An Interesting Case of Penetrating Brain Injury Due to Assault with Meat Chopper Knife

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Abstract

Penetrating injuries to brain are rare and mostly result from warfare injuries, suicidal/homicidal firearm injuries, or accidental injuries. In general, they are associated with poor outcome. We report the challenges faced in managing an interesting case of penetrating brain injury as a result of assault with meat chopper knife that underwent surgical intervention and had a good outcome.

Keywords

- penetrating brain injuries
- meat chopper knife
- surgical intervention

Introduction

Penetrating brain injuries are rare and constitute approximately 0.4% of all head injury cases.[1] Most commonly, they result from warfare injuries, firearm injuries (suicidal/homicidal), or accidental injuries.[2,3] Homicidal and accidental stabbing of other body regions are frequent, but stabbing brain injuries are rare and are typically caused by weapons with a smaller impact area applied at a lower velocity (knives, nails, metal poles, ice picks, keys, pencils, chopsticks, and power drills).[2,3] These penetrating brain injuries are usually associated with poor outcomes.[4] We report the challenges faced in managing a patient with penetrating brain injury due to an assault with a meat chopper knife that underwent surgical intervention and had a good outcome.

Case Report

Our patient, a 40-year-old lady, was brought to our emergency department with a large meat chopper knife firmly embedded in the right side of the head. It extended from eyebrows (anteriorly) to parietal–occipital region (posteriorly) approximately 2 cm above the upper margin of the pinna (►**Fig. 1A** and **B**). Allegedly, she had been assaulted by her relative a few hours back.

General Examination

On general examination, she was conscious but disoriented. Her blood pressure was 110/70, pulse rate was 96/m (tachycardia), respiratory rate was 28/m (tachypnea), and Glasgow Coma Scale (GCS) was 13 (E3V4M6). Her left pupil was normal in size and reaction, but her right pupil could not be examined due to injury. There was a palpable fracture of the superior orbital rim at lateral ⅓ and medial ⅔ junction, the lids were swollen, darkened, and contused, the conjunctiva was congested, the cornea was hazy, and the anterior chamber had hyphema. She also had left hemiparesis (⅘) without any sensory loss.

Local Examination

On local examination, the knife was deeply embedded in the right fronto-temporo-parietal region (►**Fig. 1A** and **B**). At places, brain matter was visible along the length of the blade of the knife. The knife length was 41 cm with blade length 21 cm and handle length 20 cm. There was dried blood all over her scalp, face, neck, and upper chest.

Radiology

Anteroposterior and lateral view of radiographs of the head (►**Fig. 1D** and **E**) and noncontrast computed tomography head with bone window revealed the foreign body (knife) embedded deep in the right orbito-fronto-parietal region

