

Intracranial Foreign Body by Unusual, Long-Standing Metallic Object: About A Case

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ABSTRACT

Intracranial foreign bodies caused by non-projectile metallic objects are rare. Long-standing cases have been seldom reported in the literature. The clinical presentation depends primarily on the location of the brain injury and the resulting intracranial vascular damage. CT scanning is the key diagnostic tool. Surgical removal of the foreign body is indicated to prevent or reduce secondary damage and late complications. Craniectomy is the optimal surgical approach for removing an intracranial foreign body with dural perforation. It allows for controlled surgery in case of hemorrhage. Postoperative monitoring assesses the patient's neurological status using the Glasgow Coma Scale (GCS). It also looks for signs of seizures, cerebrospinal fluid leaks, and infections. A follow-up brain CT scan should be performed within 72 hours to look for secondary complications such as hematoma in the surgical site.

Keywords

Foreign body, Metallic, Computed tomography, Craniectomy.

Introduction

Intracranial foreign bodies from non-projectile metallic objects are rare and potentially fatal if accompanied by intracranial vascular injury [1]. They occur following work or domestic accidents and self-mutilation (psychiatric context) for the most part [2]. They are rarely secondary to physical aggression. The context is generally suggestive and the diagnosis is straightforward, often evident upon immediate examination. However, long-standing cases have been seldom reported in the literature [3]. Their management remains ambiguous, both in terms of surgical treatment of these lesions, particularly with the development of surgical techniques [3], and in terms of pre- and postoperative radiological investigations. They constitute a major cause of death and disability in neurovascular structures [1].

Clinical case

This was a 22-year-old patient with unknown vaccination status, whose medical history dated back 8 years, following a road traffic accident. This resulted in an initial loss of consciousness of approximately 3 minutes with a left frontal wound of ± 2 cm,

which was sutured at his health center (Figure 1a).



Figure 1a: Profile view showing a left frontal scar of ± 2 cm.

Approximately two years later, he began experiencing severe headaches and epileptic seizures, for which he received traditional

treatment. About six years later, he consulted the neurology department of the Gabriel Touré University Hospital (Bamako) for suspected epilepsy, where a CT scan was performed. On admission, his respiratory rate was 18 breaths/min, heart rate was 80 beats/min, blood pressure was 130/80 mmHg, peripheral pulses were normal, and his temperature was 37.5°C.

Neurologically, he was conscious, cooperative, and able to perform simple movements. His Glasgow Coma Scale score was 15/15, with normal dilated and reactive pupils, and preserved motor function in all four limbs.

The brain CT scan revealed a foreign body (a fragment of a motorcycle clutch), with a metallic density (2004 UN), located within the left frontal lobe of the brain. It measured 42 × 20 mm and was located adjacent to an old fracture of the left frontal bone.

An old ischemic lesion of the frontal cortico-subcortical frontal and knee of the left body measuring 32 × 21 mm with dilation of the frontal horn of the ipsilateral ventricle (Figure 1b, 2b, 3b).

Surgical Technique

The procedure was performed 8 years after the accident. The patient, under general anesthesia, was placed in the supine position with his head tilted to the right. A ±10 cm arcuate incision was made in the left frontal bone along the hairline. The left frontal bone was exposed, revealing a dural tear with cerebrospinal fluid leakage. A burr hole was drilled 2 cm from the tear, followed by a circular craniectomy. After opening the dura mater and removing the adhesions, the motorcycle clutch fragment was extracted progressively. Hemostasis was achieved with tamponade and 0.9% saline solution, followed by dural repair with Surgicel and closure with a flat dressing over a suction drain (Figures 1c, 2c, 3c, 4c, 5c, 6c).



Figure 1b: CT scan, axial section showing the left frontal metallic foreign body.



Figure 2b: CT scan, sagittal section showing the left frontal metallic foreign body.



Figure 3b: CT scan, coronal section showing the left frontal metallic foreign body.



Figure 1c: Showing the left frontal arcuate incision of ±12cm.



Figure 2c: Showing the drill hole 2cm from the dural breach.



Figure 3c: Showing the adhesion covering the foreign body.



Figure 4c: Showing the extraction of the foreign body.



Figure 5c: Showing the closure by plane on a drain.



Figure 6c: Showing the foreign body, a fragment of a motorcycle clutch, ± 4 cm.

The antibiotic therapy was based on ceftriaxone 2 grams/day, metronidazole 1.5 grams/day for 15 days; and an anti-seizure treatment of Depakine Chromo 500mg 1 tablet 2 times a day.

The postoperative course was satisfactory. The follow-up brain CT scan performed on the 3rd day after the procedure revealed dilation of the frontal horn of the left lateral ventricle and ipsilateral ischemic lesions (Figure 1d).

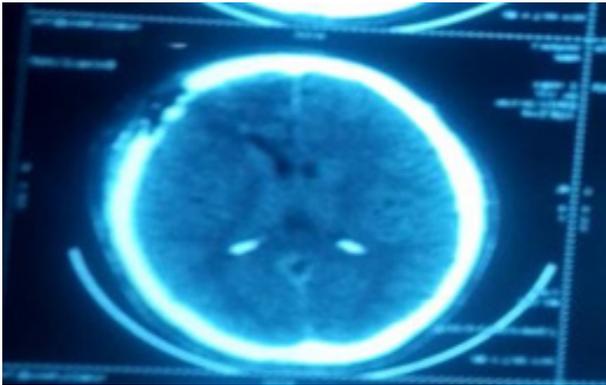


Figure 1d: CT scan of control, axial slice showing ischemia and dilation of the frontal horn of the ipsilateral ventricle.

