

Management of an Unusual Intranasal Foreign Body Abutting the Cribriform Plate: A Case Report and Review of Literature

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ABSTRACT: A 35-year-old man with history of schizophrenia presented 3 weeks after placing a screw in his right nostril. Initial imaging showed a screw in the right ethmoid sinus with the tip penetrating the right cribriform plate. On exam, the patient was hemodynamically stable with purulent drainage in the right nasal cavity but no visible foreign body. While most nasal foreign bodies occur in children and are generally removed at the bedside, intranasal foreign bodies in adults tend to require further assessment. The foreign body in this case was concerning for skull base involvement and the patient was brought to the operating room (OR) with neurosurgery for endoscopic sinus surgery (ESS) and removal of foreign body. The screw was removed and the patient recovered with no signs of cerebrospinal fluid (CSF) leak postoperatively. Any concern for skull base or intracranial involvement should call for a full evaluation of the mechanism of injury and intervention in a controlled environment.

KEYWORDS: Intranasal, foreign body, endoscopic, cribriform plate

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Introduction

Intranasal foreign body is typically a common chief complaint among the pediatric population. In a review of all Emergency Department (ED) visits in a 5-year span, there were 6418 (3.2% of all visits) visits nationwide for management of nasal foreign bodies, only 214 (0.1%) of which were adults. The median age was 3 years.¹ The majority of these patients were discharged from the ED, but certain foreign objects such as button batteries and sharp objects required further assessment. Due to the low incidence of nasal foreign bodies among adults with different mechanisms of injury (self-inflicted vs projectile), most literature reports individual cases. Here, we present a unique situation where an adult patient inserted a large screw into his ethmoid sinus that abutted the cribriform plate.

Case Report

The patient was a 35-year-old male with history of schizophrenia and psychosis who reported that he inserted a screw inside his right nostril 3 weeks prior and presented with mild epistaxis and nasal congestion. He reported that he heard voices that told him to put the screw in his nose so that he could keep his job. He endorsed trying to push the screw in further, hoping it would fall out of his mouth. The patient was seen by his primary care physician in the past for foreign objects in his ears and nose. He once swallowed a part of a milk can that required surgical removal with exploratory laparotomy. At the time of presentation, he was in an outpatient psychiatric program and compliant with his medications. He was sent to the ED by the director of his program for evaluation of nasal foreign body. He denied additional symptoms, including fever, nasal drainage, pain, or vision changes. On initial nasal



Figure 1. Initial non-contrast CT sinus coronal view demonstrating intranasal foreign body displacing the cribriform plate. CT indicates computed tomography.

endoscopy, there was purulent drainage along the floor of the right nasal cavity but no obvious foreign body visualized. Non-contrast computed tomography (CT) sinus confirmed the foreign body with dehiscence of anterior cranial fossa (Figures 1 and 2).

Upon arrival at our institution, CT angiography was obtained that did not reveal any intracranial vascular injury. He was started on intravenous (IV) vancomycin and ceftriaxone while cultures were sent and consulting teams from Neurosurgery, Psychiatry, and Infectious Disease were called. At the recommendation of the Infectious Disease service, ceftriaxone was continued until cultures resulted in methicillin-susceptible



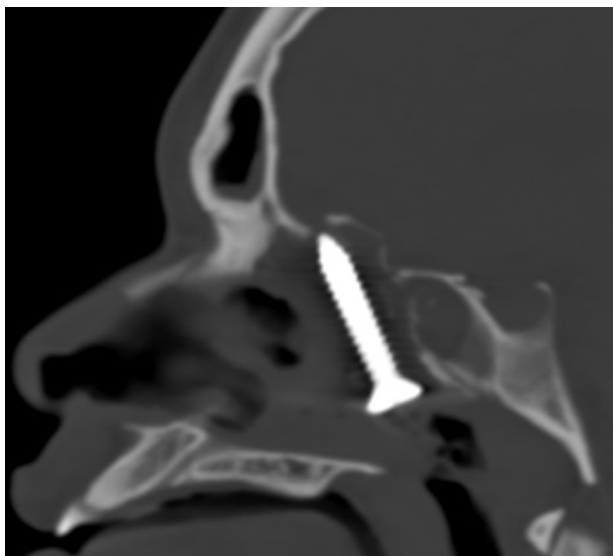


Figure 2. Initial non-contrast CT sinus sagittal view demonstrating size and position of intranasal foreign body, identifiable as a radiopaque screw. CT indicates computed tomography.

