

# Penetrating Orbitofrontal Foreign Body: Case Report

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Indian J Neurotrauma 2018;15:43–46

## Abstract

Orbitofrontal foreign-body injuries comprise a major cause of all facial injuries referred to a neurosurgeon. The authors hereby present an unusual case of a pressure regulator of a domestic pressure cooker impacted into the orbit and extending through the orbital roof into the basifrontal cortex. The globe was intact externally with no obvious sign of such a large object impacted behind the globe. On imaging, the foreign body was found to have fractured the orbital roof with one end protruding into the basifrontal cortex. A transcranial approach was taken to remove the object with removal of the orbital rim and roof to reach the object. After successful retrieval of the metallic body, all displaced bone fragments were removed and the dural closure was done in a water-tight manner. The vision could not be salvaged, most likely due to damage to the optic nerve. However, the globe was left intact and the ocular movements were normal. An important factor to consider in removal of such foreign bodies is that the bone fragments that get impacted should be meticulously removed and the dural tears should be sealed to prevent any intracranial infections and cerebrospinal fluid leaks. Removal of the orbital rim helps in adequate exposure of the retro-orbital space and the basifrontal dura.

## Keywords

- ▶ pressure cooker
- ▶ foreign body
- ▶ orbitofrontal
- ▶ pressure regulator

## Introduction

Penetrating orbital injuries can have devastating consequences with visual loss and intracranial trauma being the most devastating complications. The goals of treatment in such cases are not only to remove the foreign bodies but also to ensure intactness of the dura and removal of any fractured bone that may have been impacted in the frontal cortex. A pressure cooker is a sealed pot with a valve that controls the steam pressure inside. As the pot heats up, the liquid inside forms steam. This raises the pressure in the pot. This high pressure raises the boiling point of the water in the pot. The cover of a pressure cooker has a vent pipe and a pressure regulator at the center, which maintains approximately 15 lbs of pressure that is ideal for household cooking. We hereby present an unusual case of penetrating orbital injury due to a pressure cooker regulating valve injuring the globe, orbital roof, and basifrontal brain.

## Case Report

A 30-year-old man presented to us with an orbital penetrating injury to the right eye following a projectile from a pressure cooker malfunction. On examination, he had a hypotonic globe most likely due to rupture with feature of orbital cellulitis and subconjunctival hemorrhage. There was complete loss of vision in the right eye. There were no lid or periorbital skin tears (▶ **Fig. 1**). Immediate X-Ray and computed tomography (CT) scans were done, which showed the large 3 by 2.5 cm metallic head of the pressure regulator of a pressure cooker impacted in the orbital roof, fracturing the orbital roof bone and entering the basifrontal region along with the bone fragments. The foreign body had completely penetrated the medial canthal region, and there was no externally visible part of the same (▶ **Figs. 2–5**). The patient was hemodynamically stable and had a Glasgow coma scale of 15. He was immediately posted for surgery via a

## received

January 16, 2018

## accepted

April 2, 2018

## published online

September 6, 2018

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DOI <https://doi.org/>

10.1055/s-0038-1669491.

ISSN 0973-0508.



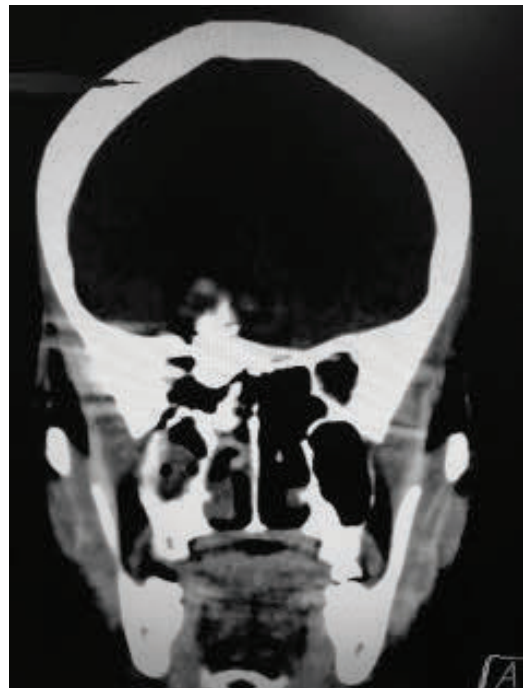
**Fig. 1** Clinical photograph of patient at presentation. Absence of any lid or periorbital tear.



