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Penetrating Foreign Bodies in Head and Neck Trauma

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Abstract: ***Foreign bodies are one of the most common emergencies encountered by the otorhinolaryngologists. However, penetrating foreign bodies of the head and neck region present with a much greater challenge in terms of evaluation, imaging and management. A complete evaluation of the location , type and nature of injury is of utmost importance due to the presence of vital structures in the head and neck region. A complete evaluation must always be done before removal of the foreign body to avoid injuring these structures Following is a case report of 8 patients who presented to our department with a wide variety of penetrating foreign bodies to the head and neck region and were managed accordingly.***

1. Introduction

Penetrating neck injuries are present in 5 to 10% of alltrauma cases[1]. A sharp foreign body in the neck posesdiagnostic and therapeutic challenge if the penetration is deep with a chance of migration.Entry of these foreign bodies can be marked by minor wounds, likelacerations and abrasions, that are likely to be contaminated with loose gravelor dental fragments and such debris. They need to be distinguished from severe wounds caused by impalement, shootings, stabbings, and explosions. Blast injuries resulting from terror attacks are challenging recent therapeutic concepts, their injury patterns being uncommon, they carry the risk of impacted foreign bodies.

We present 8 cases of penetrating foreign body injuries which were duly diagnosed with the help of radiological imaging and managed by adequate exploration.

2. Case Report

Case 1

An 11 year old boy presented with a history of accidental fall on bamboo stick with impalement in the lateral aspect of the neck . The patient had no neurological deficits. After taking a proper history, a CT with 3D reconstruction was advised to assess the depth and area of impalement. It was observed that the broken bamboo stick was present anteriorly to the left carotid sheath and impinged on no major structures. A thorough exploration was carried out under GA and all remnants were removed. The patient did well post operatively with no neurological deficits or soft signs and was discharged 4 days post operatively.

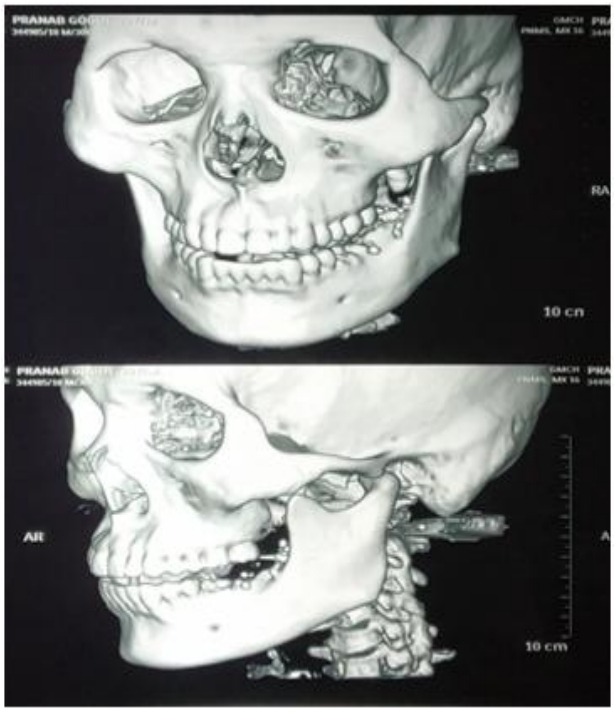
Image showing bamboo splinter

Case 2

A 30 year old male presented with a history of point blank bullet injury intraorally, by a terrorist organisation, after 3 days of the event. The patient complained of restricted mouth opening, deviation of angle of mouth to the right side, difficulty in closure of left eye (grade 3 facial palsy) and pain in the retro mandibular region on the left side. Intraoral examination revealed an entry wound just above the left retro molartrigone but no exit wound. On a CT scan with 3D reconstruction a bullet just below the mastoid tip withmultiple small pellets along the tract was seen. An external approach exploration was done under GA and the bullet along with 4 pellets were removed. Post operatively the patient's facial palsy improved (grade 2) and the patient was discharged on day 10 postoperatively.

