Transoral Penetrating Knife Injury in the Oral, Maxillofacial Region: A Case Report

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Abstract

Penetrating injuries are a rare yet complex variety of oral and maxillofacial trauma and often require a multidisciplinary approach to treatment. The primary survey is always the first step in trauma management prior to proceeding with further evaluation and treatment. The following case report discusses the clinical strategy for a rare transoral and trans-spinal penetrating injury. A 42-year-old man presented with a penetrating metal injury through the oral cavity. A computed tomography scan revealed a 12.8-cm-long knife penetrating through the tongue, floor of the mouth, and hypopharynx reaching the spinal cord in close proximity to the right vertebral artery. The patient did not present with any neurological malfunctions. An emergency tracheotomy was performed for airway protection. A balloon catheter was inserted into the right vertebral artery using interventional angiography to prevent massive bleeding prior to extraction. The knife was then surgically removed, and soft tissue reconstruction was performed without major bleeding. Postoperative magnetic resonance imaging angiography showed no bleeding of the right vertebral artery, but there was mild cerebellar infarction. Early isolated paresis of the right arm returned to nearly normal function within 1 week. This case demonstrates that complex penetrating injuries of the oral and maxillofacial region require a structured and multidisciplinary approach to prevent further side effects and obtain an ideal clinical outcome.

Keywords
► penetrating injury
► knife injury
► oral and maxillofacial surgery

Craniofacial traumas are frequent and thus economically relevant events in both acute and normal care. The National Trauma Registry of the German Society for Trauma Surgery estimates the number of injuries (abbreviated injury scale > 3) to the head and facial area to be above 48.1 and 11.1%, respectively. In severely injured patients, the occurrence of head and facial injuries has risen by 65%.

Penetrating knife injuries are a particularly rare but complex variety of oral and maxillofacial trauma. The low incidence of impacted knife wounds in the facial region can be primarily explained as a result of protection of the face with the hands in self-defense. In general, the penetrating material is stiff enough to cross through various anatomical structures during a violent collision caused by an accident or an attack. In most cases, simple withdrawal of the penetrating blade is administered without any untoward effect. However, knife extraction still bears the risk of injuring the surrounding structures, such as the rich vascular supply of the tongue and the floor of the mouth. This potentially leads to substantial hemorrhage. Therefore, a reasonable diagnostic and therapeutic strategy...
should preferably include three-dimensional radiographic and angiographic imaging and focus on acute airway management. Foreign body extraction should be planned carefully and performed under safe conditions in the operating theater. The following case report reviews the diagnostic and clinical strategy for a patient who received a transoral intracranial penetrating knife stabbing injury.

**Case Report**

A 42-year-old man presented in the evening to the emergency medical service after receiving a stab wound in the head and neck area from someone near a homeless shelter. The paramedics reported that the patient was found in a pool of blood outside in a park.

An initial survey revealed no acute airway injury (SpO2 97%), stable vital signs (blood pressure 115/85 mm Hg, heart rate 98 bpm), and no neurological disorders. Upon closer examination of the head and neck area, the patient showed no extraoral trauma; however, intraoral examination revealed a broken metal blade protruding ~ 2 cm out of the tongue and floor of the mouth (Fig. 1). The blade was immovable upon palpation.

Diagnostic chest X-ray and a computed tomography (CT) angiography of the head and neck area were performed. The chest X-ray did not show any signs of a pneumothorax. The CT angiography revealed a 12.8-cm-long metal blade running on the right side of the tongue through the oropharynx penetrating the posterior pharyngeal wall. Its tip resided in the posterior vertebral body arch C2 2 mm from the spinal cord and 3 mm from the right vertebral artery (Fig. 2). Antibiotic treatment was initiated to prevent infection (1.5 g cefuroxime every 8 h). A tetanus vaccination was administered as well as a glucocorticoid (500 mg Solu-Decortin) to prevent further swelling of the airway.

This interdisciplinary approach then dictated an awake tracheotomy for airway protection and to remove the blade under controlled conditions in the surgical theater the next day. The patient was sedated and brought to the intensive care unit overnight where he was treated with analgesics and broad-spectrum antibiotics to prevent further infections around the foreign body.