**Fig.3** Preoperative 3D computerized tomography image.



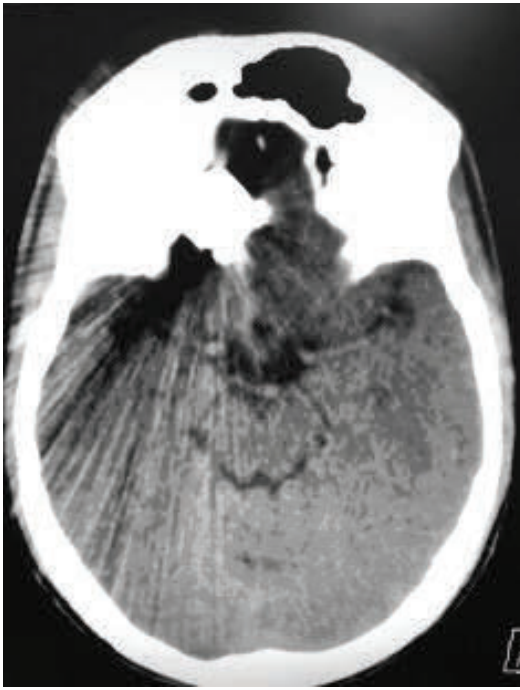
**Fig. 2** Preoperative roentgenogram image showing the foreign body impacted in the orbital roof.



**Fig. 4** Preoperative coronal computed tomograph (CT) image.

transcranial approach. Preoperative radiologic confirmation was done using a C-arm on table, and right-sided supraorbital craniotomy was done with removal of orbital rim (► **Fig. 6**). The orbital roof was nibbled till the metallic body was palpable. Periorbital fascia and fat was intact above the globe; however, the globe was lax. The dura was retracted superiorly, and the upper limit of the foreign body was identified

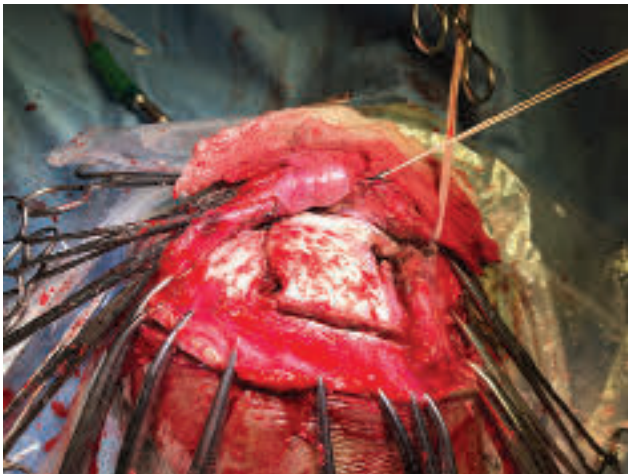
first passing through a dural tear. Surrounding comminuted bone fragments were removed in the process. The upper end was grasped with a forceps and pulled out taking care not to cause further damage to the dura or brain parenchyma. All impacted bone fragments were removed, and hemostasis was achieved in the brain parenchyma. Removal of the foreign body was confirmed with the C-arm (► **Figs. 7, 8**). Dural