CT image of bullet in retromandibular region


Image showing bullet being extracted



3D reconstruction for visualization of the bullet

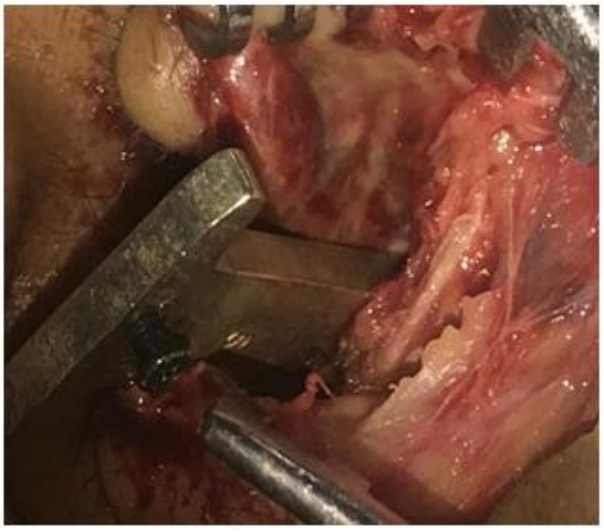
Case 3

A 3 year old boy presented with an accidental impalement by a wooden splinter 8 months ago into the hard palate while playing. Granuloma formation over the alleged site of entry was seen. A CT scan revealed a splinter insidenot extending into the Nasal cavity or involving any major structures. After a comprehensive evaluation, the patient was operated and the splinter removed. No intraoperative or postoperative complications were encountered and the patient was discharged 8 days postoperatively. Post operative follow-up after 2 weeks also showed adequate healing with no signs of inflammation.

Case 4

A 46 year old man presented with a key inserted into the left pre- auricular region as a result of a violent altercation with a rival. Radiological imaging (including X-rays and MDCT) showed , a close proximity to the ocular bulb in the infraorbital region and maxillary sinus although neither of these structures appeared affected. The patient was immediately taken to the OT after a thorough evaluation. Under GA, the foreign body was removed. The patient developed facial nerve palsy (grade 3) postoperatively but showed adequate healing with no signs of infection 4 weeks later.


Pre operative image of foreign body (key)


Intraoperative image showing key

Xray image of key in preauricular region


Foreign body (key) after extraction

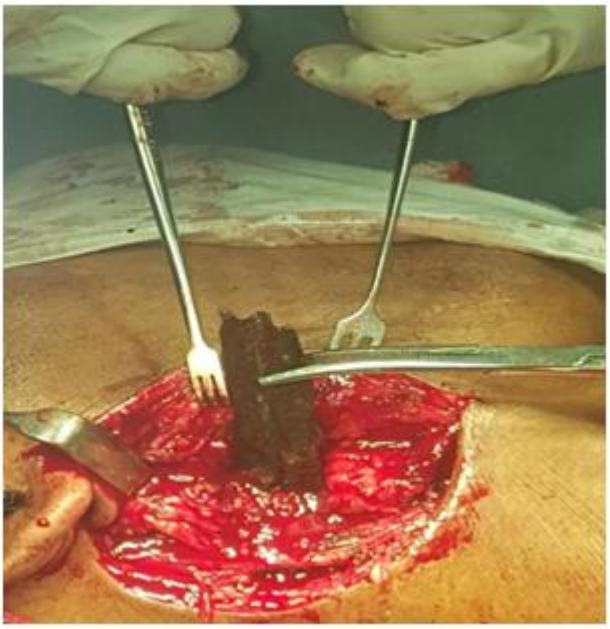
Case 5

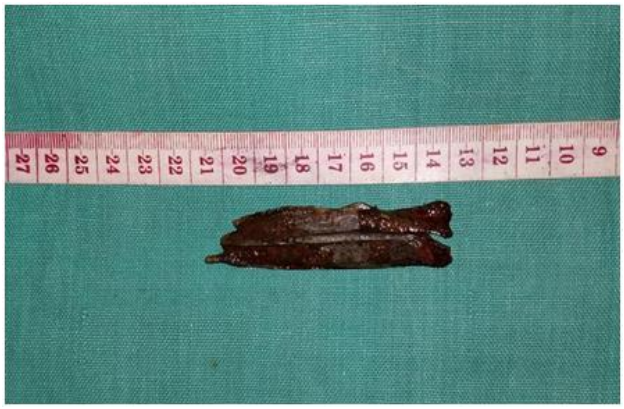
An 8 year old girl , was accidentally shot while playing with a local air gun like contraption used to shoot chickens and presented with a metal pellet at the level of C6. A CECT of the neck was done to check for vascular and neural bundle proximity. After ascertaining the position the foreign body was removed using a lateral incision with no postoperative neurovascular deficits. The patient was discharged 5 days postoperatively.

