

Penetrating Head Injury from Angle Grinder at Workplace: Case Report and Review of Literature

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Abstract

A 21-year-old male presented to the emergency department with head injury while working with an electric angle grinder. Angle grinders, used to cut stone, metal, and concrete, consist of high-speed revolving metal or carbon discs that can cause high-velocity penetrating injuries. This patient had large right frontal lobe hematoma with foreign body besides compound comminuted depressed fracture of the right frontal bone. Penetrating injuries from broken disc of an angle grinder are very sparsely reported.

Keywords

- ▶ angle grinder
- ▶ penetrating
- ▶ depressed fracture

Introduction

Penetrating craniofacial injuries at workplace are extremely rare and may be associated with significant morbidity and mortality. We report a very rare and interesting case of transfrontal penetrating cranial injury from a broken disc of an angle grinder in a young male along with pertinent review of literature. Most common causes of angle grinder injuries include human error, use of worn discs, and removal of guard and handle. Management of penetrating craniocerebral injuries includes debridement of wound, excision of ragged edges, and removal of penetrating foreign body and bone fragments.

Case Report

A 21-year-old male presented to the emergency department of a tertiary care hospital with head injury while working with an electric angle grinder when a piece of a knife-sharpening disc shattered into pieces and struck him on forehead. Patient was conscious but had a lacerated wound over the forehead. The sharp disc of the angle grinder shattered while cutting metal when patient was not wearing any facial protection and the protective guard had been removed. Computed tomography (CT) head revealed foreign body in the right frontal lobe with a large hematoma surrounding it along with comminuted fracture of the frontal bone on the right side extending to

involve all walls of the bilateral frontal sinus along with pneumocephalus (▶**Fig. 1**). The disc caused extensive soft tissue injury in the forehead extending from the right side up to the midline. The disc then caused depressed fracture in the right frontal bone and penetrated the dura to reach the right frontal lobe. Patient was immediately shifted to the operation theater and contused necrotic brain, foreign body, and the depressed bony fragments were removed (▶**Fig. 2**). Frontal sinus was exteriorized and water tight dural closure was performed. Patient was given antimeningitic antibiotics in appropriate dosages for 2 weeks and was discharged in satisfactory condition.

Discussion

Traumatic brain injury occurring at workplaces is an important cause of disability in the developing occurring and carries major economic implications in terms of loss of wages and medical expenses. Penetrating head injuries constitute a small fraction of the total number of traumatic head injuries seen in casualty.

Penetrating head injuries may be high- or low-velocity type, but most are high-velocity type caused by missile injuries, gunshot, and shrapnel wounds. Penetrating head injury in civilian population is mostly low-velocity type and is caused by knives or sharp cutting objects, but several bizarre craniocerebral perforating injuries have been

