

CASE REPORT

Diagnosis and treatment intraorbital foreign body: A case report

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Key Clinical Message

Wooden foreign bodies inside the eye socket are an uncommon kind of eye injury that falls into a distinct category of intraorbital foreign bodies. Due to the wide range of clinical presentations and imaging features of intraorbital wooden foreign bodies, misinterpretation and failure to diagnose correctly often happen.

Abstract

Wooden foreign bodies inside the eye socket are an uncommon kind of eye injury that falls into a distinct category of intraorbital foreign bodies. The condition mostly manifested in individuals of youthful and middle age. Due to the wide range of clinical presentations and imaging features of intraorbital wooden foreign bodies, misinterpretation and failure to diagnose correctly often happen during the first examination. The risk of orbital infection might greatly rise if there is a delay in diagnosing woody foreign substances inside the eye socket. The majority of patients need surgical intervention as the recommended course of therapy. Nevertheless, it is essential to avoid disregarding undetected diagnoses and the existence of foreign material remnants after prior surgical procedures. Hence, achieving a precise diagnosis relies on a comprehensive assessment of the patient's trauma history, meticulous examination of the eyes, vigilant monitoring of clinical symptoms, accurate imaging techniques such as magnetic resonance imaging (MRI) or computerized tomography (CT), and prompt and thorough removal of wooden foreign objects within the eye socket.

KEYWORDS

computer tomography scan, intraorbital wooden foreign body, magnetic resonance imaging, orbital trauma

1 | INTRODUCTION

Orbital foreign bodies, which may be metallic (magnetic or non-magnetic) or non-metallic (such as plants, plastics, glass, etc.), are often linked to eye damage. Computed

tomography (CT) scans are often used for diagnosing ocular damage and detecting metallic foreign bodies. Even small objects measuring only 2mm may be readily seen on CT pictures due to their typically high density.^{1,2} Misdiagnosis or missed diagnosis is uncommon,

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as is an orbital infection, due to the tendency of metallic foreign materials in the orbit to get readily embedded inside the orbital tissue. In cases where there is no intraorbital infection or imprisonment in the optic nerve, little metallic foreign bodies or those placed at the orbital apex frequently do not need removal. This is because the surgical procedure itself may lead to orbital hemorrhage, optic nerve damage, and other severe problems. Wooden objects have a low density or may not be seen at all on a CT scan. Determining the amount and makeup of foreign objects is a challenging task, and the CT scans of wooden foreign objects may change over time, frequently resulting in incorrect or overlooked diagnoses.^{3–5} Wooden foreign objects, because of the pores on their surface and the properties of organic material, provide an excellent environment for bacterial development. If they are not swiftly removed, they may cause illness. Furthermore, the wooden foreign objects are delicate and challenging to extract.^{6,7} Hence, the operation is much more challenging in comparison to metallic foreign objects. Instances of diagnosing and treating wooden foreign entities are seldomly documented. In this study, we reported cases of orbital foreign bodies managed at our hospital and discussed the clinical manifestations, imaging features, and treatment of orbital foreign bodies.

2 | CASE HISTORY

A 65-year-old male patient arrived with many scrapes and bruises on his face, including in the area around his right eye, after falling while working in a tea plantation (Figure 1). Upon admission to the hospital on the second day after the incident, the minor lesions on the right side of the face had formed scabs. Additionally, there was conjunctival congestion and a visual acuity of 0.5 in the right eye. The orbit CT scan showed linear, gas-like areas with low density in the upper quadrant and below the eyelid of the right eye (Figure 2). The patient was administered intravenous cefmetazole to manage the infection, and symptomatic measures including performing incision



FIGURE 1 Swelling in the left upper eyelid with skin wound.

and drainage of a localized abscess. After the reduction of edema around the eyes, the patient was released. After a period of 6 days, the patient was hospitalized again due to the presence of edema and congestion in the upper eyelid on the right side, along with a loss of visual clarity.

3 | METHODS

The physical examination showed erythema and edema of the upper eyelid on the right side, along with the presence of a localized abscess. Additionally, probing at the inner corner of the right eye indicated tissue hardening. An *Acinetobacter baumannii* infection was discovered in a bacterial culture of purulent discharge from the eye.

4 | RESULTS

A follow-up CT scan of the eye socket revealed that the initial linear regions of reduced density are still present and are extending into the orbital septum. The surrounding areas show somewhat higher-density spots (Figure 3). Continuing with wound care did not resolve the purulent discharge; therefore, further investigation of the abscess cavity was necessary. A wooden object of foreign origin, measuring about 3 cm in length and with a diameter of roughly 3 mm, was successfully removed by meticulous dissection and separation from surrounding tissue (Figure 4). The patient was administered intravenous cefmetazole for a duration of 3 days, which led to the remission of symptoms and subsequent release. During the 3-month follow-up, the patient showed no aberrant results.

