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Fatal Skullbase-penetrating Brain Injury with Pruning Shears: Case Report

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Abstract An unusual case of penetrating brain injury by pruning shears is reported. CT scan on admission showed subarachnoid and intraventricular hemorrhage, and intracerebral hematoma. Autopsy revealed that these hemorrhages were caused by penetration of the shears. The penetrating fracture at the frontal skull base could not be diagnosed by plain radiography or CT scan. As has been stressed previously, we recommend that foreign bodies which have penetrated the head should not be removed at the site of the accident.

Key words: Penetrating brain injury, Skull base, Prunings shears, Computed tomography, Autopsy

INTRODUCTION

Craniocerebral penetrating injuries are rare. We report an unusual case of penetrating injury to the cerebrum via the skull base.

CASE REPORT

A 46-year-old male gardener fell from a stepladder (height 3.5 m) when he was pruning trees. His fall was unobserved, and he was found later with the blades of his pruning shears stuck into the right cheek and neck (Fig. 1). His fellow worker removed the shears on the spot, causing massive bleeding from the wounds. He was admitted to our hospital in a comatose state (Glasgow Coma Scale score 3) with an initial blood pressure of 55/25 mmHg. The pupils were isocoric but slightly dilated (4.0 mm), and light reflex was absent bilaterally. There were penetrating wounds in the right cheek and neck (Fig. 2), but no other serious wounds to the head or

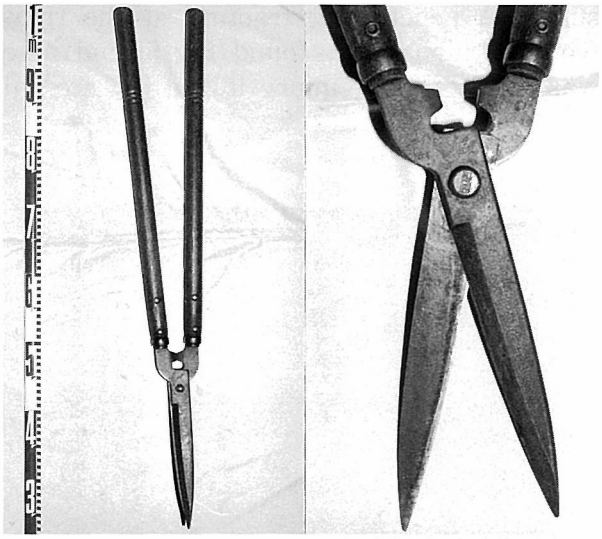

Fig. 1 The pruning shears that penetrated the skull.

body except for a small contusion on the right parietal skin and an abrasion on the left calf. No information was obtained about how deep the pruning shears had penetrated.

The patient was intubated, and his blood pressure was controlled using dopamine. On plain radiograms, no skull fractures were identified. However, the right maxillary sinus was cloudy, indicating bleeding and a fracture of the right maxilla due to penetration of the shears into the sinus. CT scan revealed massive subarachnoid hemorrhage in the suprasellar, interhemispheric and sylvian cisterns and an intracerebral hematoma in the left basal ganglia as well as intraventricular hemorrhage (Fig. 3A). Postcontrast CT scan showed an area with strong enhancement located from the anterior part of the suprasellar cistern to the interhemispheric fissure (Fig. 3B). After CT scanning, massive bleeding from the wound in the right cheek as well as from the nasal cavities occurred again. Intranasal balloons and tampons were used for hemostasis. Cerebral angiography demonstrated non-filling of the anterior and middle cerebral arteries (Fig. 4). Despite every effort, arterial blood pressure remained low (50-60/20-30 mmHg), and the patient died 24 h after admission. Autopsy was then carried out. There were massive subarachnoid hematomas in the basal cistern and cortical sulci. A penetrating fracture at the right frontal skull base was found (Fig. 5), and there was a penetrating injury in the left frontal lobe (Fig. 6A, B). The left anterior cerebral artery was injured at the A1 portion by one of the blades of the shears.