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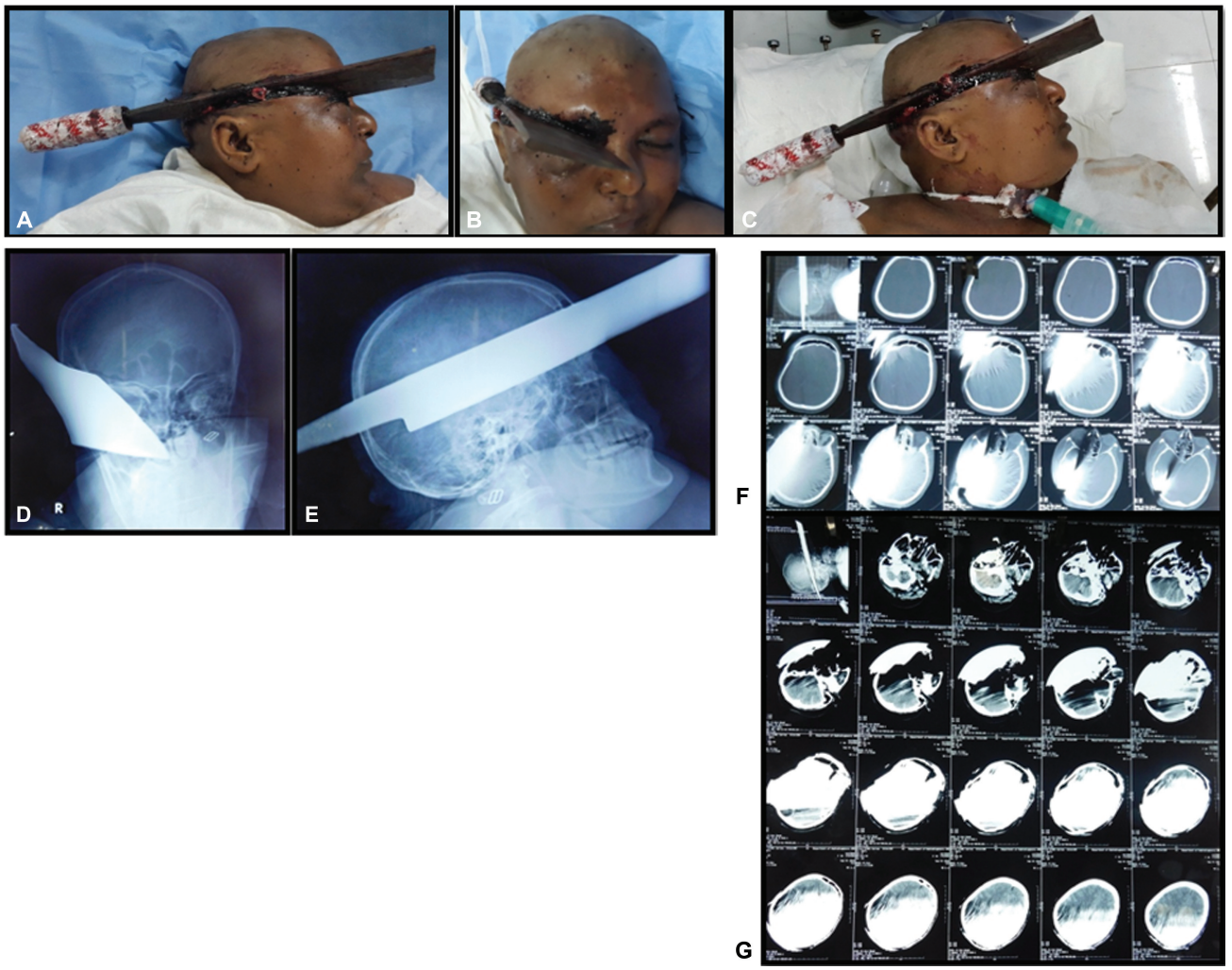

Fig. 1 (**A**–**C**) Preoperative photographs of the patient. (**D** and **E**) Preoperative X-ray face and skull anteroposterior/lateral view showing the knife. (**F** and **G**) Preoperative computed tomographic head and bone window showing metallic artifact.

(►**Fig. 1F** and **G**). Due to metallic artifacts, it was not possible to comment on hematoma or infarction. The facility for emergency digital subtraction angiography was not available.

Pre-Surgery

We planned an emergency surgery for the removal of the knife along with debridement and repair. After a written and informed consent, she was shifted to operation theater where an elective tracheostomy (►**Fig. 1C**) was done and general anesthesia was given. A blood transfusion was started as her hemoglobin was low (9.8 g %).

Surgery

It was very difficult to decide where to start. Even part preparation was challenging. We shaved her head and cleaned the head along with the foreign body multiple times with a betadine scrub. Then handle of the knife was wrapped separately in a sterile bandage and the area was draped.

As it was a horizontal wound extending anteroposteriorly from orbit to the parietal region, we gave a "T" incision from the middle of the knife toward the vertex. After raising the flaps (►**Fig. 2A**), a small craniectomy (►**Fig. 2B**) was made 1 cm away from the knife and gradually extended along the length of the knife using up-cutting forceps and Rongeurs. As this step was completed, the knife became a little loose near its posterior end, but the anterior end was still firmly embedded in the lateral orbital rim. Through the edges of the torn dura, damaged brain tissue was bulging out that was taken care of by suction, irrigation, and bipolar cauterization. After debriding the damaged tissue and controlling bleeders on the vertex side of the knife, the temporal side of the knife was also explored in a similar fashion (small craniectomy, debridement by suction, irrigation, and bipolar cauterization) (►**Fig. 2B**). At last, the knife was kept stabilized at both ends by an assistant, and the part of the knife embedded in the lateral orbital rim was freed by removing a part of the orbital rim. While the knife was still in place, damaged brain tissue above and below the knife was sucked out, cauterization was used as necessary, and the wound was packed lightly with wet cotton patties. After this, the knife was lifted from the posterior end gradually along with continued debridement, cauterization

