Key in Brain: An Interesting Case of Civilian Penetrating Head Injury

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Abstract

Civilian penetrating head injuries are not common, and the occurrence of such injuries in the pediatric population is rare. Pediatric penetrating head injuries are low-velocity injuries, resulting from household objects. Presentation entirely depends on the area of the brain involved. There are several management dilemmas related to the nature, size, shape, and location of the object, but always warrants removal of the foreign body into the operation theater. The outcome depends on the presenting neurological status of the patient, which reflects underlying parenchymal injury. We are reporting an interesting case of civilian penetrating head injury in a 5-year-old female child with a key in the brain. Computed tomographic scan of the brain revealed a household key penetrated through the right temporal bone. The patient underwent a surgical procedure for the removal of the key. She recovered well without any neurological deficit.

Keywords
- foreign body
- key in brain
- penetrating head injury

Introduction

Brain is well protected by the bony cranium which prevents injury to the underlying parenchyma. However, there are weak points in the cranium that leads to an easy entry of various objects into the skull; they are suture lines, a thin wall of orbit, and rarely thin temporal bone especially in children. Civilian penetrating head injuries resulting from various types of foreign body being reported which include scissors, fan, blade, sickle, pencils, chopsticks, and power drills.[1–6] Here, we report an unusual case of civilian penetrating injury in which a key had entered the brain through the weak temporal bone in a 5-year-old female child. The management of accidental pediatric penetrating head injury by an unusual foreign body is described in the case presented below.

Case Report

A 5-year-old female child presented to our emergency room with pain over right side of the face and a bunch of keys hanging from the right side of her face through a key which has gone deep into the skin and soft tissue between the tragus and lateral angle of right eye (►**Fig. 1D**). She was fully conscious and without any neurological deficit. Earlier, she was playing with the key chain having multiple keys, outside on the street. In response to a call from the mother, she ran towardsher home with the keychain in her right hand and while running she fell down over the ground due to something stuck in her foot. As the impact was over the head and she tried to protect herself using right hand, one of the keys from the keychain had penetrated in the right temporal region. On examination, she was conscious, alert. Glasgow coma score was 15/15. Pupils were bilaterally equal in size and normally reacting to light, rest of neurological examination was unremarkable. Local examination revealed a key penetrating through the skin via a small wound and was firmly stuck into the temporal region. There was no active bleeding. X-ray skull (►**Fig. 1A, B**) showed a foreign body, key; penetrated through right temporal bone. Computed tomographic (CT) scanof the brain (►**Fig. 2A, C**)

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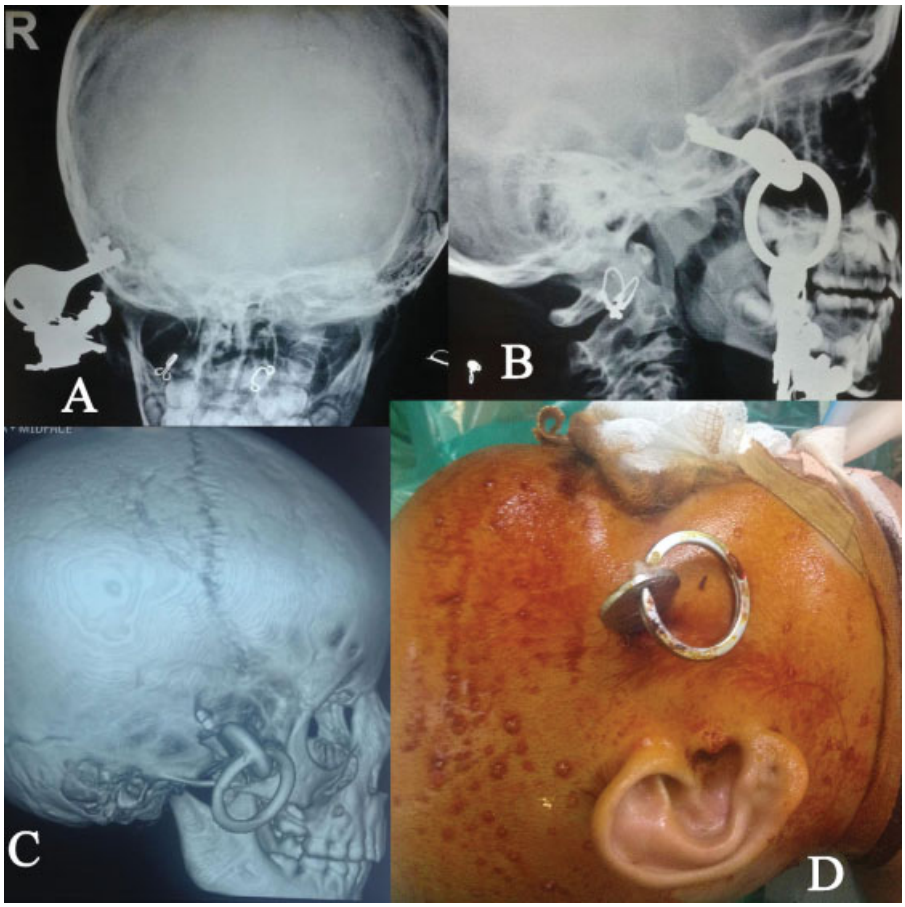

Fig. 1 (A) AP X-ray of the skull, (B) lateral X-ray of the skull, (C) three-dimensional bone window computed tomography scan, (D) clinical photograph of patient. AP, anteroposterior.

showed a key in the right temporal bone just above the zygoma. Because of artifact, it was difficult to understand the exact intracranial penetration.

