Case Report

Penetrating Injury of Craniovertebral Junction

Brinda J Rana[1], Sanjay D Muley[1], Rajesh D Ursekar[1]
[1]Emergency Medical Department, Bharati Vidyapeeth (D T U) Medical College, Katraj, Pune

Corresponding author
Brinda Rana
E – mail ID - brindarana@ymail.com

Submission : 02.06.2021 Acceptance : 15.07.2021 Publication : 28.07.2021

https://www.doi.org/10.56136/BVMJ/2021_00013

Introduction

Penetrating injury around the craniovertebral junction occurs when any object in projectile/linear motion breaches the craniovertebral junction, underlying musculature and the underlying dura mater. Depending on the weapon's velocity, force, and shape, it may either remain inside the skull/cervical spine or have an exit point. Penetrating injuries of the craniovertebral junction caused by foreign bodies are relatively uncommon, representing about 0.4% of all head injuries[1,2]. The exact incidence of penetrating and perforating injuries near the craniovertebral junction in citizens is not known, but current estimations credit that bullets lead to around 4.6% and puncture wounds, stab, nail, etc., produce about 0.4% of this kind of craniovertebral injuries[3,4]. It is mostly due to inter-personal conflicts, which affect males more than females.

Case report

A 35-year-old male was brought to the Emergency Medicine Department with an alleged history of assault due to stabbing with a knife by two unknown people at his home. His vital parameters were:

Pulse-94/min

BP- 130/86mmHg

SpO2-99% on room air

Respiratory system: Bilateral clear and equal air entry

Cardiovascular system: S1S2 heard, regular heart rate with no murmurs

Central Nervous system: conscious, oriented, GCS 15/15

Per Abdomen: soft, non-tender

On examination, he had a penetrating foreign body (knife) 2 × 0.5 cm over the posterior aspect of the neck, which was bleeding from the stab site and was associated with severe pain. There were no complaints of motor weakness, numbness, or radiculopathy. CT scan showed a metallic foreign body (knife) in the occipital region on the left side, traversing the left posterior para-spinal muscles and tip extending up to the left lateral element of the C1 vertebra. The approximate distance between the tip and left vertebral artery was 2 to 2.7 mm. CT Angiogram was not done as the patient did not have any neuro deficits, and there was only a slight trickling of blood from the site of injury.