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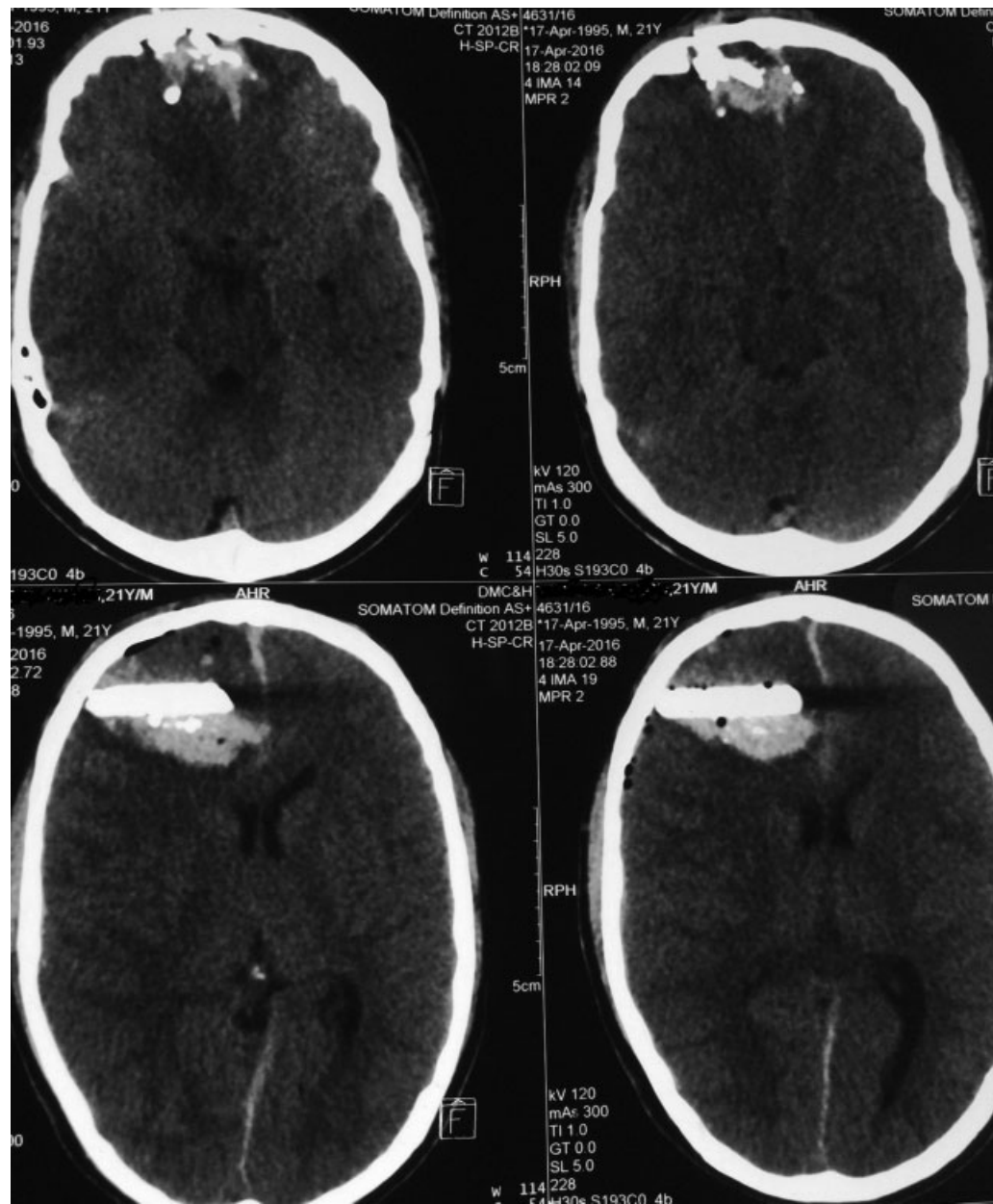


Fig. 1 Computed tomography scan of the head revealing right frontal intracerebral foreign body along with hematoma.

reported, including those caused by nails, ice picks, keys, pencils, human teeth, spikes, iron rods, scissors, fan blades, screwdrivers, stones, sharpened wooden sticks, pencils, and paint brushes.

Penetrating craniofacial injuries at workplace are extremely rare, are unexpected and unplanned, and may cause injuries to one or more workers. Such injuries are now reported increasingly around the world, especially in developing countries, because of unsafe working conditions and because of working with life-threatening instruments.

Angle grinders are used to cut stone, metal, and concrete and are one of the most dangerous tools (→ **Fig. 3**). These consist of high-speed revolving metal or carbon discs that can cause high-velocity penetrating injuries if they are broken during use. Most common causes of angle grinder injuries include human error,

use of worn discs, and removal of guard and handle. Correct-sized disc for appropriate grinder should be used.¹ The wheel may kick back from the surface it is cutting, sending the rotating disc toward the operator, parallel to the axis at which it is being used.² Head and face are most commonly injured sites followed by upper limbs and lower trunk.

Penetrating soft tissue injuries resulting from the use of angle grinders are numerous, but penetrating intracranial injuries with remnant disc fragments are very sparsely reported. We report a very rare case of transcranial penetrating injury with use of angle grinder with remnant disc fragment in the right frontal region along with pertinent review of literature.

