesion anterior to the frontal horn of left lateral ventricle (Figure-3). Cerebral angiography could not be performed. After psychiatric consultation the patient was discharged without any neurological deficit.

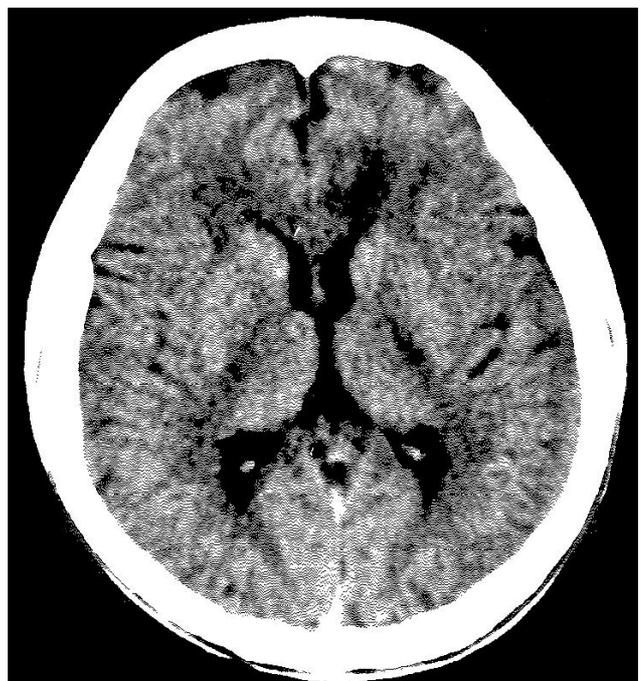


Figure 3: Preoperative axial CT scan. A hypodense area is seen in the left frontal region.

DISCUSSION

Penetrating cranial injuries mostly result from shotguns. Other causes are infrequent and include criminal assaults, industrial accidents and accidents during childhood (2-4,6,14). Suicide attempts and self-inflicted injuries may also occur but they are rare (1,2,4,6,9,13).

Several foreign bodies penetrating the cranium such as knives, nails, pencils, wood pieces, wire, ice picks, keys, chopsticks, umbrella ends, antennae, scissors, paint brushes, crochet hooks, sewing needles, carpet tacks, thumbtacks, automobile bolts, crowbars and fishing harpoons have been described in the literature (2-4,7,8,10,13,14). Self penetrating foreign bodies are due to suicide attempts or self mutilation and pencils, ice picks, power drills, chopsticks, metallic wires, nails and sewing needles are reported bizarre implements (1,2,6,9,12,13,15). In our case, an instruction nail was inserted into cranium with the aim of self-mutilation.

The entrance sites of foreign bodies into cranium include the relatively vulnerable portion of the cranial bone, e.g., orbital roof, temporal squam and cribriform plate (2,7). In cases of suicide or self harm injuries, the vertex is usually used as the region to insert the foreign body (1,2,5,9). Nasal orifices and the orbita have also been utilized for this aim (6,15).

The free ends of the foreign bodies may be seen during physical examination (6). However, the extracranial component of the foreign body is no longer visible in some cases and only the penetrance site can be detected (2). The scalp has to be evaluated carefully and the presence of cerebral tissue in hemorrhagic material from the scalp should be checked (2).

Repeated unsuccessful suicide attempts may be present in the patient's history and signs of old cuts and traumas may be detected during physical examination (1,6).

A variety of psychiatric disorders have been described in such patients (2,6,9). These patients require careful psychiatric evaluation and treatment is necessary when indicated. No psychiatric disorder was observed in our patient.

A careful radiological examination should be performed to locate the foreign body and reveal which structures it has passed through (2,15). Direct X-rays are helpful for intracranial localization of metallic foreign bodies (1,2,5). In the cases of non-metallic bodies, cranium defects or the foreign body

itself can be occasionally shown. Cranial CT is the most important method of diagnosis and follow-up, although it has disadvantages for evaluation of organic intracranial materials (4,6,8).

Cranial CT is the most valuable method to detect metallic bodies and even foreign bodies as small as 0.06 mm³ can be detected (6). Cranial CT can also provide information about the cerebral parenchymal damage and haematoma in the early period (8,15). It is an important device for evaluation of complications and for showing whether the foreign body was completely removed or not (7). However cranial CT can not delineate the damage to the intracranial vascular structures and angiography can be necessary in such cases. In the late postoperative period, follow-up of complications can be carried out using cranial CT (7).

Preoperative angiography is mandatory to document the vascular damage when the foreign body is located just beneath the major arterial or venous systems (2).

Penetration of the cranium with foreign bodies for suicide attempts result in death in the majority of patients (1,2,5,6,15). Intracerebral hemorrhage, contusion, major vascular damage and meningitis are underlying factors causing death in the early period (1,4). Miller et al have reported 42 cases with intracranial wooden pieces with a mortality rate of 25% (11). Despite antibiotic treatment, a brain abscess was found in 48% and infectious complications were seen in 64% of the patients described. Prompt surgical exploration is mandatory to reduce the mortality and complication rate (8). The morbidity rate is 33% in case of prompt surgery despite antibiotic treatment and rises to 53% in case of delayed surgery. The overall mortality rate is 10% with surgery and increases to 62% in the group where surgery is not performed (11).

Foreign bodies located deep in the brain can be left in place (7,10,12). If the foreign body is not in the close vicinity of major arteries or veins and has extracranial components, a blind removal without craniotomy can be performed (2). However, deterioration and death have been described after removal in such cases.

Cerebral tissue seems to tolerate the presence of a foreign body well (1,10). Toxic chemical reactions between the metallic bodies and the cerebral tissue should be taken into consideration (1). Exploration is the choice of treatment in appropriate locations (2).

Surgery is performed for the removal of contaminated foreign body, repair of vascular or dural damage and drainage of intracranial mass lesions (6,7). Bony fragments have to be excised. Optimal treatment necessitates removal with the least harm to the related neural and vascular structures (2). Meticulous surgical technique should be utilized so as not to cause extra damage and the removal of the foreign body must be complete (2). In case of vascular damage, anticoagulant and antiplatelet treatment or direct surgical intervention is recommended for avoiding strokes or other ischemic complications (6).

Removed foreign bodies should be cultured for aerobic, anaerobic or fungal organisms (7). In our case, all cultures were negative.

Tetanus immunization and vigorous antibiotic treatment should be added to surgery (7). Anticonvulsant therapy is begun and adjusted according to serial EEG and clinical follow-up (4).

Complications might develop following surgery. Intracranial abscess formation, meningitis, CSF fistula, vascular stroke, hematomas, traumatic aneurysm, carotid-cavernous fistula, cerebral arteriovenous fistula, epileptiform convulsions, obstructive hydrocephalus and focal neurologic deficits due to localization are the most frequently reported complications (2,4,8,10).

In conclusion, surgery should be performed emergently and a craniotomy is preferred to blind removal. Vascular or dural damages should be repaired, if any, and the foreign body must be removed completely. These patients should be followed for psychiatric disorders.

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