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AN UNUSUAL PRESENTATION OF CRANIOFACIAL PENETRATING TRAUMA BY AN IRON ROD

Surgery

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ABSTRACT

Penetrating Craniofacial injury is challenging, as head and neck region comprises complex vital structures and those injuries may have a high potential to cause death or catastrophic events. Treatment modalities depends on the overall condition of patient. Stabilizing the patient and managing according to ATLS protocol is of great importance in reducing the mortality and morbidity rate. Accurate assessment of these injuries with radiological assistance is mandatory. Here we are presenting an unusual case of penetrating craniofacial trauma and its management.

KEYWORDS

Penetrating injury, vital structures, iron rod, ATLS protocol

Introduction

The head and neck region have dense concentration of complex vital structures which make the injuries in this region more challenging and unique. Injuries involving body parts either partially embedded or fully transected by a foreign body are known as penetrating injuries .The protective reflexes of face helps to divert from these penetrating agents even though there are many cases, reported with high risk of morbidity and mortality. These injuries often causes devastating consequences to patient ranging from infection, loss of function, massive blood loss due to injury of major blood vessels ,upper airway obstruction with foreign body impaction, edema or hematoma to even death. A proper clinical and radiological examination and timely intervention with a multidisciplinary approach are required for the proper management of these injuries.

Case report

A 72 year Male patient reported in emergency department with a penetrating craniofacial injury by an iron rod passing through the left side neck ,directly penetrating through mouth and exiting through right orbit. He had a history of fall from height on an iron rod in a construction site and brought to the emergency department after cutting the rod from construction site insitu. [fig.1]

Fig 1. Iron rod insitu

Emergency care as per the protocol was done with the GCS 15/15. Clinical examination reveal that entry part being the submental region penetrating through the tongue, palate and exiting through the medial wall of right orbit.

After primary care and confirm patient stability, investigations were directed towards the path of raw. CT scan was taken which reveal the clinical finding.[fig 2] The involvement of major anatomical structures and base of the skull were ruled out.

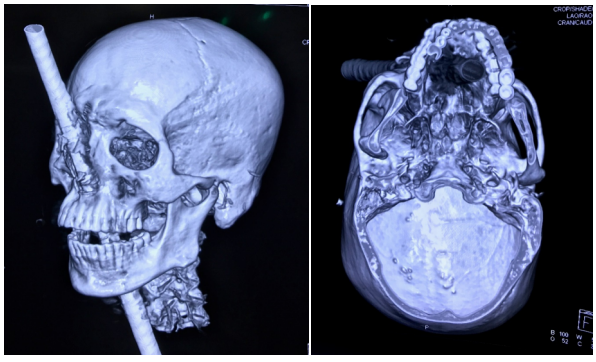

Fig 2a. **Fig 2b.**

Fig 2(a,b) : Computed Tomography Scan Showing the Path of penetration of iron rod

Patient was taken for general anaesthesia under elective tracheostomy and the sectioning of metallic rod was attempted using heavy motors and turned out to be unsuccessful. Later by gentle manipulation and rotation the rod was pulled out and immediate hemostasis was achieved from layer to layer. [fig 3] Initially from the medial wall of orbit , palate later from tongue and taken out submentally.[fig 4]

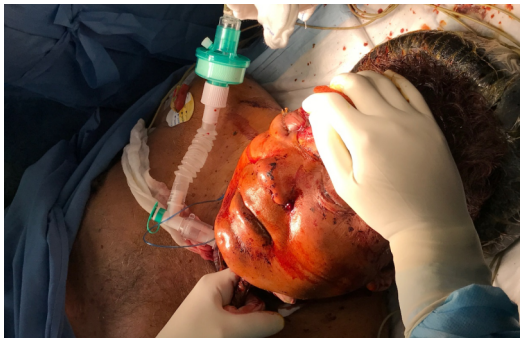

Fig 3: Rod being gently manipulated using rotational movement

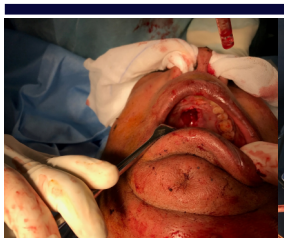

Fig 4a.

