A rare case of penetrating cranial trauma by knife with direct lesion to the anterior cerebral artery

Ricardo Rezende Campos1, Marcos Fortunato de Barros Filho1; Silvana Maria Ferreira1, Marcelo Eduardo Sette dos Santos1, Guilherme Brasileiro de Aguiar.1
1 Division of Neurosurgery, Santa Marcelina de Itaquaquecetuba Hospital, São Paulo, Brazil.

Resumen
Las lesiones penetrantes en el cráneo por lo general se asocian con alta mortalidad. Ellos pueden ser el resultado de numerosos eventos, la mayoría de ellos están causados por un trauma de alta energía. La perforación de un cráneo por los objetos de baja energía cinética es inusual en la práctica neuroquirúrgica. Un alto porcentaje de los casos con lesiones penetrantes craneales se asocian con lesiones vasculares, lo que requiere el estudio de la vascularización intracranial para una conducta médica adecuada. Presentamos un caso de una paciente de 32 años de edad que sufrió un trauma penetrante en el cráneo con un cuchillo a través de los huesos del cráneo, con lesión directa a la arteria cerebral anterior, e incluimos una breve revisión de la literatura sobre el tema.

Palabras clave: Lesión cerebral traumática, lesión cerebral penetrante, cráneo, neuroimágenes, angiografía cerebral, neurocirugía.

Abstract
The penetrating injuries of the skull are usually associated with high mortality. They may be the result of numerous events, the majority of them being caused by high energy trauma. Penetrating brain injury by objects of low kinetic energy is unusual in the neurosurgical practice. A high percentage of the cases with penetrating injuries is associated with cranial vascular lesions, requiring study of the intracranial vasculature for proper management. We report on a case of a 32-year-old patient who suffered a head-penetrating trauma by a knife through the bones of the skull, with direct injury to the anterior cerebral artery, including a brief review of the literature on the theme.

Key words: Traumatic brain injury, penetrating head injury, skull, neuroimaging, cerebral angiography, neurosurgery.

Introduction
Penetrating cranial lesions can be the result of numerous intentional or unintentional events, including wounds by firearm projectiles, knife injuries, and automobile or work accidents (nails, screws and others)2,3. Due to the inexpressive casuistry of low-energy penetrating lesions, there are few reports of such pathology in the literature.

The penetrating cerebral lesion by low kinetic energy objects is uncommon in the neurological practice2,7. Diverse objects have been mentioned in the literature as the causes of penetrating encephalic lesions, habitually being of small dimensions and of facial entry2,3. Due to the inexpressive casuistry of low-energy penetrating lesions, there are few reports of such pathology in the literature.

We report the case of a patient who was the victim of a low-energy penetrating cranial trauma through the skull bones with a direct lesion to the anterior cerebral artery, and we include a brief review of the literature on that theme.

Case report
This was a male patient, 32 years-old, who was admitted to our emergency service as the victim of a knife wound to the cranium in the left parietal region. As part of the pre-hospitalization services rendered by the rescue team, the patient underwent orotracheal intubation and mechanical ventilation due to his worsening neurological status. Upon hospital admittance, the patient presented with a Glasgow Coma Scale 8, with bilaterally
proximal segment (A1) and hypovascularization in its territory (Figure 2 A-C). The patient was then submitted to a surgical procedure (Figure 1 B-C) with temporal frontal craniotomy and dissection of the Sylvian fissure, with relief of the neurovascular structures in the blade trajectory and extraction of the foreign body. The anterior cerebral artery had been sectioned, making it necessary to promote its coagulation in the A1 segment. Following surgery, the patient remained in the intensive care unit, but due to his previous neurological condition he died after a few days.

Discussion

Penetrating cranial lesions are generally associated with an elevated mortality rate\(^8\). The vast majority of these penetrating cranial lesions is caused by high kinetic energy traumas, such as wounds caused by firearm projectiles\(^2\),\(^7\). Low-energy traumas represent a minority of penetrating cranial lesions and in most cases are constituted by penetration of foreign bodies through the eye, mouth or auditory conduit\(^4\). More rarely, the penetration occurs through the cranium through the skull bones\(^4\) as occurred in this case.

Due to the grave risk of nerve and vascular structures, it is mandatory to know the trajectory and location of the foreign body\(^4\). This penetrating lesion can frequently affect vascular structures, with partial or complete sectioning of a cerebral artery, as well as lead to the formation of traumatic aneurysms\(^8\),\(^9\) or carotid-cavernous fistulas\(^8\). It has been estimated that the rate of vascular complications following a penetrating cerebral lesion is between 5% and 40%\(^4\). The formation of a traumatic aneurysm is a serious consequence of a vascular lesion associated with a penetrating trauma to the cranium\(^8\),\(^9\), already well-documented in the literature. The section of the intracranial artery, in turn, represents a serious and rare lesion which generally requires urgent neurosurgical intervention, reportedly in up to 25% in this type of trauma\(^5\),\(^6\).

Imaging exams, such as a head computed tomography and the cerebral angiography, are necessary not only to evaluate the lesion to the encephalic parenchyma, but also to verify possible associated vascular lesions, thus assisting in the correct surgical planning\(^3\),\(^9\). When
direct lesions to intracranial vessels is suspected, based on the trajectory of the penetrating instrument, a cerebral angiography should be readily performed to identify and promote better therapeutic planning\(^1\). In the present case, as the tip of the blade was crossing the anterior fossa, there was a strong suspicion of direct lesion to vascular structures, which motivated the performance of an urgent cerebral angiography, which in turn confirmed our hypothesis.

**Conclusion**

The present case has the particularity of the penetration of the foreign body having occurred directly through the parietal bone and not through natural orifices, such as the eyes or nose, damaging the left anterior cerebral artery and reducing the blood flow in its territory, as demonstrated in the cerebral angiography. The option to remove the knife by surgical procedure with the opening of the Sylvian fissure and relief of neurovascular structures under direct vision is the safest procedure for the removal of a foreign body affecting noble structures of the brain.

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**References**


**Corresponding author:**

Guilherme Brasileiro de Aguiar
Rua Abílio Soares, 121 / 84 - Paraiso. 04005-000. São Paulo - SP, Brazil. 55 11 63450036. E-mail: guilhermebraguiar@yahoo.com.br