Case 6

A 45 year old male presented with a persistent discharging sinus from the left side of the mandible since 1 year. The patient had a history of industrial accident 13 years ago following which there was a laceration at the same point which was sutured by a local doctor. On radiological imaging a metallic plate was seen embedded in the mandible leading to osteomyelitis of the mandible causing a persistent purulent discharge. The foreign body was extracted under GA following which saucerisation was done. The patient received high dose intravenous antibiotics but was found to be recovering satisfactorily post operatively.


Preoperative image of patient


Intraoperative image of foreign body



Postoperative extracted foreign body

Case 7

A 27 year old male gave a history of self fall , following which his front 2 incisors impaled his own lower lip, broke

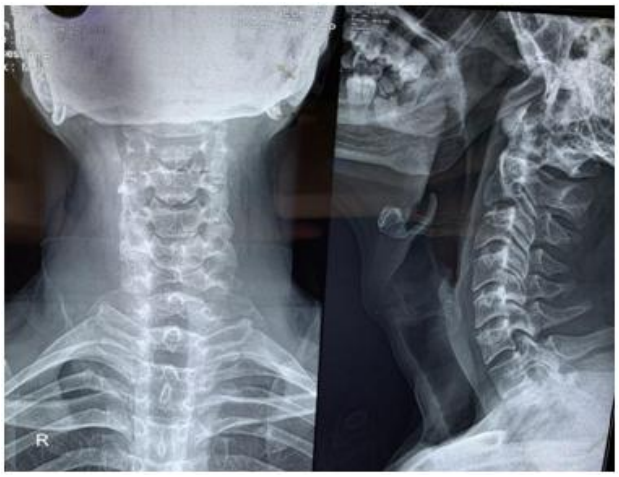
and got embedded. The patient presented to us after a week and the x-ray showed 2 teeth in his lower lip. Due to the fibrosis it was difficult to assess the depth of the teeth. An incision was given horizontally on the lower lip and both the teeth extracted along with a few broken fragments. The patient was allowed to go home the same day.

Image of patient showing teeth Insitu.X ray

Image showing embedded teeth

Case 8

A 22 year old IV drug abuser presented to us with an insitu needle supraclavicularly. The needle broke when it was inserted for the drug dosage. The needle was visible on xray and the patient showed no neurological deficits pre operatively. An incision was given on the injury site and the needle was found embedded just below the platysma. The patient did well postoperatively and was discharged the same day.



X ray image showing needle in the supraclavicular region

3. Discussion

ENT surgeons are frequently confronted with foreign body injuries caused by a diversity of different trauma. In our patient population , the major included accidental (5 cases) , homicidal (2 cases) and self inflicted (1 case). In a study by Voss et al they found maximum number of cases associated with suicide attempts. due to the rising number of refugees and thetransfer of seriously injured patients from combat zones, aswell as the increase in global terroristic attacks, specialattention should be paid to injuries caused by destructiveweapons and explosives.[2]

A thorough examination of minor wounds and lacerations especially due to explosive attacks and RTAs must be undertaken so as to not leave behind foreign bodies. (As seen in case 6)

In general, injuries of the head and neck are potentiallylife-threatening depending on the location and extent ofpenetration of the foreign body.[3-5] Penetration injurieswith or without impalement of the foreign object into theoral cavity, paranasal sinus, neurocranium, or neck riskinjury to large vessels, airways, and crucial neurologicalstructures, which present severe consequences for thepatient.[6] Based on a biblical narrative about the murderof Sisera, an impalement injury of the craniofacial region isoften referred to as Jael syndrome.[7] These injuries are potentially life-threatening as theypenetrate into the neurocranium. Furthermore, deep impaction of the foreign object and damage to vital structures alsopose complications for its removal. [8]

Acute care

The overall status of the patient determines the acute care regime to be followed. Vitals. Must be stabilized and airway secured before attempting any other intervention. Patients with life-threatening injuries are stabilized with advanced life support bysecuring the airways and managing blood loss/bleeding tomaintain a sufficient blood supply.[9-10] There are differencesin the injury patterns of pediatric patients and, therefore, possible variations in the therapeutic regime should beconsidered.[11]

In primary care (first aid response), it is important thatforeign bodies be left in place until diagnostics with radiological assessment is available, as the foreign bodies mightact as a tamponade preventing severe bleeding.[12] Attempting hasty removal without adequate knowledge of the anatomical location ,depth and structures impinged by the foreign body may lead to disastrous consequences.

