

Case Report

Transorbital penetrating head trauma leading to serious cerebral edema - A case report

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A B S T R A C T

Penetrating transorbital head injuries are rarely seen. We present a 6-year old male patient who was referred to our department after a wooden stick penetrated his right eye. On admission his general condition was well and he showed no neurologic deficits. On his cranial computed tomography (CT) there was a fracture on his right orbital wall and minimal subarachnoid hemorrhage in his right frontal lobe. On later follow-ups the patient's condition worsened and his control CT showed diffuse cerebral edema. The patient underwent emergent decompressive surgery. Due to this immediate intervention the patient was released from the hospital with no major deficits later. Up to our knowledge, there are no cases in the literature reported in which decompressive craniectomy was necessary after a transorbital penetrating head trauma.

Introduction

Penetrating transorbital head injuries are an uncommon type of injury and are mostly seen after assault injuries [1] and consist of only 0.4% of all head injuries [2].

The orbit is shaped like a horizontal pyramid which permits three entry zones in transorbital trauma: from the orbital roof, from the superior orbital fissure or the lateral wall of the orbit [3].

Most of the time the patients do not recognize the history of the trauma so that making the diagnosis is difficult when no major macroscopic injury is seen. Patients may not show any kind of major deficit on admission. Acute injuries include intracerebral hematoma, contusion and subarachnoid hemorrhage. But days, weeks and months later late onset injuries like cerebral edema, seizures, meningitis or abscess may develop [4,5].

Case report

A 6-year old male was admitted to our emergency department after a wooden stick penetrated his right eye and came out after falling on the street. On admission, his general condition was well and Glasgow Coma Scale (GCS) was 15. There was widespread periorbital edema on his right eye. Pupils were isochoric, pupil reflexes globe movements were intact bilaterally. He showed no motor or neurologic deficits. On cranial computed tomography (CT) a displaced fracture on the right superior and posterior orbital wall and right frontal subarachnoid hemorrhage (SAH) were observed. The optic nerve was intact (Fig. 1).

Ophthalmology was consulted and tetanus vaccine was administered. 2 h later the patient's condition worsened and control CT showed cytotoxic edema on the right hemisphere. 4 h after admission the patient had 40 °C fever. Due to cytotoxic edema lumbar puncture was not considered. A single dose of 1 mg/kg Mannitol was administered for the cerebral edema and empirical antibiotics in

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Fig. 1. Cranial CT on admission, axial view: bone fragment of the displaced right posterior wall and minimal subarachnoid hemorrhage.

form of Ceftriaxone-Vancomycin were given.

On the following day, 12 h after admission, a decrease in GCS was observed. Heavy effusion with parenchymal character was coming from his right eye (Fig. 2). Diffuse cerebral edema (Fig. 3a) with progression of the SAH were seen on CT (Fig. 3b) and the patient underwent immediate surgery.

An external ventricular catheter (EVD) with an intracerebral pressure monitoring probe was placed. Beginning pressure was measured as 32 mm Hg. After sufficient cerebrospinal fluid (CSF) drainage a wide 10×10 cm frontotemporal craniectomy was performed. Brain parenchymal invasion in the right orbital canal was observed. The free bone fragments of the orbit were removed and the dura was repaired using galeal graft and the orbital wall was reconstructed. Due to cerebral edema the bone flap was not put back and placed in the subcutaneous tissue under the intercostal space. Regression of the cerebral edema was observed in the post-operative cranial CT (Fig. 4). ICP was measured as 6 mm Hg. The patient was extubated 6 days after surgery. He was cooperative for



Fig. 2. Cranial CT 12 h after admission, axial view: right orbital effusion with parenchymal character.