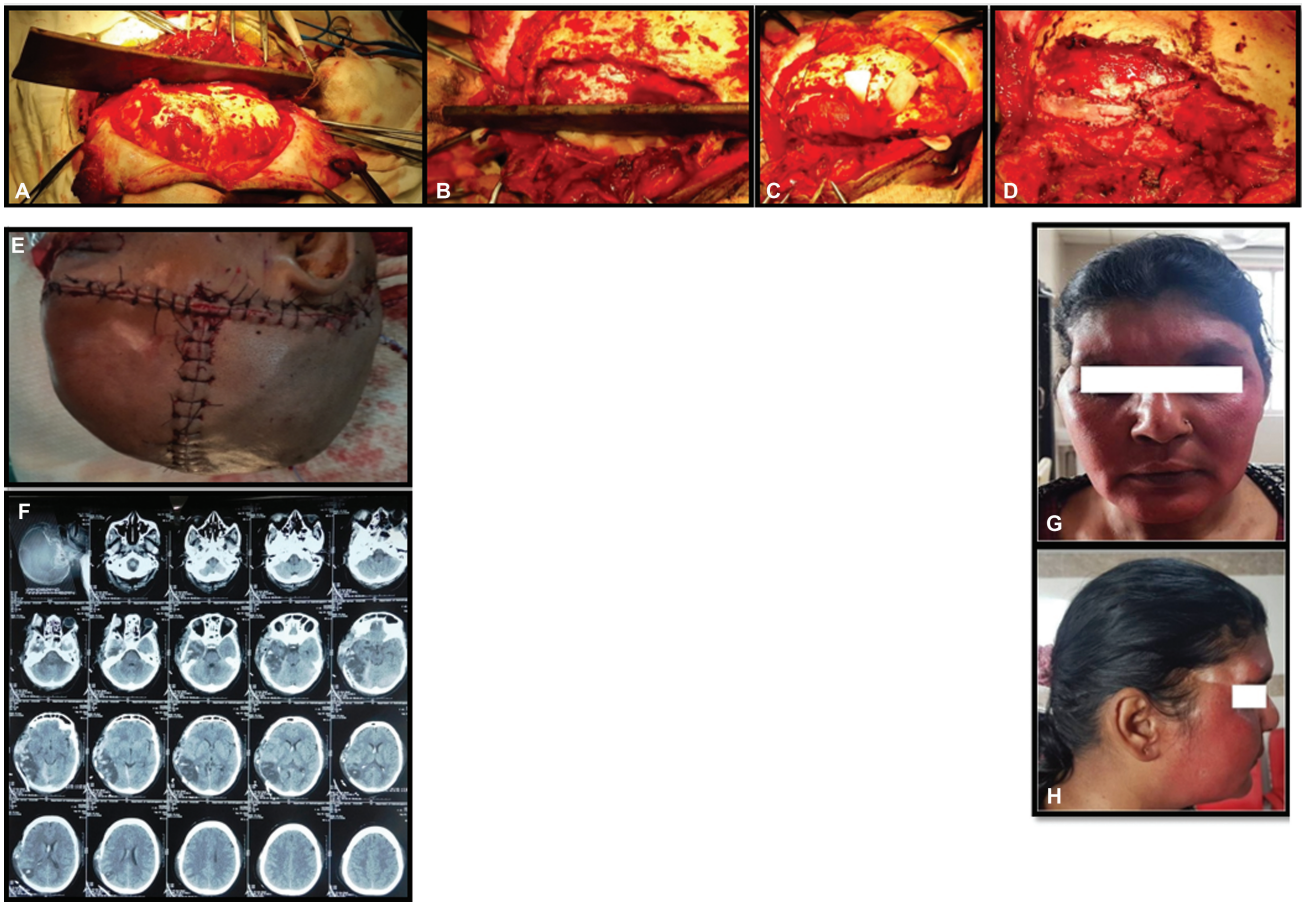

Fig. 2 (**A**) Scalp flaps raised. (**B**) Craniectomy on sides of knife. (**C**) After removal of knife. (**D**) After dural closure. (**E**) After closure of incisions. (**F**) Postoperative computed tomography head showing right middle cerebral artery infarct. (**G** and **H**) Two years after surgery.

