

Unusual Stab Wound of the Temporal Region

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We report the case of an unusual penetrating injury of the temporal region of the head caused by knife. A long kitchen knife was protruding from the upper auricular area of the left temporal region of victim's head. It cut through the posterosuperior part of the left auricula and remained fixed to the postauricular region. Brain computerized tomography (CT) scan revealed that the knife had reached deep into the petrous part of the temporal bone, and was directed toward the sulcus of the sigmoid sinus. There were no signs of intracranial bleeding. An otorhinolaryngologist and a neurosurgeon removed the knife in operating room, with the patient in general anesthesia. The audiogram obtained after 7 days of hospitalization showed left conductive hearing loss of 40 dB at frequencies up to 2 kHz, and of 90 dB above 2 kHz, probably due to hemotympanum caused by the operation. Control examinations performed 14 days and one month after discharge confirmed the patient's complete recovery and no significant defects in his hearing or balance. We suggest multidisciplinary teamwork as a proper approach in the treatment of such injuries.

Key words: head injuries, penetrating; patient care team; petrous bone; wounds, stab; wounds, penetrating

Penetrating wounds of the head and neck are rare and potentially life-threatening injuries (1-11). The severity and extent of such injuries depend on the weapon used and the anatomic site involved, and the risk of vascular, neurological, aerodigestive, eye, and ear injuries is particularly high (9,11,12). The wide spectrum of injuries observed in this type of head trauma presents a challenging problem for physicians who initially evaluate the trauma patient, as well as surgeons. The management of such patients receives considerable attention, as can be seen from the reports published so far (1-14).

We describe the management and recovery of the patient with a stab wound of the temporal region caused by a knife. The treatment of the wound required multidisciplinary approach.

Case Report

A 56-year-old Caucasian man was brought to the Split University Hospital's emergency room on November 23, 1999, after sustaining a knife stab wound in the head inflicted by his daughter, a drug addict. A long kitchen knife was protruding from the upper auricular area of the left temporal region of his head. It cut through the posterosuperior part of the left auricula and remained fixed to the postauricular region. The wound was not bleeding. External acoustic meatus was intact, and the otoscopic findings showed no signs of injury. Basic clinical tests of vestibular activity revealed no nystagmus, vertigo, or disequilibrium in Romberg position. The patient was conscious

on admission; he remembered the event, and had not fainted during or after the assault. The Glasgow coma score was 14. A grinder was used to cut off the knife handle and allow the further management of the patient (Fig. 1). The X-ray of the head revealed that the knife tip was in the petrous part of the temporal bone, pointing toward endocranial structures. Brain computerized tomography (CT) scan performed immediately afterwards revealed that the knife had reached deep into the petrous part of the temporal bone, and was directed toward the sulcus of the sigmoid sinus. The blade was directed infratentorially to the right, cutting through the petrous part of the temporal bone, and the knife tip stopped at the very border of intracranial space, or slightly protruded intracranially. There were no signs of intracranial bleeding. However, large artifacts produced by a foreign metal object hindered accurate examination (Fig. 2).

Angiography of the left common carotid artery and vertebral artery was indicated because the border between the knife tip and osseous structures in the temporal bone opposite the sigmoid sinus and other vascular structures of the petrous part of temporal bone was not clear due to the numerous artifacts. The angiography was performed via the right transfemoral approach. After contrast medium application, regular ramifications of the internal carotid, external carotid, and vertebral artery were shown (Fig. 3). The venous phase of angiography showed that the left transversal and sigmoid sinus filled more slowly but without signs of contrast extralumination or thrombosis (Fig.

4). Lateral X-ray of the head showed distinctly that the knife tip reached very close to, but did not penetrate, the dural venous sinuses (Fig. 4).

Based on the findings, it was clearly established that the knife tip had predominantly damaged the structures of the petrous part of the temporal bone, along with cutting through the auricle. Although endocranial structures (cerebral sinuses, dura mater, and brain tissue) were not affected, the proximity of the knife tip to the sigmoid sinus in the petrous part of temporal bone required surgical team approach. An otorhinolaryngologist and a neurosurgeon removed the knife in operating room, with the patient in general anesthesia. The auricle was separated from the mastoid planum by sharp incision. The retroauricular incision was used to remove the skin and subcutis from the mastoid planum, which was then laid bare by use of a raspatory. A drill was used to reach the

place around the knife and release its tip. During mastoidectomy and after exploring mastoid cellulae, healthy bone was observed, ie, unaffected lamella leaning directly on the dura outlining the sigmoid sinus. The lamella of tympanic tegmen was also intact, which suggested no penetration in middle cranial fossa. This confirmed the absence of intracranial penetration of the knife and indicated that the distance of



Figure 1. Preoperative view of the temporal stab wound. The knife was shortened in the hospital.



