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Intracranial penetrating injury by paring knife: An unusual case report

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Abstract:	<p>The intracranial stab wounds are a rare form of traumatic brain injury, with common entry points being the orbital and the mouth. The fatality and outcome significantly depend on route, depth and location of cranial penetration. Penetrating traumatic brain injury mostly result in death, with reported intraoperative shock due to massive bleeding, postoperative hematoma resulting in cerebral hernia, or later severe intracranial infection. We report a young woman in a medical underdeveloped region suffering from severe intracranial penetrating injury by a paring knife was successfully treated by surgery.</p>
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Opposed Reviewers:	

Dear Editors:

I am pleased to have such a chance to send my present work to you for review. And I declare that this article is original, and has not been published or under review elsewhere. Our intent is to be published in " Asian Journal of Surgery ".

This is an interesting rare case, which shows intracranial penetrating injury by paring knife. A 32-year-old young woman and her ex-boyfriend got into a scuffle. The head computed tomography (CT) demonstrated that the trajectory of the knife went through the left temporal lobe, the left middle cranial fossa, across the tentorium cerebelli and finally to the right cerebellar hemisphere. In the absence of craniotomy dynamic system, microscope, endoscope, we still successfully treated her. For such injuries in medically underdeveloped areas, intraoperative video connection may be a good way to help. As we share our experience in treating this rare injury, we hope to serve as a reference for similar injuries in the future.

So, we do think that this case report is very interesting. And then we submit the manuscript to you. And we hope that it could have such chance to be published in your great journal.

Thank you for your time and patience to review my manuscript.

Best regards!

Jiao Wu, MS,

2023.04.12

Intracranial penetrating injury by paring knife: An unusual case report

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Abstract

The intracranial stab wounds are a rare form of traumatic brain injury, with common entry points being the orbital and the mouth. The fatality and outcome significantly depend on route, depth and location of cranial penetration. Penetrating traumatic brain injury mostly result in death, with reported intraoperative shock due to massive bleeding, postoperative hematoma resulting in cerebral hernia, or later severe intracranial infection. We report a young woman in a medical underdeveloped region suffering from severe intracranial penetrating injury by a paring knife was successfully treated by surgery.

Key Words: Non-missile penetrating injury, paring knife, video link

Introduction

Unlike injuries caused by handguns, arrows and other “high-velocity” objects, intracranial injuries caused by penetrating foreign objects are

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relatively rare.¹ The most common route for transcranial objects to enter the skull is through areas of thinned bone such as the temporal squama, skullbase foramina, and orbit.² The following complications may also result from penetrating traumatic brain injury: hematoma, pseudoaneurysm, carotidcavernous fistula, meningitis, abscess, seizures, and pneumocephalus.^{3,4} We describe an unique case that was successfully treated surgically and correlate our experience with a literature. It is our intention to demonstrate some general management principles that can be applied to improve outcomes of such patients in medical underdeveloped areas.

Case presentation

During the fateful morning, a 32-year-old young woman and her ex-boyfriend got into a scuffle. In a fit of rage, the ex-boyfriend forced a paring knife into the patient's head. When she arrived at our hospital, the paring knife was still firmly embedded in her head, only the wooden handle protruded. On presentation, the patient was hemodynamically stable with a Glasgow Coma Scale score of 11 (E3 V3 M5), a bloody bandage covered her head. The pupils on both sides of her are approximately 3mm in diameter, reactive to light rapidly, and her right limb was slightly weaker than her left. Inspection of the head revealed that the blade of the knife is entirely inside the skull, only the handle is visible.(Fig .A).

Imaging

The head computed tomography (CT) demonstrated that the trajectory of the knife went through the left temporal lobe, the left middle cranial fossa, across the tentorium cerebelli and finally to the right cerebellar hemisphere. There was no intracranial hematoma. The limited situation at Agostinho Neto Hospital prevents the computed tomography angiography examination (CTA) from being completed even though it is the best hospital in Cape Verde. (Fig. B).

