New Approaches to Infratemporal Fossa Foreign Body Removal

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OBJECTIVES:

- **Review indications for removal of a foreign body**
- **Discuss the use of new surgical technologies**
- **Review the anatomy of the infratemporal fossa**
- **Presentation of cases and introduction of a novel technique for removal of FBs from the infratemporal fossa**

INTRODUCTION

Foreign bodies in the head and neck are attributable to a traumatic or iatrogenic event. Infection and delayed migration of the object into neurovascular structures, the orbit, the pharynx, or the cranial fossa are a risk as long as a foreign body is left in place. Open removal of these objects from the head and neck can be challenging. Blind explorations often lead to lengthy operative times, and exposures necessary for open access to areas such as the skull base and infratemporal fossa may result in significant morbidity.

Image-guidance has gained popularity as a technology that is well-suited for surgery in the head and neck. Computed tomography (CT) guided explorations allow for minimal dissection, shorter operative times, and rapid identification of vital structures, which may be closely related to foreign bodies. Increasing familiarity with endoscopic techniques has led to a number of reports in the literature describing successful transnasal removal of foreign bodies from the paranasal sinuses. With the complementary technology of image-guidance, there are now increasing reports of CT-guided, endoscopic, transnasal removal of objects from the anterior cranial fossa and orbit. Minimally-invasive, endoscopic approaches through external incisions have also gained popularity, most notably in the realm of cosmetic surgery. An endoscopically-assisted external approach to the frontal sinus as well as a transoral, endoscopic exploration of the maxillary sinus has been described.

In this paper we describe the first reported cases of CT-guided, endoscopic, transoral management of infratemporal fossa foreign bodies. This minimally-invasive alternative to open exploration of the infratemporal fossa may also hold promise as a route of access for obtaining diagnostic tissue.

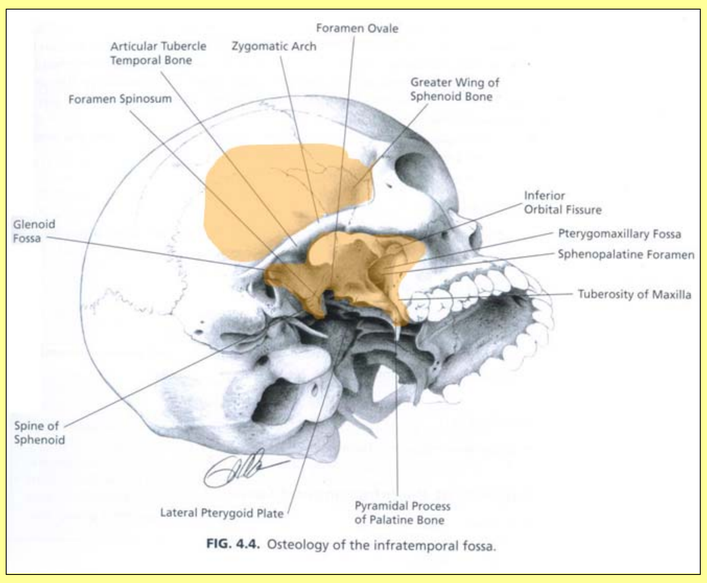

FIG. 4.4. Osteology of the infratemporal fossa.

Figure 1. Osteology of the infratemporal fossa
Modified from Janfaza P. *Surgical Anatomy of the Head and Neck*. Philadelphia, Pa: Lippincott Williams & Wilkins; 2001