The diagnosis and visualisation of the foreign body can be challenging especially when objects are not fully visible. For such cases a clinical examination along with a detailed history is of utmost importance. This isparticularly important for small foreign bodies, for whichsoft tissue examination is essential for the detection andremoval of the object.[13,14]

Radiological assessment

Radiological assessment (conventional X-ray, ultrasound, MDCT, or magnetic resonance imaging [MRI]) should be adapted to the expected material of the foreign body (wood, glass, metal, tooth, debris, etc.) to minimize the risk of false-negative findings.[15] To address this, several studies have evaluated the efficiency of detecting foreign bodies by different radiological methods.[16,17] In general, MDCT imaging is most successful for detecting the majority of foreign bodies; however, it struggles with wooden objects. [18] The role of ultrasonography in visualisation of wooden foreign bodies is fast gaining importance. Radiological assessment with contrast in order to asses proximity to vascular structures must be done. (Case 5)

In addition to the preoperative evaluation, intraoperative navigation and X-ray by C-arm provides excellent additional support for localization, as well as for the removal of debris particles from the soft tissue, including shotgun projectiles.[19] Due to the unavailability of a C-arm in our department this could not be done.

Foreign body removal

In general, foreign bodies should be removed to avoid acuteor chronic infection, as well as an immune response.[20] Otherindications include neurological impairment, mechanicaland functional impairment, and compromised aesthetics.However, when considering the surgical removal of a foreignbody, the risk of collateral damage and possible benefitsshould be considered.[21] Even though the existence of foreignbodies might be uneventful in some cases, and wounds withpersisting foreign bodies may heal uneventfully in the firstplace[22], sequela may occur, even many years later.[23-24](As in case 6) .

As in cases 7,8 foreign bodies can be removed under local anesthesia as well. However, in cases of deeplyembedded, large objects, we believe general anesthesiashould be chosen due to the risk of excessive bleeding afterremoval, edema, and complications by the movements of thepatient.[25]

Large abrasion wounds contaminated with loose graveldebris require diligent brushing in the emergency setting toavoid unaesthetic dirt tattoos. Besides thorough woundcleaning, these wounds require the use of drainage systemsto allow drainage of wound fluid. Nonhealing wounds withchronic infections often indicate persisting remnants. Inthese cases, a second-look surgery is essential for undisturbed healing.[26,27]

Systemic therapy

Along with tetanus prophylaxis , pre and post operative antibiotic therapy is crucial for prevention of infections as foreign bodies are generally contaminated. Petersen and Waterman published a comprehensive overview of prophylaxis and treatment of infections associated with various penetratingtraumatic injuries of the head and neck. An intravenoustherapy with cefazolin (2 g every 8 hours) or a combination of ampicillin and sulbactam (2 g every 6 hours) should beadministered for 10 to 14 days in cases of maxillofacialinfection.[28]

Exceptional Cases

Gunshot and Blast Injuries- Special attention should be paid to the treatment of self-inflicted gunshot or rifle injuries, as these wounds mightexhibit severe powder burns and a large degree of destruction due to the high velocity of the bullet and close proximityof the gun. Therefore,these injuries, in particular, requirediligent cleaning and reconstructive treatment. (Case 2) [29,30]

Another injury pattern is presented by victims of blastinjuries, caused by a variety of improvised explosive devices (IEDs) in the context of terror attacks or acts of war. While the majority of these injuries primarily occurduring war-related conflicts, the incidence of terror attacksthat utilize IEDs has increased. These IEDs cause severetrauma with a higher frequency of penetrating injuries, aswell as mortality rate, in the less protected civilian population.[31,32]

These traumas carry the risk of severebleeding from damage to the large vessels of the head andneck, thereby compromising the patient's airways. Therefore, aggressive bleeding control and maintaining andrestoring airways with early tracheotomy or coniotomy are often necessary.[10] After stabilizing vital signs, the patientshould be transferred to a major trauma department withneurosurgery, head and neck surgeons, and ophthalmologists. Radiological assessment is critical in the followingdiagnostic approaches as inconspicuous wounds might coverup large pieces of shrapnel.[33]

4. Conclusion

In summary, even though foreign bodies present as emergencies an overall optimal planning for its removal is crucial for preservation of vital structures and restoration of function. Soft tissue reconstruction as and when required needs to be done in order to ensure an aesthetically pleasing, cosmetic, optimal rehabilitation.

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