Figure 2. Brain CT scan after admission. Preoperative axial CT scan shows the knife tip reaching deeply to the petrous part of the temporal bone, but its border toward sigmoid sinus is not clear due to numerous artifacts.



Figure 3. Angiography of left internal and external carotid artery (top) and vertebral artery (bottom). Angiography showed normal ramification of the left internal and external carotid artery and the vertebral artery. There are no signs of contrast extralumination or occlusion. Arrow indicates the position of the blade's tip.

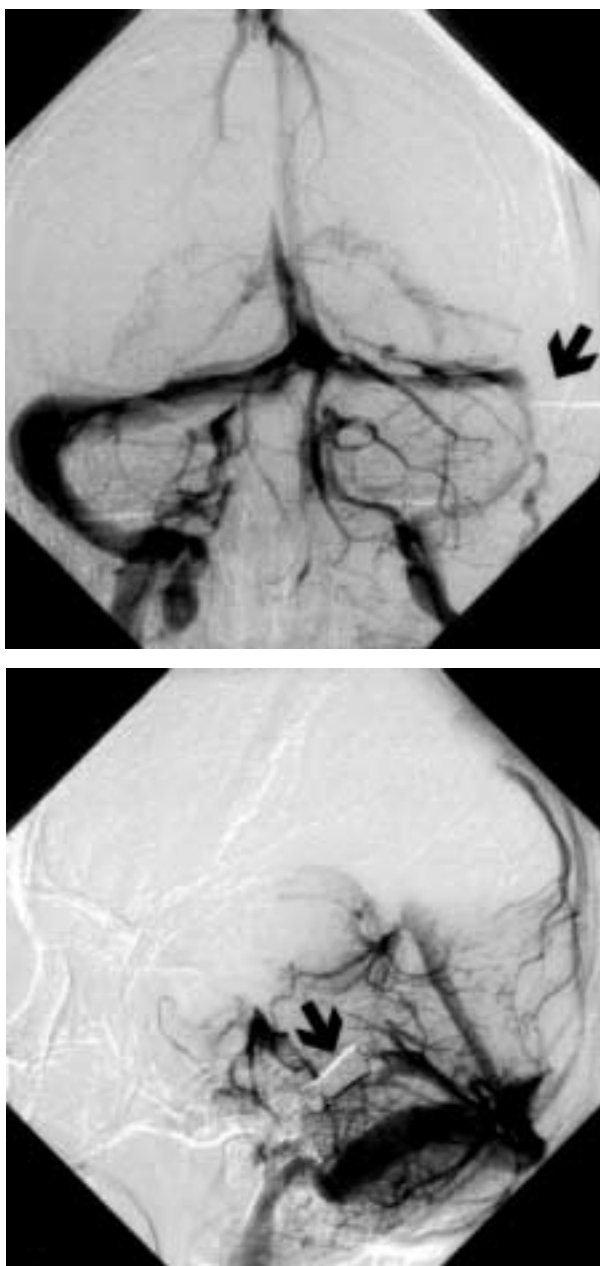


Figure 4. Venous phase of angiography of the left internal and external carotid artery and vertebral artery. Venous phase of angiography showed that left transversal and sigmoid sinus filled more slowly without any sign of contrast extralumination or thrombosis (top). Lateral X-ray distinctly showed that the knife tip reached very close to but did not penetrate the venous sinuses (bottom). Arrows show blade.

the knife tip in the temporal bone from the sigmoid sinus was 1-3 mm. The distance from the posterior wall of the external auditory canal and the knife tip was more than 5 mm. The injured auricle was sutured in layers, with minor debridement.

Postsurgical therapy included parenteral antibiotic administration, with analgetics when necessary.

