Transcranial Injury: Case Report

Transkraniyal Yaralanma

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ABSTRACT Penetrating cranial injury is a potentially life-threatening condition. Shell and shrapnel fragments are the most common cause of high velocity penetrating head injuries. The pathophysiological consequences of penetrating head injuries depend on the kinetic energy and trajectory of the object. If the velocity of the penetrating object is high enough, the object shape and sharpness is not very important for penetrance. We reported a case of transcranial injury caused by a broken wooden shovel handle. The Glasgow Coma Scale score of the patient was 4 in the emergency department. Wooden shovel handle had entered through the right maxillary region, penetrated the brain and come out of the skull through the right parietal bone. Surgery was planned according to the radiological studies. Expeditious removal of the foreign body was carried out by craniotomy. The patient died on postoperative day 3. A number of high velocity transcranial injuries have been reported in the literature, but to the best of our knowledge, there was no report on transcranial injury with a wooden shovel handle.

Key Words: Head injuries, penetrating; craniocerebral trauma

ÖZET Delici kafa yaralanması potansiyel olarak yaşamı tehdit edici bir durumdur. Bomba ve şarapnel parçaları yüksek hızlı delici kafa yaralanmalarının en yaygın nedenidir. Delici kafa yaralanmalarının patofizyolojik sonuçları kinetik enerjiye ve nesnenin izlediği yola bağlıdır. Eğer delici nesnenin hızı yeterince yüksekse, şekli ve keskinliği delicilik açısından çok önemli değildir. Bu makalede, kırık bir tahta kürek sapının neden olduğu transkraniyal bir yaralanma olgusu sunulmuştur. Hasta acil serviste değerlendirildiğinde, Glasgow Koma Skalası skoru 4 bulundu. Tahta kürek sapı sağ maksiller bölgeden girmişti, beyni delip parietal kemiğin sağ kısmından kafatasının dışına çıkmıştı. Radyolojik incelemelere göre cerrahi girişim planlandı. Kraniyotomi yapılarak yabancı cisim hızlıca çıkarıldı. Hasta postoperatif 3. günde öldü. Literatürde çok sayıda yüksek hızlı transkraniyal yaralanma bildirilmiştir; fakat bildiğimiz kadarıyla hiçbirinde tahta kürek sapı ile transkraniyal yaralanma bildirilmemiştir.

Anahtar Kelimeler: Kafa yaralanmaları, delici; kraniyoserebral travma

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Transcranial brain injuries are serious conditions with high mortality and morbidity rates. Estimated mortality rates were reported between 34% and 93% in various studies.[1] High velocity transcranial injuries are mostly caused by shell and shrapnel fragments. Because the shape of the wooden shovel handle is rough and thick, its penetrance to the cranium is very difficult. To the best of our knowledge, wooden shovel handle has not been described as a cause of high velocity transcranial injury in the literature.

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CASE REPORT

A 37 year-old man accidentally hit his wooden shovel handle to the gang saw machine while he was working. Then wooden handle crashed and a long piece of the handle penetrated through his face with high velocity. He was referred to our clinic. He was intubated and had no spontaneous ventilation. His initial Glasgow Coma Scale (GCS) score was 4. Wooden shovel handle had embedded in the right maxillary region, penetrated the brain and come out of the skull through the right parietal bone. The foreign body had pushed the scalp but had not penetrated it. Enucleation developed in his right glob (Figure 1). Computed tomography (CT) revealed a 2.5 cm foreign body, entering through the anterior maxillary bone, extending through the orbit to the cranium passing through the frontal and parietal lobes and leaving the cranium through the right parietal bone. There was contusion around the foreign body, traumatic subarachnoid hemorrhage and 7 mm subfalcian shift to left hemisphere (Figures 2-5). Computed tomography angiography revealed no pathology in the proximal

FIGURE 1: Preoperative photograph of the patient showing the injury. (See for colored form http://tipbilimleri.turkiyeklinikleri.com/)

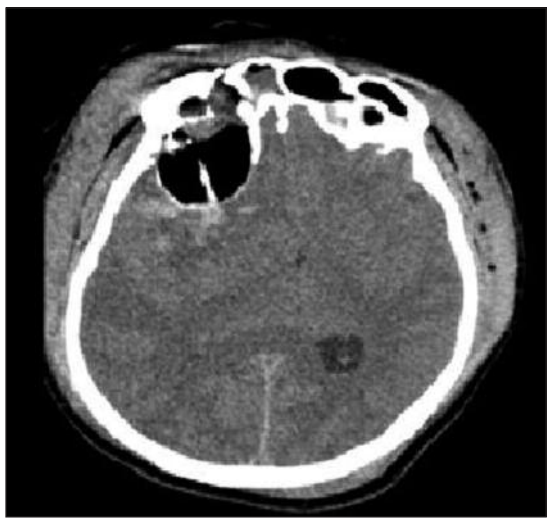

FIGURE 2: Axial computed tomography of the patient showing the foreign body penetrating the cranium and causing cerebral contusion, hemorrhage, and shift effect.

