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Penetrating head injury with impacted foreign bodies –a report of five unusual cases

KEYWORDS: penetrating head injuries, gunshot wounds, sphenoid sinus, arrow, nail, head trauma, wood.

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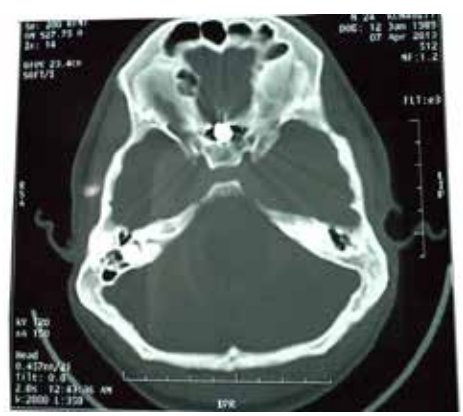
ABSTRACT *Penetrating head injuries are the interesting and rarely observed cases and account for nearly 0.4%of head injuries. Penetrating injuries except for one caused by fire arms, may lead to limited damage due to low penetration speed. Penetrating injuries are easy to identify as the external wound is visible. The six patients with penetrating head injury with different impacted foreign body in situ are described. Early aggressive resuscitation, surgery and vigorous control of intracranial pressure offer the best chance of achieving a satisfactory outcome*

Introduction

Penetrating wound to the head date from as early as 1806.One of that first case was reported in1848.Phineas Gaze was a foreman of railway construction and victim of accidental explosion. He had a piece of iron blow into his head .He is probably most famous patient to have survived such a severe damage to the brain in the nineteenth century and for sure he is also the first patient from whom we soundly learned about the relationship between cerebral functions and brain structural lesions[1].A wound in which the projectile breaches the cranium but does not exit is referred to as a penetrating wound, and an injury in which the projectile passes entirely through the head, leaving both entrance and exit wounds is referred to as perforating wound. Penetrating skull and brain injuries are observed rarely, constituting 0.4% of all head traumas. In about 10% of all head injuries a foreign body penetrate the skull and injuries the brain. Several foreign bodies penetrating the cranium such as knives, nails, wood pieces, arrow injuries have been described in the literature[2]. Most penetrating head injuries are caused by a gunshot. Stab wounds to the skull and brain are relatively uncommon and generally the result of knife injuries.

Case 1: A 25 year old police man presented with history of accidental firing of his gun on his face. On examination, the patient was conscious and an entry wound was seen on the right side of nose. No wound of exit was found. Plain x ray and CT scan showed metallic foreign body which has penetrated the posterior ethmoidal and sphenoid sinus (fig; 1)



.) Figure; 1 CT Scan of brain axial view showing pellet in the sphenoid sinus

The patient was operated under general anaesthesia transnasally by endoscopically. The posterior ethmoidal and sphenoidal sinuses were thoroughly inspected for bleeding. There was no sign of CSF leakage. Bony spicules around the foreign body were removed to offer a clear path for removal .The foreign body was grasped with and carefully extracted (fig; 2). The post operative period was uneventful Figure; 2 Removed pellet by endoscopic approach

Case; 2 A30 year old male came to the casualty with history of assault with sickle on the head. On examination patient is conscious and coherent. A sickle impacted on the right parietal region of skull. CT scan shows sickle has penetrated the skull with mild contusion beneath the foreign body (Fig; 3). Circumferential craniectomy done around the penetrated sickle and removed,the dural tear repaired. Patient recovered uneventfully.

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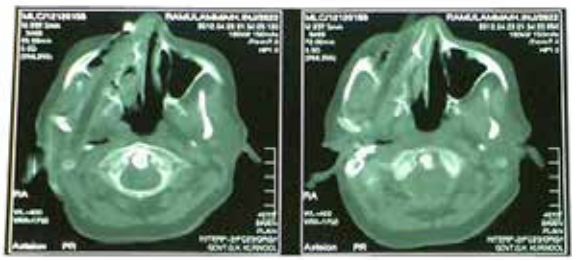
Figure; 3 CT Scan axial view showing sickle in the right parietal region brain with contusion

Case; 3 A35 year old female came to the emergency department with history of travelling in auto with collision of auto- rickshaw and a bullock cart carrying the wooden sticks. The wooden stick has penetrated from the front of face and exit over the back of the head. The patient is conscious and coherent. The wooden stick has penetrated from the right medial canthus of the eye and exit from the behind the right ear (fig; 4).

Figure ;4 Patient with injury by wooden log that has penetrated at the root of the nose on right side and perforated at the mastoid region of the head

CT scan shows the wood has penetrated from the roof of the right maxillary sinus and exit from the mastoid region of the skull (fig; 5) The stick has extracted by doing craniectomy around the exit wound



Figure; 5 CT scan axial showing the path of wooden log penetrating through the roof of the right maxillary sinus

Case;4 .A 35 year old female from the tribal area came with assault by unknown person by arrow injury on her face in the forest. Patient is conscious; the arrow has impacted in the right medial canthus of the eye. X-ray (fig; 6) and CT scan revealed metallic arrow head has penetrated the right ethmoidal sinus and the sphenoid sinus. The arrow head has removed by nibbling the bone around the foreign body in the medial canthus of the right eye.

Figure; 6 X-rays of skull lateral view showing the arrow in the skull base

Case; 5 A 50 year old male came to the emergency department with assault by axe on the left side of the head (fig; 7) .

