

Kalai Selvie Ponnusamy<sup>1</sup>, Irfan Mohamad<sup>2</sup>, Firamir Zulkifli<sup>1</sup>, Thevagi Maruthamuthu<sup>1</sup>,  
Chenthilnathan Periasamy<sup>1</sup>, Zahirrudin Zakaria<sup>1</sup>

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## Ciało obce w obrębie oczodołu i zatoki sitowej na skutek urazu przebijającego w okolicy oczodołowej

### Orbitoethmoidal foreign body through traumatic penetrating orbital injury

<sup>1</sup> Department of Otorhinolaryngology – Head and Neck Surgery, Hospital Pulau Pinang, Malaysia

<sup>2</sup> Department of Otorhinolaryngology – Head and Neck Surgery, Department of School of Medical Sciences, Universiti Sains Malaysia Health Campus, Malaysia

Adres do korespondencji: Irfan Mohamad, Department of Otorhinolaryngology – Head and Neck Surgery, Department of School of Medical Sciences, Universiti Sains Malaysia Health Campus, Jalan Raja Perempuan Zainab 2, 16150, Kubang Kerian, Kelantan, Malaysia, e-mail: irfankb@usm.my

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#### ORCID iDs

1. Kalai Selvie Ponnusamy <https://orcid.org/0009-0001-0870-0605>

2. Irfan Mohamad <https://orcid.org/0000-0001-8572-0514>

3. Firamir Zulkifli <https://orcid.org/0000-0003-4114-3326>

4. Thevagi Maruthamuthu <https://orcid.org/0000-0003-2079-3231>

5. Chenthilnathan Periasamy <https://orcid.org/0000-0001-6963-1802>

6. Zahirrudin Zakaria <https://orcid.org/0000-0003-3806-4061>

#### Streszczenie

Obecność ciał obcych w jamie nosowej, zatokach przynosowych i oczodole ma często związek z urazami szczękowo-twarzowymi powstałymi przy dużej prędkości (sile uderzenia – przyp. red.). Przypadki ciał obcych w zatokach przynosowych są bardzo rzadkie. Mogą im towarzyszyć nieswoiste objawy, co sprawia, że łatwo je przeoczyć podczas zbierania wywiadu i badania klinicznego pacjenta. U osób, które doznały urazu przy dużej prędkości, zalecany jest wysoki stopień czujności klinicznej i ocena radiologiczna, aby wykluczyć możliwość urazu przebijającego. Postępowanie terapeutyczne zależy od umiejscowienia i rodzaju ciała obcego. W niniejszej pracy przedstawiono rzadki przypadek obecności metalowego ciała obcego w okolicy oczodołu i zatoki sitowej, który wymagał skojarzonego leczenia zachowawczego i chirurgicznego z udziałem zespołu wielodyscyplinarnego.

**Słowa kluczowe:** zatoka przynosowa, umiejscowienie wewnątrzoczodołowe, ciało obce, metal

#### Abstract

Foreign bodies in the nasal cavity, paranasal sinuses, and orbit are commonly related to high-velocity maxillofacial injuries. Cases of foreign bodies in paranasal sinuses are very rare. They may present with non-specific symptoms which make them easily neglected during history taking and clinical assessment. High clinical suspicion and radiological assessments are essential in patients with high-velocity insult to rule out the possibility of impalement injury. The course of management is determined by the location and type of foreign body. We share a rare case of metallic foreign bodies in the orbitoethmoidal region which took a combined surgical and conservative course of treatment involving a multidisciplinary team.

**Keywords:** paranasal sinus, intraorbital, foreign body, metal

## INTRODUCTION

The occurrence of foreign bodies in the nasal cavity is uncommon in adults and is even rarer involving the paranasal sinuses<sup>(1,2)</sup>. The most closely associated aetiology is high-speed projectile maxillofacial trauma which can be via an external assault directly to the particular sinus or indirectly through an orbital or palatal injury. Foreign body impaction in the paranasal sinus most commonly involves the maxillary sinus<sup>(2)</sup>.

Common foreign bodies reported in the orbital region, nasal cavity, and paranasal sinuses include wood, plastic, glass, metal and bullets<sup>(1,3)</sup>. Foreign bodies in the nasal cavity or paranasal sinuses may present with symptoms such as nasal bleed, nasal obstruction, mucopurulent nasal discharge, reduced smell, and cerebrospinal fluid leak, whereas ocular complications include double vision, restricted ocular motility, visual disturbance, cellulitis, and abscess<sup>(1)</sup>.

Nevertheless, some foreign bodies may remain inert for a certain time, with only vague symptoms depending on the consistency of the foreign body, but later cause congestion, mucosal ulceration or destruction and toxic reaction<sup>(2)</sup>. Therefore, each patient should be given an individualised treatment approach based on weighing up the benefits and risks of removal of the foreign body depending on its type and location.

