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# A challenging case of an orbitocranial wooden foreign body in a child

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## ABSTRACT

Orbitocranial penetrating injuries (OCPI) caused by wooden foreign bodies are very rare and life-threatening. They might pose unusual diagnostic and surgical challenges. Swift identification through appropriate imaging techniques and prompt extraction are imperative. We herein present the case of a young girl who has experienced an orbitocranial injury caused by a wooden foreign body (WFB) due to striking the tree branches while playing. She underwent exploration, and the foreign body was removed through the entry wound with an intracranial microscopic control through a modified orbito-zygomatic approach. This case describes the clinical manifestation, radiographic features, and treatment of this rare trauma, with an emphasis on imaging diagnosis and multi-disciplinary management.

Keywords
orbito-cranial penetrating injury,
wooden foreign body,
craniotomy,
infection

## INTRODUCTION

Orbitocranial penetrating injuries (OCPI) are infrequent occurrences , accounting for 24% of penetrating head traumas in adults and 45% in children [1,3,4,5,12] . The cause of injury could be metal, glass, wood, or plastic objects. Nevertheless, transorbital penetrating intracranial injuries (TOPII) by WFBs are extremely uncommon[5].Usually resulting from high-speed trauma and, occasionally, minor incidents . Much of what we know regarding orbitocranial wood is gleaned from case reports. These injuries pose severe risks due to their proximity to crucial structures such as the brain, nerves, and blood vessels they could lead to blindness, neurological deficits, and even death[1,3,4,6]. Besides to this , the risk of infection, panophthalmitis, or fistula formation is heightened, as the WFB can act as a potential medium for infection. Here we present a very rare case of transorbital penetrating intracranial injury by a WFB in a child with a quite satisfactory result without fatal long-term complication.

## CASE PRESENTATION

We present a case of a 10 year-old girl who has fallen down onto a tree branch while playing outside and was struck by a stick in the left periocular region and lacerated her left upper eyelid. On examination , the child was conscious and oriented, with a Glasgow coma scale score

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of 15. She reported headaches, nausea and vomiting, With no motor or sensory neurodeficit . Initial ophthalmologic examination was limited. It has revealed ptosis, periorbital edema, chemosis and subconjunctival hemorrhage with no vision loss. Extraocular motility was moderately limited in up gaze. External examination was significant for a stick of a tree penetrating the left upper eyelid just above the medial canthus. A 2.5cm section of the wood was extending externally (Figure.1).

**Figure 1.** Left eye of the patient at presentation, showing the external portion of the wooden foreign body.

An immediate non-contrast CT scan of the brain and orbit was performed which revealed a linear-shaped with low density foreign body that penetrated the medial orbit plane passing through superior orbital fissure, extending posteriorly up to the temporale fossa, in intimate contact with homolateral internal carotid artery (supraclinoid segment) and oculomotor nerve (Figure.2).

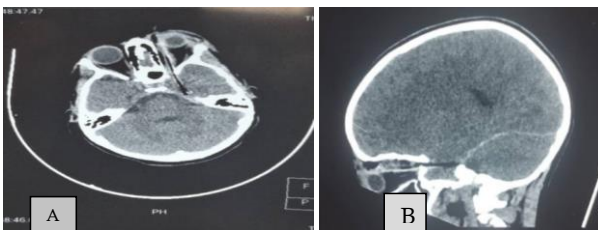


**Figure 2.** CT scan(A) axial and (B) sagittal views showing the hypodense linear-shaped wooden foreign body.

The case was thoroughly discussed with the ophtalmological team.The patient underwent a craniotomy with a modified orbitozygomatic approach. We decided to use this approach not only because it was the closest approach to the foreign body position but also to get a clear visualization of the foreign body through the intracranial cavity, in order to have an inside control and also it is good for cleaning up the wood fragments that entered the intracranial cavity. The patient was lying in the supine position . Craniotomy was performed and the dura was opened. The brain parenchyma was retracted and the foreign body was seen in the carotido-occulomotor triangle .The removal of the foreign body was performed from the outside, through the entry wound, slowly under a microscopic control from inside. After that, exploration and irrigation with hemostasis were done meticulously (Figure 3).

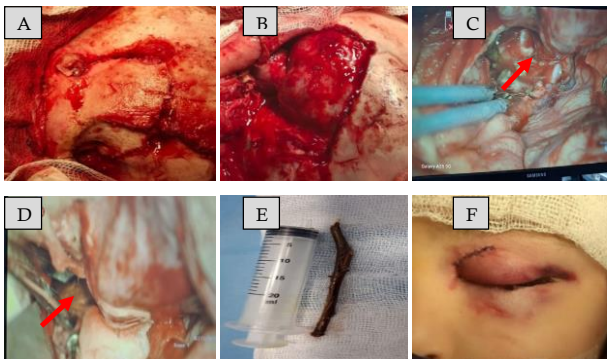


**Figure 3.** Intra-operative photographs **(A,B)** Modified orbito-zygomatic approach, **(C,D)** Microscopic view of the WFB in the temporal fossa, **(E)** The WFB after removed from intracranial space, **(F)** The entry wound closure after extraction of the WFB.

**Figure 4.** Clinical appearance of the patient 3 months after; partial recovery of ptosis and ocular motility (up gaze) with no signs of infection.

Postoperatively, the patient was admitted to ICU where broad-spectrum antibiotic and antifungal were administered. No signs of infection were detected and the patient was recovered and discharged after 7 days.

Following removal of the wood, the patient's periocular edema and erythema resolved. During subsequent examinations over the past three months, the patient has done remarkably well. She had no cellulitis or other signs of infection indicating residual WFB. A partial recovery of ptosis and ocular motility was obtained (Figure.4).