Orbital roof and temporal bone are the most common sites for penetration into the cranium since these are

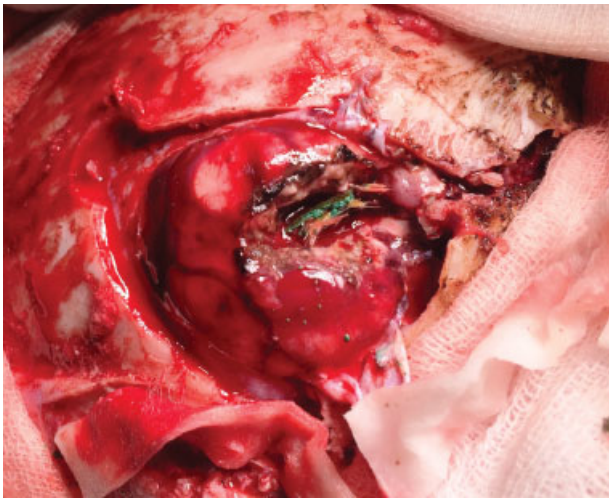


Fig. 2 Intraoperative picture depicting foreign body and contused brain.

relatively thinner and projectile objects with less force can easily penetrate and travel long distance inside the brain parenchyma.

Senthilkumaran et al reported injury from shattered disc of angle grinder in two construction workers while cutting stone with an angle grinder without protective guard. One fragment hit on the forehead of one of the workers, while one fragment hit on the occipital region of his coworker. One patient had bilateral frontal and ethmoid comminuted depressed fracture with bilateral frontal lobe hemorrhagic contusions. The second patient suffered bilateral cerebral multiple hemorrhagic contusion, acute subarachnoid hemorrhage, and pneumocephalus.³

Abdoli and Amirjamshidi reported two cases of head injury from industrial grinder tool. One patient had scalp laceration with underlying depressed fracture of the frontal bone with frontal contusion. The second patient suffered injury to the right eye and underwent subscleral approach for the retrieval of foreign body.⁴



Fig. 3 Angle grinder.

Telmon et al reported a case of death of a 38-year-old male who was found dead lying on a floor in a pool of blood with scalp laceration and depressed fracture in a garage, and an electric angle grinder was found at some distance to him. Autopsy report suggested that injury was caused by an electric grinder with injury to the longitudinal sinus, which led to massive bleeding and hemorrhagic shock.⁵

Kim and Park reported a case of penetrating injury to the face from the broken blade of an industrial grinder. Facial bone CT revealed blade fragment in the anterior skull base from the nose to the dorsum sellae area and CT angiography revealed nonvisualization of the right carotid artery. The carotid artery was found to be impinged between the foreign body and the anterior clinoid process; an intracranial carotid artery decompression was performed with retrieval of foreign body.⁶

Satyarthee et al reported a case of penetrating injury in a 28-year-old construction worker in whom a piece of knife-sharpening stone entered into the head through the right orbital roof. CT scan of the head revealed a foreign body in the right parietal region with depressed fracture of the right frontal bone and the right orbital roof extending to the right medial orbital wall with right frontotemporal acute subdural hematoma with bifrontal contusion and pneumocephalus.⁷

CT scan remains investigation of choice to locate remnant foreign body and to define extent of injury, which helps in decision-making of surgical strategy. If injury to a major cerebral vessel or venous sinus is suspected, cerebral angiography must be performed. Decision regarding the advisability of endovascular or surgical treatment can be made with adequate exposure of the proximal vessels in the area of injury⁸

Management of penetrating craniocerebral injuries includes debridement of wound, excision of ragged edges, and removal of penetrating foreign body and bone fragments. Focal debridement of the scalp, skull, dura, and involved parenchyma is the goal of surgical treatment.⁷ Watertight dural closure should be performed to avoid cerebrospinal fluid fistula, to prevent cerebral infestation, and to provide an important barrier to infection. Impacted object if not removed carefully can cause further damage to the cerebral tissue or may lead to vascular injury. Early treatment is warranted to avoid delayed vascular, infectious, and epileptic complications.

Complications of penetrating head injuries include parenchymal injury, infectious complications, and vascular complications. The infection rate is higher in patients with retained foreign body and retained bone fragments. Vascular complications are rare but may occur following penetrating head injury, such pseudoaneurysm, posttraumatic arteriovenous fistula formation, and caroticocavernous fistula.⁹

Source of Support

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Presentation at Meeting

None.

Conflict of Interest

The authors declare that they have no conflict of interest.

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