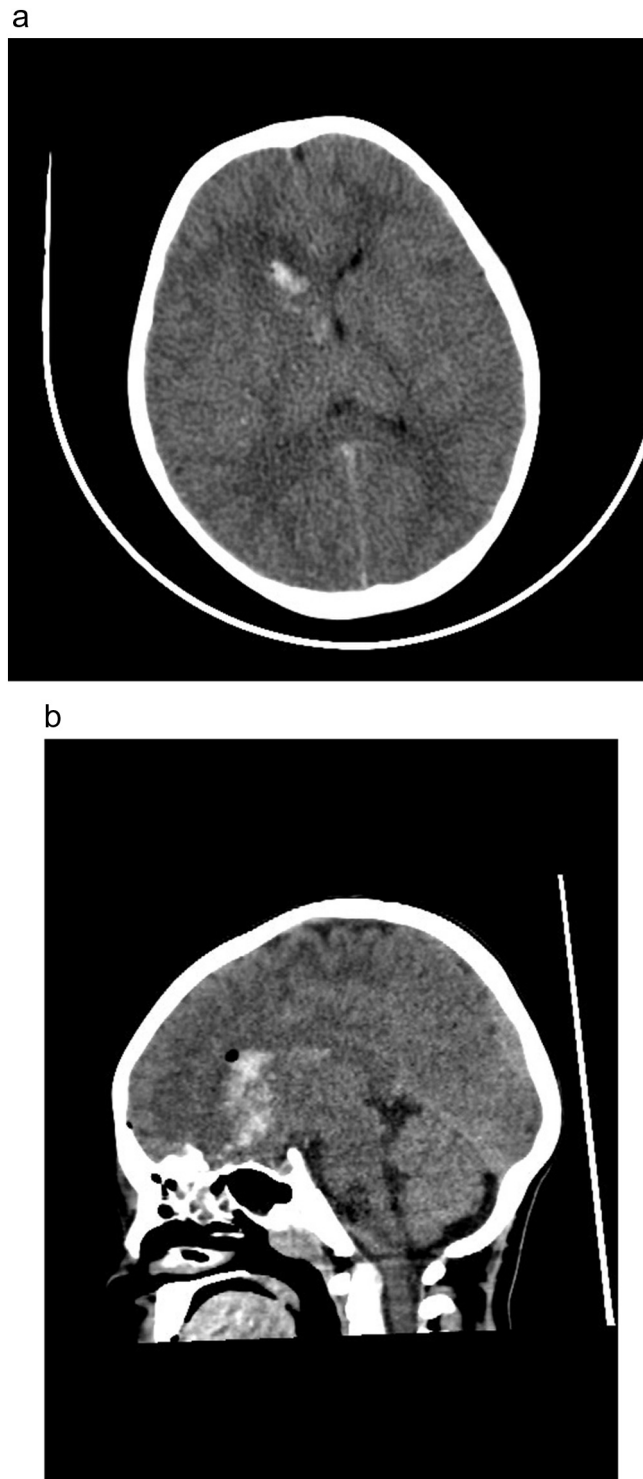


Fig. 3. a: Cranial CT 12 h after admission, axial view: diffuse cerebral edema.
b: Cranial CT 12 h after admission, sagittal view: progression of the subarachnoid hemorrhage.

simple verbal commands. No motor deficit was observed and was released from hospital after 21 days without any motor or neurologic deficits. On his third month follow-up he did not show any complaints and underwent cranioplasty surgery from his own autologous bone graft harvested from his subcutaneous tissue (Fig. 5).

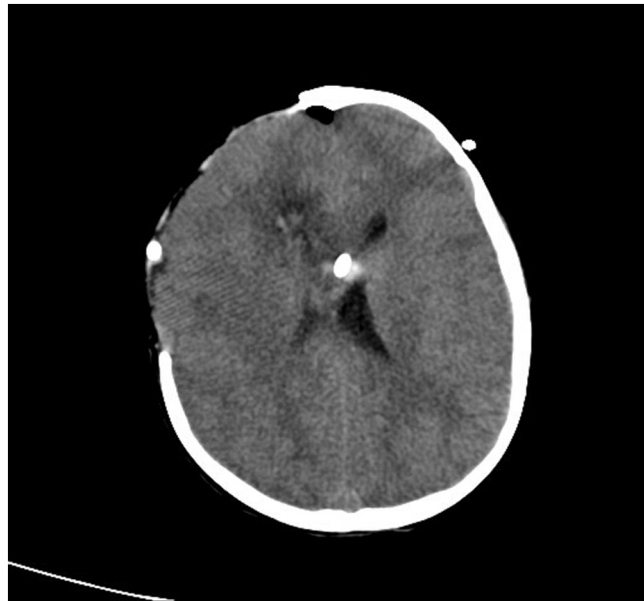


Fig. 4. Postoperative cranial CT, axial view: frontotemporal decompression with external ventricular drain placement.