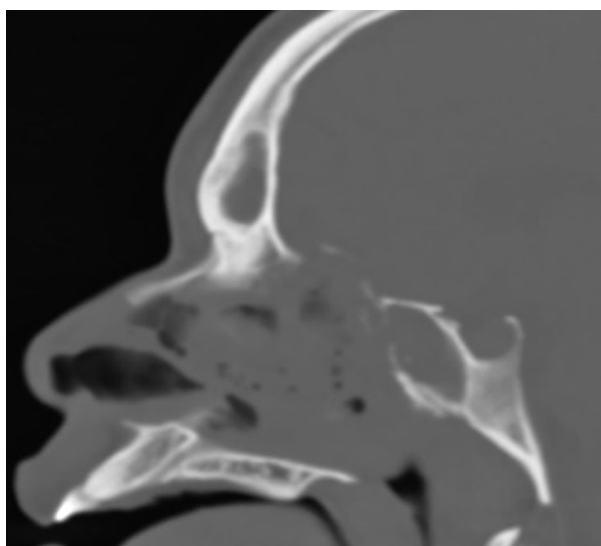


Figure 3. Postoperative non-contrast CT sinus sagittal view after removal of foreign body demonstrating persistent elevation of anterior skull base. CT indicates computed tomography.

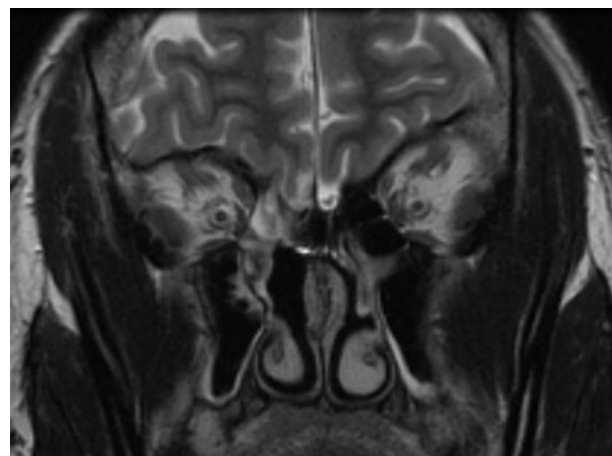


Figure 4. Postoperative MRI coronal view with arrow demonstrating leptomenigeal enhancement but no encephalocele or other pathology. MRI indicates magnetic resonance imaging.

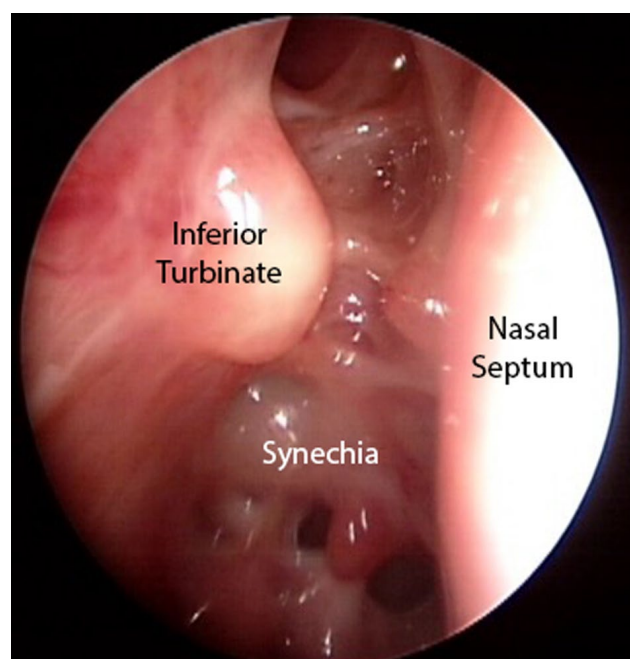


Figure 5. Endoscopic image at 6-month follow-up showed patent ethmoid and frontal sinuses with synechia.

Staphylococcus aureus (MSSA) and *Klebsiella*. He remained stable during the course of the admission and was discharged on Augmentin 875 mg twice a day for 10 days.

