# An unusual occupational accident – a case of penetrating head injury

# Neobvyklý pracovní úraz – případ penetrujícího poranění hlavy

#### Dear editor,

Work-related traumatic brain injury may lead to catastrophic results and serious sociomedical problems [1]. Head injury may develop due to various reasons such as falling from a height or the same level or an object hitting the head. The use of protective equipment reduces the risk of traumatic brain injury [2].

Penetrating head injuries have high mortality and morbidity due to their high potential to damage neural tissues. Direct neural tissue damage, infection, dural injury, bleeding due to a foreign body at the time of trauma or during its removal, and cerebral edema are some potential problems; their treatment is difficult, which often requires a multidisciplinary approach [3]. We herein present the case of a patient who was injured with an unusually large metal object



Fig. 1. Condition of the patient when he was first examined in the emergency room.

Obr. 1. Stav pacienta při prvním vyšetření v ambulanci urgentního příjmu.

in the frontal region. The management and problems of such cases are discussed within generally accepted principles.

A 40-year-old male patient was injured with a metallic rod that fell on his head from a height while working at a construction site without using protective equipment or helmet. Based on the examination in the emergency room, the patient was conscious, opened his eyes upon verbal stimulation, and obeyed verbal commands (Glasgow Coma Scale: E3V4M6). The pupils were isochoric, direct/indirect light reflexes were bilaterally positive and there were no significant signs of lateralization. However, due to his state of consciousness, the patient's vision could not be examined clearly. Respiration was normal, and his vital signs were stable. There was a round, approximately 70-cm long metallic rod with a diameter of 2 cm that entered the patient's head from the left frontal, moved toward the medial, and was visible in the upper palate inside the mouth (Fig. 1). Brain CT and paranasal sinus tomography revealed a metallic body that entered the cranium from the left frontal, crossed the left orbit posteriorly, passed through the left maxillary sinus, and ended in the upper palate (Fig. 2A). The departments of eye diseases and plastic and reconstructive surgery were consulted and reported an intact eyeball.

The patient was operated following prophylactic antibiotic therapy and surgical preparation. Under general anesthesia, the foreign metallic body was shortened using bone scissors. Subsequently, bicoronal skin incision was performed, and a  $8 \times 5$  cm bifrontal bone flap was removed. The dura was enlarged around the foreign body. After determining that there was no massive bleeding in the vicinity of the foreign body, the foreign body was removed. No major tissue bleeding occurred. Following coagulation, the skin layers were primarily closed. As the The Editorial Board declares that the manuscript met the ICMJE "uniform requirements" for biomedical papers.

Redakční rada potvrzuje, že rukopis práce splnil ICMJE kritéria pro publikace zasílané do biomedicínských časopisů.

## A. Arpa<sup>1</sup>, P. Aydin Ozturk<sup>1</sup>, T. Yilmaz<sup>1</sup>, B. Aslanoglu<sup>2</sup>

- <sup>1</sup> Department of Neurosurgery, Dicle University Medical Faculty, Diyarbakir, Turkey
- <sup>2</sup>Department of Neurosurgery, Health Science University Gazi Yasargil Education Research Hospital, Diyarbakir, Turkey

### $\bowtie$

Pinar Aydin Ozturk, MD Department of Neurosurgery Dicle University Medical Faculty Diyarbakir Turkey e-mail: aydinpinar12@gmail.com

foreign body that penetrated into the intracerebral area was infected, antibiotic therapy (ceftriaxone 2x 2 g and metronidazole 3x 500 mg) was administered for 5 days. Since there was no increase in inflammatory parameters or signs of infection, antibiotic therapy was discontinued upon the recommendation of the infectious diseases department. As the patient's neurological examination was normal, he was transferred to the clinic after 1 day of follow-up in the intensive care unit during the postoperative period. Postoperative brain CT revealed no bleeding (Fig. 2B). Temporary loss of vision in the left eye continued for approximately 1 month. No evidence of cerebrospinal fluid leak was observed during follow-up, therefore, no dural repair was planned for the anterior cranial fossa. There were no permanent sequelae in the patient, and he has been followed up for 7 years.

# proLékaře.cz | 30.3.2025 AN UNUSUAL OCCUPATIONAL ACCIDENT – A CASE OF PENETRATING HEAD INJURY

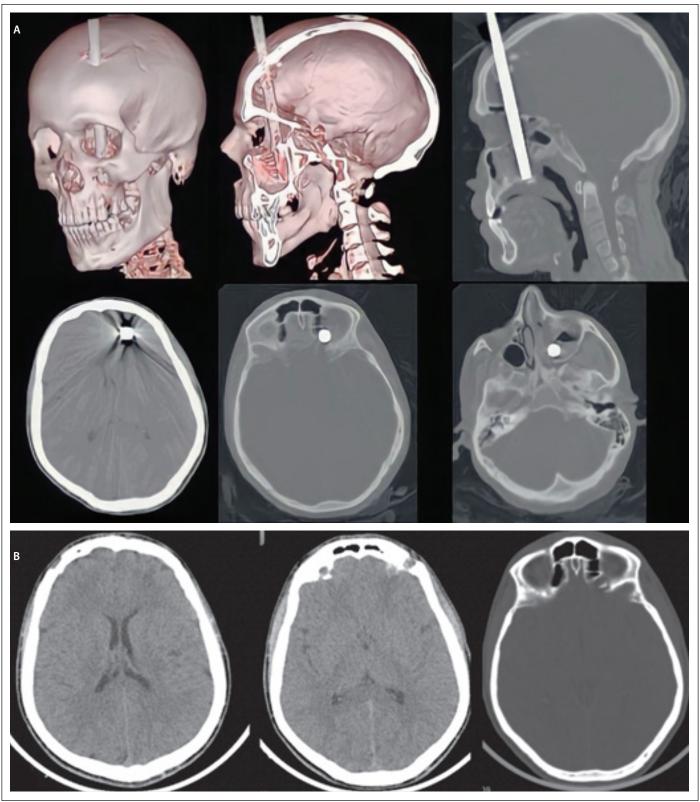


Fig. 2. (A) Preoperative brain CT; (B) postoperative brain CT. Obr. 2. (A) Předoperační CT mozku; (B) pooperační CT mozku.

