

# Traumatic Foreign Bodies in the Paranasal Sinuses

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## Abstract

It is a retrospective study in which rare or unusual cases of traumatic foreign bodies in the paranasal sinuses, which exclusively resulted from explosions and violent acts over the last five years, were analyzed and studied. In the presence of security instability and violent acts with explosions and clashes in the unstable areas in Iraq, many casualties including civilians and military subjects are affected.

In this review, eight cases of traumatic foreign bodies in the paranasal sinuses were collected and the majority was managed by the author. Six patients were civilians, while 2 were military personals. All patients were males except for one female casualty. The ethmoid sinuses were affected in the majority of cases (5 cases), while the maxillary sinus was affected in 2 patients, and the sphenoid sinus in one patient. Surgical intervention was done in 4 patients, while 4 patients were not operated.

This study outlines the presentations, effects, and complications of the foreign bodies in the sinuses, together with a description of the surgical procedure adopted in the operated patients.

**Keywords:** Foreign bodies (FB), Paranasal Sinuses (PNS).

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## Introduction

The presence of a foreign body (FB) in the paranasal sinuses is not a rare finding. In an adult, foreign bodies of the nose or paranasal sinuses are mainly caused by traumatic events.<sup>1</sup> Penetrating injuries of the paranasal sinuses due to a foreign body are rare, and evaluation of the extent of injury plays a major role in planning management.<sup>2</sup>

The literature review reveals that more than 50 per cent of these foreign bodies were found in the maxillary sinus, involvement of the frontal, ethmoid, and sphenoid sinuses was nearly equal.<sup>3,4</sup> The maxillary antrum was the sinus most often involved in dental procedures.<sup>5-7</sup> Most frequent foreign bodies are metallic or vegetable ones.<sup>8,9</sup>

The removal of these objects usually required a surgical endoscopic approach which demanded a well-founded anatomy of the sphenothmoidal region because of the presence of important and vital structures.<sup>10</sup>

In the current study, we try to concentrate on traumatic FB caused exclusively by bomb explosions and bullet injuries and demonstrate the behavior, complications, and destinations of such high speed FB, which may be different from those caused by other etiologies.

## Patients and Methods

This is a retrospective study, which was conducted in Al-Jamhori teaching hospital. Over a 5-year period, eight cases of traumatic foreign bodies in the paranasal sinuses were all the result

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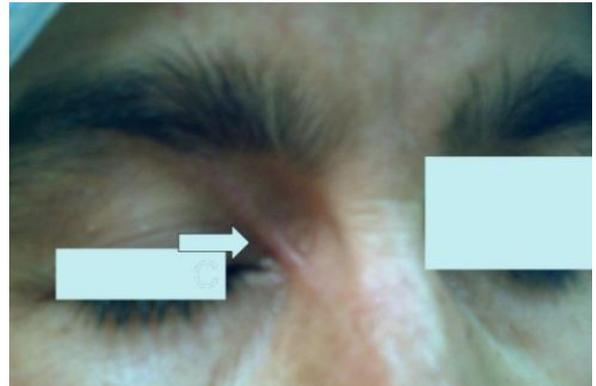
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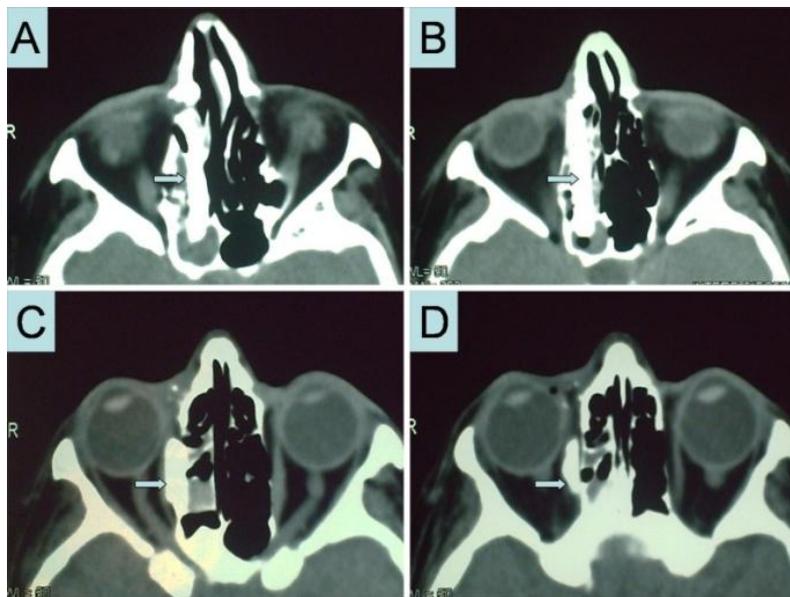
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of violent actions (bomb explosions and clashes) in Mosul Province, Iraq. These cases were referred to the author for consultation. Here we describe these cases with some details about the presentations, complications, and management.