FIGURE 3: Axial computed tomography of the patient showing the foreign body coming out of the cranium.

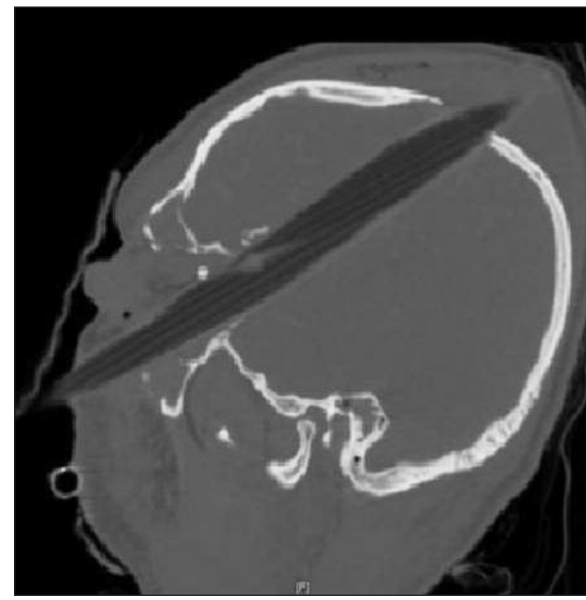

FIGURE 4: Sagittal computed tomography (bone window) of the patient showing total cranial injury.

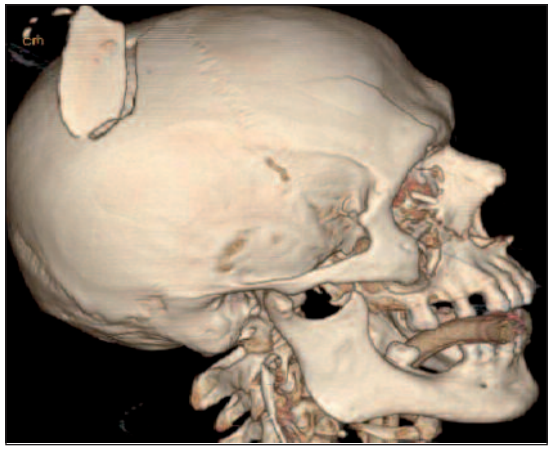

FIGURE 5: 3D computed tomography of the patient showing cranial injury.
(See for colored form http://tipbilimleri.turkiyeklinikleri.com/)

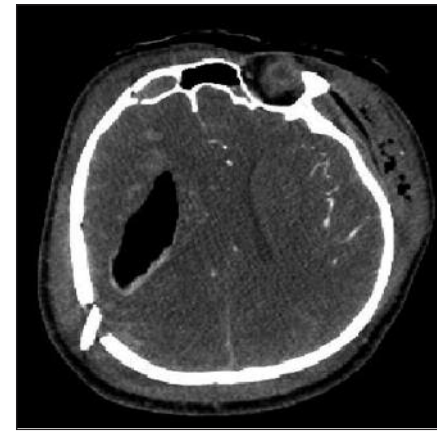

FIGURE 6: Computed tomography angiography of the patient showing no blood stream in the distal middle cerebral artery because of compression of the foreign body.

