Early versus delayed extraction of intraorbital wooden foreign body

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**ABSTRACT**

Orbital trauma caused by wooden foreign bodies are relatively uncommon. Both immediate admission and late presentation of wooden trauma may pose a medical challenge to diagnose and manage due to wood can be easily missed on initial imaging. All organic types of intraorbital foreign bodies (IOrbFBs) should be extracted by surgical removal. In this report, we describe two cases of wooden IOrbFBs following penetrating orbital injury at a tertiary eye hospital. The first patient was injured by wood log with early admission, while the second patient presented two months after the injury with penetration by wooden arrow, both involving the sino-orbital. In this case, endoscopic approach is better used to have a more thorough assessment and guided surgery. Eventually, favorable outcomes of both patients can still be achieved. Follow-up is also crucial in patients with intraorbital trauma.

**Introduction**

Managing intraorbital foreign bodies (IOrbFBs) is challenging for ophthalmologists. Orbital FBs are commonly found in males and younger patients. They are often associated with metallic (steel), nonmetallic (inorganic such as plastics, glass) and organic material [1], like wood or plants (usually occur after a high velocity injury including industrial accident or trivial trauma). They are poorly tolerated, elicits an intense inflammatory reaction and need to be removed urgently [2]. Organic types are relatively rare, comprising only 3.52% [3]. However, they can give rise to serious complications, causing loss of the eye. This case series reported two patients with wood orbital trauma.

**Case illustrations**

**Case 1**

A 32-year-old male presented with penetrating injury to his right eye (RE) by a wood log while repairing his house roof, nine hours...
after the injury. The patient complained of blurred vision and active bleeding from his RE. The visual acuity was 6/12 and 6/6.75 in RE and left eye (LE) respectively. Right eye examination revealed an axial proptosis, superior eyelid hematoma, inferior eyelid ectropion, 5-mm lagophthalmos without corneal exposure, ptosis, and crepitation at the inferior orbital nasal side. A 10-mm diameter dark brown piece of wood was noted, pierced at 3 mm below the inferior eyelid margin. There were inferior partial-thickness eyelid laceration 8 mm inferior to lateral canthus extending medially 7 mm in length, and a 10-mm full-thickness eyelid laceration covered by wood. LE was unremarkable. Orbital CT scan showed a 3.9 cm extraconal tubular-shaped FB extending from inferior orbital extraconal to right maxillary sinus with inferior orbital wall fracture, herniation of orbital soft tissue, and anterior displacement of the right globe (Fig. 1 a–c).

The patient underwent surgery for FB removal, eyelid laceration repair, and orbital floor fracture reconstruction. Before surgery, he received anti-tetanus and intravenous (IV) ampicillin-sulbactam. The wound was extended by lateral and medial incision until the inferior orbital margin was exposed, followed by periosteal incision. Maxillary sinus anterior wall was exposed using Caldwell-Luc approach through the right sublabial incision. Complete evaluation of the maxillary sinus and identification of the FB were performed using endoscope with 0 and 30-degree tips alternatively through the Caldwell-Luc window. A bigger wooden fragment was extracted by forceps (Fig. 2 a–b) and smaller fragments were irrigated. Endoscope was used to visualize intranasal area and ensure the clearance of all FBs. After orbital floor reconstruction using silicon block, the periosteum was sutured, followed by repair of each layer of the inferior eyelid laceration.

Postoperatively, the patient was administered topical chloramphenicol eye ointment, oral methylprednisolone, analgetic, and IV ampicillin-sulbactam. In two weeks, he had no complaints, visual acuity of both eyes was 6/6 without eye movement restriction (Fig. 3 a–b).

Case 2

A 32-year-old male experienced wooden arrow piercing into superonasal side of his LE then through the medial orbital wall and nasal cavity upon a tribal war two months prior to presentation. At the end of the fight, he pulled out the arrow himself immediately, but no improvement of discomfort in his LE. He complained red eyes, eye discharge, and repetitive swelling around the nose and eye, despite consuming oral antibiotics. Due to the rural area’s medical referral system, it took him almost two months to reach our eye hospital. Ophthalmological examination revealed conjunctival injection near the left caruncle, granuloma at the left superior nasal, and visual acuity was 6/6 in both eyes with normal extraocular motility. Given the concern for intranasal and intraorbital retained FB on the LE (Fig. 4 a–c), the possible complications of the FB extraction surgery were explained. He underwent surgical exploration which revealed a broken piece of wood measuring 20 mm. Most of the FB was found in intranasal area, therefore endoscopic endonasal approach was performed. The wood retention caused a more difficult visualization because the FB was covered by mucous and granulation tissue. Each layer was explored carefully and all visual evidence of bark was removed. The patient was treated with the IV broad spectrum antibiotics. On the next day, he instantly felt comfortable and less pain. During 6 months follow up, patient had no complaints and the wound was in good condition. There was no evidence of recurrent infection.

Discussion

Organic FB degrades gradually and is difficult to be assessed with radiologic modalities [4–6]. Despite being highly sensitive and specific for detection of FB, CT scan may produce false-negative results, particularly in FB < 0.5 mm or wooden objects [2]. The wood density has been reported to be variable over time. Dry wood is not detected in CT scan because it appears hypodense, similar to entrapped air [6,7]. Live wood has greater water content and appears isodense with surrounding adipose tissue [7]. Dead wood has greater air content, which appears radiolucent. Chronic retained wood absorbs more water to increase its radiodensity, making it more difficult to visualize.