Control brain CT scan on the day after the operation showed completely normal findings. There were no posttraumatic endocranial complications. Postsur-

gical course was normal, the lesion healed *per primam*, the drain was taken out after 5 days, and stitches were removed 7 days after the surgery.

The audiogram obtained before the discharge after 7 days of hospitalization showed left conductive hearing loss of 40 dB at frequencies up to 2 kHz, and of 90 dB above 2 kHz, probably due to hemotympanum caused during the operation.

Control examinations performed 14 days and one month after discharge confirmed the patient's complete recovery and no significant defects in his hearing or balance.

Discussion

Craniofacial stab injuries are defined as Jael's syndrome (3,6). The term *Jael's syndrome* is an oblique biblical reference to the Jael's murder of Sisera. Our case of the attempted homicide of a somnolent victim by knife resembles to that in the tale of Jael and Sisera. Stab wounds to the temporal region or, more precisely, to its petrous part, as described in our case, are unusual variants of the Jael's syndrome. We reviewed the literature and did not find a similar report on knife injury of the temporal bone without any other associated vascular or endocranial injuries.

Although our case qualifies as severe head injury, a complete absence of serious signs and symptoms in our patient on admission to hospital was surprising. Similar lack of morbidity has been noted in previous reports of Jael's syndrome (1,3,6,10). Considering the proximity of the knife tip to vital structures, sigmoid sinus, internal carotid artery, cerebral tissue, and bone microstructures of the inner and middle ear, it is miraculous that the injury did not result in any permanent damage. There were neither significant hearing defects nor impaired sense of equilibrium, although the knife penetrated into the petrous part of the temporal bone, meaning that the blade bypassed the inner and middle ear structures. Also, we observed no facial movement disorder or neurologic deficiency due to the possible impairment of the facial nerve. The fact that the knife had been driven so deeply into the bone (82 mm of its length) and that it remained fixed probably saved the patient's life, because the assailants could not pull it out from the victim's head. The knife was also impossible to remove on admission to the hospital emergency unit. The handle of the knife was therefore cut off with a grinder after previous fixation of the distal part of the knife to reduce vibrations around the blade in the temporal bone. This allowed further neuroradiologic examination and facilitated patient management.

We particularly point out the importance of urgent neuroradiologic examination in deciding on the type of the surgical treatment of lesion. Radiological examination of facial stab wounds should consist of three phases: 1) X-ray and CT scan of the head to establish the precise location of a foreign body in relation to vital structures; 2) angiography to detail the proximity of the knife to large vessels; and 3) postoperative examinations to confirm the total removal of the object and detect possible complications of operative procedures (3,14). Selective emergency arterio-

graphy in the evaluation of penetrating temporal, cranial injuries is particularly useful (14). Our case was handled more easily after the angiographic examinations of the common carotid and vertebral artery. Selective emergency arteriography of the internal and external carotid artery and vertebral artery provided essential information before the operative exploration and treatment of the wound (14).

Although retained transcranial knife blades have high incidence of early and late vascular and infectious complications, that was not the case with our patient, who developed no complications during the 10-month follow-up (11-13). Deeper petrous injury and penetration to the brain are thought to be significant causes of complications in this type of wound (11). Although the petrous part of the temporal bone was injured in our patient, no damage to vascular and nervous structures in the temporal bone were observed. There was also no infection. Even if there is no sign of vascular injury, we do recommend the blade to be removed in the operating room, with the patient under general anesthesia, due to the fact that retained blade could be tamponading the vessel it had incised and its removal could cause serious hemorrhage (11).

In our patient, the severe impalement injury in the temporal region was not associated with correspondingly severe clinical features (1,3,6,10). The case illustrates the protective function of the neurocranial bones (6), ie, the temporal bone, which act as a crumple zones that absorb the trauma and protect the endocranial structures.

Although a series of attempts have been made to establish algorithms and classify penetrating craniofacial injuries (5,9,11), the variety of cases described so far (1-14) speaks in favor of individual approach to the treatment of such injuries. Individual approach may be highly effective only through multidisciplinary teamwork of a neuroradiologist, otorhinolaryngologist or maxillofacial surgeon, and neurosurgeon.

Our case supports the view that individualization of each patient with Jael's syndrome together with multidisciplinary teamwork is a proper approach to the treatment of such injuries.

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