

Glass displaced into the infratemporal region from submandibular injury: case report

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Abstract

This report describes an unusual case with foreign body displacement from submandibular region to infratemporal fossa. An appropriate surgical approach to retrieve the object using a trans-oral approach is discussed, whereas other surgical approaches are reviewed.

Case report

An 18-year-old intoxicated female was admitted to our hospital at the A&E department after accidental falling in the bar whilst holding a wine glass. She fell onto the glass. On physical examination, the patient presented with a 1.5 cm laceration in the submandibular region. The buccal mucosa was normal without any signs of tearing or fistula. The wound was cleaned, debrided and sutured. The patient was kept under observation in the hospital for 12 hours and discharged with a Glasgow Coma Scale (GCS) of 15 by the A&E staff. In the follow-up clinic, the patient reported swelling, pain, and impaired mouth opening for over 2 days after the discharge.

Cross-sectional scanning detected a moderately dense irregular mass located in the infratemporal fossa (ITF). The thickness (1 mm) and shape of the mass suggested a glass fragment. The glass fragment superiorly extended to the skull base and sphenoid sinus, inferiorly to the level of para-pharyngeal space

and anteriorly to the lateral pterygoid process.

In the Head and Neck Trauma Multi-Discipline meeting (MDM), discussion about leaving or removal of the glass fragment was raised, with final consensus decision toward operative exploration and removal. This was predicated on the following factors: a high-risk location with proximity to the maxillary artery and size of the object (2 × 2 cm) and facial weakness.

The glass fragment was successfully removed via a trans-tuberosity approach under general anaesthesia. A vertical incision was made starting in the gingivo-labial sulcus posteriorly, close to the maxillary tuberosity, and then extended to the retro-molar area and proceeding down to the mandibular ridge, then along the ascending ramus towards mandibular angle. An osteotomy was performed in the tuberosity to provide a wide exposure of the fragment. The pterygoid process was trimmed whilst preserving the coronoid process.

To allow maximum sensitivity and control, the surgeon performed a finger dissection to facilitate the movement of the fragment through various anatomic spaces, starting from below and moving upward. The pathway of egress was mapped by keeping close to the lateral pterygoid plate and then moving along the lateral surface of the medial pterygoid muscle toward the lateral pterygoid muscle. Extreme care was taken to avoid an inferior alveolar nerve injury.

The Howarth periosteal elevator is used trans-orally, both for exposure and haptic feedback. Once the intraoral elevator palpated the fragment, intestinal clamping forceps clamped the fragment whilst avoiding the local

soft tissue. The fragment was gently removed with malleable copper retractors placed medially to the fragment to protect the vasculature during manoeuvring (Figure 1). By 2 weeks post-operatively, the patient fully recovered, without adverse sequel.

Discussion

ITF is a quadrangular space bounded anteriorly by the maxillary sinus, medially by the pterygoid plate, laterally by the temporalis muscle and ramus of the mandible and superiorly by the greater sphenoid wing in the floor of the middle cranial fossa. This cavity contains several structures including blood vessels and nerves, which are responsible for supplying the face and head. Because of the special anatomy of ITF, a surgical approach to this region requires careful consideration.

Many surgical approaches have been suggested in the literature to recover a foreign body displaced into the ITF, such as long incision in the buccal sulcus, Caldwell–Luc approach through the maxillary sinus after removal of the whole posterior wall and resection of the coronoid process. Paoli *et al.* applied only the coronal approach in a case in which both maxillary third molars were displaced into the ITF¹.

In our case, the glass fragment (foreign body) was displaced at the lower part of the ITF; therefore, an intraoral approach using partial maxillectomy (tubersectomy) was chosen, which showed satisfactory results without any additional procedure. This approach has 3 advantages: (1) it offers a good cosmetic result without obvious scarring (2) it provides adequate exposure and (3) it protects the facial nerves.

