

Penetrating maxillofacial injury: A case report

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Abstract

Objective: Penetrating injuries in the maxillofacial region pose a great challenge due to the anatomical complexity inherent to the area compounded with vital functions such as vision and airway. This paper highlights the importance of meticulous preoperative planning and a concerted effort of a multidisciplinary team in managing penetrating maxillofacial injuries.

Case Presentation: A 38-year-old man reported to the emergency department with a knife impacted in the medial wall of the orbit, travelling up to the base of the cranium. A CT scan aided in evaluating the site, depth, and relation of the foreign body to the adjacent structures. A team of oral and maxillofacial surgeons, ENT and neurosurgeon successfully retrieved the knife and the patient recovered with no morbidities.

Conclusions: Penetrating injuries in the maxillofacial region are rare and there is a dearth of documentation in literature. A quick response with proper preoperative planning and a team approach is paramount in the successful management of these patients.

Keywords: Knife, Maxillofacial, Stab injury

Introduction

In maxillofacial region, injury from the foreign objects can be penetrating injury or perforating injury. In penetrating injuries, the object traverses soft and hard tissues and remains confined within the maxillofacial skeleton. The wounding object is considered as a foreign body. The object may be a bullet and its fragments, pieces of glass, wood, knife blade, nail, or metal piece. In perforating injuries, the objects pass through the soft and hard tissues with an entrance and exit wound (1).

Jael's syndrome is defined as an intentional or deliberate craniofacial injury due to assault. This was described by Jefferson in 1968 (2,3).

Blunt injury or nonpenetrating trauma is a traumatic injury caused by the use of mechanical force, an object or instrument. They do not pierce the skin or mucosa. These injuries may be simple contusions or severe panfacial trauma (4). The incidence of injuries to the maxillofacial region is less due to the presence of protective reflexes which can help to divert from the attack (5).

Penetrating neck injuries are trauma to the neck which breach the platysma muscle. This accounts to 5%-10% of all trauma cases. The most common causes for penetrating injuries are stab injuries in interpersonal violence, gunshot wounds, industrial accidents, road traffic accidents, and self-inflicted injuries (6).

Penetrating injury can be by high velocity projectiles or low velocity objects like knives. Knife injuries to

the maxillofacial region are rare. Complex anatomy of maxillofacial region poses a greater risk. Penetrating injuries can obstruct airway, impair vision, and cause massive haemorrhage and neurologic deficit. The management involves a multidisciplinary approach (5).

Case Presentation

A 38-year-old man was referred to the emergency department with a knife impacted in the right medial wall of the orbit. He was stabbed in a fight. The patient was well oriented and stable. On examination, the knife was firmly impacted on the right medial wall of the orbit engaging the infraorbital rim. The vision was normal and there were no other injuries (Figure 1).

CT scan was taken to view the trajectory and the position of the knife. The knife had traversed through the medial wall of the orbit, and the superior margin of the knife was just below the frontal sinus, cavernous sinus and chipping the floor of the sphenoid sinus. The tip of the knife had reached the clivus (Figure 2).

The curvature of the knife was pointing superiorly to the base of the cranium. Knife had penetrated around 10 cm. It was firmly held in the infraorbital rim. The treatment plan was removal of the knife under general anaesthesia and the care team consisted of an oral and maxillofacial surgeon, the ENT surgeon and a neurosurgeon. The patient was orally intubated. Knife was attempted to be removed along the path of insertion with stabilization of





Figure 1. Knife in situ



Figure 2. CT showing the extent of knife penetration



Figure 3. Knife removed, showing the area of entry



Figure 4. One-week postoperative view

the head. The knife had a serrated superior margin and a sharp inferior margin. The inferior margin of the knife was firmly held in the infraorbital margin; it did not yield to the removal. A 2 cm vertical incision was placed at the inferior end of the knife extending to the anterior surface of the maxilla. Soft tissues were reflected; the inferior end of the knife was firmly held in the infraorbital rim. Lateral osteotomy around the inferior end of the knife was performed to release the knife. As the knife had hooked superiorly to the base of the cranium, it was pushed inferiorly and was pulled along the path of the entry (Figure 3).

A very minimal bleeding was observed and there was no injury to the adjacent structures. Irrigation was done, haemostasis was achieved and soft tissues were closed in layers. The patient received antibiotics and tetanus prophylaxis. Post operatively, the patient had epiphora for three days and healing was uneventful (Figure 4). The follow up at the end of one year was satisfactory.

