CASE REPORT

Metallic foreign body in the sphenoid sinus after ballistic injury: a case report

Corps étranger métallique dans le sinus sphénoïdal après un traumatisme balistique : à propos d’un cas

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Available online 28 November 2007

KEYWORDS
Angiography;
Carotid canal;
Facial injury;
Foreign body injury;
Sphenoid sinus

Abstract Paranasal sinus injuries by foreign bodies have a lower incidence compared with facial injuries. Among them, penetrating maxillofacial injuries to the sphenoid sinus and skull base remain rare. We report the case of a 41-year-old man who presented with, after a missile-related maxillofacial injury, a metallic foreign body enclosed within the sphenoid sinus with carotid-canal fracture. Angiographic evaluation showed a mass in the right internal carotid artery. The foreign object was successfully extracted through a transmaxillary sublabial approach with a good outcome. We discuss the extensive preoperative evaluation and interdisciplinary management of this unusual injury.

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MOTS CLÉS
Angiographie ;
Canal carotidien ;
Corps étranger ;
Traumatisme facial ;
Sinus sphénoïdal


Published by Elsevier Masson SAS.
Introduction

Maxillofacial injuries by penetrating foreign bodies are uncommon in both wartime and civilian practice [1,4,7,9,10]. The cranial orbit, and frontal and maxillary sinuses are the structures most often involved. In contrast, the ethmoid and sphenoid sinuses are rarely damaged but, when they are, there is a potential for life-threatening consequences [3,6,9,12]. Usually, the foreign body reaches the sphenoid sinus through the orbit or the nostril [6,12]. A transmaxillary penetrating foreign body enclosed within the sphenoid sinus with carotid-canal injury has never been previously reported. We present our case of a missile-related facial injury by a metallic foreign body that had penetrated the right maxillary sinus, lodged in the sphenoid sinus and fractured the carotid canal.

Case report

A 41-year-old man, a shepherd, came to us with a wound over the right cheek. One week previously, he had lit a campfire for warming his meal. At that moment, a sudden explosion occurred, producing facial injury. An unknown explosive device was suspected. The patient complained of a right facial neuralgic pain without epistaxis, rhinorrhea or fever. He was examined at a nearby rural health center; the facial wound was sutured and he was referred to our hospital. Physical examination showed that his vital signs were stable. Ophthalmological and neurological examinations were normal except for a facial hypoesthesia of the right second trigeminal division territory. There was trismus and limited jaw mobility for mouth opening and chewing. Intranasal and oral examination revealed no abnormality. There was no systemic involvement. The facial wound, in the right cheek just below the molar eminence, was clean and closed, but the skin had an atypical puncture similar to a bullet entrance wound.

Plain X-ray and head CT-scan showed a metallic cylindrical foreign body, $10 \times 30 \times 30$ mm in size, retained in the sphenoid sinus, but involving the right retromaxillary space above the attachment of the pterygoid process, a few millimeters below the orbital floor and just in front of the carotid canal, which was fractured anteriorly. Both the anterior and posterior walls of the right maxillary sinus, and the anterior wall of the sphenoid sinus were fractured, with multiple bone fragments within the right carotid canal (Fig. 1). Carotid injury was therefore suspected. Angio-MRI was contraindicated because of the potential risk for migration and further injury by the metallic foreign body. Angiographic evaluation showed an anterior smooth mass in the right internal carotid artery without any intimal lesion, contrast extravasation, pseudoaneurysm, dissection or arteriovenous fistula (Fig. 2).

Neurosurgeons were consulted for further management of this deep-seated injury. The patient was operated on using a right transmaxillary approach via a sublabial incision. Fluoroscopic imaging was used for intraoperative guidance. The posterior maxillary wall was carefully approached until the foreign body was visualized. Bony spicules around the foreign body were removed to offer a clear path for removal. The foreign body was grasped and carefully extracted.

Figure 1 Craniofacial CT, coronal (A) and sagittal (B) reconstructions (bone window) showing a cylindrical, metallic foreign body lodged in the sphenoid sinus above the attachment of the pterygoid process. Axial CT (C) shows the metallic foreign body enclosed within the sphenoid sinus. Note the multiple bone fragments within the carotid canal (arrow).
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Figure 2 Right internal carotid arteriograms: right oblique anterior (A) and sagittal (B) views showing an anterior segmental mass in the right carotid artery (arrow).

(Fig. 3). The sinus cavity was thoroughly inspected for bleeding. There was no sign of cerebrospinal fluid leakage.

The patient was treated with systemic antibiotherapy for 8 days and an analgesic for 3 days. Follow-up CT-scan showed no abnormality (Fig. 4). Both the postoperative and the follow-up (3 months) periods were uneventful.

Discussion

Penetrating missile injury into the sphenoid sinus by foreign body is rare, as the projectile tends to cause skull-base and intracranial injuries, and may prove disastrous because of the potential damage to surrounding deep vascular and neural structures [3,4,9,10]. Numerous immediate complications may be observed, such as intra-extracranial bleeding (with possible major airways or circulatory compromise), cerebral damage, epileptic seizures, cranial-nerve deficits, visual defects and cerebrospinal fluid leakage. In addition, high-velocity projectiles tend to produce more damage by the ‘shock wave’ that extends beyond the path of the foreign body [10]. Among the various delayed complications, the most significant are carotidocavernous fistulas, pseudoaneurysms and infections. Pyogenic infection is always a risk, leading to the onset of chronic sinusitis, chronic fistulae, necrotizing fasciitis, periostitis, meningitis or cerebral abscess formation if the cranial cavity is involved [2].

CT scanning with three-dimensional reconstruction is the investigation of choice for sphenoid sinus-penetrating foreign objects as it can identify the foreign body and the extent of the damage, and determine the missile’s path, as well as provide useful information for the planning of the surgical procedure and, usually, for the prognosis. MRI can add precious supplementary data for non-metallic objects, especially if intracranial lesions are suspected. A penetrating foreign body located in the sphenoid sinus should be...
evaluated by angiography to rule out injury to the internal carotid artery before removal of the object [3,11]. Intracranial carotid injury usually requires angiographic embolization or surgery; however, our case was noteworthy in that the internal carotid artery was smoothly compressed, with no vascular or intracranial complications.

Sinonasal endoscopy is the method of choice for direct visualization and removal of the foreign body from the paranasal sinuses [1,2,6,8]. However, in our case, the object could not be removed endoscopically because of its width. The approach for removal of the foreign body depends on its size, anatomical location, structure(s) involved and the surgeon’s preference. In our patient, the projectile was successfully removed through the transmaxillary sublabial approach, which was selected because of its considerably lower morbidity. As with complex intracranial aneurysms, we prepared the right internal carotid artery in the neck to ensure intraoperative vascular control and minimize hemorrhagic risk.

Penetrating maxillofacial injuries to the sphenoid sinus due to a missile foreign body are rare. For this reason, extensive preoperative evaluation and interdisciplinary management (ophthalmologist, maxillofacial surgeon, emergency physician, neuroradiologist and neurosurgeon) are recommended to minimize patient morbidity and mortality. A combination of three-dimensional craniofacial CT scanning, MRI (in cases with a non-metallic foreign body) and angiography represent the gold-standard investigation of this unusual injury, especially when skull-base and intracranial lesions are suspected. Endoscopic and intraoperative imaging guidance are major aids during the surgical procedure for the safe removal of the foreign body [5,8].

References