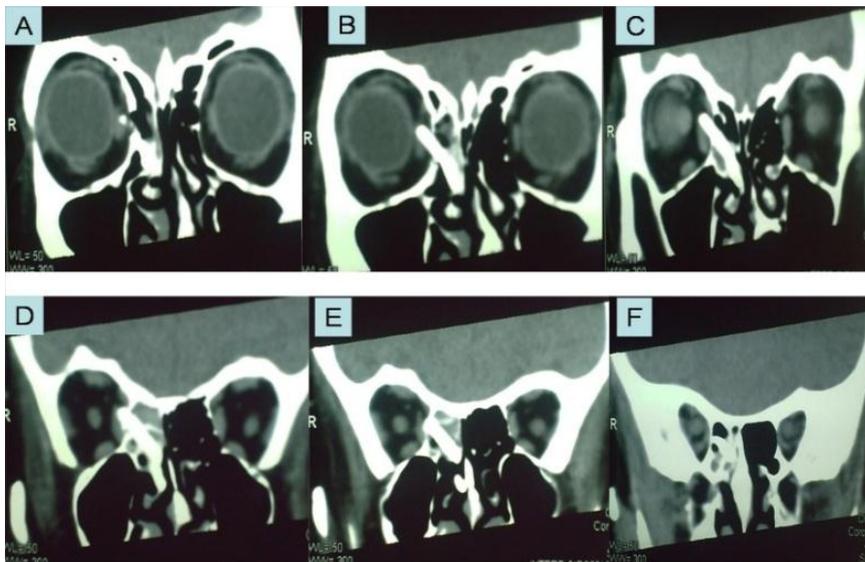
In 5 patients, the ethmoid sinuses were affected. In the first case, there was a trans-orbital penetration of glass foreign bodies into the ethmoid sinuses. A 43-year-old female patient was at home when a huge explosion took place in her neighborhood. High speed shells of glass penetrated into the right eye at the region close to the medial canthus. After wound suturing, the patient was referred to the ophthalmology department because of vitreous hemorrhage. The checkup CT scan revealed the presence of foreign bodies in the right ethmoid paranasal sinuses. After the subsidence of the eye condition, about one month after the incidence, she was referred to the author to deal with the accidental foreign bodies found in the paranasal sinuses (figures 1-3).



**Figure (1):** *The scar of the entry wound extends from the eyebrow to a point just medial to the medial angle of the eye.*

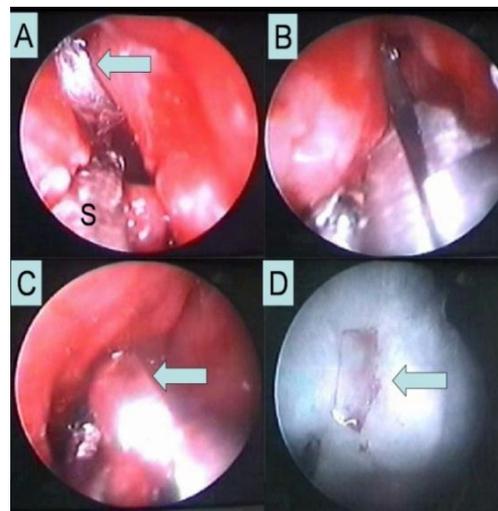


**Figure (2):** *Axial CT showing the extent of foreign body in the ethmoid and sphenoid sinuses. Foreign bodies are isodense to bone, extending through the ethmoid cells and being partly in the orbit.*



**Figure (3):** Coronal CT, the pieces are breaching the lamina papyracea and coming in contact with the medial rectus muscle.