Discussion

Maxillofacial region has a complex anatomy and is highly vascular. The presence of pneumatized cavity and resistant buttresses are suited to absorb shocks. These favourable anatomical features result in less injury to the adjacent structures. The injuries penetrating the face and entering

the cranium often have devastating consequences (5). The management of penetrating maxillofacial injuries require a systematic and multidisciplinary approach. In addition, it depends on the site of injury, anatomical structures at the site, type of the foreign body and the amount of soft and hard tissue injury (7). The patient is assessed for immediate life-threatening complications, like air way obstruction, haemorrhage, shock and the patient is stabilised. The exact type and extent of injury is assessed once the patient is stabilised. Radiological findings reveal the extent of foreign body penetration and anatomical structures in proximity. Plain radiographs are taken in two different planes to locate the foreign object. CT scan and 3D CT scans show the spatial relationship of the foreign body. Image intensifiers are used for locating and removal of deeply penetrated bullets and pellets. Ultra-sonography is useful to identify wood injuries that penetrate deep and not obscured by bone or gas (7). In case of penetrating maxillofacial trauma emergency, angiogram is an important diagnostic aid to rule out injury to the vascular system (8). Kreutz and Bear recommend arteriography in penetrating craniofacial injuries. This can show primary vascular injury, arterial thrombus, arteriovenous fistula, and bullet embolus (9). This provides essential information to plan surgical exploration. The relative contraindications for performing angiogram are high blood pressure, bleeding disorders, and severe anaemia. Also, angiogram is used in case of major neurologic/cardiovascular problems. In case of an

emergency, the procedure should definitely outweigh its potential risks (10).

Patient should be medically stable to tolerate the operative intervention. The penetrating maxillofacial injuries differ in each case. The factors to consider when treating a facial penetrating injury include the location or site, depth of the penetrating object, the type of foreign body involved and anatomical structures in close proximity and the amount of the injury to the hard and soft tissues (7). The surgical plan should involve the simplest route for removal of the foreign body which is usually through the entrance wound and the tract created by the object. It may be necessary to extend the entry wound caused by the object to facilitate adequate exploration of the tract and recovery of the object. Removal of the sharp knife point or ragged fragments of bullets must be approached with extreme caution as the object due to its sharpness may cause further damage to vital structures during removal. When foreign bodies are present for a long period, the entrance tract becomes obliterated and the object gets surrounded by the thick fibrous tissue making it difficult to locate the object (9). For penetrating injury, the surgical team should be prepared for bleeding vessels once the pressure of the foreign body has been removed as vessels tamponade from the foreign body. Exploration of the region should be performed both before and after removal of the object. Also, haemorrhage and hematomas should be identified and treated. Soft tissue track created from the penetrating injuries should be thoroughly debrided, irrigated and approximated to prevent the dead space (7).

Systemic anticoagulation may be required for patients with history of thromboembolic events or non-haemorrhagic vascular injury diagnosed by angiography. Anticoagulation improves the peripheral blood flow when infarct has been demonstrated (10).

Primary treatment is the treatment of the wound within 48 hours of injury with the intent to definitively manage all aspects of the injury. The aim of the primary treatment is management of both hard and soft tissue injuries with primary closure. Primary treatment claims superior aesthetic and functional outcome. The majority of penetrating facial injuries are lacerations which can be repaired by primary intention (11). The low velocity wounds are favourable for early treatment. Considerations for delayed treatment are contaminated, infected laceration, complex soft tissue injuries and to allow oedema to settle down (4). In case of open fractures, the soft tissue is approximated at intervals to allow oedema to resolve and after 7-10 days, definitive management of bony defects can be done. Maxillofacial fracture reduction determines the amount of facial projection, width and height. In high velocity wounds, there is greater amount of tissue loss and devitalization. It requires observation of the wound and several debridements. This creates a healthy base for definitive approach and also reduces

bacterial count at the site. The prevention of infection is very important and tetanus injections along with preoperative and post-operative antibiotics must be considered (12). In multiple stage reconstruction cases, the free flaps option is delayed until the exact nature of defect is determined and the patient is fit for the intervention. For a complex composite defects in the partially dentate patients, options for reconstruction are osteocutaneous free flap and distraction osteogenesis as it provides good bone and soft tissue coverage. The thin, non-hairy pliable flaps are preferred inside the oral cavity (11). The recent advances like the navigation system is useful particularly when access is difficult, many foreign bodies are present and with history of prior attempt.

Penetrating knife injuries to the maxillofacial region are reported less in the literature. Cohen and Boyes reported 37 cases of penetrating injuries to the maxillofacial region, of which only 4 cases were as a result of knife injury (3). A case of knife penetrating in the right orbit and extending up to the skull base was reported by Bourguignon Filho et al, where the knife was removed along the path of entry with no major intraoperative or postoperative complications (13). According to Jett et al, victims of penetrating knife and gunshot wounds are males in the age group of 15-35 years, drug abusers from the lower socioeconomic strata. Simple withdrawal of the retained knife has been reported in the literature (14,15). This type of penetrating injury is best managed in the operating theatre and no attempts should be made to remove it at bedside (9). Impacted knife itself tamponades the lacerated vessel (16). In the present case, the knife was snugly held at the infraorbital rim. Subsequently, the bone was removed around the infra orbital rim and the knife was retrieved successfully. Movements of the eye ball and vision were normal. Postoperative recovery was uneventful. The impacted knife prevented the patient from receiving another attack and proved to be safe.

Conclusion

The management of maxillofacial penetrating injuries is a challenging task and requires interdisciplinary team approach for accurate assessment of the extent of penetration, visualization of adjacent structures and for removal of the object.

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Competing interests

None.

Ethical Approval

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