Figure 1: X-ray Cervical spine lateral view of the foreign body in situ

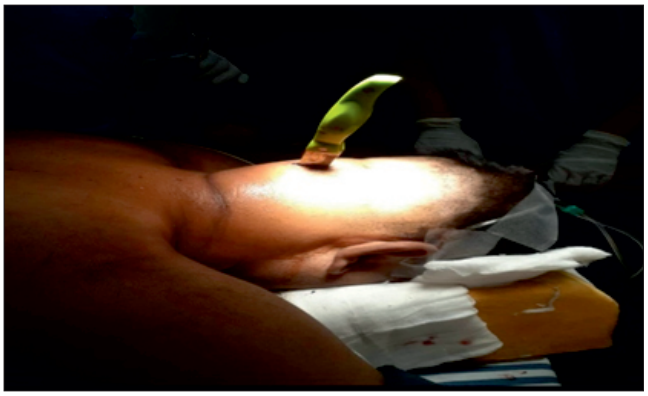

Figure 2: Position of the patient in operation theatre

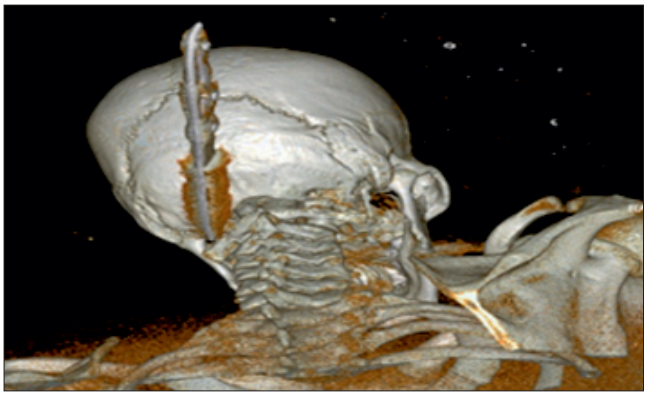

Figure 3: CT Brain 3D reconstruction posterior view of the foreign body in situ

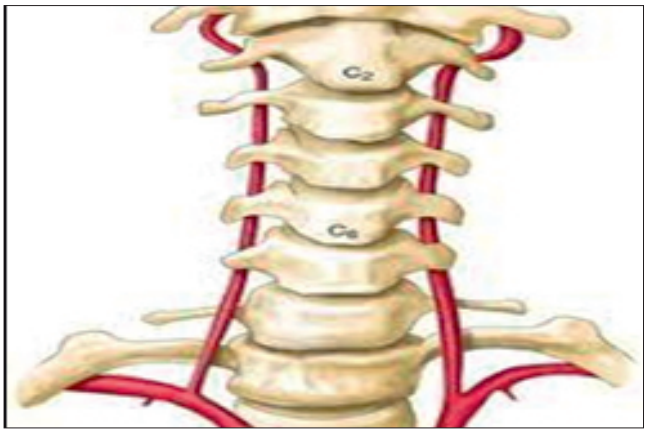

Figure 4: Anatomical location of vertebral arteries

Figure 5: CT Brain 3D reconstruction side view of the foreign body in situ

Management

The patient was taken into the operation theatre in an emergency. He was put in the prone position, and local infiltration of lignocaine + adrenaline was given. An elliptical incision was taken around the foreign body, it was deepened up to bone and upon visualizing the tip of knife, it was removed as one piece. Wound exploration along with debridement of surrounding tissue was done. A thorough wash with betadine and hydrogen peroxide was given. The skin was closed, and the procedure was uneventful. Postoperatively he was treated with antibiotics and prophylactic anti-epileptic medications in ICU. Repeat CT brain showed a normal craniovertebral junction. The patient was discharged four days later without any neurodeficits.

Discussion

Most of the craniovertebral junction stab wounds are caused due to a variety of objects most common being the knife blade (Pilcher)[5]. In this case, the assault weapon used was also a knife. More incidences of stab on the left side of the skull are probably due to right-handedness of the assailant except when the victim is hit from the back. Major complications associated with such injury are meningitis, retained fragments of foreign body, injury to spinal cord leading to paraplegia/hemiplegia. Heiden JS[6] et al. observed that the treatment modality could not predict neurological recovery; meaning, whether or not the surgical intervention was required has no effect on the time taken for recovering from neuro deficits. Orbay A. S [7], in his study, has observed a case of penetrating injury to a craniovertebral junction in children, concluding that even though such injuries in that age group are uncommon, it is still grievous to life. These injuries are frequently seen in army personnel who are exposed to gunshot or missile injuries. It is very rarely seen in the civilian population. In the civilian population, it is because of assault or accidental fall on sharp objects[8]. The gunshot or missile injuries are in projectile motion and cause more extensive damage because of the splinters. While in the assault, the injury is in linear motion and precise. Hence the extent of damage is not as severe as seen in gunshot injuries. CT scan is mandatory to diagnose intracranial injuries, hematoma, major vascular injury, or brainstem injury. A 3D reconstruction view further helps in viewing the pathway of entry along with surrounding important neurovascular structures, which can be useful pre-operatively to plan regarding the best approach for initiating the surgery. However, using MRI for diagnosis is contraindicated in such cases since the weapon is a metallic object. It can be used postoperatively to look for the extent of damage to tissue and cerebral edema after removal of foreign body.

Conclusion

Penetrating injury around the craniovertebral region needs rapid evaluation and imaging to assess the injury and its extent in the emergency department. At low velocity (i.e., below 300 m/sec), injury results from direct disruption and laceration of tissues. The penetrating knives are usually sharp and may cause little injury to the adjacent soft tissues; hence any sharp object with enough energy colliding with the craniovertebral region should be evaluated at least with a plain CT scan.

Source of support: Nil

Conflict of interest: Nil

ORCiD

Brinda J Rana 0009-0005-5714-3701

References

1. Gennarelli TA, Champion HR, Sacco WJ, Copes WS, Alves WM. Mortality of patients with head injury and extracranial injury treated in trauma centers. J Trauma. 1989 Sep 1; 29(9):1193-201.
2. Hayashi Y, Fujisawa H, Tohma Y, Yamashita J, Inaba H. Penetrating head injury caused by bear claws: case report. J Trauma Acute Care Surg. 2003 Dec 1; 55(6):1178.

3. Haworth CS, De Villiers JC. Stab wounds to the temporal fossa. Neurosurgery. 1988 Oct 1; 23(4):431-5.
4. MAcEWEN CJ, Fullarton G. A penetrating orbitocranial stab wound. Br J Ophthalmol. 1986 Feb 1; 70(2):147-9.
5. Pilcher C. Penetrating wounds of the brain: an experimental study. Ann Surg. 1936 Feb; 103(2):173.
6. Heiden JS, Weiss MH, Rosenberg AW, Kurze T, Apuzzo ML. Penetrating gunshot wounds of the cervical spine in civilians: Review of 38 cases. J Neurosurg. 1975 May 1; 42(5):575-9.
7. Orbay AŞ, Uysal OA, Erkan D, Güldoğuş̄c F. Unusual penetrating faciocranial injury caused by a knife: a case report. J Craniomaxillofac Surg. 1997 Oct 1; 25(5):279-81.
8. Yoneoka Y, Akiyama K, Seki Y. Glass fragment injury to the craniocervical junction with interatlantooccipital penetration to the subarachnoid space: Not-to-be-missed important aspects of craniocervical trauma even in the middle of the COVID-19 pandemic: Case report and review of literature. World Neurosurg. 2020 Sep 1; 141:402-5.