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Case report

Intracranial penetrating glass injury: A case report

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ABSTRACT

A case of penetrating head injury caused by glass is reported. Rarely does this material cause such an injury. Most of the intracranial foreign bodies occur around the orbit, frontal sinus, nasal and temporal area. Intracranial penetration of glass to the parietal region is rare due to the hardness and thickness of overlying parietal bone. Other reports of this unusual type of head injury are reviewed. Management and possible complications of this type of injury are discussed.

1. Introduction

Penetrating head injuries can be the result of numerous intentional or unintentional events, including missile wounds, stab wounds, and motor vehicle or occupational accidents (nails, screwdrivers, etc). Stab wounds to the cranium are typically caused by a weapon with a small impact area and low velocity. The most common wound is a knife injury, although bizarre craniocerebral-penetrating injuries have been reported that were caused by nails, metal poles, ice picks, keys, pencils, chopsticks, and power drills. According to the literature, most of the intracranial foreign bodies occur around the orbit, frontal sinus, and the nasal areas. Intracranial penetration of a glass piece through the temporal region is also reported.[1]

Intracranial penetration of glass to the parietal region is rare due to the hardness and thickness of overlying parietal bone. To our knowledge, this is the first report of an intracranial glass penetrating injury to the parietal lobe. Since the clinical manifestations occasionally do not correspond to the appearance of the laceration after glass penetrating injuries, serious caution concerning patients with intracranial glass penetrating injuries is important.

2. Case report

A 9 years old boy slipped on a bathroom floor impacting a broken glass bottle with his head and right hand. His right parietal scalp and right hand were cut by the broken glass. He visited our emergency unit 30 h after sustaining the injury. Glasgow coma scale on arrival was 11/15. Physical and neurological examinations showed left hemiparesis along with two lacerated wounds on both the right parietal scalp (2.5 cm) and the right hand skin (10 cm). Foreign bodies were not palpable around the lacerated wounds. CT head was done which disclosed a single, 3-cm long, radio-opaque foreign body penetrating through the skull bone into the right parietal lobe (Fig. 1).

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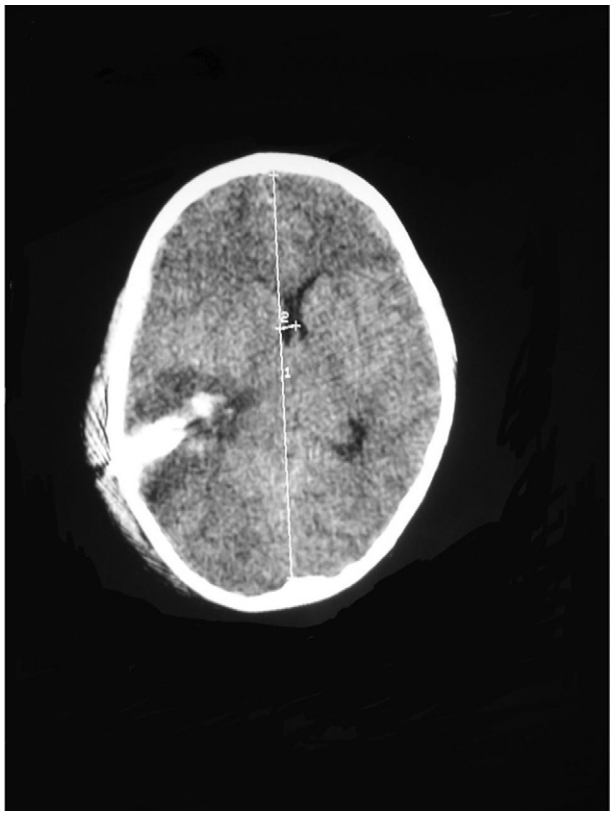

Fig. 1 – CT head showing foreign body in the right parietal area.

He underwent craniotomy and total removal of the foreign body with dural repair (Fig. 2). Postoperative angiography showed no vascular lesions. He was discharged a week later.

3. Discussion

A wound in which the projectile breaches the cranium but does not exit is described technically as penetrating, and an injury in which the projectile passes entirely though the head, leaving both entrance and exit wounds, is described as perforating. Penetrations most commonly occur in the thin bones of the skull, especially in the orbital surfaces and the squamous portion of the temporal bone.