The patient underwent an elective right maxillary antrostomy, total ethmoidectomy, and frontal sinusotomy with removal of anterior skull base foreign body. Synechia between the septum and lateral nasal wall was removed before locating the screw, which was covered in a plastic sheath. The screw was displaced inferiorly away from the skull base and maneuvered out of the nasal cavity. Other foreign material was cleared from the nasal cavity and close inspection revealed no visible cerebrospinal fluid (CSF) leak or skull base defect. Surgicel and Evicel tissue glue were applied and held up with Nasopore.

Postoperatively, patient appeared well but had diminished sense of smell. Repeat CT scan showed elevation of the skull base and no pneumocephalus (Figure 3). Postoperative magnetic resonance imaging (MRI) showed some leptomenigeal enhancement but no encephalocele (Figure 4). The patient did not demonstrate any sign of CSF leak. The patient was discharged on postoperative day 2 with oral antibiotics. He was last seen 6 months later with no complaints. There was synechia again noted between the septum and inferior turbinate. Ethmoid and frontal sinuses were patent, but the maxillary sinus opening was not visualized (Figure 5). The patient has since been lost to follow-up.

Table 1. Review of the literature.

AUTHORS	YEAR	FOREIGN BODY	LOCATION	PRE-OP IMAGING	BEDSIDE/ OR	ENDOSCOPIC ASSISTED	SURGICAL ENTRY	ANTIBIOTIC USE	COMPLICATIONS
Dehgani Mobaraki et al ²	2016	Nail	Ethmoid	X-ray	OR	Yes	Transnasal	None reported	None reported
Nguyen et al ³	2016	Ballpoint pen	Ethmoid, sphenoid	CT	OR	No	Craniotomy	None reported	None reported
Dominguete et al ⁴	2013	Knife blade	Maxillary	X-ray	Bedside	No	NA	Amoxicillin 500mg, 3 times a day	None reported
Tang et al ⁵	2012	Screw	Sphenoid	X-ray	Not specified	Yes	Transnasal	None reported	None reported
Verhaeghe et al ⁶	2012	Airgun bullet	Sphenoid	X-ray, CT	OR	Yes	Transnasal	None reported	None reported
Lee et al ⁷	2011	Metal chopstick	Intracranial, trans-sphenoid	CT	OR	Yes	Transnasal	None reported	CSF leak immediately following removal of foreign body
Scolozzi et al ⁸	2010	Axe fragment	Maxillary	X-ray, CT	OR	No	Transoral	None reported	None reported
Al Saif et al ⁹	2009	Bullet casing	Sphenoid	X-ray, CT	Not specified	Yes	Transnasal	None reported	None reported
Ebner et al ¹⁰	2009	Needlefish jaw	Maxillary	CT	OR	Yes	Transnasal	Ciprofloxacin 500 mg	None reported
Harvinder et al ¹¹	2008	Fishing arrow	Maxillary	X-ray	OR	No	Transoral, Caldwell-Luc	None reported	None reported
Singh et al ¹²	2008	Sewing needle	Nasopharynx	X-ray, CT	Not specified	Yes	Transnasal	Unspecified antibiotic	None reported
Presutti et al ¹³	2006	5 cm metal fragment	Sphenoid	X-ray, CT	OR ^a	Yes	Transnasal	Ceftriaxone 2g/day with packing, 1 g/day once removed	Rhinorrhea requiring bed rest ×4 days
Burduk et al ¹⁴	2005	Bead surrounded by calcified tissue	Superior nasal cavity	CT	Not specified	Yes	Transnasal	None reported	None reported
Dodson et al ¹⁵	2004	Multiple foreign bodies	Maxillary, ethmoid, intracranial	CT	OR	Yes	Transnasal	IV antibiotic regimen ×2 weeks	CSF leak immediately following removal of foreign body

(Continued)

Table 1. (Continued)

AUTHORS	YEAR	FOREIGN BODY	LOCATION	PRE-OP IMAGING	BEDSIDE/ OR	ENDOSCOPIC ASSISTED	SURGICAL ENTRY	ANTIBIOTIC USE	COMPLICATIONS
Boahene et al ¹⁶	2004	Metal screw	Maxillary, ethmoid	X-ray, CT	OR	No	Transnasal	Unspecified IV antibiotic	Headache, periorbital discomfort 6mo postoperatively
Fan and Korvi ¹⁷	2002	Sewing needle	Maxillary	X-ray	OR	No	Transoral, Caldwell-Luc	Postoperative co-amoxiclav, unspecified antibiotic × 10 days	None reported
Salley and Wohl ¹⁸	2000	Open safety pin	Nasal cavity	X-ray	OR ^b	No	Transnasal	None reported	None reported
Sharif et al ¹⁹	2000	Pencil and pen	Through cribriform plate to corpus callosum	CT	Both ^c	No	Craniotomy	None reported	None reported
Yamamoto et al ²⁰	1985	Wooden chopstick	Intracranial, trans-sphenoid	X-ray, CT	Bedside	No	NA	None reported	Meningitis, death

Abbreviations: CSF, cerebrospinal fluid; CT, computed tomography; IV, intravenous; NA, not available; OR, operating room.

