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Article

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Unusual cranial trauma caused by pencil in teenager: case report

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Abstract: *Introduction*: Penetrating lesions by pencil in the temporal lobe in children and adolescents are uncommon. We present the case of a teenager with penetrating injury by strange object in the temporal lobe. *Case*: Twelve years old male patient, with history of trauma while he was playing with his friends, presents alteration of the consciousness state, weakness in right hemibody and dysphasia. Urgent surgery is practiced employing an incision in "C" form with improvement of the consciousness state during post-operative. *Discussion*: Penetrating lesions in the skull and brain are classified as missiles and non-missiles depending of their impact velocity. The wood is a porous organic material that provide a natural deposit of microbian agents, making it potentially lethal. Pre-operative radiological evaluation allows check the trajectory of the penetrating object and secondary lesions present guiding de neurosurgical approach. The prognostic depends on penetration site, timely handling and complications associated. *Conclusion*: Penetrating lesions by pencil are uncommon, an appropriate imaging evaluation is fundamental to determine the neurosurgical approach that allows prevent and/or decrease secondary damage.
Key words: penetrating injuries, neurotrauma, head injury, Trauma

Introduction

Cranioencephalic Trauma caused by penetrating pencil lesions in children and adolescents are relatively rare and generally presented in the skull based, orbital cavity and temporal bone, being this one the less frequent. We present the case of 12 years old child with penetrating lesion by pencil in the temporal lobe.

Case report

A 12-years-old male patient, with an imprecise history of trauma while he was playing with his friends, who presented altered state of consciusness with a Glasgow scale score of 8/15, associated to grade 2 weakness in right hemibody and dysphasia. A small wound is observed on bleeding left temporal side, initially sutured in the emergency room, where a computed tomography (CT) scan of the brain was performed, and empiric antibiotic treatment and prophylactic antiepileptic drugs were started (Fig. 1). Five hours post trauma was performed an urgent surgery using an incision in "C" form centered around the wound, with bottom flap base. (Fig. 2, 3 A and B). Intraoperative it was observed a circular orifice followed by a circumferential craniotomy. The intracranial fragment of the pencil was extracted with minimal bleeding and the fragment of the pencil located intracerebrally measured 7.7cms. (Fig.4). The source of the bleeding was from the tract that ceased with the irrigation disposed of the extraction of the pencil with debridation of the bone. Postoperative tomography showed small residual intracerebral bleeding.

After the intervention, the patient shows improvement of the state of consciousness in the Respiratory Care Unit (RCU) followed by 5 days in the neurosurgery room. To be discharged completely conscious and with minimal weakness and improvement in speech.

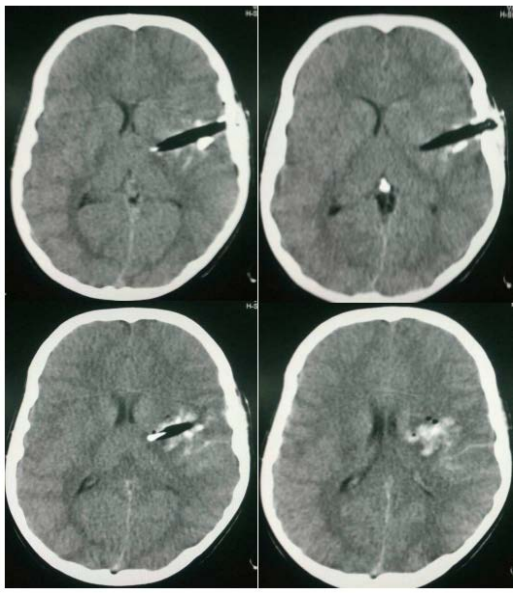
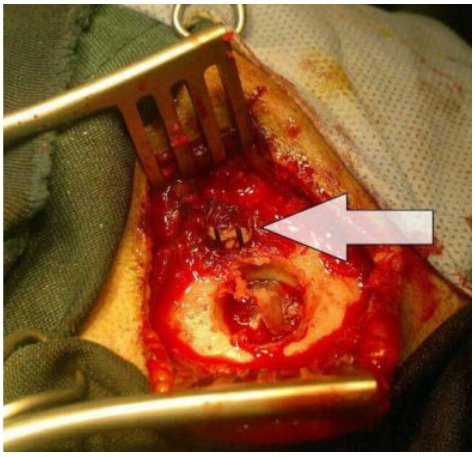