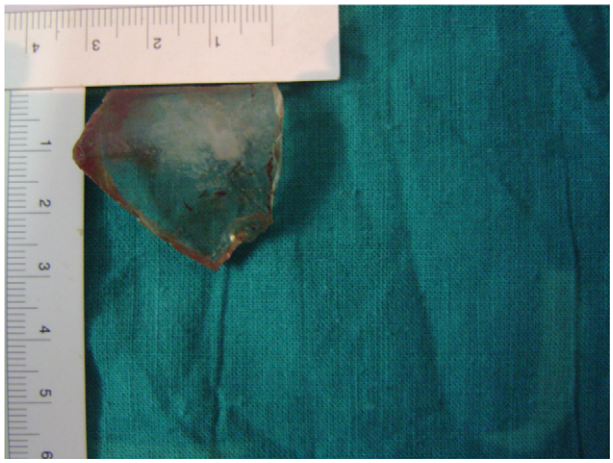

Fig. 2 – Glass piece removed during surgery.

The mechanisms of neuronal and vascular injury caused by penetrating wounds may differ from those caused by other types of head trauma. In missile injuries there is concentric zone of coagulative necrosis caused by dissipated energy, while in motor vehicle accidents diffuse shearing injury to the brain occurs.

The pathological consequences of penetrating head wounds depend on the circumstances of the injury, including the properties of the weapon or missile, the energy of the impact, and the location and characteristics of the intracranial trajectory. Following the primary injury or impact, secondary injuries may develop. A biochemical cascade begins when a mechanical force disrupts the normal cell integrity, producing the release of numerous enzymes, phospholipids, excitatory neurotransmitters, Ca, and free oxygen radicals that propagate further cell damage. Penetrating wounds caused by shattered glass are usually accidental in nature. Due to the involuntary actions carried out by a falling person, the injuries are often more severe. Rothschild et al (2001) investigated glass puncture wounds and found that most victims were at home and had fallen against glass door panels, or against windows.[2] Glass fragments can take on many shapes – some of which bear more than a passing resemblance to knives. Wounds caused by impacting upon vehicular windscreen have been considerably reduced with the increased use of laminated windscreen, which prevents the escape of the glass fragments.[3]

It is widely accepted in the literature that glass is radio-opaque on radiographs as long as the fragments are larger than 0.5 mm and the fragments are not projected over bone.[4,5] There has been a previous preconception that glass radio-opacity depends upon lead content, but now it has been addressed that glass is radio-opaque because its density (2.4–2.8 mg ml−1) is greater than that of soft tissue (1.5 mg ml−1).[6,7] Glass fragments may break off within the wound, and such injuries should be thoroughly investigated (under magnification if necessary) to confirm the presence of splinters. Blind removal of the penetrating object is dangerous, because blind removal may rock or twist the object, resulting in secondary vascular impairment and brain damage.[8]

Apart from infection and CSF leak, a common complication of transcranial penetration is vascular injury, occurring in 30% cases. It leads to aneurysm in 15%, carotid - cavernous fistula in 7%, other arterio –venous fistula in 4%, occlusion in 4%, transaction in 3%, and severe vasospasm in 3%.[9] Glass wounds can also result in death due to exsanguination and air embolism.

4. Conclusion

This case illustrates the necessity of exploring scalp wounds to assess for possible skull fractures and of using the history to

direct management. It also highlights the requirement for thorough guidelines for use by junior staff.

REFERENCES

1. Sharma A, Pandey A, Diyora B, Shah S, Sayal P, Dwivedi N. Intracranial penetration of a glass piece through the temporal region in civilian head injury. *J Trauma*. 2006;60(4):891–893.
2. Rothschild MA, Karger B, Schneider V. Puncture wounds caused by glass mistaken for stab wounds with a knife. *Forensic Sci Int*. 2001;121(3):161–165.
3. Allen TJ, Cox AR, Barton S, Messam P, Lambert JA. Breaking of flat glass-part 4. Size and distribution of fragments from vehicle windscreens. *Forensic Sci Int*. 1998;93:209–218.
4. Dickinson G. Glass is detectable on plain radiographs. *CMAJ*. 1989;140:265.
5. De Lacey G, Evans R, Sandin B. Penetrating injuries: how easy is it to see glass (and plastic) on radiographs? *Br J Radiol*. 1985;58:27–30.
6. Bokhari AA, Stirrat AN. The consequences of punching glass. *J Hand Surg*. 1997;22:202–203.
7. Edgar K. Glass in the hand and foot: will an X-ray film show it? *Paediatrics*. 1983;72:223–224.
8. Shih TY, Kuo YL. Development of intracranial complications following transoral stab wound in children. *Paediatric Neurosurg*. 2002;37:35–37.
9. Kieck CF, De Villiers JC. Vascular lesions due to transcranial stab wounds. *J Neurosurg*. 1984;60:42–46.