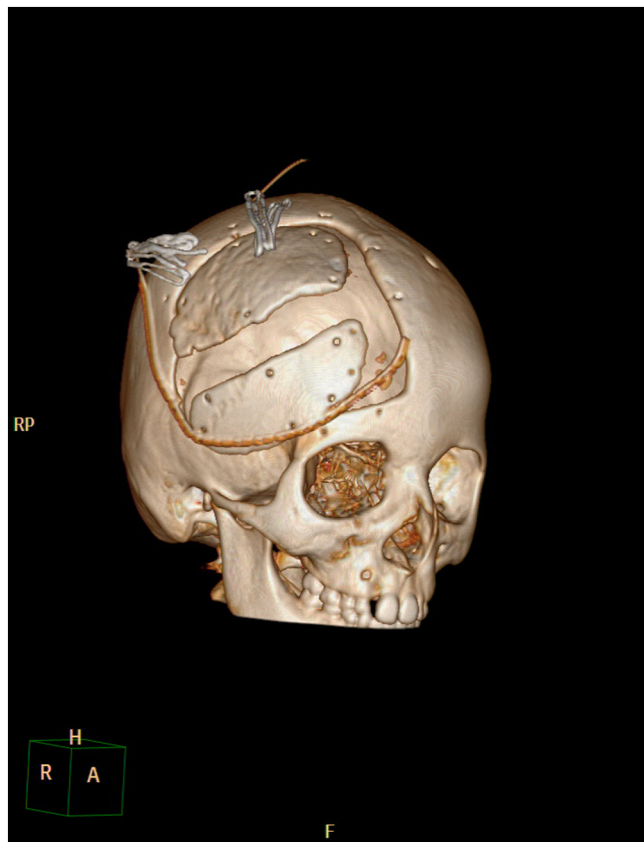


Fig. 5. Postoperative cranial CT after cranioplasty, 3D-reconstruction: cranioplasty with autologous bone graft harvested from subcutaneous tissue.

Discussion

Penetrating head traumas are rare and brain damage due to transorbital trauma are a much rarer condition. In previous cases trauma due to a paint brush [6], bicycle brake handle [7], chopstick(?) and as in our case, wood were reported. CT is the gold standard for diagnosing transorbital head injury caused by foreign objects [8] but it can be quite challenging. As an organic material, wood absorbs water and can mimic air on CT. The Hounsfield unit (HU) of wood range between -500 and -200 HU, whereas HU of air is -1000 [9]. There was no wood in the parenchyma in our case because it came out after piercing the right orbital wall. Although the patient was in good condition on admitting to the emergency department he worsened within hours. This shows the potential life conditioning risk for this kind of traumas. In transorbital head traumas the likelihood of neurologic impairment on admission is rare. Following acute injuries are intracerebral hematoma, contusion or as in our case subarachnoid hemorrhage. But late onset injuries like cytotoxic edema might follow so that the patient must be monitored carefully. As wood is a porous organic material it works as an ideal harvesting field for bacteria. Fever due to infection from the dirty wood is common and must be taken notice. There is a risk for meningitis in 64% of the cases and a 48% risk for cerebral abscess [10] and mortality ranges from 12.5 to 25% [5]. Meningitis usually occurs 12–24 h after the trauma. But also cases in which meningitis developed after 2–3 months were reported [11].

Conclusion

Diagnosis and treatment of transorbital head trauma is a challenging subject. Careful history taking and physical examination must be done and it is very important that the physicians know about the early and late complications of the traumas. To our knowledge, no cases were reported in the literature in which compressive craniectomy was needed after transorbital head trauma. Early decompressive surgery and the right choice of antibiotics might result into managing late-onset intracranial complications without lethal outcomes.

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