

Transfixing Cranioencephalic Wound in a Child: Case Report and Literature Review

Razafindraibe Faneva Angelo Parfait^{1*}, Rahanitriniaina Nadia Marie Philibertine², Ramarolahy Rija², Rajaonera Andriambelo Tovoher² and Rakotoarison Ratsaraharimanana Catherine Nicole¹

¹*Surgical Emergency Unit of Joseph Ravoahangy Andrianavalona Teaching Hospital, Antananarivo, Madagascar*

²*Surgical Critical Care Unit of Joseph Ravoahangy Andrianavalona Teaching Hospital, Antananarivo, Madagascar*

***Corresponding Author:** Razafindraibe Faneva Angelo Parfait, Surgical Emergency Unit of Joseph Ravoahangy Andrianavalona Teaching Hospital, Antananarivo, Madagascar.

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Abstract

Introduction: Penetrating head trauma includes all traumatic brain injuries which are not the result of a blunt mechanism. Penetrating brain injury caused by non-missile, low-velocity objects represents a rare pathology among civilians with a better outcome. Our objective was to report a case of transfixing wound of the skull and to report its management.

Case Report: A three year old boy who presented with a cranio-encephalic trauma with a trans-cranial insertion of a round iron of 12 mm diameter following a fall over a height of two meters was admitted to the CHU-JRA Department of Surgery. At admission the boy was subconsciously with equal and reactive pupils and without any senso-motor deficit. The boy was operated under general anesthesia in order to remove the foreign body and medical treatment was focused on prevention of bleeding, control of cerebral edema and prevention of infection. On the fourth post-operative day the boy developed left hemiplegia which was completely recovered two weeks later. The patient was discharged one month after surgery without any senso-motor deficit.

Keywords: *Wound Transfixing of the Skull; Management; Prognosis; Madagascar*

Introduction

Penetrating brain injury includes all traumatic brain injuries which are not the result of a blunt mechanism [1]. In civilian populations, penetrating brain injury is mostly caused by high velocity objects, which result in more complex injuries and high mortality. Penetrating brain injury caused by non-missile, low-velocity objects represents a rare pathology among civilians, with better outcome because of more localized primary injury and is usually caused by violence, accidents, or even suicide attempts [2-5]. In pediatrics, there are various causes of penetrating head injuries include pens, nails, needles, table knives, forks, scissors and other instruments [6-8]. In the military, they are the most deadly lesions because it is mostly caused by ballistic high velocity objects [1]. It is a diagnostic and therapeutic emergency by haemorrhage and infection that can be life-threatening and also with the risk of major neurological sequelae [9]. The objective of our work was to report a case of transfixing wounds of the skull and to report its management.

Observation

It was a three year old boy, weighing about 15kg, victim of a domestic accident, a notion of falling on a height of 2 meters about 6 hours before admission, causing a cranio-encephalic transfixing wound with impaling on a round iron 12 mm in diameter. A notion of initial loss of consciousness of indefinite duration was noted. On arrival at the Surgical Emergency Department of CHUJRA, the clinical examination

observed a trans-cranial perforation by a metallic iron (left parietal entry port and right parietal outlet) with presence of sero-haematological flow (Figure 1). The child was crying, he was subconscious (Glasgow score 13/15) with equal and reactive pupils and without any senso-motor deficit. A placement of two peripheral venous routes has been performed. The patient had analgesic, tetanus prophylaxis and antibiotic therapy (combination ceftriaxone/metronidazole). We had sedated and intubated the patient before performing the brain scan. The brain scan showed a metallic foreign body passing through the left and right parietal bone, the 2 hemispheres and the false brain. There was no hematoma or compressive blood collection (Figure 2). Surgery has been indicated to remove the foreign body. The patient was operated under general anesthesia. The anesthetic products used were propofol and fentanyl. A section of the iron at the level of the left parietal bone and an extraction of the metallic body on the right side were realized, followed by a closure of the meninge and the scalp. Inoperative, the child had a blood transfusion (01 pocket of red blood cell), osmotherapy with mannitol 20%, and a tranexamic acid adapted to the weight. Intraoperative blood loss was approximately 150 ml. The surgery lasted 90 minutes. Four hours after the operation, a brain scan was done to check for bleeding. No intra or extra-cerebral hematoma was observed (Figure 3). We continued antibiotic therapy and osmotherapy postoperatively. From the 3rd day, we relayed mannitol 20% with glycerotone. A weaning of ventilation was done after 48 hours of sedation and mechanical ventilation. The patient had left hemiplegia from the fourth postoperative day. A third brain scan was requested at D4 which showed an image in favor of a hemorrhagic edematous lesion transverse of the two hemispheres crossing the false brain (path of the metal body) and a blood break of the two lateral ventricles (Figure 4). The anti-edematous was continued. Seven days after hospitalization in surgical resuscitation, we had tracheotomized the patient. Two weeks later, the child began to move the deficit members, Glasgow score was 15/15. We decided to remove the tracheostomy tube and transfer the patient to Neurosurgery. The patient was discharged from hospital 30 days after the operation.



Figure 1: Transfixing cranioencephalic wound in a child.



Figure 2: CT image before surgery.