Operative Details

After a rapid preoperative examination, the patient underwent emergency surgery. In order to reduce the risk of hemorrhagic shock during surgery due to the lack of preoperative CTA. Our entire operation was conducted through a mobile phone video link with a Chinese neurosurgery professor. According to his extensive clinical experience and the CT of the patient's head, the vessels most likely to be damaged during the operation are the left superior petrosal and sigmoid sinuses, because they overlap with the location of the paring knife. With the patient in the right recumbent position, a left pterional craniotomy was performed. A U-shaped incision across the knife was designed. Following strict disinfection and paving the area with sterile towels, the scalp was cut open. In the absence of a craniotomy power system, we used a hand

drill to drill into the skull about 5cm from the blade(Fig. C). A cranial bone flap (7x8 cm) was formed with a rongeur forceps, exposing the knife penetrating the dura mater with a small amount of local hematoma. After the dura mater was cut open with radial scissors, local contusion of the cerebral cortex with high tension was found. Subsequently, the knife (12.5cmx2cm) (Fig. D) was pulled out along the original tract, after which no severe bleeding occurred (Fig. E). Repeated washing the original tract with normal saline and repaired the dural defect. Without reduction of the bone flap, a subcutaneous drainage tube was inserted into the head incision. The skin was sutured layer by layer.

Postoperative Course

The patient was transferred to a medical intensive care unit where he received continuing treatment, such as head elevation, analgesia, sedation, and dehydration. Six hours after surgery, the brain CT showed no massive intracranial bleeding or local edema. After surgery, ceftriaxone and vancomycin were administered for 2 weeks to prevent infection. Fosphenytoin was used for seizure prophylaxis. After removal of the tracheal intubation on the second postoperative day, the patient was gradually able to eat a small amount of food. After surgery, the Glasgow Coma Scale score increased from 11 to 14 steadily. Four weeks after surgery, the patient was discharged to residence for rehabilitation. At discharge, neurological examination showed a clear mind, slow speech,

slightly slow reactions, muscle strength grade 4 of the right limb, standing with assistance, unstable gait. (Fig. F)

DISCUSSION

Injuries that penetrate the skull or brain can be classified as missile penetrating or non-missile penetrating. The incidence of cranocerebral piercing injuries is very low, at around 0.4%.^{5,6} There are only a few reports of paring knife injuries and no standardized treatment guidelines, especially in medically underdeveloped areas. Therefore, this case report is valuable for the development of management strategies. The CT examination and three-dimensional reconstruction helped to understand the relationship between the embedded knife and surrounding structures from different perspectives. When there is a high index of suspicion for vascular injury, a CT angiography, or a digital subtraction may be necessary before surgery for operative planning⁵. It is crucial to quickly transport a patient with an intracranial foreign body to a specialized facility with neurosurgical capabilities.⁷ As the patient lived in an underdeveloped medical area, preoperative evaluation of cerebral vessels was not possible. A craniodynamic system was not available during the procedure, and neither an intraoperative microscope nor an endoscope could be utilized to determine whether or not deep cerebral hemorrhage had occurred. In order to save the patient, we are communicating intraoperatively with a Chinese professor of neurosurgery via video link.

Under his help, we developed a thorough surgical plan and successfully completed the treatment of the patient.

CONCLUSIONS

Penetrating injuries caused by paring knife are rare non-missile penetrating injuries, which always cause severe intracranial injury. For such injuries in medically underdeveloped areas, intraoperative video connection may be a good way to help. As we share our experience in treating this rare injury, we hope to serve as a reference for similar injuries in the future.

Funding

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Author contribution

Han Wang reviewed the literature and contributed to manuscript drafting; Imadoêno Cabral participated in the surgical treatment; Yong Yi guided the operation through a video link; Jiao Wu participated in the whole treatment of the patient as a surgeon of China's aid to Cape Verde.

Ethics approval and consent to participate

Informed consent was obtained from the patient to publish his case, and this case is a retrospective study and has nothing to do with ethics.

Declaration of competing interest

The authors declare that they have no competing interests.

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