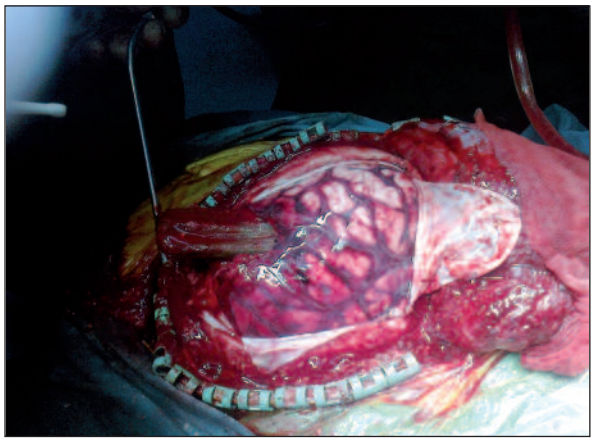

FIGURE 7: Peroperative photograph of the patient showing the foreign body exitting the cranium after craniotomy and dura mater incision.
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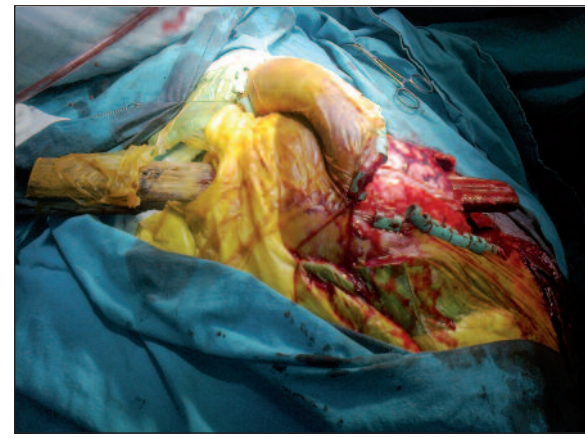

FIGURE 8: Peroperative photograph of the patient showing entry and exit sites of the foreign body.
(See for colored form http://tipbilimleri.turkiyeklinikleri.com/)

middle cerebral artery and no blood stream in the distal middle cerebral artery due to the compression of the foreign body (Figure 6). The patient underwent urgent surgery including craniotomy, removal of the foreign body, debridement of the bone fragments and repair of the dura mater (Figures 7-9). He was monitored in the intensive care unit with antiedema, antibiotic and antiepileptic therapies. The patient died on postoperative day 3 because of consisted cerebral damage.

DISCUSSION

Transcranial head injuries constitute only a small part of all traumatic head injuries. Traumatic brain

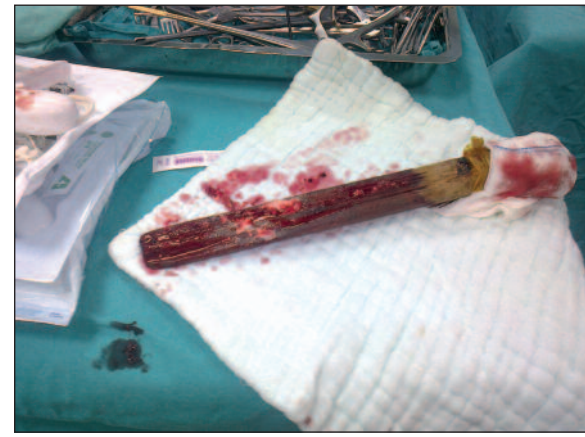

FIGURE 9: The photograph of the foreign body after removal.
(See for colored form http://tipbilimleri.turkiyeklinikleri.com/)

injury occurring at the workplaces comprises about 7% of all traumatic brain injuries.[2] The most common cause of high velocity transcranial injuries is missile. Non-missile high velocity transcranial injuries are unusual conditions, which result in high mortality and morbidity.[3] Transcranial wooden shovel handle injury is a very unusual condition. Because wooden shovel handle has a wide and rough tip and thick body, it may penetrate the cranial bone only with too high velocity.

Rare injuries with fishing harpoon, electrical plug, metal rod, flying wire fragment, wheel of grinder tool, drill bit, nail or needle knife, pencil, lawn darts, toy, plastic hair beads, and screw driver have also been reported.[4-15] A new object, wooden shovel handle was reported in this paper.

Tricco et al. reported 488 work related injuries with traumatic brain injury accounting for 45%. Ninety per cent of those patients were male. Different characteristics and mechanisms compared to those of non-work related traumatic brain injury have been reported.[16]

Nathoo et al. analyzed 597 patients within a 12-year period. GCS score was suggested to be the most effective predictor of outcome in penetrating head trauma.[17] GCS score of our patient was 4 and as expected his prognosis was poor.