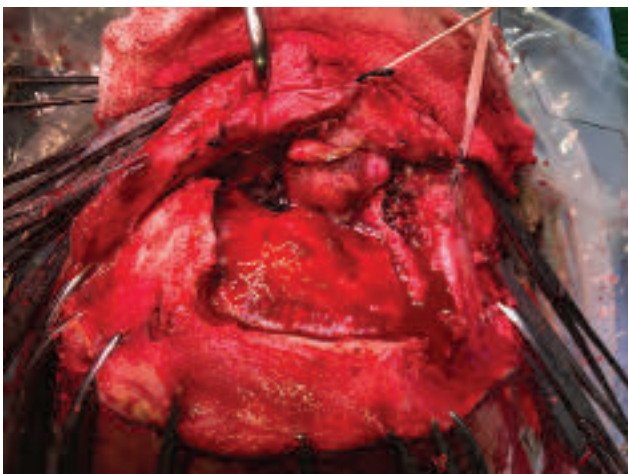
**Fig. 5** Preoperative axial computed tomograph (CT) image showing small frontal contusion.



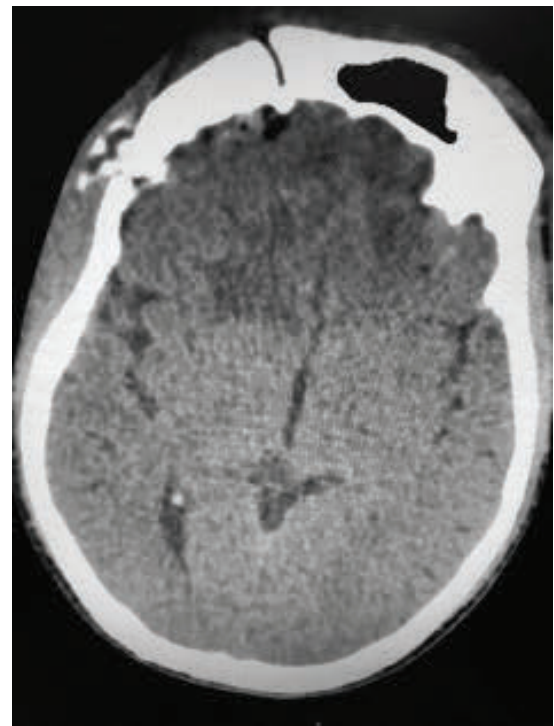
**Fig. 8** Foreign-body specimen.



**Fig. 6** Intraoperative image of the supraorbital craniotomy.



**Fig. 7** Intraoperative image after removal of the foreign body.



**Fig. 9** Postoperative computed tomograph (CT) axial image showing no residual impacted metal or bone fragments.

tears were sealed using muscle patches and sutures and reinforced with fibrin glue. Bone flap was repositioned back, and the patient was extubated. He had no neurologic deficits postoperatively, and CT scan confirmed complete removal of the bone fragments and the foreign body (→**Fig. 9**). As the globe integrity and lid integrity were adequate, there was no need of evisceration in the patient. Right-sided vision, however, could not be salvaged.

## Discussion

Penetrating ocular injuries are a leading cause of blindness. Domestic penetrating injuries are an underreported entity compared with workplace injuries.<sup>1</sup> Craniofacial penetrating injury constitutes 0.4% of all injuries to the brain and is life threatening. Orbital roof is the most common site for orbital foreign-body injuries due to the thin bone of the roof and also due to leaning back during any blast or foreign-body impact.<sup>2</sup> Accidental pressure cooker explosion can be compared with any other blast injury wherein there may be release of gases (steam), metal fragments (lid or nozzle), and of hot contents (food material and liquid).<sup>3</sup> Blast injuries cause damage due to primary, secondary, and tertiary mechanisms.<sup>4</sup> Domestic ocular injuries are usually caused by fist, stick, balls, fire crackers, bursting bottles, needles, and other sharp objects. A previous study of causes of ocular trauma stated pressure cooker explosion as the cause in 4.6% of these cases.<sup>5</sup> However, complete penetration of the pressure regulator of a pressure cooker into the orbit and anterior cranial fossa is very rare. Meticulous removal of all fragments of impacted bone and

the foreign body with debris and a proper dural closure are essential in such a situation to avoid further complications.

### Conflict of Interest

There are no conflicts of interest in this report.

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