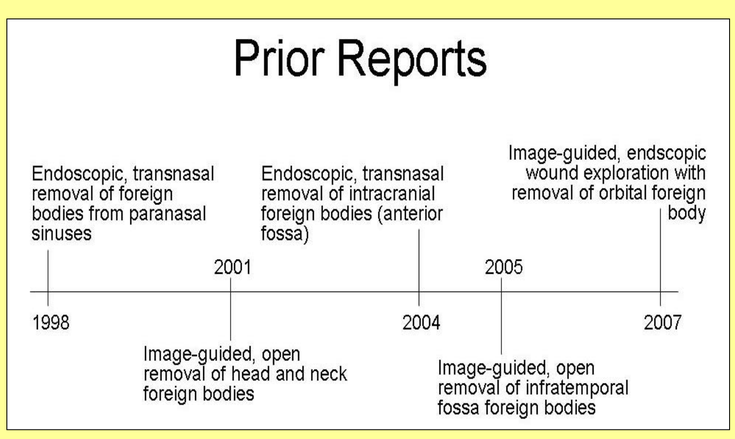

Figure 2. A timeline of prior reports of novel techniques for removal of foreign bodies from the head and neck area. There is a trend towards endoscopic and image-guidance technologies, both of which minimize dissection and shorten operative time

REPORT OF CASES

Case 1:

A 66 year-old man was undergoing an inferior alveolar nerve block at the dentist when the injection needle broke off. Immediate attempts at open removal of the needle fragment were unsuccessful. After obtaining plain films for localization of the foreign body, a one hour attempt at exploration and retrieval under local anesthesia with sedation in an office setting also failed. Symptoms of pain and trismus persisted; a CT scan demonstrated a 2.5 cm needle fragment in the right medial pterygoid muscle (Figure 3 (a+b)). After preoperative radiographic study with an image-guidance system, the patient was taken to the operating room for CT-guided, endoscopic, transoral exploration of the right infratemporal fossa. A side-biting mouth gag was placed and the tongue retracted; an intraoral incision was made in the right posterior, superior buccal mucosa. The image-guidance blunt probe was passed deep into the pterygoid space until the tip of the probe corresponded to the location of the needle fragment. Limited electrocautery was then used to cut down along the shaft of the probe for a distance of approximately 2 cm. The probe was removed and a 0 degree, 4 mm endoscope was used to explore the wound. The broken end of the needle tip was identified and removed using straight, small Blakesley forceps (Figure 3 c+d). The wound was closed with 3-0 plain gut. The patient was discharged home the same day and has done well in follow-up. On follow up exam the patient no longer has pain and his jaw motion feels normal to him.

REPORT OF CASES

Case 2:

A 23 year-old man was referred for removal of a retained cottonoid sponge in the left infratemporal fossa. He had recently undergone open repair of LeFort III and left trimalar fractures. During the procedure the string attached to a cottonoid was accidentally avulsed during drilling. The sponge was driven into the infratemporal fossa and could not be retrieved, despite intraoperative attempts at removal with use of a C-arm for localization. Post-operatively, the patient developed an infection with drainage from an intraoral wound and was referred for further management. A preoperative CT scan with an image-guidance system revealed a foreign body in the left infratemporal fossa medial to the zygoma consistent with a retained surgical sponge (Figure 4 (a+b)). He was taken to the operating room for CT-guided, endoscopic, transoral wound exploration. After infiltration with lidocaine and epinephrine the gingivobuccal incision was opened and the wound packed with cottonoids soaked in 4 cc of 4% cocaine. These were then removed and the wound was retracted and explored using the image-guided system so as to identify the proximity of the retained sponge. A 0 degree 4 mm endoscope was used to explore the cavity and locate the foreign body (Figure 4c). The sponge was removed using Blakesley forceps though the intraoral incision (Figure 4d). The miniplate was then removed so as to avoid a foreign body in the infected wound bed. Postoperatively the patient noted marked improvement in pain and drainage within 48 hours and has done well in follow-up.