The patient underwent endoscopic sinus surgery to remove these foreign bodies, which was done under general anesthesia. During the procedure, the uncinate process was left intact, and the bulla ethmoidalis was penetrated using the sucker tip and then opened widely using a Blakesley forceps. The pieces of glass were searched and removed (figure 4). Oral antibiotic (Augmentin 625 mgs, three times daily) was prescribed for about two weeks following surgery. Figure (5) shows the whole foreign bodies removed from the ethmoid sinuses.

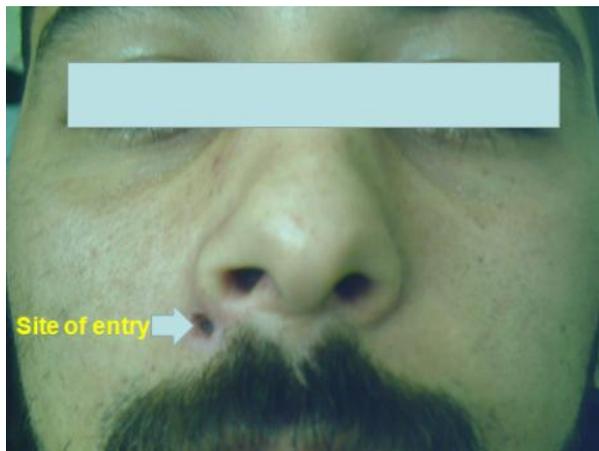


**Figure (4):** Endoscopic removal of pieces of glass. The arrow points to a piece of glass, which was removed by forceps. S: sucker.

The second case, a 24-year-old male, was accidentally in the middle of clashes and had a bullet injury of the face. The site of entry was just inferior to the right nostril at the margin of the alar crease (figure 6). A CT scan showed the presence of a foreign body in the left ethmoid sinuses. He was transferred to the author about one week after the accident.



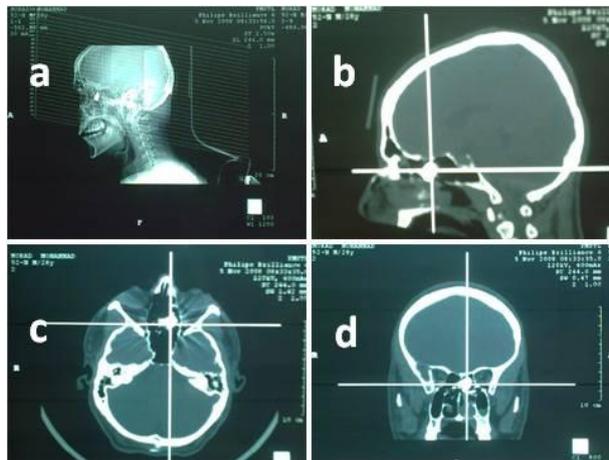
**Figure (5):** Pieces of glass removed from the right ethmoid sinus.



**Figure (6):** The site of entry of the bullet in the face.

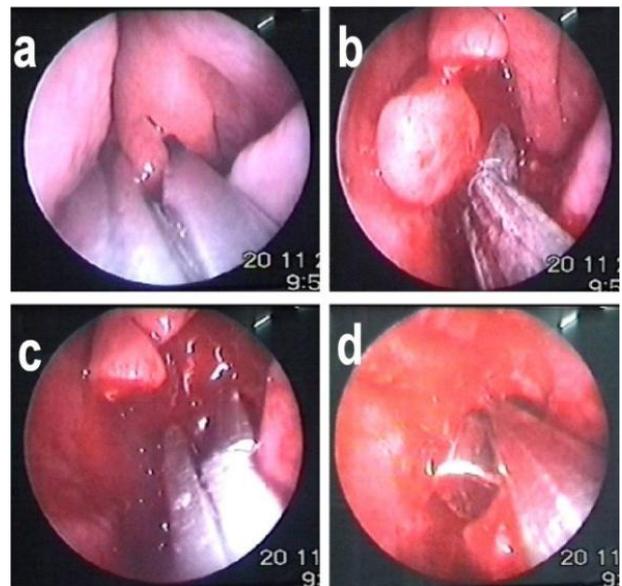
On examination by rigid endoscopy, only septal deviation to the right was seen together with evidence of old clotted blood in the nasal cavity.