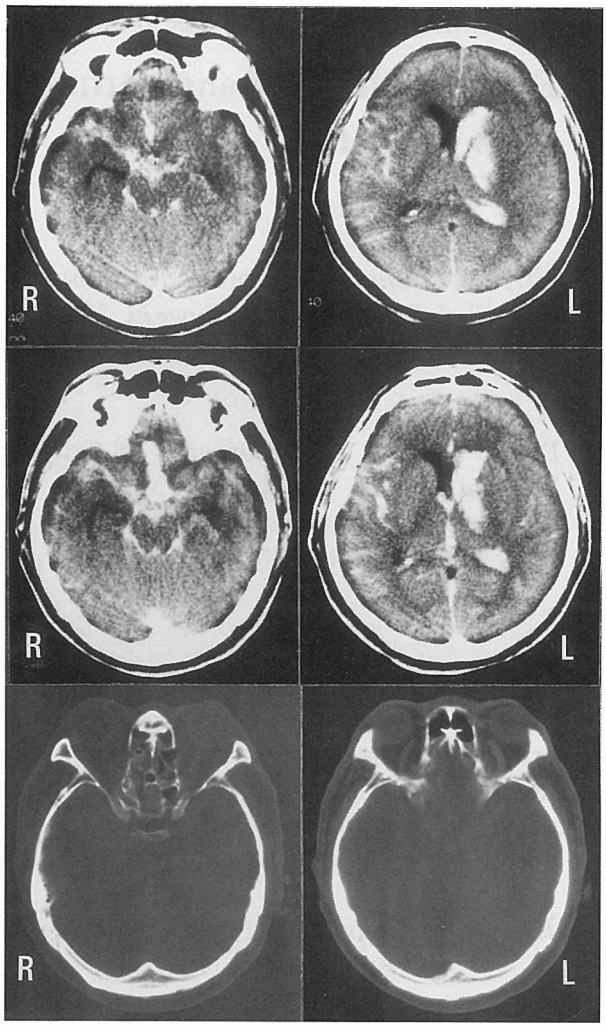

Fig. 3 CT scan on admission. A: Precontrast CT scan. Subarachnoid and intraventricular hemorrhage and an intracerebral hematoma are evident. B: Postcontrast CT scan. An area of strong enhancement is seen in the anterior part of the suprasellar cistern extending to the interhemispheric fissure. C: There is bleeding in the bilateral ethmoid sinus, but the fracture at the skull base is not identifiable.

Fig. 2 The wounds in the right cheek and neck.

DISCUSSION

In the case reported here, CT scan on admission revealed subarachnoid and

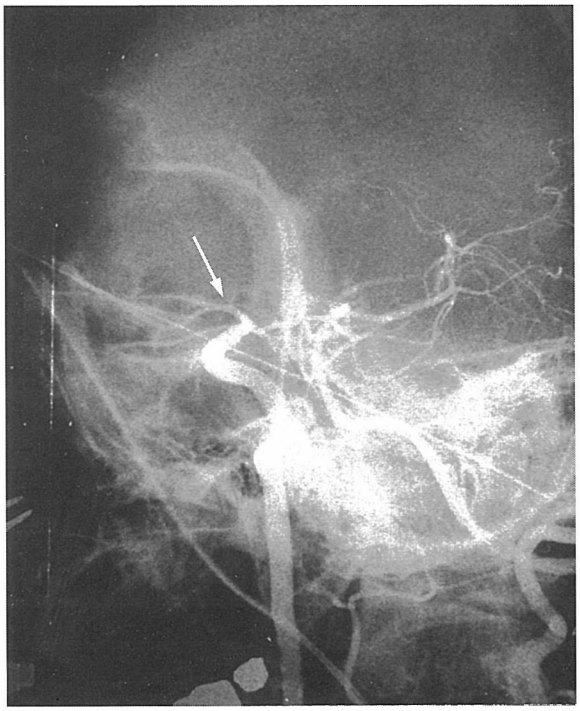

Fig. 4 Carotid and vertebral angiogram demonstrating non-filling of the anterior and middle cerebral arteries (arrow).

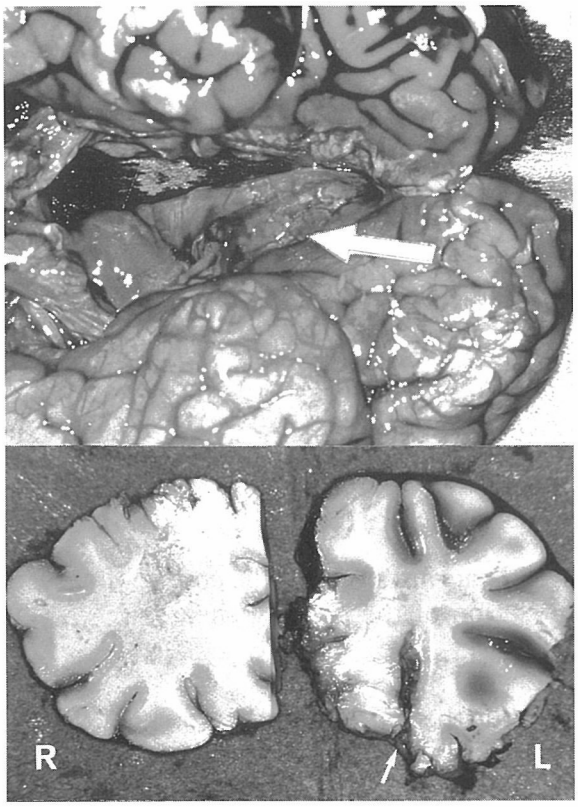

Fig. 6 A, B: The penetrating injury in the left frontal lobe (arrows).