A balloon catheter was placed the next day prior to extraction because of the anatomical position close to the right vertebral artery. Next, the patient was brought to the operation theater where the knife was extracted using special forceps for elastic stable intramedullary nailing without causing major hemorrhaging. The body of the tongue as well as the posterior

**Fig. 1** Front view of the patient with a broken knife blade in situ.

**Fig. 2** Computed tomography angiography of the same patient showing the topographical proximity of the impacted knife (white arrow) and the right vertebral artery (red arrow).
pharyngeal wall was then reconstructed using absorbable suture material (►Figs. 4 and 5).

Magnetic resonance imaging (MRI) angiography of the head and neck area was performed after surgery. Bleeding was found in the penetrating, paravertebral, and spinal canals with signs of a mild myelopathy and cerebellar infarction. Neurologically, the patient presented a high-level monoparesis of the right arm and incomplete Horner's and Brown-Sequard's syndromes. Apart from the neurological malfunctions, the patient showed no signs of cardiovascular instability and was awake and breathing simultaneously. On the second postoperative day, the patient was transferred to the high dependency unit. The early paresis declined with practically normal muscle strength. Upon further improvement, the patient was transferred to the normal ward 5 days post surgery. The following day, the patient was decannulated without any complications. A follow-up angio MRI of the head 10 days postextraction revealed a long segmental thrombosis of the sigmoidal sinus, leading to treatment with low molecular weight heparins at therapeutic dose. Three weeks post surgery, the patient was discharged from the hospital and started neurological rehabilitation. The early neurological malfunctions almost normalized apart from mild Horner's syndrome. The wound healing appeared on time and was satisfactory (►Fig. 6).

**Discussion**

Penetrating knife injuries are a rare yet complex variety of oral and maxillofacial trauma—most published occurrences are from South Africa. The primary patient demographic is male (87.5%), relatively young (mean age 26.5 years), and from a low socioeconomic background. The most affected anatomical areas are the zygomatic-temporal and frontozygomatic regions as well as the bridge of the nose.

Transoral penetrating knife injuries are even more rare with only two cases described in the present literature. Kim et al report a case of a self-inflicted transoral intracranial stab wound that led to brain stem and medulla oblongata lesions, but the patient fully recovered after intensive rehabilitation. Mepani and Antscherl described a 17-year-old male patient who developed a massive hematoma of the floor of the mouth after getting stabbed in the orofacial region; they recommend emergency tracheotomy.
In most cases, knife extraction can be performed under general anesthesia without any complications. Nevertheless, a thorough clinical investigation following the ATLS principles with a focus on airway protection as well as radiographic imaging should be performed prior to extraction. Here, CT angiography was used as the primary diagnostic imaging because it has various advantages: noninvasiveness, short examination time, and the ability to visualize injuries to hard and soft tissues and other vital structures.

Additional imaging includes angiography even though routine angiography has been questioned due to its high costs and low rate of positive examinations in penetrating neck injuries. Other studies recommend the use of selective angiography in patients suffering from penetrating maxillofacial injuries. Because of the topographical proximity of the retained knife blade, a selective angiography with the placement of a balloon catheter was performed here to prevent major hemorrhage after extraction.

The postoperative protocol should include intensive care rehabilitation and treatment with broad-spectrum antibiotics and analgesics. Interestingly, there were no signs of wound infection or sepsis in this case, which agrees with other recorded cases.

High dosage of glucocorticoids (i.e., Solu-Decortin) should be considered when the airway is affected by the impacted knife because they significantly reduce postoperative swelling. Furthermore, care should be taken regarding any neurological disorders after extraction—especially when the foreign body penetrates the spinal canal. The only other case of spinal canal penetration through a transoral route is reported by Kim et al. Similar to this case, the patient nearly completely recovered after neurological rehabilitation.

Conclusion
Penetrating transoral knife injuries without definite signs of vascular injury can be safely managed after a thorough clinical and diagnostic examination. The initial management should follow the ATLS principles with a focus on airway protection. A tetanus prophylaxis and antibiotics should be initiated. Other specialties (neurosurgery and vascular surgery) should be consulted if indicated prior to extraction. Further diagnostics might include angiography with selective embolization of the feeder vessel. The postoperative protocol should include intensive and neurological rehabilitation if indicated.

Competing Interests
The authors report no conflict of interests.

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References

Fig. 6 Postoperative result 2 weeks after surgery.
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