It appeared that the pathway of the bullet was from the right to the left sides through the nasal cavity. The bullet was then deflected to impact in the left posterior ethmoid sinuses (figure 7).



**Figure (7):** CT scan shows the bullet in the left posterior ethmoids.

Under general anesthesia, endoscopic sinus surgery was done to retrieve the bullet. Surgery included partial removal of the lower half of the left middle turbinate, anterior ethmoidectomy, identification of the bullet in the posterior ethmoids, and then removal of it (figures 8 and 9). Similarly, an oral antibiotic was given for 2 weeks postoperatively.



**Figure (8):** a and b: steps of bullet removal, left partial middle turbinectomy; c and d: anterior ethmoidectomy and bullet removal.



**Figure (9):** The bullet after removal.

The third case was a 14-year-old male who was exposed to a shell injury through the nose. The entrance was just below the nasal bones, just to the left of midline. It appears that the pathway was through the nasal septum and crossed the midline to be resident in the right anterior ethmoid sinuses (figure 10). This shell was removed by the endoscopic approach under general anesthesia.

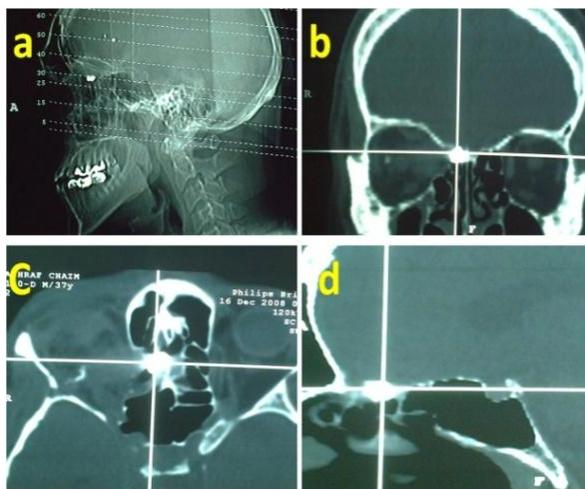
The fourth case was a 43-year-old male who was exposed to a nearby explosion with a shell injury entering his right eye. This trans-orbital shell injury caused severe orbital damage that ended in enucleating the right eye in the ophthalmology

department. The CT scan showed a shell in the roof of the right ethmoid sinus which seemed very close to the cribriform plate (figure11).



**Figure (10):** CT shows the shell in right anterior ethmoid sinus

The decision of the author was to leave this shell untouched and to put the patient on regular follow ups. Surgical intervention might have led to intracranial complications and CSF leak. Six monthly follow ups over 2 years revealed no significant symptoms or complications. A CT scan was repeated after 2 years, and it showed no changes from the first one.



**Figure (11):** The shell is at the roof of the right ethmoid sinus, very close to the cribriform plate.

The fifth case was a military victim who was exposed to a shell injury from an explosion. The shell penetrated the left eye and became resident in the left anterior ethmoid sinus.

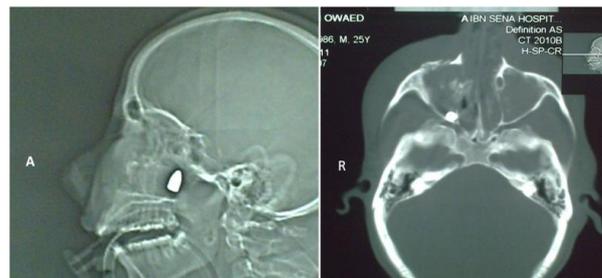
Preliminary assessment of the patient showed total loss of vision with a dilated non-reactive pupil. This patient was transferred to the military hospital and further management was lacking.

In two patients, the maxillary sinuses were affected. The first case was a 45-year-old male with a shell injury to the face, which became resident in the right maxillary sinus. The shell was removed by the Caldwell-Luc technique, and the patient had a smooth postoperative course (figure12).