5 | DISCUSSION

Orbital foreign bodies often occur in cases of falls, when they enter the orbital or face region and get lodged as foreign objects. They may also be encountered in instances of impact accidents or penetrating injuries during occupational or recreational activities. Common foreign objects often include tree branches, chopsticks, maize stalks, bamboos, and wood. Research reveals that children and young adults have a higher propensity for sustaining injuries, while senior individuals constitute a very minor fraction. The reason for this is that toddlers are prone to falling when engaged in play, whereas young people often engage in carpentry activities.

Several of our patients had eyelid laceration, whereas a small number got conjunctival laceration. Wooden foreign bodies have a coarse surface that facilitates the attachment

FIGURE 2 CT scan showing the strip low-density shadow in the lateral orbit, small flake low-density shadow around foreign body.

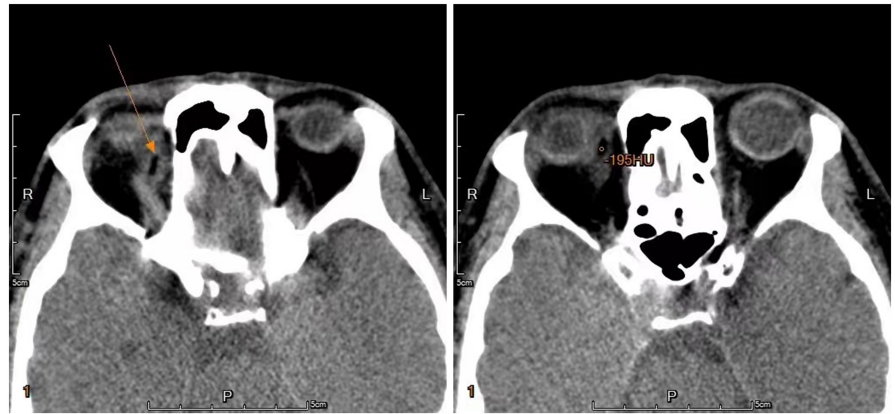


FIGURE 3 CT scan showing the strip low-density shadow in the lateral orbit, small flake low-density shadow around foreign body.

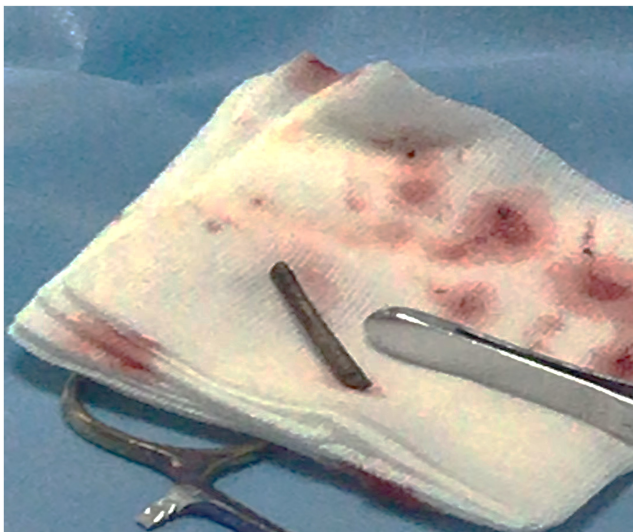
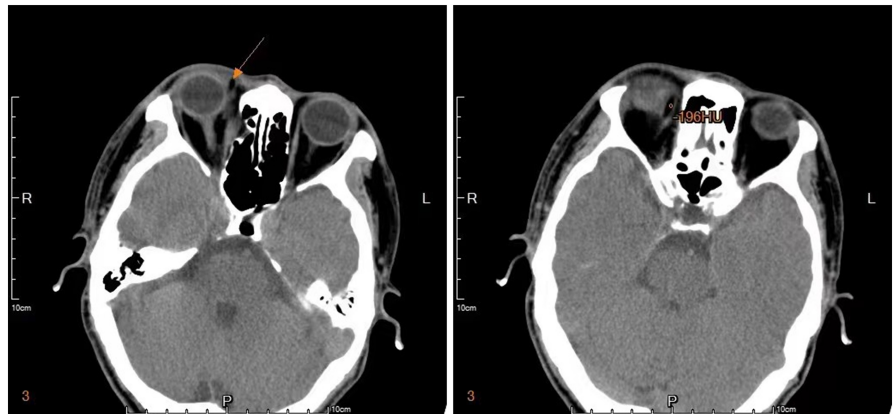


FIGURE 4 Foreign bodies moved intraoperatively.

of germs and parasites. If foreign objects enter the orbit and are not promptly eliminated, they will trigger an immediate inflammatory response.^{8,9} Foreign objects made of wood will undergo calcification and organization, leading to the formation of an inflammatory granuloma in the surrounding region. Moreover, wooden objects that enter

the eye are delicate and prone to fracturing and breaking inside the eye socket following an accident, which may lead to difficulties in completely removing them or accurately diagnosing the situation. The absence of foreign substances in the wound contributes to the misdiagnosis.