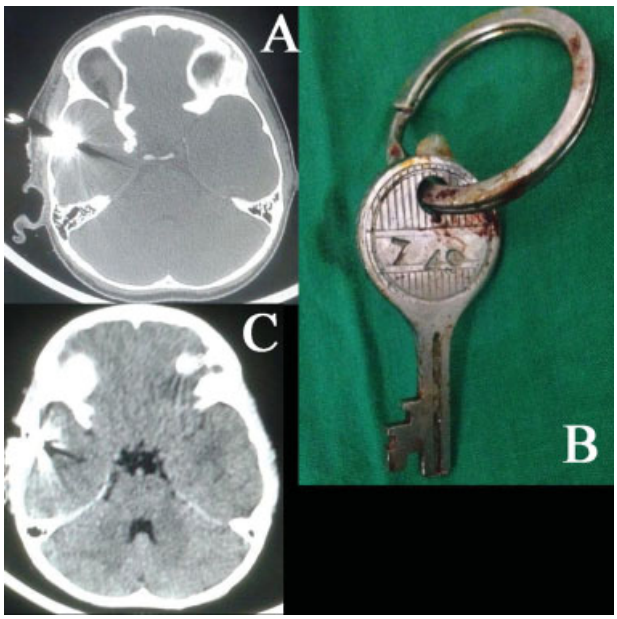

Fig. 2 (A and C) computed tomographic scan of brain with bone window, (B)key after removing from the skull.

She underwent exploration of the foreign body in the operation theater. Under general anesthesia first rest of the keys were removed from thekey chain. Under all aseptic precaution, right temporal vertical incision taken, temporal bone exposed adequately along with the foreign body tract, burrhole made, and bone surrounding the foreign body nibbled out. Key entering the dura became loose, which is then gently removed as shown in ►**Fig. 2B**. There was a linear tear in dura and a small laceration on the brain surface without any bleeding. Dura closed primarily. Wound thoroughly washed with antiseptic solution and closed primarily. Postoperative course was uneventful. The child completely recovered from her injury without any neurological deficit.

Discussion

Head trauma is exceedingly common in children, most injuries are secondary to fall or road traffic accident,[7] and civilian pediatric penetrating head injuries are rare.[8] Penetrating injuries reported from war zone, mainly affects adult populations. They result from missile, bullets, and rifles. Commonly civilian penetrating injury results from pistol or gunshot. Nonmissile civilian penetrating injuries are uncommon and results from a variety of objects; such as scissors, fan, blade, sickle, pencils, chopsticks, and power

drills.[1–6] These injuries are usually low velocity secondary to domestic violence, suicidal attempt or due to fall on or over the household objects or due to professional tools. Injuries are influenced by anatomical location, type of tissue involved, ballistic properties (low/high velocity, firearm/air propelled), design of the weapon, and shape and construction of the projectile and its trajectory angle[9] Pediatric penetrating injuries are facilitated by thinness of the temporal bone and because of the short distance to the deep vital brain and vascular structures.[10]

Skull radiographs and CT of the head are the main modalities employed in the investigation of head-injured patients. In nonemergent cases with penetrating craniocerebral injuries, plain radiographs of the skull with additional tangential views should be obtained.

CT scan plays a very important role in the initial evaluation of the patient with penetrating head injuries. The presence of the foreign object, its location, and nature, relation with the brain parenchyma, major blood vessels, and cranial nerve can be easily evaluated. CT also plays very vital role in the diagnosis of associated injury to the cerebral parenchyma and detection of intracranial hematoma both nearby and away from the penetrating site. Role of cerebral angiography considered when suspecting a vascular injury.[11] The role of magnetic resonance imaging is time consuming and can be dangerous in the presence of retained ferromagnetic objects due to magnetic torque.

Tan and Choudhari[12] recommended that in the presence of an obvious penetrating injury with an embedded foreign body under no circumstances any attempt should be made to remove the object, until the patient had a thorough clinical and radiological evaluation. Sudden removal can cause loss of the tamponade effect and subsequent catastrophic intracranial hemorrhage. Removing the impacted object is best done in the operating theater, under general anesthesia, by a dedicated neurosurgical team.[13]

Management of unusual foreign body in the brain depends on type, size, shape, location, and composition. Though the surface extending objects can be easily removed during the exploration of the wound, deeply penetrated objects may be difficult to remove. In such cases frameless stereotaxy system greatly facilitates localization of deep-seated intraparenchymal foreign body.

The principles of management of penetrating head injuries consist of debridement and removal of the penetrating object. Devitalized tissue and clots should then be removed, followed by meticulous hemostasis, and watertight dural closure.

Infection and seizures are the most common complication of penetrating injuries. Risk factors associated with infection include contaminated wound due to dirt, penetrating object passing from contaminated paranasal cavity with communication to cerebrospinal fluid and prolong hospital stay.[14]

The infection rate is higher in children than adults with retained bone fragments[13] less common complications are cerebral abscess, cerebrospinal fluid fistula, and neuroendocrine dysfunction. Prognosis of patients depends on age, mode of injury, area of the brain involved, associated other condition such as coagulopathy, hypotension, radiological finding of underlying brain hematoma and preoperative neurological status which is the reflection of underlying parenchyma injury.[15]

Conclusion

Keys, a very common household article played with by children, may accidentally result in fatal penetrating injury. Parent and children education and awareness about the possibility of such kind of injuries can play very vital role in prevention of such injuries.

Conflict of Interest
None.

Conferences Presented
None.

Acknowledgment
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