## Discussion

The presence of a WFB in the orbit, extending into the intraparenchymal region of the left temporal

lobe, is a rare occurrence that can lead to severe injuries to both orbit and brain.The diagnosis and management of orbitocranial WFB are difficult for several reasons. Initial history is often incomplete or misleading. External signs of trauma may be either minimal or absent.In our case fortunately a puncture wound with an external section of the foreign body were seen on intial examination.

**Intracranial Penetration**

The structural characteristics of the orbit play an important role in the pathogenesis of orbital injuries with intracranial penetration. Its pyramidal configuration tends to deflect foreign objects toward the orbital apex and skull base, sometimes resulting in intracranial penetration[7]. There are three usual routes through which the foreign body can penetrate intracranially; through the orbital roof route, superior orbital fissure, and the optic canal[8]. The first one is the most common cause[8]. As pointed out by Miller et al[11] the relatively thin bones of the orbital roof and apex provide the portal of least resistance for penetrating injury to the cranial vault. In addition, there may be a natural tendency for neck hyperextension as a reflex to avoid injury, channeling the orbitocranial WFB toward the orbital roof.

The second most common site is through the superior orbital fissure as seen in this case which may affect the optic nerve, cavernous sinus, carotid artery, and even the brain stem resulting in a serious injury. In our case, the patient had a WFB that penetrated through the superior orbital fissure when she hit her head on a tree stump in a fall. In the series of 42 cases by Miller et al [11] only 10% traversed the superior orbital fissure, while the literature review by Nishio et al[10] found that superior orbital fissure penetration occurred in 44% of all transorbital intracranial WFBs. The severity of the damage, however, depends on the size and shape of the stab tool, on its trajectory, force, and entry point. This indicates that the GCS score at admission is not always a good predictor. However, our patient was fortunate to be conscious throughout the hospital course.

**Imaging**

Radiographic studies are essential for determining the shape, size, and trajectory of the foreign body penetration, supporting correct diagnosis, and choosing a proper surgical protocol. However, the organic components of a WFB might hinder the display of the fragment morphology and lead to misdiagnosis. Dry wood often mimics pneumocephalus on a CT scan, which could be differentiated by its linear appearance and different attenuation. It may start to appear like soft tissue as the wood absorbs water over time[4,9]. As a result, CT has limitations in detecting WFBs. It is suggested that CT has a 42% missing rate for non-metallic foreign bodies[3]. Multiple cases have been reported in which CT failed to identify an orbitocranial WFB. In contrast, MRI is a more sensitive diagnostic technology because dry wood is hypointense on the T1- and T2-weighted sequences, wet wood is hypointense on the T1-weighted and hyperintense on the T2-weighted scans, and gadolinium enhancement may reveal any inflammation of the surrounding soft tissues [3,9]. CT scan , MRI, and CT angiography are key imaging modalities that are frequently used to determine the course of the foreign object and the extent of brain tissue injury as well as to rule out vascular injury in these types of cases[3]. In our case only an immediate CT scan was possible to perform at nightshift and it has well defined the extend of the WFB from the orbit to the temporal parenchyma.

**Craniotomy**

Extracting an orbitocranial WFB is technically difficult and prone to high failure rates. There is no consensus regarding the removal of an orbitocranial WFB with an extracranial portion from the entry wound with or without craniotomy. The general principle guiding surgical treatment of such patients is preferred to be a direct visualization of the object and extent of the injury also called “open and see” [3].We believe that the goal of the craniotomy is safe removal of the object without further damage to the brain, debridement of wood fragments, evacuation of hematoma, meticulous hemostasis, removal of devitalized brain with preservation of all viable brain tissue, and appropriate repair and closure of the dura and scalp wound. For this reason, in our case,we have removed the WFB from its external section with a simultaneous microscopic intracranial control through a modified orbitozygomatic approach.

**Infection**

Wood can be a welcoming medium for bacteria

because of its porous consistency and organic nature. If not removed in time, serious infectious complications like fulminant meningitis, panophthalmitis, and orbital and intracranial abscesses may occur days, months, or even years after initial trauma. Miller et al. reported that infection was a complication in 64% of their 42 cases of intracranial wooden foreign bodies, in spite of the use of antibiotic agents. Brain abscess occurred in 48%, and the total mortality rate was 25%. So the early removal of foreign body with thorough irrigation is essential[8,10,13,14]. Empiric therapy is advised. Because of the proximity of the central nervous system to the orbit and the possibility of occult intracranial penetration, antibiotics with good blood-brain barrier penetration are recommended. The place of empiric antifungal agents is still discussed , they are not recommended by most of the authors because of the dearth of fungal pathogens reported with orbitocranial WFB in the literature and the inherent toxic side effects of many antifungal therapies[9].

## Conclusion

Intracranial transorbital injuries by wooden foreign bodies are emergencies requiring immediate diagnosis and management, often necessitating surgical removal. In our case , the patient presented with an eyelid laceration and an external fragment of the wood . CT is the imaging study of choice for intraorbital wooden foreign body, but it can miss a significant number of orbitocranial WFB , therefore it must be discusses in detail with the radiologist in order to optimize the technique. Surgical management is guided by the fundamental principle of excellent intraoperative visualization and control of the entire foreign body tract prior to removal, we believe that having a microscopic control through a craniotomy is the best technical issue .Because of the potential for infection is high, broad spectrum antibiotic coverage in high doses with good intracranial penetration is strongly recommended. Early removal of wooden foreign body that penetrate to the intracranial via transorbital is mandatory and should be involved multidisciplinary approach in order to get optimal result and avoid the fatal complication both neurologically or ophtalmologically.

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