Figure; 7 Photograph of patient with axe injury in left temporal region

Patient is drowsy and irritable. The impacted axe was present in the left temporal region of the head. X-ray (fig; 8) and CT scan revealed the foreign body has penetrated the

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left temporal and parietal bone with underlying contusion of the brain. Patient was operated by doing craniectomy and the axe was removed. The contusion of the brain was mild and the dura repaired. The patient recovered well.

Figure; 8 X-ray skull AP view showing axe injury in the left parietal region of the skull

Results

The present study is confined over five patients who are admitted in Neurosurgery Department, Government General Hospital Kurnool Andhra Pradesh India. Three patients are resulted from assault and two are the result of accidentally injured. Prophylactic antibiotics, prophylaxis for tetanus and prophylactic anticonvulsants are used and impacted foreign are removed in all these cases and all patients recovered uneventfully. Removal of foreign body is in the direction of trajectory without zig-zag movements.

Discussion

Low velocity injuries differ from gunshot and missile injuries in that they do not cause concentric zones of cavitations and necrosis. Instead the damage is predominantly restricted to hemorrhagic infarction in the line of the wound track[3]

The arrow injuries depend upon the type of bow and arrow used. Arrow shafts are constructed from a variety of materials and are generally equipped with either a field tip or a broad head tip. The broad head tip, used predominantly for hunting. The injury with broad head tip is associated with a stellate entrance wound and increased tissue destruction. The average velocity of broad head arrow fired from compound bow is 60 to 90m/s. The field tip, commonly used in target practice, the entrance wound closely simulates gunshot wounds [4]. Due to the elasticity of the tissues and the arrow lodged in the tract a tamponade effect may occur which prevents major bleeding. Because of the sharp force applied by arrows, injury is limited to the tissues that are directly incised by the blade of the arrowhead [5].The arrow wounds are very rare in western countries, but they are still prevalent in the Indian tribal population. It is important to reiterate the advice of O Neil etal, that arrows with barbs should be removed in an anterograde direction along the line of its trajectory to avoid snagging blood vessels and other structures. CT scans documented the trajectory of the arrow. This rare form of civilian injury should be treated with diligence. The arrow should be kept in wound, secured against displacement during transport and only removed in a proper setup.

Majority of gun injuries are work related accidents, several cases of self inflicted harm or suicide have been described. Usually the foreign body reaches the sphenoid sinus through orbit or the nostril. Penetrating gunshot wounds into the sphenoid sinus is rare and is disastrous because of the potential damage to the surrounding deep vascular and neural structures. CT scanning with three-dimensional reconstruction of choice for sphenoid sinus penetrating foreign body for proper planning of surgery. Sino nasal endoscopy is the method of choice for direct visualisation and removal of the foreign body. Endoscopic and intraoperative imaging guidance are the major aids during the surgical procedure for the safe removal of the foreign body[6]. Non ballistic penetrating head trauma tends to occur at a low velocity, which often cause vital structures to be shifted aside rather than obliterated.[7] The prognosis for non missile penetrating head trauma is good in the absence of a laceration to one of the major intracranial blood vessels with development of a subsequent massive intra cerebral hematoma or direct injury to the brainstem. The usual areas of penetration are in the locality of the orbits or in the temporal areas where the skull is thin.[8] Radiographic assessment may consist of a CT scan skull series angiography and MRI . CT scan can detect the path and location of the embedded foreign body, bone and metal debris fragments, intracranial haematoma and the mass effect. Most deaths from penetrating trauma are caused by damage to the blood vessels, which can lead to intracranial heaematoma and ischemia, which can in turn lead to a biochemical cascade called ischemic cascade[9].

Because of its porous organic nature and frequent proximity to soil, wood is an ideal reservoir for bacteria and fungi and is likely to promote inflammation. CT scan is excellent for high density material such as glass or metal but is much less sensitive for low density objects like organic foreign bodies. Wood is virtually undetectable on routine x-rays since its radio density is similar to that of soft tissues. Dry wood appears as a linear, circular or oval luecency, similar to air, however green (hydrated) wood is more difficult to be detected on CT scan because of its high density and resembles that of fat. CT scans should be repeated if the area becomes inflamed as the reaction may make it easier to visualize the foreign bodies [10, 13]. MRI is contraindicated in the presence of metallic fragments as the magnet may cause movement of the projectile.MRI is more sensitive for low density organic objects. Fluoroscopic imaging was used for intraoperative guidance. A penetrating foreign body located in the sphenoid sinus should evaluated by angiography to rule out injury to the internal carotid artery before removal of the object[11].The complications associated with it include infections, intracranial haemorrhage, cerebrospinal fluid leak, epileptic seizures and loss of mental and motor functions[12] .immediate hospitalization and prompt treatment are keys to a favourable prognosis. a prophylactic wide spectrum antibiotic treatment amenable to crossing the blood brain barrier should be given as soon as possible to avoid the risk of infection, the use of anticonvulsant prophylactic agents is recommended in those cases in which traumatic brain lesions are evident, such as intracerebral haemorrhage ,subdural haematoma, and depressed skull fracture and neurological deficits.

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Conclusion

The purpose of surgery in penetrating head injuries is removal of the foreign body and the debridement of the affected tissues following the emergent stabilization of the patient. Craniotomy is preferred to blind removal. Neurological and vascular complications may thus be minimized. Delayed complication like pseudo aneurysm, sepsis and CSF leak should be anticipated. Considering the great variability of trauma mechanisms and possible associated neurological deficits, each patient should be treated individually.

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