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Case Report

Safe Removal of a Knife *In Situ* in the Neck: Improvising in the Operating Room

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Abstract

Patients stabbed with a knife rarely present with the knife *in situ*. After stabilizing the patient according to routine trauma care guidelines, the knife must be removed, preferably in the operating room. We present the case of a 21-year-old man who was stabbed in the neck and presented with the knife *in situ*. He had an intact airway and was physiologically stable. He was brought to the operating room for exploration which showed no injuries. However, the knife could not be extracted. A mechanical device was improvised which applied force to the knife along its axis, allowing removal. He was discharged home and did well. While in the past, penetrating wounds to the neck were managed according the anatomic location of the injury, contemporary management is based on the physiologic status of the patient. In some patients, a CT angiogram may be useful as preoperative imaging. Due to the change in management, many patients with penetrating wounds to the neck are now managed non-operatively.

Keywords: *Knife In Situ; Neck; Operating Room*

Introduction

Patients stabbed with a knife rarely present with the knife *in situ*. After stabilizing the patient according to routine trauma care guidelines, the knife must be removed, preferably in the operating room.

Report of Case

The patient was a 21-year-old man assaulted on the street and transported to the emergency room by ambulance. He was reportedly stable and awake during transport. On arrival, his airway was intact with a clear voice and he had bilaterally equal chest excursion with equal breath sounds bilaterally. His pulse was 95/min and blood pressure 110/80 mmHg. Two upper extremity peripheral intravenous catheters were placed and normal saline administered rapidly. He spontaneously moved all four extremities. Examination after removing his clothing showed no injuries other than a knife impacted in the right neck. A chest X-ray was obtained in the emergency room (Figure 1) and a urinary catheter placed. He remained awake and alert and physiologically stable. The secondary survey revealed no abnormalities. Examination of the neck showed no pulsatile mass, no subcutaneous emphysema and no hematoma surrounding the protruding knife blade. Neurologic examination revealed an alert patient, cranial nerves I-XII were intact bilaterally, and peripheral sensation, strength and deep tendon reflexes were intact throughout. The patient had no significant past medical or surgical history. He did not smoke or drink alcohol, and his family history was unremarkable. The review of systems was unremarkable. A computed tomography (CT) scan was considered at this point but it was felt that the presence of the knife would yield images of little value.

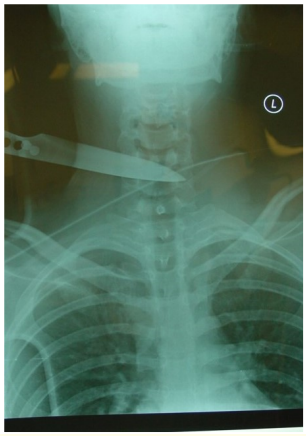

Figure 1: *Antero-posterior chest X-ray imaging on admission to the trauma bay showing a knife in situ in the right neck.*

The patient was brought to the operating room for further evaluation. A neck incision was made parallel to the sternocleidomastoid muscle. Exploration revealed that the knife entered the deep neck posterior to the sternocleidomastoid muscle. The carotid artery and jugular vein were uninjured. There was no blood or saliva at the base of the knife. The next step was to remove the knife. Despite multiple attempts to withdraw the knife manually, being careful to bring it straight out along its axis, the knife was immovable. The force applied was sufficient to raise the head and neck of the patient slightly off the operating table, but the knife would not move. Finally, in order to apply force only in the axis of the knife, a device was improvised using sterile instruments to remove the knife with the force of a hammer (Figure 2). After striking the Richardson retractor numerous times, the knife was extracted. There was no bleeding. At the end of the operation, there was no blood in the endotracheal tube and esophageal endoscopy revealed no blood or injuries. The patient remained stable throughout the operation and was admitted to a regular ward bed. On postoperative day 2, a magnetic resonance imaging (MRI) scan of the neck was obtained. This scan clearly showed that the knife passed extremely close to the spinal cord and had been lodged deep in the vertebral body, explaining why it could not be easily removed. The patient did well and was discharged with no neurologic deficits.

Figure 2: *An apparatus improvised in the operating room using sterile instruments, shown after removal of the knife, to assure application of removal force in the axis of the knife.*

Discussion

The management of penetrating injuries of the neck has been extensively described and has undergone conceptual changes in the last few years. The standard practice for penetrating neck injuries in military practice was mandatory exploration, which was adopted in civilian practice as well. In order to reduce the incidence of negative explorations, the anatomically-based zone approach to penetrating neck injuries was introduced in 1969. This rigid algorithm led to a high rate of non-therapeutic interventions, missed injuries and complications especially in patients with Zone II injuries which is the most common location of penetrating neck injuries [1]. In addition, it was pointed out that the external wound site, the basis of the zone approach, does not correlate with the location of internal injuries.

These considerations have led to a change in the approach from an anatomically based zone approach to a physiologically based approach. Following initial resuscitation based on Advanced Trauma Life Support principles, patients who are physiologically unstable are brought for immediate operative exploration and patients who are stable undergo computed tomography with angiography [1]. Patients with negative imaging studies are observed and those with positive studies undergo further therapy as indicated. The "no-zone" approach with management based on clinical signs and symptoms, has been shown to have superior outcomes compared to the traditional zone approach [1,2]. Although existing international guidelines for the management of penetrating neck injury, are still based on the zone approach, selective management has taken a more prominent role in some institutions [3].

There is a similar case reported in a web site with some interesting similarities to the present patient [4]. In the reported case, a man presented awake and alert with a knife *in situ* in the left neck. CT angiogram was obtained which showed no vascular injuries. The end of the knife had crossed the midline and was embedded in the right clavicle. Similar to the present patient, the knife could not be removed by pulling alone, and as in the present patient, when trying to remove the knife the patient's head and neck were lifted from the operating table without the knife moving. However, in that patient the knife was impacted in the clavicle and the author describes "wiggling" the knife to remove it, which was safe at the time based on preoperative imaging. This may have led to a poor outcome in the present patient because of the proximity to the spinal cord, which was not known until the postoperative MRI scan was reviewed. The device improvised for the present patient would have been useful to remove the knife from the patient in the report.

There are at least two reported cases of patients presenting with a knife *in situ* in the neck which could not be removed easily by manual force. The present report highlights the management of a patient presenting with a knife *in situ* in the neck. In the presented patient, it was considered that the knife must be removed by force applied only in the axis of the knife to avoid injury to deep structures. This was accomplished by improvising a device to apply the force of a hammer in the axis of the knife using sterile instruments easily available in the operating room. Improvisation remains an important part of surgical practice.

Conclusion

Patients who are stabbed rarely present with the knife in place. The first priority in the care of a patient with a stab wound to the neck is airway control, breathing and circulation as stated in ATLS guidelines. Imaging studies may not be helpful depending on the location of the stab wound. In some cases, an CT angiogram may be useful. Once these are stabilized, the patient should be brought to the operating room to remove the knife. The knife should be removed straight out, rather than "wiggling it". In some situations an improvised device may help remove the knife.

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