Occupational traumatic brain injury is a global health problem that reduces the quality of life and productivity, may lead to death, and has high health and social costs [3]. The use of helmet reduces occupational traumatic brain injuries [4]. We evaluated the peroperative and postoperative processes of a patient who developed occupational traumatic brain injury from a falling object as a result of not using protective equipment.

Penetrating head injuries lead to high mortality and morbidity due to their destructive effects on the structures of the central nervous system; their treatment is difficult and patients require special care [4]. The severity of the trauma depends on the depth and area of penetration, its relationship with vascular injury, and the presence of hematoma [5,6]. Following an initial assessment of the patient's respiration and hemodynamic status, the urgency of foreign body removal depends on the extent of the injury and the associated vital structures. Rapid intervention limits the risk of postoperative infection and increases the rate of recovery without sequelae [7]. CT reveals the intracranial anatomy and accurately shows the location of the bone and foreign body. Further, it facilitates effective surgical treatment by providing rapid visualization of intracranial hematoma and contusions [8]. In penetrating orbitocranial injury cases, evaluation of the life functions of the patient at the time of admission as well as the shape, localization, penetration, and adjacency of the foreign body play an important role in the decision on surgery. The intracranial end of the foreign body should be well recognized. Intracranial foreign bodies with smooth contours and penetrating transorbital extension can be slowly removed under CT guidance, while keeping a surgical team alert for any bleeding [9]. In the presented case, we believe that rapid evaluation of the patient, multidisciplinary approach including consultation with the relevant clinics regarding radiological imaging, and controlled removal of the foreign body under operating room conditions minimized perioperative complications.

The main postoperative complications are reportedly infections due to the long-term presence of a foreign body, bleeding, neuralgia, and visual disturbances [10]. Potential complications were prevented in our patient as a result of rapid intervention and antibiotic therapy.

Head injuries are important among occupational accidents. Therefore, the use of protective equipment is vital. Penetrating head injuries can be fatal either during an injury or during the removal of the object causing the injury. To minimize mortality and morbidity, a multidisciplinary approach, comprehensive preoperative clinical and radiological evaluations, and rapid intervention are necessary. Morbidity and mortality can be minimized with a multidisciplinary approach, preoperative evaluation, surgical method selection and postoperative management.

# Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

# **Conflict of interest**

The authors declare they have no potential conflicts of interest concerning drugs, products, or services used in the study.

### References

1. Kim SC, Ro YS, Shin SD et al. Preventive effects of safety helmets on traumatic brain injury after work-related falls. Int J Environ Res Public Health 2016; 13(11): 1063. doi: 10.3390/ijerph13111063.

2. Haider AH, Saleem T, Bilaniuk JW et al. An evidencebased review: efficacy of safety helmets in the reduction of head injuries in recreational skiers and snowboarders. J Trauma Acute Care Surg 2012; 73(5): 1340–1347. doi: 10.1097/TA.0b013e318270bbca.

**3.** Baron SL, Steege AL, Marsh SM et al. Nonfatal work-related injuries and illnesses – United States, 2010. MMWR Suppl 2013; 62(3): 35–40.

**4.** Erdogan E, Gönül E, Seber NÇ. Craniocerebral gunshot wounds. Neurosurg Quarterly 2002; 12(1): 1–18. doi: 10.1016/S0303-8467(97)81613-7.

5. Khalil N, Elwany MN, Miller JD. Transcranial stab wounds: morbidity and medicolegal awareness. Surg Neurol 1991; 35(4): 294–299. doi: 10.1016/0090-3019(91)90008-w.

**6.** Kieck CF, de Villiers JC. Vascular lesions due to transcranial stab wounds. J Neurosurg 1984; 60(1): 42–46. doi: 10.3171/jns.1984.60.1.0042.

7. Villarmé A, Savoldelli C, Jean-Baptiste E et al. Multidisciplinary surgical management of an unusual penetrating foreign body of the face. Eur Ann Otorhinolaryngol Head Neck Dis 2018; 135(5): 361–363. doi: 10.1016/ j.anorl.2018.05.011.

**8.** Cooper PR, Maravilla K, Cone J. Computerized tomographic scan and gunshot wounds of the head: indications and radiographic findings. Neurosurgery 1979; 4(5): 373–380. doi: 10.1227/00006123-197905000-00 001.

**9.** Ildan F, Bağdatoğlu H, Boyar B et al. The nonsurgical management of a penetrating orbitocranial injury reaching the brain stem: case report. J Trauma 1994; 36(1): 116–118. doi: 10.1097/00005373-199401000-00 020.

**10.** Cohen MA, Boyes-Varley G. Penetrating injuries to the maxillofacial region. J Oral Maxillofac Surg 1986; 44(3): 197–202. doi: 10.1016/0278-2391(86)90108-4.

# Impakt faktor časopisu Česká a slovenská neurologie a neurochirurgie pro rok 2022 činí **0,5**.