Hidden in Plain Sight: What the Sound Cannot See – A Case for the Importance of 3D Imaging in Ocular Trauma

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Abstract

We report a case of penetrating ocular trauma involving Bamboo Stick. Initial B scan ultrasonography indicated vitreous haemorrhage but excluded intraocular foreign bodies. Management initially focused on secondary pyogenic granuloma, however post excision recurrence of purulent discharge raised suspicion of a retained object. A subsequent MRI revealed a missed intra-orbital foreign body, which was undetectable via standard B-scan. Anterior orbitotomy was performed to successfully extract the retained Bamboo. This test underscores that B-scans have a limited role in intra-ocular pathology, persistent post-traumatic inflammation mandates cross-sectional imaging (MRI/CT) to detect intra-orbital organic foreign bodies.

Introduction: Penetrating orbital trauma frequently results in retained intra-orbital foreign bodies (IOFBs). While metallic objects are easily detected, organic materials like wood and bamboo pose a unique diagnostic challenge. They are radiolucent and often mimic air or soft tissue on conventional imaging. Furthermore, standard B-scan ultrasonography is primarily designed for intraocular assessment and typically fails to visualize objects located posteriorly in the orbital space. Missed organic IOFBs are a significant cause of persistent morbidity, leading to complications such as chronic fistulas, orbital cellulitis, and recurrent granulomas. Assessment through radiological images assists in the proper localization of foreign body, estimation of its consistency and size, and evaluation of the response of surrounding orbital tissue.[1]

Case Presentation: Initial B-scan ultrasonography indicated vitreous haemorrhage but excluded intraocular foreign bodies. Management initially focused on a secondary pyogenic granuloma; however, post-excision recurrence of purulent discharge raised suspicion of a retained object. A subsequent MRI revealed a missed intra-orbital foreign body, which was undetectable via standard B-scan. Anterior orbitotomy was performed to successfully extract the retained bamboo.

Conclusion: This case underscores that B-scans have a limited role in extraocular pathology. Persistent post-traumatic inflammation mandates cross-sectional imaging (MRI/CT) to detect intra-orbital organic foreign bodies that sound waves may miss.

Key-words: Intra-orbital foreign body (IOFB), Bamboo injury, Organic foreign body, Orbital MRI, Pyogenic granuloma, B-scan limitations.

INTRODUCTION

Penetrating orbital trauma frequently results in retained intra-orbital foreign bodies (IOFBs), which constitute approximately 16–25% of all orbital injuries. While metallic objects are easily detected due to their radiopacity, organic materials like wood and bamboo pose a unique diagnostic challenge. They are radiolucent and often mimic air or soft tissue on conventional Computed Tomography (CT), leading to high rates of missed diagnosis.

Furthermore, standard B-scan ultrasonography is primarily designed for intraocular assessment (detecting vitreous haemorrhage or retinal detachment) and typically fails to visualize objects located posteriorly in the retrobulbar space.[2] Organic foreign bodies can cause significant inflammation and carries a higher risk of subsequent infection compared to inorganic materials. Missed organic IOFBs are a significant cause of persistent morbidity, often presenting weeks or months later with complications such as chronic fistulas, orbital cellulitis, and recurrent granulomas. We present a case where

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reliance on standard testing delayed the diagnosis of a retained bamboo stick, emphasizing the critical role of advanced imaging.

CASE REPORT

A 51-year-old male presented to the emergency department with a history of penetrating ocular trauma sustained during occupational activity involving a bamboo stick. The patient reported self-removal of a portion of the foreign body immediately following the injury. Presenting complaints included severe ocular pain and significant diminution of vision in the right eye.

Ocular Examination

Visual acuity in the right eye was 6/36. On slit-lamp biomicroscopy, the following findings were noted:

- **Lids and Adnexa:** Significant chemosis and diffuse subconjunctival haemorrhage were present.
- **Cornea:** An intrastromal organic foreign body (bamboo) was visualized, accompanied by epithelial erosion.
- **Sclera:** Suspicion of scleral perforation was noted; however, Seidel's test was negative at presentation.
- **Pupil:** The pupil was mid-dilated and non-reactive to light.
- **Motility:** Restriction of extraocular movements (EOM) was observed in the affected eye.
- **Initial Management:** Gentle B-scan ultrasonography revealed a few low-reflective echoes in the vitreous, consistent with mild hemorrhage, but the retina was attached throughout. No obvious intraocular foreign body was detected. The visible intrastromal foreign body was removed, and the patient was started on a regimen of topical antifungals, antibiotics, cycloplegics, and systemic NSAIDs.

Follow-up and Complication

At the one-month follow-up, the patient complained of persistent discomfort and dull pain. Examination revealed a granulomatous lesion at the site of the previous foreign body removal. A provisional diagnosis of post-traumatic pyogenic granuloma was made, and the patient underwent conjunctival mass excision under local anesthesia.

Definitive Diagnosis & Surgery

On the subsequent post-operative visit, a discharging pus point persisted despite the excision. In view of the non-healing wound, the patient was referred to the Oculoplasty department. Magnetic Resonance Imaging (MRI) was advised, which revealed a retained intra-orbital foreign body that had been missed by previous modalities.

Following physician clearance, the patient underwent an anterior orbitotomy. The retained bamboo piece was successfully located and extracted.

Outcome

On the first post-operative day, mild peri-orbital swelling was noted, but the wound was healthy. By the second post-operative visit (3 weeks later), the wound had healed well. Visual acuity improved to 6/18 unaided, correcting to 6/9 with pinhole and best-corrected refraction.