Discussion

Non-projectile foreign bodies have a low velocity, less than 100 meters per second [4]. They occur more frequently in young adult males [8,10], as in our case. Objects penetrating the skull through unnatural orifices require a certain amount of kinetic energy to overcome the protection provided by the bone. The thickness of the skull and its convex shape minimize the effects of the impact, making these injuries less severe [2]. Their immediate severity is related to intracranial vascular damage that the penetrating object can cause. Secondly, infectious complications are a concern because the foreign body is considered to carry bacteria.

The clinical picture is mainly a function of the location of the brain injury and the resulting intracranial vascular damage [5].

Numerous controversies exist regarding the choice of diagnostic radiological examinations. While most authors opt for skull radiography combined with cerebral computed tomography (CT) [6], others have combined cerebral angiography with the two previous examinations [7]. Chen et al. [8] preferred CT and cerebral CT angiography. The rarity of the case, the context, and the absence of an examination protocol in our work setting meant that cerebral CT was the only examination performed. Since arteriography is unavailable at our center, performing cerebral CT angiography can contribute to the search for vascular lesions related to the intracranial passage of a foreign body. Thus, the radiological investigation of a penetrating head injury involving a foreign body must necessarily include a CT scan with cerebral CT angiography. If there is any suspicion of a vascular lesion, arteriography will be performed.

Antiepileptic, antitetanus, and antibiotic prophylaxis is important in cases of intracerebral penetration of a metallic foreign body due to cortical damage caused by a potentially germ-infested metallic object. Very few authors have performed antiepileptic prophylaxis [9]. This practice is not yet validated by scientific studies. However, it should be noted that approximately 30% to 50% of patients with penetrating head trauma develop seizures following direct traumatic injury to the cerebral cortex with subsequent scarring [10]. Li et al. [3] recommend prophylactic anticonvulsants during the first week following the trauma because of the high risk of epilepsy. This prophylaxis can be continued for up to 6 months in the absence of seizures [11]. Tetanus prophylaxis was not administered because it was treated conventionally.

Surgical removal of the foreign body is indicated to prevent or reduce secondary damage and late complications. For this reason, the procedure should be performed as early as possible. There is no standard strategy for the surgical removal of a foreign body. The aim being to be as minimally traumatic and damaging as possible, careful analysis of radiological examinations and a thorough knowledge of brain anatomy can help in the uncomplicated extraction of the introduced metal. Some authors have proposed performing intraoperative radiological examinations to detect early intracranial bleeding secondary to foreign body extraction [5,12]. This approach requires logistics and maneuvers that are not strictly necessary. Open surgical intervention eliminates the need for this approach.

Craniectomy is the optimal surgical approach for removing an intracranial foreign body with dural perforation. It allows for controlled surgery in case of hemorrhage. For foreign bodies that have not penetrated the dura mater, simple removal under local anesthesia can be performed [13]. AWORI et al. [14] found that the presence of a retained foreign body is not considered an absolute indication for surgical intervention. From our perspective, surgery for a metallic foreign body is justified by the potential risk of infection, even if it is located subcutaneously. All authors agree on antibiotic prophylaxis, but with different molecules and protocols. Broad-spectrum antibiotics are the most recommended [8,15]. Those that cross the blood-brain barrier may provide a better outcome [16]. In our case, ceftriaxone was used for 12 days with a satisfactory result. The choice of antibiotic and the duration of antibiotic therapy depend on the location of the foreign body (subcutaneous or intracerebral) and the habits of the teams.

Postoperative monitoring assesses the patient's neurological status using the Glasgow Coma Scale (GCS). It also looks for signs of seizures, cerebrospinal fluid (CSF) leak, endocrine disorders, and infections. CSF leakage occurs in 0.5% to 3% of cases of penetrating head trauma [17]. This complication was not observed in our patient. Patients with penetrating head trauma involving a non-sterile foreign body are at risk of developing infections, such as brain abscesses and meningitis. Antibiotic administration can reduce the risk of this complication.

In addition to a follow-up brain CT scan, which should be performed within 72 hours to look for secondary complications such as a hematoma in the surgical site, it is advisable to repeat the CT angiography and cerebral arteriography 2 to 3 weeks later [7]. These two examinations will look for a pseudoaneurysm related to vascular injury caused by the foreign body. The initial Glasgow Coma Scale (GCS) score before treatment is an important prognostic factor. An initial GCS score below 15 is predictive of an unfavorable outcome [10]. Our patient did not experience any altered mental status. His management was favorable, with a satisfactory clinical outcome.

Conclusion

Long-standing intracranial foreign bodies have been rarely reported and are mainly seen in the context of self-harm in psychiatric patients. Cases secondary to assault are exceptional. The initial Glasgow Coma Scale score is an important prognostic factor. The severity of clinical signs depends on the location of brain involvement and associated vascular lesions. Infections and intracranial vascular lesions are the main complications to be concerned about.

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