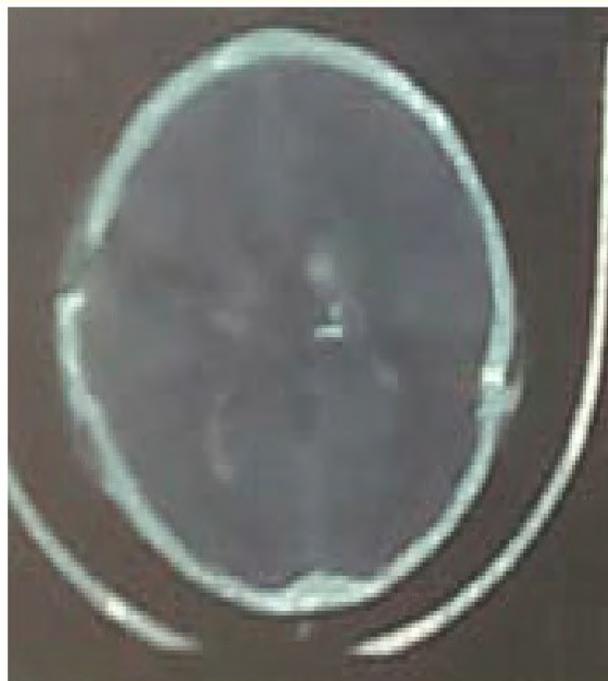


Figure 3: CT image 4 hours postoperative.

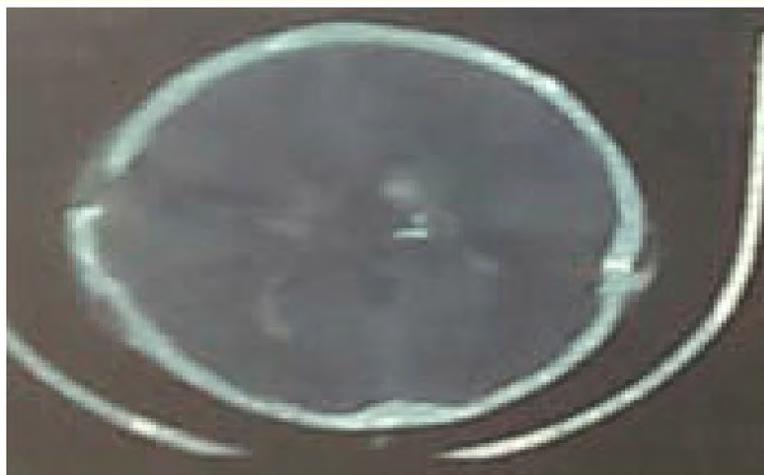


Figure 4: CT image 4 days postoperative.

Discussion

In our case, the prognosis of the penetrating trauma of the skull was good. Penetrating brain injury caused by non-missile, low-velocity objects represents a rare pathology among civilians, with better outcome because of more localized primary injury and is usually caused by violence, accidents, or even suicide attempts [1]. According to Kazim., *et al.* [10], Glasgow coma scale score of 3 with bilaterally fixed and dilated pupils, and high initial intracranial pressure have been correlated with worse outcomes in penetrating brain injury patients. In the military, it is mostly due to high kinetic trauma (bullet wound). The lesion is most often complex with a high mortality rate [1].

Regarding the surgical treatment, there was no opening of the cranial box. After iron section at the level of the left parietal bone, extraction of the foreign body on the right side was performed, followed by washing with isotonic saline, closure of the meninges and scalp. Intraoperatively, osmotherapy was performed to avoid posttraumatic intracranial hypertension. Pediatric non-missile penetrating head injury is usually accidental attributed mainly to the softer skulls of growing children. However, it is a rare entity, and therefore no consensus exists regarding treatment to effectively prevent immediate and long-term complications. Throughout the literature, these injuries are mostly discussed in case reviews and case series in the general population. Surgery timing and method as well as anticonvulsant and antibiotic therapy still remain debatable [11].

According to Khalil., *et al.* for penetrating trauma due to violence, accidents or suicide attempts, treatment consists of a small craniotomy around the foreign body, cleaning and debridement of necrotic tissue and repair of lesions [3]. The management of penetrating traumas of the skull requires a good knowledge of the mechanism and physiopathology of the trauma. It is based on the control of bleeding, intracranial pressure and the prevention of infections [12]. For the antibiotic, we used Ceftriaxone/metronidazole for 7 days. The risks of local wound infections, meningitis, ventriculitis or cerebral abscess are very high if penetrating head trauma occurs. The abscess typically develops in three to five weeks after the trauma. *Staphylococcus aureus* is the most commonly observed organism. Antibiotic therapy typically begins with a combination of metronidazole and 3rd generation cephalosporin [13].

Our patient had left hemiplegia from the fourth postoperative day. This motor deficit was completely recovered two weeks later. Surveillance by the neuropsychiatrist is useful for assessing possible sequelae. In Brazil in 2015, Da Silva., *et al.* [14] reported a case of an 18 month old boy, with accidental fall history of metal grid with cranial penetration and transfixation in the right fronto-parieto-temporal region. In this case, it was observed that the foreign body, even transfixing the rich area of the brain vascular the surface only acted against cerebral vein, with no complications, such as brain abscess or meningitis, seizures and focal neurological deficits. According to Esposito., *et al.* [1], epilepsy is the most common complication after penetrating trauma of the skull. It is secondary to the direct trauma of the cerebral cortex. The least common complications are cerebrospinal fistula and neuroendocrine dysfunction [13].

Conclusion

Penetrating brain injury caused by non-missile, low-velocity objects represents a rare pathology among civilians. Treatment of penetrating head trauma aims at controlling bleeding, controlling intracranial pressure and preventing infections. The prognosis is generally good because the primary lesions are localized well.

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