

# Transorbital penetrating head injury by a toilet brush handle

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## Abstract

**Background** Transorbital penetrating brain injuries are rare lesions without defined therapy standards.

**Clinical presentation and intervention** A male patient presented at our institution with a toilet brush handle in the right cerebral hemisphere. CT imaging identified the object entering the right orbit and having crossed the right hemisphere in the ventricular plane. After performing a medium-sized craniotomy, the object was removed step-by-step under monitoring with an intraoperative CT scan to ensure no involving major hemorrhage.

**Conclusion** Transorbital penetrating brain injuries are treated best by utilizing all up-to-date technical developments such as intraoperative CT-scanning to increase the safety in the management of such exceptional lesions with increased risk of immediate life-threatening intracranial bleeding.

**Keywords** Traumatic brain injury · Foreign body · Intraoperative CT

## Introduction

Orbital injuries are commonly seen in the emergency department but they seldomly involve the intracranial compartment. Non-projectile penetrating traumatic brain injuries due to unusual foreign bodies entering the brain via the orbit do not occur very frequently [1]. This is the first report describing a transorbital craniocerebral injury caused by a toilet brush handle as well as the removal of the foreign body under control of an intraoperative CT-scan.

## Case report

A 55-year-old man experienced a severe open head injury as result of a generalized seizure while sitting on the toilet. He lost consciousness and fell facedown onto an upright standing toilet brush, which entered the right orbit (Fig. 1a–b). CT-scanning substantiated these findings showing that the object destroyed the orbital roof and crossed the right hemisphere in the ventricular plane at a depth of 9 cm. CT-angiography showed no interference with larger cerebral vessels (Fig. 1c–d). After performing a right-sided fronto-temporo-parietal craniotomy the object was removed step-by-step under direct vision from the entry point, guided by an intraoperative CT-scan. No evidence of ongoing bleeding or brain contusion hemorrhage was noted intraoperatively (Fig. 1e). Follow-up CT detected a brain abscess within the area of the former trajectory, which resolved after neuronavigated puncture and prolonged systemic antibiotic therapy (Fig. 1f). Microbiological cultures of abscess material as well as the subsequent polymerase chain reaction DNA sequencing remained sterile. After discharging the patient 49 days later to a rehabilitation

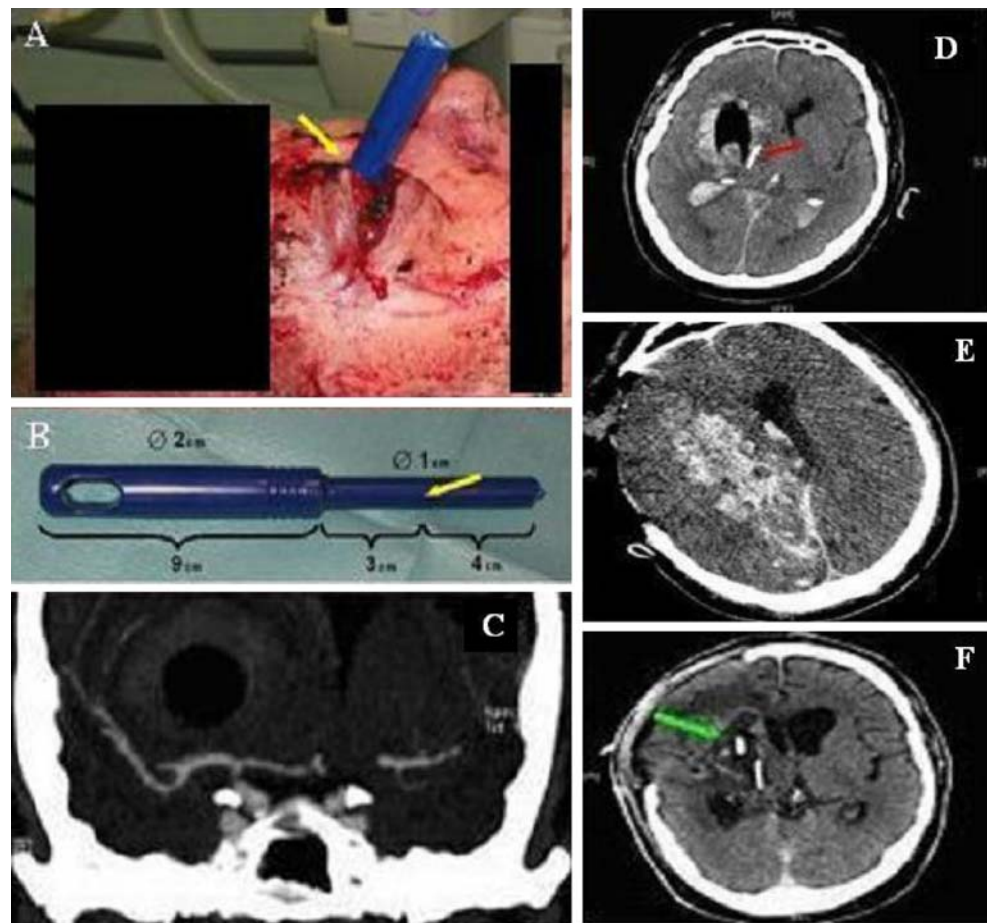
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**Fig. 1** **a** The plastic toilet brush handle entered the right orbit (lateral view). **b** Toilet brush handle after removal. **c** Contrast-enhanced CT-angiography (coronal section) shows the relationship between toilet brush handle and vascular structures on the *right*. **d** Axial CT-scan demonstrates intraparenchymal tract of the toilet brush handle (hypodense, “air-like” signal). Arrows indicate displaced orbital roof bone fragments. Concomitant contusions, ventricular bleeding and midline displacement can be seen. **e** Axial, native CT-scan obtained intraoperatively immediately after removal of the foreign object demonstrates a hemorrhagic contusion along the trajectory without the need for immediate evacuation. **f** Consecutive axial contrast-enhanced cranial CT (day 12 post-trauma) reveals a hypodense mass occupying the right frontal lobe, with a hyperdense ring and cerebral edema around the lesion suggesting cerebral abscess



facility, he remained in a “severely disabled” state according to the Glasgow Outcome Scale.

## Discussion

Penetrating craniocerebral damages are among the most fatal injuries of the head and usually have a poor outcome. Surgical treatment is still the mainstay of management in these patients. In the absence of evidence-based studies, a surgical treatment standard for e.g. craniotomy before removal of the object has not yet been determined. However, in some reported patients craniotomy seemed to promote survival patients with an extensive transorbital brain injury [3]. A rational treatment strategy should focus on preventing further brain damage. The aim of primary surgical management is prompt craniotomy for decompression in extended transorbital brain injuries and removal of the foreign object. Early follow-up cranial CT-scans are strongly recommended to detect residual or delayed

hematomas with mass effect and/or increased intracranial pressure, which may need re-operation. However, severe bleeding and brain swelling may occur during the removal of the object and cause rapid serious deterioration of the patient. Intraoperative CT may help in recognizing and treating this event. Complications such as a brain abscess or meningitis occur in 48% and 64% of patients with craniocerebral injuries, respectively [4]. In approximately 20% of the patients, microbiological cultures of abscess material remain sterile [2]. Polymerase chain reaction is described as an alternative, especially in the identification of slow-growing and fastidious organisms [2]. However, in our patient, we were not able to demonstrate a causative pathogens despite the use of both bacterial cultures and PCR techniques.

Transorbital penetrating brain injuries are treated best utilizing all up-to-date technical developments including intraoperative CT-scanning to increase the safety if there is a risk of immediate life-threatening intracranial bleeding.

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