## CASE SUMMARY

A 27-year-old male welder was referred to the casualty department following workplace injury to the left eye. He was cutting a metal plate without proper protective goggles and face shield, when the metal broke into fragments, striking his face. Upon assessment, the patient was alert and systemically stable. There was no complaint of loss of vision in either eye except for mild pain and swelling over the left eye. His visual acuity was 6/6 bilaterally, with a normal perception of light. Bilateral ocular motility in all directions was not restricted.

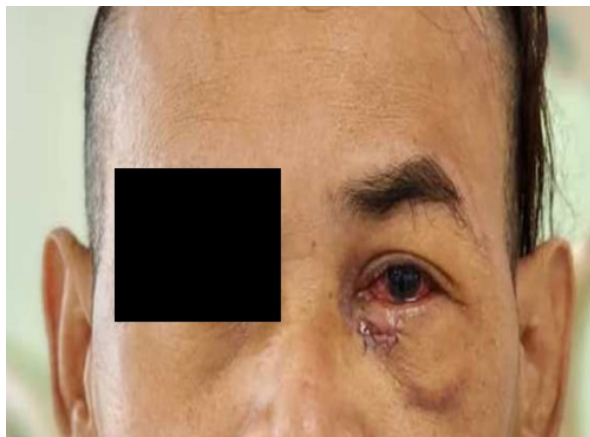


Fig. 1. Subconjunctival haemorrhage in the left eye with periorbital swelling and sutured laceration wound on the left lower eyelid on arrival to casualty

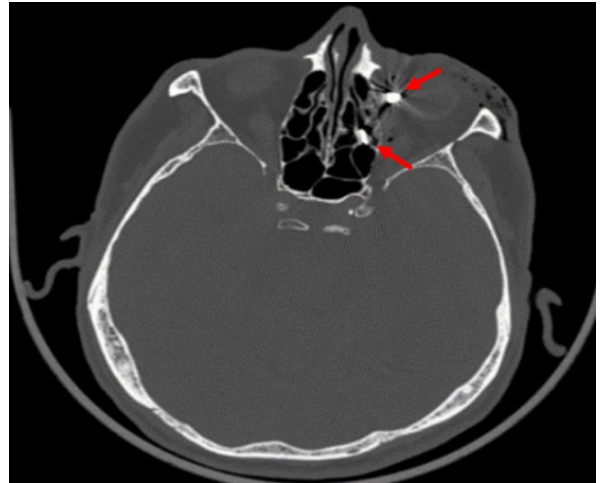


Fig. 2. CT orbit axial view showing two radio-opaque foreign bodies at the ethmoid sinus and intraorbital region (arrow)

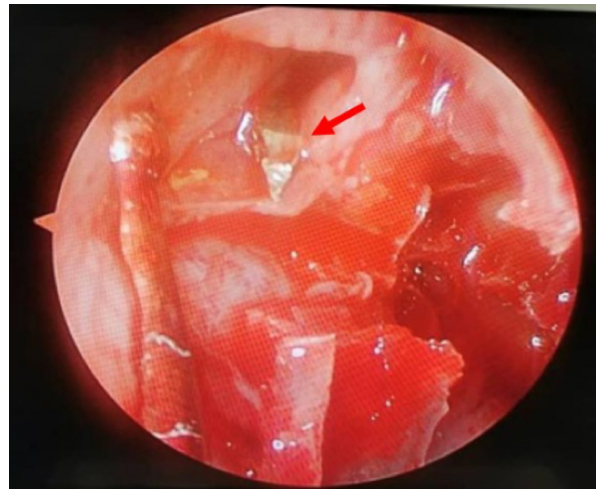


Fig. 3. Foreign body located posterior to the left frontal recess (arrow)

External examination of left eye revealed left commotio retinae from 6 to 8 o'clock, with preretinal, vitreous and subconjunctival haemorrhage. There was no visible breach in the sclera. He had a linear lacerated wound, 1.5 cm in length, over the left lower eyelid which, was sutured at the casualty ward (Fig. 1). There was no obvious foreign body visible nor palpable through the open wound. Besides the localised pain and ipsilateral eye redness, he denied any nasal or facial symptoms.

Skull radiograph revealed two radio-dense foreign bodies lodged in the left intraorbital region. Computed tomography (CT) of the orbit confirmed the presence of two radio-opaque foreign bodies, with the larger fragment located deep in the orbital cavity at the inferomedial aspect of the left eye globe, while the relatively smaller piece was lodged in the ethmoid sinus (Fig. 2). The otorhinolaryngology team (ORL) was called in to co-manage the foreign body in the sinonasal region. On nasendoscopy, no foreign body or any other significant findings were noticeable.