All orbital FBs patients should be treated with anti-tetanus prophylaxis and broad-spectrum antibiotic since infection may rapidly

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Fig. 1. (a) Clinical examination showed 5 mm lagophthalmos without corneal exposure, (b) eyelid rupture, and a piercing wood which was located 3 mm below the inferior eyelid margin; (c) Sagital view of orbital CT scan confirmed the location of the FB.
occur. A third-generation cephalosporin (e.g. ceftriaxone, cefotaxime, ceftazidime) is the most recommended regimen [8]. Sino-orbital FBs can be managed by endoscopy or open approach depends on the size, nature, and location of the FB. The first patient was managed by an open approach because wooden FB often breaks during removal and can adhere to its surrounding tissues. To reach the FB location, Caldwell-Luc procedure proved to be appropriate in the infratemporal fossa, including the maxillary sinus. Endoscopic-assisted Caldwell-Luc procedure was preferred over naso-endoscopic approach to provide better visualization without intervening the osteomeatal complex.

Penetrating orbital injuries most commonly occur following accidents, followed by assaults, terror attacks or warfare [9,10]. Organic IOrbFB retention has a much higher rate of infection and inflammation than inorganic IOrFB [1]. Wood, a great bacterial growth medium, should be removed in all cases. Our second patient encountered a devastating effect despite the immediate wooden arrow self-removal. Initial trauma history is crucial to detect retained IOrbFB since it may result in persistent acute inflammation until the FB is completely removed. A vague history of trivial trauma, particularly wood FBs in late presentation, can prove to be particularly difficult due to lack of external signs of injury [7,8]. During surgery, the hard part of the wood was palpable. Endoscopy is chosen to extract the IOrbFB in this patient because the large number of wood fragments and an intranasal approach would unlikely cause iatrogenic trauma to his eye. If needed, postoperative evaluation using magnetic resonance imaging (MRI) is suggested to search for any retained wooden FB. MRI evaluation could not be performed in both cases because the patients were referred from remote areas outside of the city. Hence, after the surgery and post-operative follow-up, patients immediately returned to their hometown. Although, ideally a post-operative imaging using MRI should have been done for both of the cases. Since the wood typically splinters, meticulous removal of all fragments, careful debridement of necrotic tissue, and copious irrigation of the surgical wound with antibiotic solution should be ensured [8].

**Conclusion**

Endoscopic approach allows a complete surgical removal of retained sino-orbital FB without damaging the orbit. Wooden IOrbFB removal must be done immediately before complications occur.
Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Declaration of competing interest

The authors declare no conflict of interest.

References

[1] J. Li, L.P. Zhou, J. Jin, H.F. Yuan, Clinical diagnosis and treatment of intraorbital wooden foreign bodies, Chin. J. Traumatol. Engl. Ed. 19 (6) (2016) 322–325.
[2] A. Al-Mujaini, R. Al-Senawi, A. Ganesh, S. Al-Zuhaibi, H. Al-Dhuhihi, Intraorbital foreign body: clinical presentation, radiological appearance and management, Sultan Qaboos Univ. Med. J. 8 (1) (2008) 69–74.
[3] Y. Zhang, M. Zhang, C. Jiang, H.Y. Qiu, Intracocular foreign bodies in China: clinical characteristics, prognostic factors, and visual outcomes in 1421 eyes, Am. J. Ophthalmol. 152 (1) (2011) 66–73.e1.
[4] A.D. Bilge, H. Yilmaz, B. Yazici, F. Naqadan, Intraorbital foreign bodies: clinical features and outcomes of surgical removal, Ulusal Travma ve Acil Cerrahi Dergisi 22 (5) (2016) 432–436.
[5] L.K. Chehade, D. Curragh, D. Selva, Traumatic intraorbital wooden foreign body: lessons learnt, Clin. Exp. Ophthalmol. 47 (4) (2019) 543–545.
[6] B.D. Edgington, C.E. Geist, J. Kuo, Intraorbital organic foreign body in a tree surgeon, Ophthal. Plast. Reconstr. Surg. 24 (3) (2008) 237–238.
[7] S.M. Scofield-Kaplan, E.K. Weidman, G. Moonis, L.R. Dagi Glass, Orbital wooden foreign body manifesting as hyperdensity on computed tomography, J. AAPOS 23 (1) (2019) 45–47.

Fig. 4. (a) Clinical photographs of the patient shows redness on the left eye; (b) A retained piece of wood was visible on the inner part of the left eyelid; (c) CT scan revealed a diagonal piece of wood.
[8] H.N. Shelsta, J.R. Bilyk, P.A.D. Rubin, R.B. Penne, J.R. Carrasco, Wooden intraorbital foreign body injuries: clinical characteristics and outcomes of 23 patients, Ophthal. Plast. Reconstr. Surg. 26 (4) (2010) 238–244.

[9] V.K. Baranwal, R.P. Gupta, S. Johri, A.K. Dutta, P.K. Murthy, A. Mishra, A case of orbitocranial foreign body, Med. J. Armed Forces India 72 (1) (2016) 82–84.

[10] Mohapatra S.S. Das, J. Das, H. Bhattacharjee, An unusual case of orbitocranial wooden foreign body with amazing outcome: a case report, Indian J. Ophthalmol. 68 (2020) 219–221.