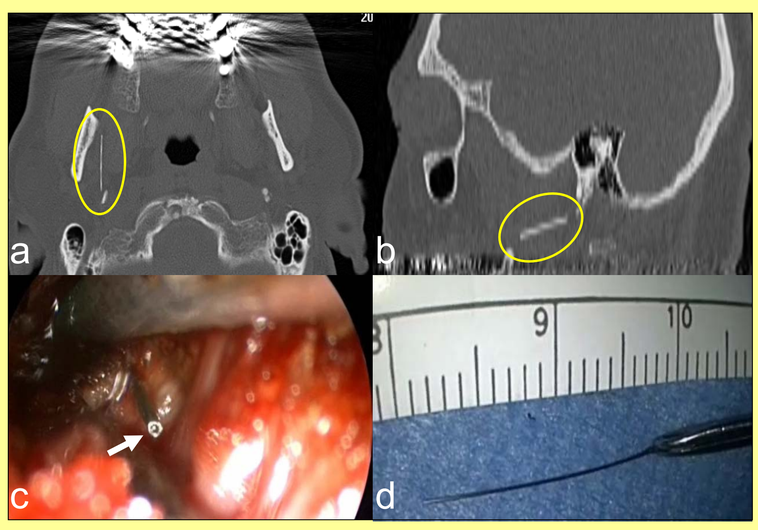

Figure 3. Case 1: Needle fragment, approximately 2 cm in length, lodged in the right medial pterygoid muscle, removed through a CT-guided, endoscopic, transoral approach.

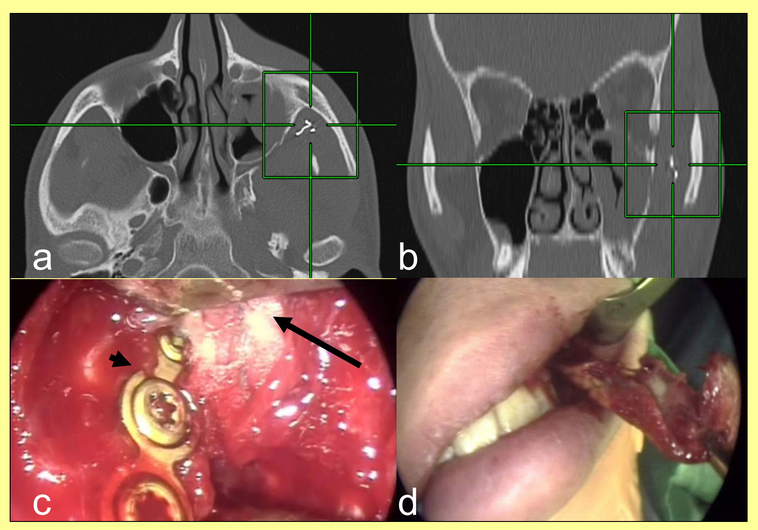

Figure 4. Case 2: CT-guided, endoscopic, transoral removal of a retained sponge in the left infratemporal fossa via gingivobuccal incision. Arrow: cottonoid sponge, arrowhead: miniplate over zygomaticomaxillary buttress

DISCUSSION

Image-guidance technology facilitates removal of radio-opaque foreign bodies by limiting dissection and assisting in localization. While this technology has gained widespread acceptance for use in endoscopic sinonasal surgery, its use for retrieval of foreign bodies from the head and neck region is less commonly practiced. In the two cases described in this report, initial attempts at wound exploration failed to localize either foreign body, even after several hours of dissection. Once image guidance was employed, there was rapid identification of the objects in question, and the use of endoscopic equipment facilitated focused dissections through small, intraoral incisions.

There are a number of reports of CT-guided, endoscopic, transnasal removal of objects from the paranasal sinuses, anterior cranial fossa and orbit. This paper describes the first reported cases of CT-guided, endoscopic, transoral removal of infratemporal fossa foreign bodies. This technique proved highly successful, even in cases where prior open exploration failed. Although CT-guided approaches have not been useful in cases where the foreign body in question is not radio-opaque, magnetic resonance imaging (MRI) is now adaptable to image-guidance devices and may prove useful in the future. In patients who present with infratemporal foreign bodies, consideration should be given to the use of image-guidance during the surgical retrieval of these objects. Additionally, this minimally-invasive alternative to open exploration may hold promise as a route of access for obtaining diagnostic tissue from the infratemporal fossa and central skull base.

CONCLUSIONS:

- **An endoscopic, transoral approach may be used to explore the infratemporal fossa in a minimally invasive way**
- **The use of image-guidance limits dissection and shortens operative time by facilitating the location of radio-opaque foreign bodies in the infratemporal fossa**
- **An endoscopic, minimally invasive, image-guided, transoral approach to the infratemporal fossa may be useful for biopsy as well as foreign body removal.**

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