

CASE REPORT

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Fatal Cranial Injuries Caused by an Electric Angle Grinder

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ABSTRACT: A case of fatal cranial injuries caused by an angle grinder is reported. The scalp lesions were typical of those produced by a cutting disk in a side-slipping movement. On the cranial vault were two bony losses of substance, one of which was deep enough for intracranial penetration of the disk. Signs of deflection of the disk, identical to those found on the scalp, were observed on the external bony table. Because of the circumstances in which the victim was discovered, in particular the damage to the machine which had a broken handle, and the lack of any indication of homicide or suicide, an accident is the most likely hypothesis.

KEYWORDS: forensic science, forensic pathology, death, autopsy, angle grinder, head injury

A case of fatal cranial injuries caused by an angle grinder is reported. Injuries caused by circular saws, chain saws, or angle grinders have been described by some authors (1,2). Chain saw injuries are usually confined to the left side of the body and the face (generally sparing the eyes); the neck, hands and feet are most frequently injured (3–5). The radiological features of chain saw injuries have been described and include chipping of bone, breaching of joint cavities and partial severing of tubular bones (6). Circular saw injuries are confined to the two hands. Angle grinders have a disk which rotates at about 10 000 rpm and which can cut or grind a variety of materials such as cement or iron (Fig. 1). Because of the weight of the machine and speed of rotation of the disk, they must be held with both hands: one on the hilt and the other on the body of the machine. This case was interesting because of the probable circumstances in which it occurred and the appearance of the bony lesions.

Case Report

The deceased was a 38-year-old man who was found lying face down on the floor of his garage. There was copious blood on the floor. The only object found near the body was an electric angle grinder. It was 2 m from the corpse and still connected to the electric circuit, but switched off. The hilt of the machine was broken

and was lying near the angle grinder. The weight of this device in working order is 3 kg. It has a disk 23 cm in diameter with chips on its circumference (Fig. 2).

Inspection of the area showed grinding marks in a corner of the garage. These marks were at a height of 2.30 m off the floor. The victim's rectal temperature was 22.4°C. Time of death was estimated to be 37 h prior to discovery (7).

Autopsy Findings

External examination showed numerous lesions. There was a horizontal bruised wound 3 cm long on the left side of the scalp on the vertex, and just posterior, on the left parietal bone, a second large horizontal wound 11 cm long with eruption of brain tissue. This wound presented erosions parallel to the precedent scalp wound on its anterior side and on the left. In the middle of this large wound, on the posterior side, there was another oblique wound 6 cm long in a left posterior direction. The occipital area bore a large arc-shaped wound, where the scalp was detached and formed a flap measuring 7 cm long with a base of 10 cm (Fig. 3). On the right elbow were three bruises 2 cm in diameter; whatever the manner of death, these bruises can be explained by the fall of the body on the floor. The rest of the body was free from injury and there were no defense wounds.

At autopsy, we observed anterior to the second cutaneous wound described above total loss of bone measuring 10 × 1.5 cm, with chips of parietal bone at the extremities of the wound. Anterior to the oblique wound was a second loss of cranial bone measuring 7 × 1 cm. The margins of the losses of bone were regular but showed traces compatible with burns on the right margin (Fig. 4). We also observed a superficial external loss of bone in the occipital zone anterior to the arc-shaped cutaneous wound (Fig. 5). The dura presented a horizontal wound 8.5 cm long immediately below the most anterior loss of bone and the cerebrospinal fluid was hemorrhagic. This wound penetrated 1 cm into the brain tissue, involving both parietal lobes and transecting the longitudinal sinus.

In conclusion, the mechanism of death was massive bleeding after a wound of the longitudinal sinus and cause of death was hemorrhagic shock attributable to this bleeding.