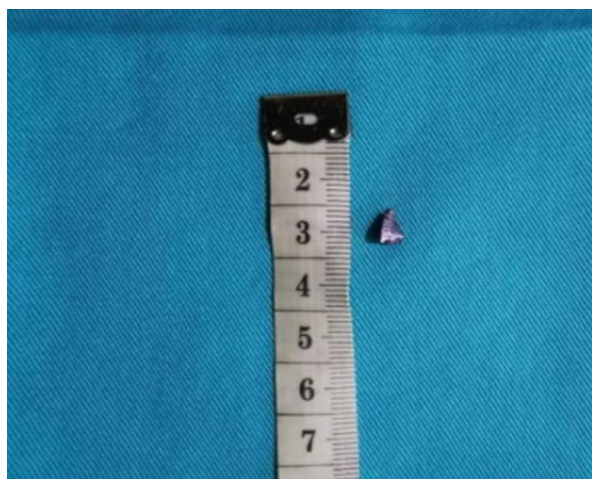


Fig. 4. Triangular-shaped metallic fragment with sharp edges removed from posterior to left frontal recess via endoscopic endonasal approach surgery

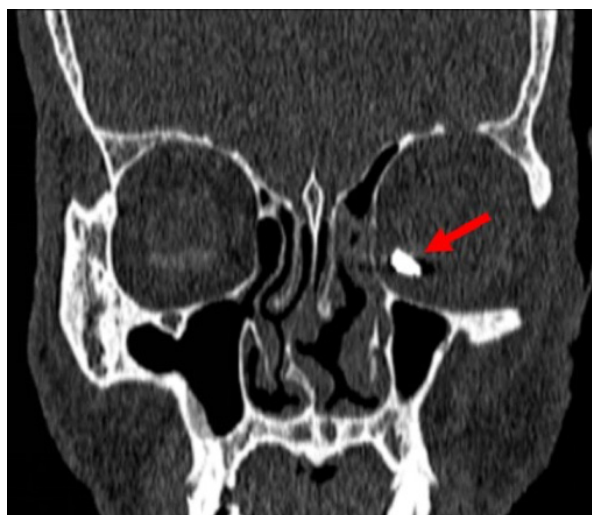


Fig. 5. Repeated post-operative CT scan showing the remaining foreign body located inferomedial to the left globe (arrow)

The patient was scheduled for an examination under general anaesthesia by a combined team of ORL and ophthalmology specialists. No foreign bodies were discovered despite a thorough exploration of the medial aspect of the infraorbital cavity up to the equator performed by the ophthalmology team. However, minute traces of dark-coloured particles were removed. This was followed by an endoscopic-assisted transnasal approach surgery by the ORL team, when the foreign substance was found concealed posterior to the frontal recess and then successfully removed (Fig. 3). We discovered that the foreign object was a triangular-shaped metallic fragment with sharp edges, measuring 7 mm long and 5 mm wide and weighing approximately 1 gram (Fig. 4). No immediate complications were encountered postoperatively.

Adequate anti-inflammatory and pain treatment with broad-spectrum antibiotics was introduced. A postoperative CT scan showed the intraorbital foreign body still

present in the same location, medial to the left globe and just inferior to the medial rectus muscle, as in the previous CT scan (Fig. 5). Oculoplastic team was consulted for further management and a re-exploration of the left eye was done, however, the foreign body still could not be located despite the second attempt. A decision was made on the table to abandon the procedure and leave the foreign body in place after taking into consideration the risks of orbital injury with further exploration. The patient was later briefed on the difficulties encountered intraoperatively with the foreign body location, leading to the tough decision to leave behind the foreign body to prevent further iatrogenic complications. The patient was agreeable upon counselling for a watchful waiting treatment approach. He remained asymptomatic upon discharge and during his follow-up visits to the clinic.

## DISCUSSION

Trauma associated with head and neck foreign bodies can occur in any age group and may lead to serious complications<sup>(3)</sup>. In rare cases, they are lodged into the paranasal sinuses, and the majority are associated high-velocity maxillofacial trauma. More than 50% of foreign bodies occur in the maxillary sinus owing to its anatomical location making it the commonest site for foreign body impaction, followed by frontal, ethmoid, and sphenoid sinuses, which are nearly equal in incident rates<sup>(4,5)</sup>. In our patient, it was rather an uncommon occurrence, with the penetration of the foreign body into the frontoethmoidal region happening through the intra-orbital passage. The possibility of penetrating foreign body in this patient could have been overlooked if not for the history of the mechanism of injury and imaging findings.