of surface bleeders, and packing of the wound with wet cotton patties. Once the knife was out (►**Fig. 2C**), the wound was thoroughly cleaned and irrigated with normal saline. Dural flaps were then raised in both directions and final debridement was accomplished. The dural edges were properly defined and freed from underlying brain tissue. No major bleeders were encountered even at the depth of the wound. At the anterior end, the eyeball was completely damaged and the lens was found lying free in orbit. The eye surgeons did the orbital debridement. A pericranium graft was used to achieve a watertight dural closure (►**Fig. 2D**) and incisions were closed after leaving a subgaleal drain (►**Fig. 2E**).

Post-Surgery

Postoperatively, the patient was put on a ventilator in the intensive care unit, but she recovered well and was off the ventilator in 2 days. Her postoperative computed tomography (CT) head (►**Fig. 2F**) revealed an area of posterior middle cerebral artery territory infarct, but she improved gradually without any further neurosurgical intervention. During immediate postoperative period, her left hemiparesis worsened to ⅖, but it improved back to ⅘ at 4 weeks. Her tracheostomy was removed at 2 weeks and Ryle's tube was removed at 3 weeks. She had developed cerebrospinal fluid (CSF) leak from wound and meningitis; it was managed with intermittent lumbar drain and appropriate antibiotics and both improved by 4 weeks. At the time of discharge from the hospital at 5 weeks, she was able to stand and walk with support.

Follow-Up

She remained on regular follow-up and within 3 months she was able to perform all her work as before trauma. For the loss of one eye, she was advised for a prosthetic eye but she refused (►**Fig. 2G** and **H**).

Discussion

Homicidal stab injuries usually involve the upper extremities and abdomen; such injuries to the brain are very rare and usually fatal.[5,6] Even their management is very challenging. Depending upon the structures penetrated, there are high chances of complications like hemorrhage, vascular injury, CSF leak, damage to the eloquent cortex, and infection.[7] Depending upon the site and extent of injuries, a CT of the brain, orbit, face, upper airways, and cerebral angiography may be required. The aim of surgical intervention is the safe removal of foreign bodies, debridement of injured brain tissue, and adequate closure of dura. The most important predictors of outcome in penetrating injuries are GCS at presentation, brainstem

penetration, and associated major vessel injury.[8] Sometimes a team approach including a neurosurgeon, ophthalmic surgeon, and ENT surgeon may be needed.[9] In our case, the patient had many favorable points, such as the patient reached us within a few hours of injury, had GCS 13 at presentation, was vitally stable, had no major vascular injury, got operated on in time, and the eloquent cortex was not involved in the injury. However, the challenging points were the large size of the knife, unavailability of cerebral angiography, damage to the right eyeball, details of injury not visible on CT scan due to large metallic artifact, leaking brain matter, and high chances of contamination of wound as a rusted meat chopper knife was used. Not only was the surgical part challenging, but postoperative care was also challenging. The patient was on tracheostomy for 2 weeks, developed CSF leak and meningitis (despite of aggressive debridement and attempted watertight dura closure), and had significant worsening of hemiparesis, imposing a lot of difficulty in postoperative care and mobilization.

Conclusion

Finally, the patient had a remarkable recovery and during her treatment, she taught us many lessons regarding the management of this kind of penetrating injury to the brain. Lessons are as follows: quick evaluation and clinical decision making become more important as CT may not provide proper information about intracranial damage; emergency surgical intervention, timely recognition, and treatment of complications are necessary to achieve a good result.

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Conflict of Interest
None declared.

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