Discussion

The bony lesions described were unusual. Their dimensions and the presence of a bony burn corresponding to the right side of

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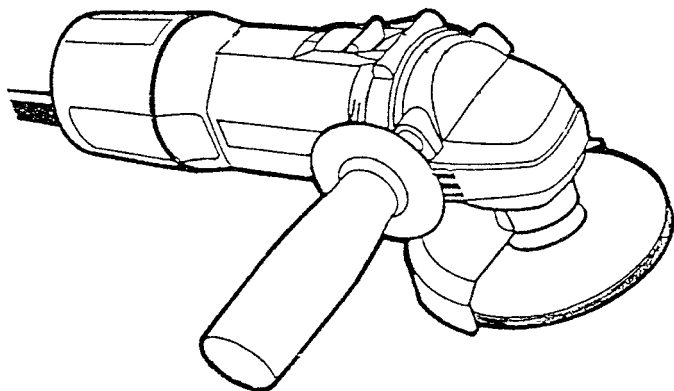


FIG. 1—An electric angle grinder.

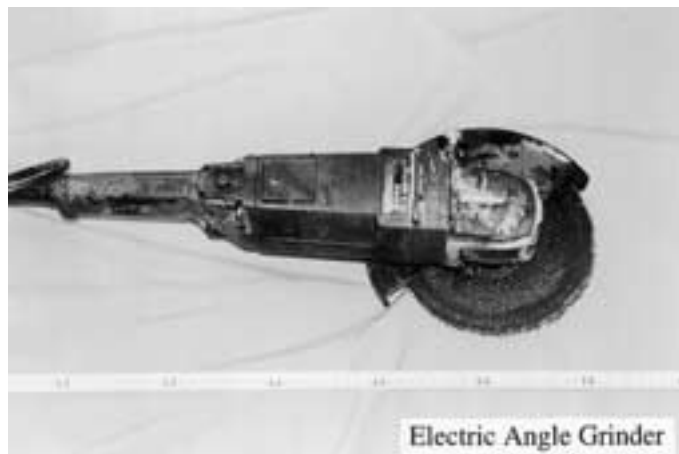


FIG. 2—An electric angle grinder, as used.

the cutting edge of the disk were compatible with lesions produced by the disk of an angle grinder of this diameter (8,9). In a single one of the two bony lesions the disk had penetrated to a maximum depth of 1.5 cm with corresponding lesions of the dura and the brain. Deflection of the disk of the angle grinder could have produced the superficial lesions observed in the occipital region. Considering the location and depth of the encephalic lesions, temporary survival was possible (10).

We attempted a reconstruction of the death. The presence of recent grinding marks 2.30 m off the floor and the absence of a ladder led us to suppose that the victim used this device at arm's length. He probably lost control of the device as the hilt broke (Fig. 6). Considering its weight and speed of rotation (10 000 rpm), the angle grinder could not be controlled without this lateral hilt. The backward fall of the grinder, still rotating, could account for the successive marks, all in the same general direction, which were found on the scalp and outer bony table. The victim probably attempted to stop the machine or to escape from it, without touching it, no doubt trying to protect his hands and not realizing the depth of the cranial wounds. While users are familiar with slight or serious injury to the hands, the skull wounds potentially caused by such machines are difficult to imagine. The location of the encephalic wounds is compatible with a lim-

ited period of survival, allowing the victim to turn off the grinder.

The victim was not depressed, had no history suggesting suicide, no cardiac or neurologic disorder and was under no medical treatment.



FIG. 3—Arc-shaped wound of the occipital area; detached skin flap 7 × 10 cm.



FIG. 4—Loss of cranial bone (7 × 1 cm); burn marks on the right margin.



FIG. 5—Superficial external loss of bone in the occipital area.

Conclusion

A criminal act seems unlikely because of the findings of the investigation, the location of injury and absence of other injuries, in particular of the hands or forearms. Suicide is also implausible considering the relatively posterior sites of injury, the presence of the broken hilt and absence of any psychiatric history to suggest suicide. An accident thus seems to be the most probable hypothesis.

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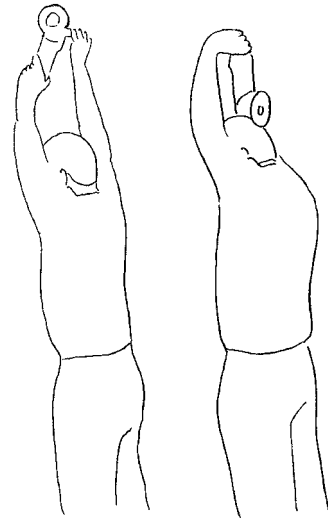


FIG. 6—Initial working position and mechanism of injury after hilt broke.

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