Fig 4b.

Fig 4c.

Fig 4d.

Fig 4 : Defect in (a) palate, (b) superomedial wall of orbit, (c) submental region and (d) tongue respectively

After hemostasis, through wound irrigation and closure was planned. Initially the medial canthal ligament was replaced along with the bone and sutured to the frontal process. The palate was replaced using local palatal advancement flap. Tongue and submental region was primarily closed in layers. Post operative period was uneventful and the wound healed very well without any co-morbidities.

Discussion

Penetrating neck injuries has been significant cause of death for centuries. Ambrose Pare` was credited with first documented surgical intervention of penetrating neck injury where he ligated carotid artery and jugular vein of a French soldier. (1) In the late 18th and 19th century during world war I and various other civil wars, several cases were reported with penetrating injuries. Later further studies done on larger number of patients with strict protocols followed with less mortality rate. With advanced therapeutic and diagnostic modalities, early intervention with definitive therapy resulted in reduced mortality rate in the 20th century.(2) Trauma is considered as one of the common cause of death all over the earth based on the epidemiological data. According to the 2009 National Trauma Databank, Chicago, penetrating neck trauma constituted only 1.04% (3). Penetrating Craniofacial injuries are even rarer accounting for 0.4% of all head injuries.(4)

Report on the causes of mortality emphasized on the following factors primarily hemorrhage and infection.(5,6) The facial skeleton are more suited to absorb shocks due to the presence of resistant pillars and buttresses and pneumatized bones.(7) But the conditions are reversed when a sharp penetrating object cause facial injury which may lead to massive bleeding, damage to the vital structures including the cranial nerves. These conditions require utmost care and precise, individually planned multi disciplinary management.

Classifications are very useful adjunctive for evaluation and definitive treatment planning. Penetrating injury involve neck is classified according to Monson's criteria (8)

The lateral neck is divided into 3 zones.
Zone 1 – extends from clavicle to cricoid cartilage and it includes thoracic duct. This region comprises of major vascular structures like the subclavian artery and vein, jugular vein, and common carotid artery, the esophagus, thyroid, and trachea.

Zone 2 - extends from cricoid cartilage to the angle of mandible . It contains the common carotid artery, internal and external carotid arteries, jugular vein, larynx, hypopharynx, and cranial nerves X, XI, and XII.

Zone 3 - small, crucial area extends from the angle of the mandible to the skull base. The internal and external carotid arteries, jugular vein, lateral pharynx, and cranial nerves VII, IX, X, XI and XII are present in this zone.

On literature search using keywords craniofacial penetrating injuries and classification, penetrating injuries classification involving face were not reported . Related to our experience the injury, partially comes under zone 3 where it involves the submental region. The different zones possess different treatment modalities.

Management of any such injuries should follow the ATLS protocol with initial assessment of airway, breathing and circulation and its proper establishment. (9) Some cases may require immediate attention and surgical intervention depending upon the type of injury, its extend, anatomical and the proposed pathway of removal. Once patient become stable, vitals are under control, assessment of the trauma have to be done by using modern technologies in the diagnostic field. Improvisation of CT with 3D reconstruction help us in assessing even the minutest details. When there is dilemma exists regarding the involvement of vital structures screening should be done with MRI and CT Arteriogram.(10)

A definitive knowledge of anatomy of the head and neck region with appropriate diagnostic and therapeutic intervention are appropriate for a proper management. The basic principle is to have a proper wound exploration strictly under aseptic technique to avoid post operative complications. Intensive parentral antibiotics and tetanus prophylaxis is mandatory.

Conclusion

Severe Craniofacial and neck injuries needs immediate attention and therapeutic intervention. Implementation of proper diagnostic work up and therapeutic management of trauma results in decreasing the morbidity and mortality rate.

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