Figure 1 - CT scan Penetrating object associated with bleeding

Figure 2 - Preoperative image showing site and size of the wound



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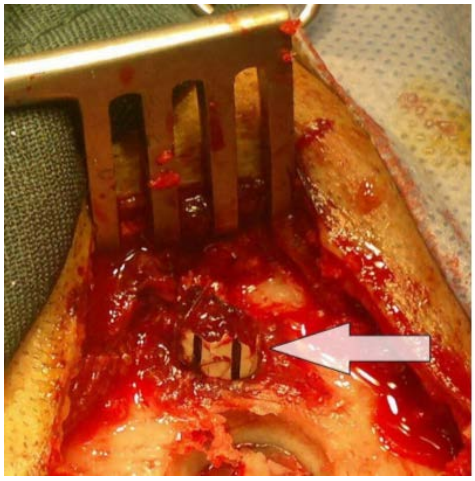

B

Figure 3 A and B - A small craniotomy near the entrance hole is done in order to facilitate removal of the pencil. We removed the fragment of the pencil by pulling gently

Figure 4 - A picture of the pencil after extraction

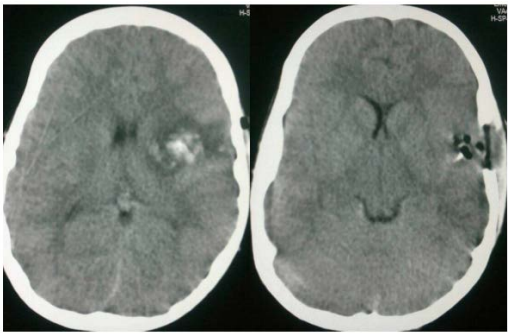

Figure 5 - Immediate postoperative Brain CT-scan

Discusion

Penetrating head injuries are among the most severe traumatic injuries and with the higher incidence of morbidity and mortality, representing approximately 0.4% of all injuries (1). Bursick et al., carried out a review of 21 cases of intracranial injuries by pencil, in which 82% of the cases were children and approximately 53% of those children were boys. In addition, they found that one of the less frequent areas is the squamous portion of the temporal bone (2). Only 4 cases of penetrating lesions in the temporal bone have been found in the literature (3–5).

Penetrating lesions in skull and brain are classified as missiles and non missiles, wich differ in the impact velocity. In non missiles lesions the impact velocity is >100m/s, causing lesions due to laceration and maceration; on the other hand, missile lesions cause injuries due to kinetic and thermal energy. Besides, the object penetration can be of two types: those that cross a natural orifice and the objects that cross the skull causing fracture, giving rise an artificial orifice(6).

Penetrate areas by low velocity are the foramen of the skull base, Orbital cavityand

squamous portion of temporal bone, being this one the less common. This cause a direct damage on brain tissue with possible laceration or vascular occlusion(7).

Penetrating lesions non missiles, unlike missiles, they not present concentric zone of coagulative necrosis caused by dissipated energy, and this allows a better management that contributes to get better the patient prognosis (1).

These injuries are usually the results of both intentional and unintentional events, caused by cloves, screwdrivers, chopsticks, keys, electric drills, knifes and pens (8).

The wounds by pencil are infrequent, and are considered dangerous by nature inherent of the wood due to it is an organic porous material that provides a natural deposit of microbian agents, also is soft, can be fragmented easily and usually it is not detected in routine radiological exams. This make that it is considered potentially letal (9).