Acute removal of fragments is easier and less hazardous than at a later

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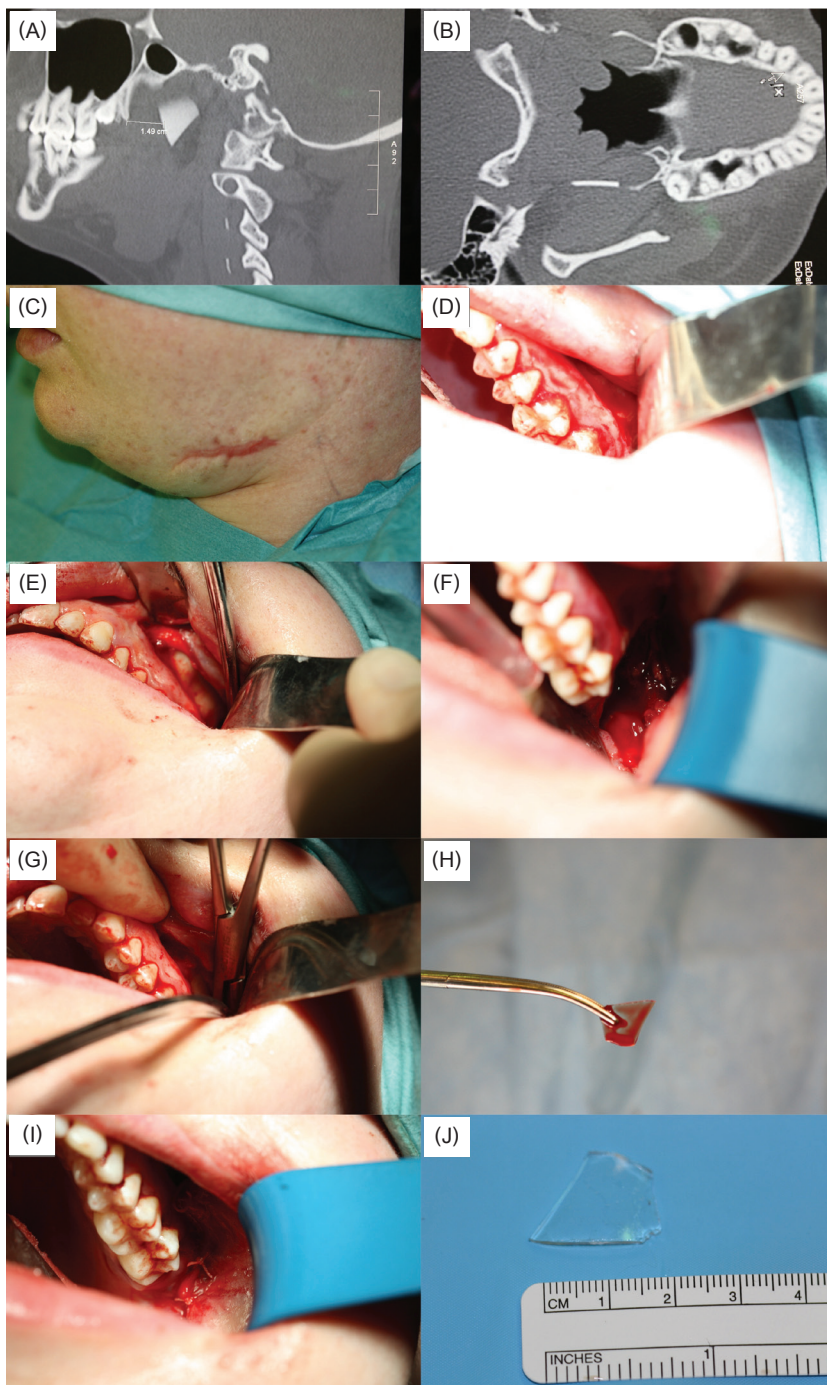
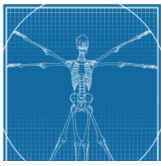


Figure 1: (A) Para-sagittal CT view showing the relation of the glass fragment (foreign body) to the pterygoid plate, skull base and cervical vertebrae. (B) Axial CT view of the same foreign body. (C) The patient being prepped prior to extraction of the foreign body; the wide submandibular scar indicated the entry site of the foreign body. (D) Intraoral view of the left upper buccal space—the site of surgical entry. (E) Incision through the left upper buccal mucosa and bone exposure. (F) Bone window opened with an aim to identify the location of the foreign body. (G) Extraction of the foreign body in process. (H) Foreign body removed (glass). (I) Closure of the buccal mucosa after appropriate debridement. (J) Final image of the foreign body after extraction.

stage, when adhesion of normal anatomic planes by fibrous tissue as well as fragment encapsulation by fibrous tissue takes place. The size of the foreign body was a factor in the decision for or against its removal. Removal of small shell fragments (≤ 1 cm in diameter) is considered when surgical damage is determined to be minimal; if not, they are left alone.