^aPresumed OR removal.

^bFailed attempt at bedside prior to OR.

^cOne object was removed at bedside and another was removed in the OR.

Discussion

Intranasal foreign bodies are common among the pediatric population. With adult patients, however, the mechanism and force of entry must be considered as there is a greater chance of violation of the skull base and possible CSF leak. In a review of the literature, there were 19 case reports of adult patients presenting with foreign bodies in the paranasal sinuses that were not caused by dental procedures, war-related injuries, or injury via an orbital entry (Table 1). Some foreign bodies were the result of accidents or explosions, while others were intentionally placed like in our case.

There were no obvious trends in preoperative imaging or approach for removal. Initial imaging included X-ray, CT, or both. No cases obtained an MRI prior to removal of the foreign object—MRI was likely contraindicated in most cases due to the risk of metallic foreign body migration. Some obtained MRI postoperatively as we did in our case. Decisions to go to the operating room (OR) depended on the stability of the patient and risks for complications such as infections or CSF leak.²¹ About half of the cases were endoscopic-assisted and most cases were done in the OR. Two cases required craniotomies for removal of foreign body.^{3,19} In 1 case, the patient could not tolerate bedside removal of an open safety pin with local anesthesia because of pain and the decision was made to remove the foreign body in the OR.¹⁸

Many reports of endoscopic removal of foreign bodies from adults have been made since the advancement of transnasal endoscopic surgery in the 1980s. Pagella et al²² demonstrated endoscopic retrieval of dental implants using trocars introduced superior and lateral to upper canine root. Dodson et al presented a case of a patient with schizophrenia that similarly placed multiple objects through the site of a molar extraction. Endoscopic retrieval of the objects in this case involved creating a larger skull base defect to retrieve a foreign body that penetrated the ethmoid roof.¹⁵

Complications of foreign bodies that violate the skull base include meningitis, brain abscess, CSF leak, neural compromise, and vascular injury. Complications of foreign bodies in the paranasal sinuses included chronic inflammation with disruption of ciliary clearance, cutaneous fistula, rhinolith formation, lead poisoning, and chronic pain.^{15,23,24} While foreign bodies (such as bullets) were usually left in soft tissue elsewhere in the body, Brinson et al²⁴ argued for removal of foreign bodies in the paranasal sinuses due to the unique environment of the sinuses that presents a higher risk for infection. However, there were conflicting recommendations regarding the use of prophylactic antibiotics. One review found that most reported cases received antibiotics, but in our review of 19 cases, only 6 case reports discussed antibiotic use (Table 1).²¹

Yarlagadda et al²¹ conducted a retrospective review of 13 retained metallic foreign bodies in the sinuses and/or skull base over the course of 10 years and recommended removal for cases that are safely accessible and at risk for infectious complications be removed. Three of these patients had involvement of the skull base

like our patient. All 3 of these patients experienced CSF leaks and 1 patient required skull base repair during removal of a nail from the clivus. Due to the unique nature of each injury and the scarcity with which they present, there was little evidence-based management for these injuries. However, Yarlalagadda et al proposed an algorithm based on their 10-year retrospective review.



Conclusions

A skull base defect or intracranial involvement may not be apparent when evaluating a patient with an intranasal foreign object. Conversely, a patient with suggestive imaging may not have an alarming clinical presentation. In our case, the patient's history and initial imaging were concerning for the need to repair a skull base defect. However, his ultimate outcome was more benign. It is important to use appropriate resources such as CT-angiogram and consulting services in carefully planning the management of these patients. Most patients will require operative exploration and possible repair of the skull base.

Author Contributions

MG, CK and SG contributed to the design, implementation and presentation of the research. MG and CK contributed to the analysis of the results and the writing of the manuscript. MG and SG contributed to the editing of the manuscript.

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