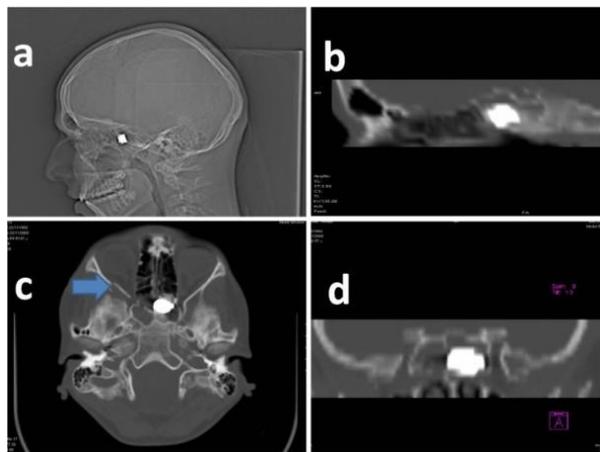
**Figure (12):** The shell is in the right maxillary sinus.

The second case was military personnel that was shot by a gun and had a penetrating bullet in the face. The bullet fractured the anterior wall of the maxilla and became resident in the posterior part of the right maxillary sinus (figure 13). He was transferred to the military hospital after stabilization of his general conditions and further management or follow up was lacking.



**Figure (13):** A bullet in the right maxillary sinus.

In one case the sphenoid sinus was affected. A 15-year-old male was exposed to an explosion with a shell injury in the head. The entry of the shell was in the right temporozygomatic region. The patient was admitted to the surgical department with full ophthalmological and neurological assessment. A CT scan showed a metallic density in the left sphenoid sinus (figure 14). It appears that the shell penetrated the right side at the temporozygomatic region. It passed through the right temporal area and beneath the right orbital cavity into the nasal cavity. The shell finally crossed the midline and became lodged in the left sphenoid sinus. There was no serious ophthalmological or neurological injury.



**Figure (14):** CT shows a shell in the left sphenoid sinus. See fracture line on right side (arrow in fig c).

After the patient became stable, he was offered surgical removal by endoscope. The patient refused surgery and he was put on observation (follow up). No significant symptoms evolved on a 3-year follow up.

## Results

Eight cases of traumatic foreign bodies in the paranasal sinuses resulting exclusively from explosions and clashes were encountered over a 5-year period. Six patients (75%) were civilians, while 2 (25%) were military people. Males were the majority of victims (7 out of 8 patients) (87.5%).

According to this study, the ethmoid sinuses were involved in the majority of cases (5 out of 8 cases) (62.5%). Of these 5 cases, the anterior ethmoids were affected in 2 (40%), the posterior ethmoids in 2 (40%), and in one case (the first case), both the anterior and posterior ethmoids were involved with partial involvement of the ipsilateral sphenoid sinus. Transorbital penetration happened in three cases.

The sphenoid sinus was purely involved in one patient (12.5%), while the maxillary sinus was involved in two patients (25%).

The foreign bodies crossed the midline to affect the sinuses contralateral to their entry site in 3 patients (37.5%). In 5 patients (62.5%), the foreign bodies affected the sinuses ipsilateral to the entry site.

In 2 patients (25%), the condition was complicated by severe orbital injury because of the transorbital penetration of the foreign bodies while in 6 patients (75%), no significant orbital problems occurred.

Four patients (50%) were managed surgically, which was by the endoscopic approach in three patients, and Caldwell-Luc technique in one patient. In one patient, surgery was avoided because of the proximity of the foreign body to the cribriform plate, and surgery carried the risk of intracranial complications. One patient (sphenoid foreign body) refused surgery and was put on observation, and 2 military patients were transferred to the military hospital for further management.

## Discussion

Bomb blast injuries to civilians in a non-combat setting have become increasingly common over the last decade, mainly as acts of terrorism. In the current study, cases of FB in the sinuses which exclusively resulted from explosions and violent acts were included. The aim was to study the behavior and presentation of high speed shell penetrations of the paranasal sinuses. For this reason, the findings may be different from those found in the literature.