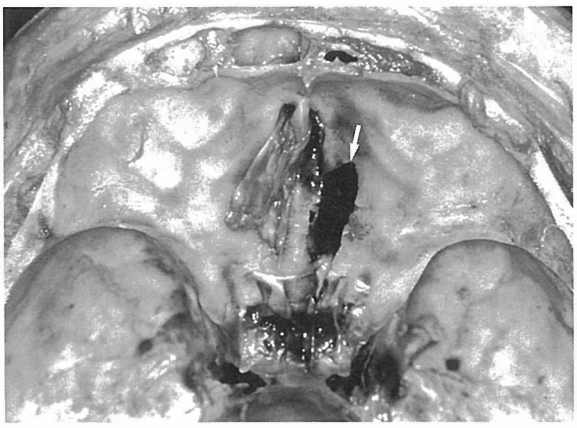

Fig. 5 The penetrating fracture at the right frontal skull base (arrow).

intraventricular hemorrhage as well as intracerebral hematoma, suggesting that the patient may have suffered a hemorrhagic stroke initially and then fallen from the stepladder. Postcontrast CT scanning was therefore performed in order to rule out any vascular malformations that might have caused a hemorrhagic stroke. Because the postcontrast CT scan showed an enhanced area from the anterior part of the suprasellar cistern to the interhemispheric fissure, aneurysmal subarachnoid hemorrhage (especially rupture of an aneurysm of the anterior communicating artery) should have been differentiated. However, on the cerebral angiogram, neither anterior nor middle cerebral artery was visible, suggesting low or lack of cerebral perfusion due to high intracranial pressure and systemic hypotension. However, autopsy revealed that these findings were due to the arteries being injured by the pruning shears, and thus the enhancement at the interhemispheric fissure had been due to extravasation of the contrast medium from the injured artery. The route of penetration is shown in Figure 7. The shears penetrated the right cheek, right maxillary sinus and right ethmoid sinus and its roof to reach the brain. The proximal portion of the anterior cerebral artery lies along this route.

Craniocerebral penetrating injuries are

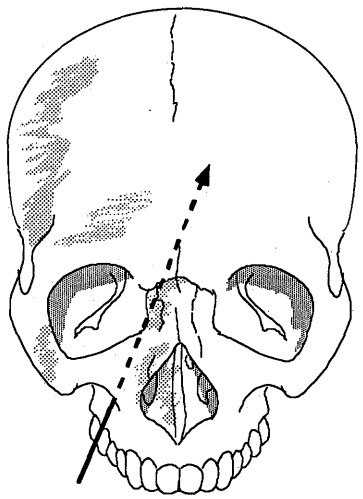

Fig. 7 Diagram showing the course of penetration of the pruning shears.

rare, but there are several reports of injuries due to a coat hanger, knives, bullets, a power drill, wood, a nail-gun, a hunting arrow, an umbrella tip, a screwdriver, knitting needles and chopsticks.[1-8] In most cases, the penetration sites were the orbit and larynx (the cranial vault in others). Gates and Hardjasudarma[1] recommended plain radiography and CT scanning to rule out fractures of the skull vault and base. In the case reported here, however, the penetrating fracture of the skull base could not be identified by either plain radiography or CT. Fractures at the roof of the ethmoid sinus, as seen in this case, seem difficult to detect by CT scan even with bone-window pictures. Recently, three-dimensional CT has become popular with the development of helical CT scanning. Although it is still difficult to obtain three-dimensional CT scans in such emergency patients, this method seems to be useful for identifying skull base fractures when they are suspected.

In the present case, removal of the pruning shears at the accident site caused massive bleeding which resulted in hemorrhagic shock. O'Neill et al.[6] stressed that it was important to ensure safe transport of such patients and prevent removal of the foreign body in the field, as well as the need for early angiographic analysis before removal of the foreign body to identify potential vascular injury. In this case, if the shears had not been removed at the site of the accident and these procedures had been observed, massive bleeding and consequent hemorrhagic shock might have been avoided, and surgical management including reconstruction of the anterior cerebral artery might have been possible. Therefore, it should be stressed again that foreign bodies which have penetrated the head should not be removed at the place of the accident.

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