The involvement of the cerebral parenchyma by penetrating wounds through the temporal bone is facilitated by the thin thickness of this structure, short distance to the brain and vascular structures. In addition, it is more likely to present major neurological deficits and infectious complications including scalp cellulitis, subdural abscess formation, osteomyelitis, subdural and epidural empyema, meningitis, ventriculitis, cerebritis, and brain abscesses (2,10).

The radiological evaluation allows to verify the trajectory of the penetrating object and the secondary lesions present guiding the neurosurgical approach. The simple radiograph offers information about the penetrating object but does not allow to analyze the cerebral parenchyma in search of damages of the intracranial structures (1,6,7,10).

Computed tomography (CT scan) adequately identifies the extent of the lesion, facilitating the detection of associated contusions, hematomas, major vascular lesions or brainstem lesions (1,6,10). Moreover, it allows a better evaluation of the bony structures and informs about the relation of the penetrating object with the adjacent structures. CT scan is also useful in the monitoring of postoperative complications (7).

Many foreign bodies, especially organic materials, have densities very close to those of the soft intracranial and orbital tissues, which is why they are lost in CT scan, so a Magnetic Resonance Imaging (MRI) should be performed when we suspect them, being more Sensitive T1 sequence than T2(1,2,6,9,11,12).

If a major vascular lesion is suspected in the venous sinus and in cases of late subarachnoid hemorrhage or intracerebral hemorrhage, angiography by digital brain subtraction may be indicated after intervention for surgical planning (6,7,9,10,13). If the first scan is negative, it is best to repeat the examination 2 to 3 weeks later (14).

Penetrating lesions by non-sterile foreign bodies tend to become infected and lead to brain abscesses and meningitis, so prophylactic treatment with broad-spectrum antibiotics is necessary to cross the blood-brain barrier in order to minimize

complications (1,6,7). The most frequent germ is Staphylococcus aureus followed by other gram-negative bacteria and occasionally anaerobic bacteria (2,6,15).

About 30% to 50% of patients with direct traumatic injury to the cerebral cortex develop seizures due to subsequent scarring (7,16). The use of antiepileptic medication prevents the onset of attacks early, but not late. For this reason, prophylaxis is recommended for the first 7 days after injury (1,7).

Among the cerebrovascular injuries reported in the literature are post-traumatic aneurysms, arteriovenous fistulas, occlusion of large vessels, venous thrombosis and vasospasm (1). Outcome of CSF is a rare complication with incidence of 0.5% and 3% (1,17).

Pituitary, immediate or late dysfunctions can occur (1). However, pituitary dysfunction as a direct result of trauma has been rarely reported (18).

Regardless of the type of cranial lesion, surgical management is recommended taking into account the point of entry (natural or not), object size, number of fragments, and secondary cerebral or vascular lesions. Its objectives include local debridement of damage to the scalp, skull, dura and cerebral parenchyma, followed by dural closure, cranioplasty and cutaneous suture to prevent CSF leakage and infection (1,6).

Surgical treatment is usually determined by factors such as location of the foreign body, path traveled, mechanism and extent of brain injury. It is for this reason, that the treatment seeks to prevent or reduce the risk of complications or secondary damages. Craniotomy is the most commonly used surgical intervention because it allows the protection of critical neurovascular structures, debridement of the necrotic tissue of the brain, evacuation of the hematoma and repair of dural defects after extraction(1). However, surgical intervention is complicated if there is a lesion in a large vessel or venous sinuses, because they can lead to massive intraoperative blood loss, in these cases the treatment should have an endovascular approach (1,7).

The prognosis of patients with this type of lesion depends on the site of penetration, timely management, associated complications, among other factors. Penetrating lesions in the frontal, temporal and occipital lobe present a better prognosis (1).

Conclusions

Penetrating lesions by pencil are rare, this object may enter through a natural hole or not. Adequate preoperative imaging is essential to determine the appropriate neurosurgical approach to prevent and / or reduce secondary damage (6). In the post-operative phase, antibiotic prophylaxis and anticonvulsive administration are recommended to reduce the presence of infectious and epileptic complications (1).

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