Depending on the mechanism of injury, some exert a higher risk of high-velocity injury involving foreign bodies, such as road accidents, occupational and domestic accidents, assaults, and suicide attempts. Foreign bodies in impalement injuries, shootings, stabbings, and explosions, though less common, can lead to more severe complications<sup>(4)</sup>. Our patient sustained a workplace injury while not wearing proper protective gear. A metal piece he was working on broke into pieces, injuring his unprotected face.

Besides patients' relevant medical comorbidities, detailed history of the circumstances leading to the trauma, diligent clinical examination, and appropriate radiological assessment are crucial for the successful detection of clinically unapparent foreign bodies<sup>(3,4)</sup>. Relatively small foreign bodies traveling at a high velocity, such as fragments of metal from power tools or explosions, may penetrate the eye through very small self-sealing wounds, which might be missed on examination<sup>(6)</sup>. The diagnosis of penetrating injury in our patient was made based on history taking leading to high suspicion of foreign body penetration which was later confirmed by imaging, as clinically there was no apparent foreign body visible or palpable.

CT scan proved to be the most useful imaging modality, superior to ultrasonography and plain radiography, for the diagnosis and treatment of nasal cavity and paranasal sinus foreign bodies. It reveals the precise dimensions and features of the foreign body in addition to its anatomical position, and the affected surrounding structures to guide physicians in surgical interventions<sup>(3,4)</sup>.

As foreign bodies in the paranasal sinuses may only cause vague symptoms depending on the entry point, they are usually discovered either after the occurrence of complications or after a radiological workup. Therefore, if their presence is not suspected, they might be overlooked. This was proven to be true in our patient, as there were no nasal symptoms on presentation. However, CT of the orbit enabled us to pinpoint the exact location of the foreign bodies, revealing that only one of them actually penetrated through the orbital space and into the paranasal sinus, which was unclear from the plain radiograph. Although magnetic resonance imaging (MRI) can help identify foreign bodies impacted in the muscle, which might be obscure via CT scan, in cases involving metallic objects, such as our case, MRI is strongly contraindicated due to the ferromagnetic nature of the foreign body, where its migration may cause serious injury to the adjacent tissues<sup>(6)</sup>.

In addition to sufficient tetanus prophylaxis, preoperative antibacterial therapy is crucial for preventing infections caused by contaminated foreign bodies and should be started as early as possible. However, there are conflicting recommendations regarding the use of prophylactic antibiotics<sup>(4,7)</sup>.

The surgical approach to extraction greatly depends on the nature of the foreign body, its location (anterior or posterior orbit), and related complications (infections, optic nerve lesions or compression, and injury to the extraocular nerve or intraorbital blood vessels)<sup>(8)</sup>. Many reports of endoscopic removal of foreign bodies in adults have been published since the advancement of transnasal endoscopic surgery in the 1980s<sup>(7)</sup>. Recent developments in endonasal techniques may improve outcomes by enhancing the speed and precision of surgery, which will reduce post-operative complications, morbidity and mortality, and shorten patients' hospital stays<sup>(9)</sup>. In the present case, functional endoscopic sinus surgery was performed, through which the foreign bodies were discovered posterior to the frontal recess and removed completely. Gray et al. demonstrated endoscopic retrieval of a large screw in the ethmoid sinus abutting the cribriform plate in a schizophrenic patient<sup>(7)</sup>. Ng et al., similar to our case, also performed functional endoscopic sinus surgery to remove a foreign body in the frontal recess found after 25 years<sup>(2)</sup>. Czyz et al. suggest that foreign bodies which are confirmed to be inorganic and not easily accessible, with the patient being asymptomatic, can sometimes be safely left in place, considering the complications which may arise from attempting extraction<sup>(10)</sup>. In both cases mentioned above, good post-operative recovery was observed.

## CONCLUSION

Patients presenting with high-velocity maxillofacial trauma should raise the physicians' clinical suspicion of penetrating foreign bodies, as some of them may present with no apparent entry points. To establish the diagnosis of a foreign body in the orbit or sinonasal space, thorough history taking and physical examination complete with 0.6–1.0 mm thin-section axial CT scans with multiplanar reformation are of key importance. Inert foreign bodies that are asymptomatic and not easily accessible, may be associated with morbid complications with surgical removal such as in our case can sometimes be safely left in place. However, such patients require close follow-ups on an outpatient basis, with monitoring for any signs of late complications.

### Conflict of interest

*The authors report no financial or personal relationships with other individuals or organisations that could adversely affect the content of the publication and claim ownership of this publication.*

### Author contributions

*Original concept of study: KSP, IM, FZ, TM, CP, ZZ. Collection, recording and/or compilation of data: KSP, IM, FZ, TM. Analysis and interpretation of data: KSP, IM, FZ, TM. Writing of manuscript: KSP, IM, FZ. Critical review of manuscript: IM, FZ, CP, ZZ. Final approval of manuscript: IM.*

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