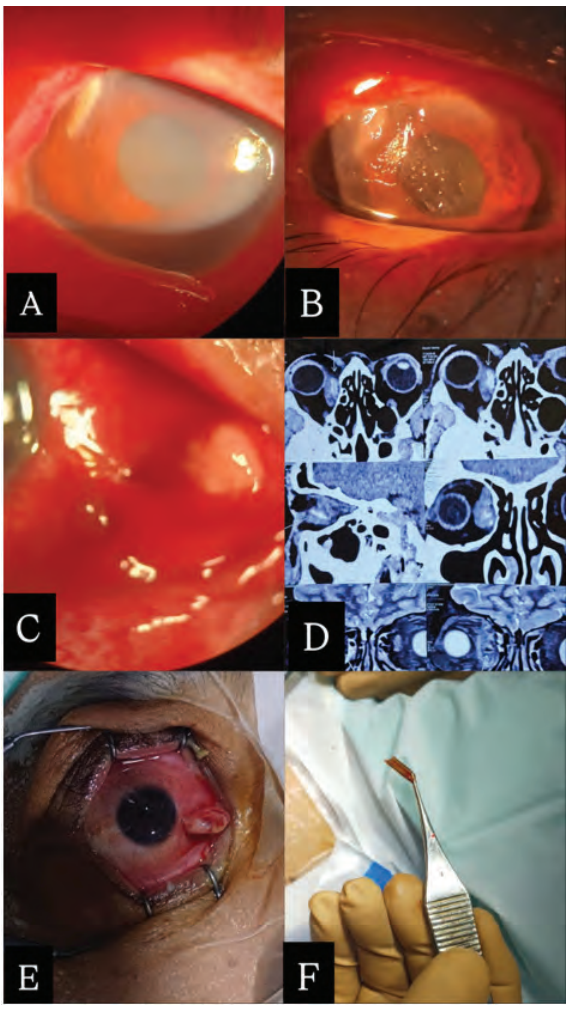

Figure 1: (a) slit lamp image showing epithelial erosion on presentation, (b) Slit lamp image showing intrastromal foreign body, (c) Pyogenic granuloma noted post conjunctival mass excision, (d) MRI showing presence of intra-orbital foreign body, (e) Intra-operative picture showing granuloma, (f) Intra-orbital foreign body specimen post anterior orbitotomy

DISCUSSION

1. **Overview and Etiopathogenesis:** Intra-orbital foreign bodies (IOFBs) are a frequent complication of penetrating ocular trauma. In rural part of India, wooden foreign bodies in orbit are seen in farmers and agricultural workers due to nature of there work.[3] While metallic or glass objects are often inert, organic materials like bamboo or wood are notoriously hazardous. Organic matter is porous and serves as a nidus for polymicrobial infection, frequently introducing fungi or gram-negative bacteria into the sterile orbital space.

   In this case, the initial clinical picture was misleading. The development of a pyogenic granuloma was not a primary pathology but a secondary "sentinel sign" of the underlying chronic inflammation. The body attempts to wall off the foreign object, leading to a foreign body granuloma, which typically manifests externally as a non-healing wound or discharging sinus.

2. **The Diagnostic Challenge:** This case illustrates a classic pitfall in ophthalmic trauma: false reassurance from standard testing.

   The "Lucid Interval": Patients often present with a quiescent period after the initial injury is treated, only to return weeks later with complications.

   The B-Scan Blind Spot: B-scan ultrasonography is the gold standard for intraocular pathology. However, it has poor penetration into the posterior orbit and cannot reliably distinguish small organic foreign bodies from retrobulbar fat or muscle. Relying solely on B-scan for orbital trauma is a critical error.

3. **The Role of Advanced Imaging (CT vs. MRI):** Radiological assessment is pivotal, but nuance is required for organic objects:

   Computed Tomography (CT): While CT is the first-line modality for trauma, it has significant limitations with wood. Dry wood has low density (-650 HU) and mimics air bubbles (pneumo-orbit), while fresh wood (-20 HU) is often isodense with orbital fat, rendering it invisible.

   Magnetic Resonance Imaging (MRI): This is the modality of choice when an organic foreign body is suspected. Wood typically appears hypointense on both T1 and T2-weighted images, providing a sharp contrast against the hyperintense orbital fat. In this case, the MRI successfully identified what the B-scan missed, facilitating the correct surgical approach. MRI is contraindicated until metallic foreign bodies have been excluded with CT, X-ray or ultrasound.

CONCLUSION

High Index of Suspicion: Penetrating orbital injuries with organic matter (bamboo, wood) carry a high risk of retained foreign bodies due to their friable nature. Ocular foreign bodies always need a high index of suspicion for the treatment.[4]

Don't Rely on B-Scan: B-scan ultrasonography is insufficient for ruling out extraocular (intra-orbital) pathology. A negative B-scan does not exclude an orbital foreign body.

Red Flags: Post-traumatic pyogenic granulomas or persistent purulent discharge are not isolated events; they are often "sentinel signs" of a retained foreign object.

Imaging Mandate: When organic trauma is suspected, cross-sectional imaging is mandatory. MRI is superior to CT for detecting wood and bamboo.

Awareness: Spreading awareness for the employment of protective measures in high risk occupations should be made compulsory and would be helpful in reducing these injuries.[5]

TAKE HOME MESSAGE

"In cases of penetrating trauma with organic matter, a persistent wound is a retained foreign body until proven otherwise. Do not stop at the B-scan; if the eye weeps, look deeper with an MRI."

DECLARATIONS

Patient Consent: The authors confirm that all necessary patient consent forms have been obtained. In these forms, the patient provided consent for their images and clinical information to be reported in the journal. The patient understands that their name and initials will not be published and that every effort will be made to maintain anonymity, although complete confidentiality cannot be guaranteed.

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CONFLICTS OF INTEREST

There are no conflicts of interest.

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