Tan et al. recommended that in the presence of an obvious penetrating injury with an embedded foreign body, under no opposite circumstances, any attempt should be made to remove the object. Sudden removal can cause loss of the tampon effect and subsequent intracranial hemorrhage may occur. After clinical and radiological evaluation, attempt to remove the object should be done in the operating room.[5]

Patients with transcranial injury should be evaluated with skull x-rays, CT and CT angiography. Accordingly, surgery was planned based on radiological studies in our patient. Knowledge on vascular lesions gives extra surgical comfort and prevents unexpected and uncontrolled bleeding during surgery. However, in some penetrating head injuries, no radiological abnormalities can be identified despite the presence of vascular lesions. Besides, some transorbital and nasal penetrating injuries may be overlooked because they do not cause scalp lacerations.[18]

Craniotomy, removal of the object, hematoma, devitalized tissues, and bony fragments, and careful hemostasis are necessary for successful surgery. Performance of a wide craniotomy in our patient provided operative comfort for the removal of the object and bony fragments as well as for hemostasis and allowed decompression for cerebral edema. Prophylaxis for infection, epilepsy and tetanus are required in such cases. Operative delay greater than 48 hours from the time of injury increases the incidence of infection from 4.6 to 36.5%.[19]

Prevention is the first step for work related injuries. Prevention provides cost effectiveness. In conclusion, improvements in socioeconomic standards, in conjunction with integration of preventive measures through education and community mobilization, are necessary to reduce penetrating neurotrauma.

REFERENCES

1. Basil A. Prognosis in penetrating brain injury. J Neurotrauma 2001;51(2):44-86.
2. Knapp LW Jr. Occupational and rural accidents. Arch Environ Health 1966;13(4):501-6.
3. Peek-Asa C, McArthur D, Hovda D, Kraus J. Early predictors of mortality in penetrating compared with closed brain injury. Brain Inj 2001;15(9):801-10.
4. López F, Martínez-Lage JF, Herrera A, Sánchez-Solís M, Torres P, Palacios MI, et al. Penetrating craniocerebral injury from an underwater fishing harpoon. Childs Nerv Syst 2000;16(2):117-9.
5. Tan MH, Choudhari KA. Penetrating head injury from an electrical plug. Injury 2003;34(12): 950-3.
6. Regev E, Constantini S, Pomeranz S, Sela M, Shalit M. Penetrating craniocerebral injury caused by a metal rod: an unusual case report. Injury 1990;21(6):414-5.
7. Bhatjiwale MG, Goel A, Muzumdar DP. Transnasal intracranial entry of a flying wire fragment. Br J Neurosurg 2001;15(3):256-8.
8. Corzillius M, Storz C, Gräsner JT. [Case report: severe neck injury caused by an angle grinder]. Anasthesiol Intensivmed Notfallmed Schmerzther 2007;42(2):102-5.
9. Gutiérrez-González R, Boto GR, Rivero-Garvía M, Pérez-Zamarrón A, Gómez G. Penetrating brain injury by drill bit. Clin Neurol Neurosurg 2008;110(2):207-10.

10. Domingo Z, Peter JC, de Villiers JC. Low-velocity penetrating craniocerebral injury in childhood. Pediatr Neurosurg 1994;21(1):45-9.
11. Dujovny M, Osgood CP, Maroon JC, Jannetta PJ. Penetrating intracranial foreign bodies in children. J Trauma 1975;15(11):981-6.
12. Sotiropoulos SV, Jackson MA, Tremblay GF, Burry VF, Olson LC. Childhood lawn dart injuries. Summary of 75 patients and patient report. Am J Dis Child 1990;144(9):980-2.
13. George M, Round J. An Eiffel penetrating head injury. Arch Dis Child 2006;91(5):416.
14. Geller E, Yoon MS, Loiselle J, Crisci KL, Bierbrauer KS. Head injuries in children from plastic hairbeads. Pediatr Radiol 1997;27(10): 790-3.
15. Bozzeto-Ambrosi P, Costa LF, Azevedo-Filho H. Penetrating screwdriver wound to the head. Arq Neuropsiquiatr 2008;66(1):93-5.
16. Tricco AC, Colantonio A, Chipman M, Liss G, McLellan B. Work-related deaths and traumatic brain injury. Brain Inj 2006;20(7):719-24.
17. Nathoo N, Boodhoo H, Nadvi SS, Naidoo SR, Gouws E. Transcranial brainstem stab injuries: a retrospective analysis of 17 patients. Neurosurgery 2000;47(5):1117-22; discussion 1123.
18. Tutton MG, Chitnavis B, Stell IM. Screwdriver assaults and intracranial injuries. J Accid Emerg Med 2000;17(3):225-6.
19. Wylen EL, Willis BK, Nanda A. Infection rate with replacement of bone fragment in compound depressed skull fractures. Surg Neurol 1999;51(4):452-7.