Irregular shape, deformation, hooks, multiple edges and position increase the number of expected complications during surgery. Shuker^{2,3} discussed projectile retrieval of high risk bullets/fragments lodged in the sphenoid sinuses and ITF. This injury has a high potential for infection and more complications in the ITF, because along its pathway, the projectile may carry with it a bone or tooth fragments that are frequently observed in its course and around the shell.

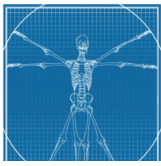
Malignant processes have been reported in conjunction with the prolonged presence of a foreign body⁴. Cases of delayed aneurysm and abscess at the site of a retained foreign body⁵ as well as foreign body granulomas and reactions have been described⁶. In addition, there remains a possibility of late infection and erosion of the vessel walls in this dangerous region. Moreover, the patients' fears may result in psychological consequences^{7,8}.

These arguments support the need for an early removal of foreign bodies whenever possible. Foreign bodies in the head and neck are occasionally difficult to manage even when a plan has been formulated from static pre-operative images. The surgeon should be prepared for unpredictable complications, such as haemorrhage, and pre-emptively consider an alternative surgical approach.

In this case report, a trans-oral approach was found to be the safest way to retrieve the foreign body. Using a submandibular approach, utilizing the entry path of the foreign body was not feasible because of adjacent vital structures.

For removal (extraction), the foreign body should be localized exactly

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intraoperatively. Different methods can be used for detection and localization. MRI is not a suitable imaging modality for detecting missile fragments, as particles with metallic content give rise to powerful interference artefacts, and since the fragments can be conductive or ferromagnetic, they present a potential hazard for the patient.

Conventional radiography in two planes can quite accurately define a foreign object, and computed tomography (CT) is even better in exact three-dimensional location of the fragment preoperatively (with a small cross marker on the skin for co-registration). Ultrasound is sensitive and specific in detecting foreign bodies in soft tissues⁹. Its intraoperative use is possible with special probes. The technique is unreliable when metallic objects are close to bones, as in a missile wound with comminute bone fracture. In such cases, the distinction between metal and bone is very difficult or even impossible.

In conclusion, the decision to retrieve a foreign body in the ITF using

an intra-oral approach should be guided by the precise location and size of the object, the signs and symptoms presented by the patient, and the surgeon's knowledge and skill.

Consent

Written informed consent was obtained from the patient for publication of this case study and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

References

1. Paoli JR, Gence E, Vives P, Boutault F, Dupui D. Removal through the coronal approach of the upper wisdom teeth. Apropos of a case of bilateral migration into the temporal fossa. *Rev Stomatol Chir Maxillofac*. 1995;96(6):392–5.
2. Shuker ST. Management of transcranial orbital penetrating shrapnel/bullet war injuries. *J Oral Maxillofac Surg*. 2008 Sep; 66(9):1927–31.
3. Shuker ST. Management of penetrating war injuries: bullet/shell fragments in the sphenoid sinuses. *J Oral Maxillofac Surg*. 2008 Oct;66(10):2067–72.

4. Kalinich JF, Emond CA, Dalton TK, Mog SR, Coleman GD, Kordell JE, *et al*. Embedded weapons-grade tungsten alloy shrapnel rapidly induces metastatic high-grade rhabdomyosarcomas in F344 rats. *Environ Health Perspect*. 2005 Jun;113(6): 729–34.
5. Chedid MK, Vender JR, Harrison SJ, McDonnell DE. Delayed appearance of a traumatic intracranial aneurysm. Case report and review of the literature. *J Neurosurg*. 2001 Apr;94(4):637–41.
6. Veselko M, Trobec R. Intraoperative localization of retained metallic fragments in missile wounds. *J Trauma*. 2000 Dec; 49(6):1052–8.
7. Ghislain PD. Spontaneous extrusion of hand grenade fragments from the face 60 years after injury. *JAMA*. 2003 Sep 10; 290(10):1317–8.
8. Wittich AC. Diagnosis and removal of a grenade fragment from the Vietnam war 35 years after injury. *Mil Med*. 2002 Jun; 167(6):519–20.
9. Oikarinen KS, Nieminen TM, Mäkäräinen H, Pyhtinen J. Visibility of foreign bodies in soft tissue in plain radiographs, computed tomography, magnetic resonance imaging, and ultrasound. An in vitro study. *Int J Oral Maxillofac Surg*. 1993 Apr;22(2):119–24.

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