In literature review, most cases described were from road traffic accidents or firearms. Orbit, maxillary and frontal sinuses were the structures most often involved. Sphenoid sinuses were deeply located and hence rarely damaged.<sup>11</sup> Garces and Norris reported that about 70% of these foreign bodies were associated with some form of maxillofacial trauma, while 30% occur in patients that underwent surgical treatment for dental problems.<sup>12</sup> A wide variety of foreign bodies has been reported in the paranasal sinuses, including retained roots of teeth and fillings, wood or bamboo splinters, pieces of cotton or gauze, bullets, shrapnel, knife blades, and glass fragments.<sup>13-16</sup>

Isolated sinus ballistic lesions are rare. An extremely high proportion of such injuries has resulted from suicide attempts and accidents in adolescent males.<sup>1,9,11</sup> With the relatively low rate of these injuries, there are no standard methods of diagnosis and management. For this reason, in this study, we tried to clarify the nature of injury, the most affected sinuses, complications and possible management procedures.

In contrast to literature review which reveals that about half of FB have been found in the maxillary sinuses, our study showed that the majority of foreign bodies were found in the ethmoid sinuses (62.5%).

The use of CT scan in cases of FB has become essential in diagnosing the extent of the injury.<sup>17</sup> Axial CT is the examination of choice for a suspected sinus FB. A CT is helpful in localizing the foreign body accurately and detecting possible complications.<sup>4</sup> In our study, all patients had CT scans of paranasal sinuses done in the coronal, axial, and in some cases, sagittal reconstruction, which showed the FB and had an impact on the management decision.

The decision to remove the foreign body should consider the possible risks. Sphenoid sinus foreign bodies should be approached with special attention due to the close proximity of such important structures as the optic nerve and internal carotid artery.<sup>1,11</sup>

In our study, half of patients had FB removal by the endoscopic approach (in 3 patients) and the Caldwell-Luc approach in one patient. Endoscopic sinus surgery for the removal of the sinus FBs is effective and avoids the need for an external ethmoidectomy.<sup>10</sup>

The opinion of the author is that only one patient was not a candidate for surgery because surgical intervention may have led to CSF leak and intracranial complications. The reasons for not operating were that one patient refused (sphenoid FB) and two other patients were military so could not for security reasons.

The nature of FB in our study was metallic in the majority of cases, and glass pieces in one patient, which agrees with many reviewed studies.<sup>1-12</sup> In our study, the frontal sinus was not affected in any patient and the maxillary in only two patients. This is different from most of the literature review, as mentioned previously, because the nature of the ballistic with a high speed of penetration can affect more deep sinuses as equal as the anterior sinuses, together with the increased risk of complications to adjacent vital structures like the orbit.

## **Conclusion**

As a conclusion, traumatic FB in the paranasal sinuses which resulted from high speed penetration shell injuries have different ways of presentation from the ordinary FB in the literature with a high incidence of deep sinus involvement, orbital damage and high chance of crossing the midline.

This study also shows the importance of a CT scan in the evaluation and management of such patients and the efficacy of the endoscopic approach in removing such FB with the least morbidity.

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## إصابة الجيوب الأنفية بأجسام غريبة

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### الملخص

هذه دراسة رجعية تم فيها تحليل ومناقشة الحالات النادرة من إصابة الجيوب الانفية بأجسام غريبة، وهذه الإصابات ناتجة كلياً من جزاء الانفجارات وأعمال العنف، خلال الخمس سنوات الماضية. وهناك حالات تمثل عدم الاستقرار الأمني وأعمال العنف في المناطق الغير المستقرة من العراق، والعديد من الإصابات التي تحدث بين المدنيين والعسكريين.

وفي هذه الدراسة تم تقييم 8 حالات من المصابين بالجيوب الأنفية بأجسام غريبة ومعالجة بعضها من قبل الباحث، وستة مرضى كانوا مدنيين واثنان فقط من العسكريين. هناك خمسة مرضى كانت اصابتهم في الجيوب المصفوية، وهناك مريضان مصابان بالجيوب الفككية وحالة واحدة مصابة بالجيوب الاسفيني. وتم التدخل الجراحي في أربعة مرضى. هذه الدراسة تدرس الأعراض والتأثيرات ومضاعفات الأجسام الغريبة في الجيوب الانفية مع وصف للعمليات الجراحية.