Typically, foreign objects consist of metals, plastics, or glass, which may be readily identified with standard X-ray imaging. Nevertheless, wooden foreign objects are few and pose a challenge to detect in standard X-ray scans, resulting in frequent oversight or delayed diagnosis. A CT scan is often conducted when there is suspicion of foreign objects. However, it is well recognized that a wooden object foreign to the body first exhibits a low-density signal on a CT scan, resembling air bubbles.^{10–12} Nevertheless, the use of MRI for open injuries is a subject of debate, and it is not possible to entirely rule out the presence of metal foreign objects. Although the use of CT in conjunction with an MRI scan, the preoperative diagnostic rate of wooden foreign bodies remains very low.^{13,14}

The patient was hospitalized for treatment on the second day after the incident. Discerning wooden foreign entities from air bubbles based on CT picture density was problematic; however, their forms were clearly distinguishable. The wooden alien bodies had irregular or peculiar properties that resembled air. The patient exhibited

an immediate inflammatory reaction around the wooden foreign object, leading to swelling and thickening of the nearby soft tissues. This was seen as a decrease in density on CT scan, accompanied with a moderate density of inflammatory tissue encapsulating the area. With the rise in fat density in the surrounding area, the boundaries became less clear, resulting in incorrect diagnosis. During the patient's readmission 6 days later, the foreign body was removed during wound debridement since the skin wound was not healing and there was an infection. However, the removal was done without taking into account the patient's trauma history or the location of the injury, which introduced diagnostic bias. Hence, the patient's medical history is of utmost importance. The patients exhibited rod-shaped high-density shadows on CT scans, which are likely caused by calcium deposition resulting from inflammatory responses. Consequently, low-density shadows appear as high-density shadows. The individuals were surrounded by soft tissue shadows of moderate density, which had distinct borders and were arranged in the shape of inflammatory granulomas.

It is important to note that wooden foreign bodies may appear hypoattenuating and linear, which can be mistaken for air on imaging studies; therefore, radiologists should be aware of their characteristic appearance.¹⁵ When obtaining the patient's trauma history, it is crucial to consider "high-velocity" trauma such as gunshots, industrial accidents, or falling onto objects. Intraorbital organic foreign bodies commonly lead to infection and vision loss with potential complications including orbital cellulitis, intraorbital abscess formation, and fistula development.^{16,17} However, due to the diverse clinical manifestations and imaging features of orbital woody foreign bodies, misdiagnosis or missed diagnosis at the initial visit are common occurrences. Nonetheless, through our observations of *in vivo* changes in orbital woody foreign bodies over time after trauma, we have gained valuable insights. The rapid healing of the skin aditus antrum may contribute to an erroneous initial diagnosis while the poor visibility of woody foreign bodies on CT scans further complicates imaging diagnosis. Upon reflection though, it provides inspiration as we have observed that CT scan results differ at different time periods following eye trauma. Over time, we found the bars gradually move toward the loose space within the orbital septum, meanwhile the shape of the woody foreign body become less distinct and inflammatory encapsulation or abscess formation occur. This allows for clearer visualization of the dynamic change of intraorbital wooden foreign bodies in such cases.

Upon confirming the diagnosis of wooden foreign items in the orbit, immediate treatment should be administered.¹⁸ Opting for the original wound method is preferable, as it adheres to the criteria of safety, little harm, and

closeness to the wound. A wooden object located in space is delicate. To prevent the presence of wooden foreign objects, surgeons must thoroughly extract them and use antibiotics for recurrent irrigation of the orbital cavity during the removal process. The wooden object fractured into many fragments in one instance as a result of prolonged use. Following a comprehensive removal of foreign objects, necrotic tissue, and scar tissue, a drainage strip was placed at the conclusion of the procedure. Additionally, it is necessary to do intraoperative ocular secretion cultures and choose appropriate medications according on their resistance to antimicrobial agents.

6 | CONCLUSIONS

Orbital trauma seldom results in the presence of foreign bodies inside the eye socket, and when it does occur, it is mostly seen in young males. Owing to the wide range of clinical signs and imaging features of intraorbital foreign bodies, misinterpretation and failure to diagnose often arise during the first consultation. A precise diagnosis requires a thorough assessment of the patient's trauma history, meticulous examination of the eyes, and a systematic interpretation of imaging tests. While CT is often considered the most reliable method, MRI scans outperform CT scans in detecting minute fragments of wood for diagnostic purposes. Surgery is the recommended course of therapy, during which doctors must meticulously remove all foreign objects. Failure to do so may lead to an orbital infection caused by the remaining pieces. Both postoperative sinus drainage and systemic antibiotic therapy are essential.

AUTHOR CONTRIBUTIONS

Hongqing Zhao: Conceptualization. **Hui Feng:** Data curation; methodology. **Lei Du:** Investigation; project administration.

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None.

CONFLICT OF INTEREST STATEMENT

The authors have no conflicts of interest to declare.

DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no datasets were generated or analyzed during the current study.

CONSENT

Written informed consent was obtained from the patient to publish this report in accordance with the journal's patient consent policy.

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