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Impalement Injury to the Thoracic Spine and Lung (A Case Report)

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Abstract

Background: Impalement injury to the thoracic spine and lung is very rare. We report a case of an older child with impalement injury to the thoracic spine and penetration into the right lung that was successfully managed in our hospital. **Case Report**: We present a case of a 15-year-old boy who was stabbed with a bread knife at the back during a family dispute at the level of T5 vertebra. The blade was lodged in the spine as the handle broke off completely. X-ray and CT scan results showed the tip of the knife was lodged in the right lung. Successful removal of the impaled object was achieved via a posterior spinal approach, and a chest tube was passed in the right pleural cavity. The patient had neither neurological deficit nor pleural effusion in the post-operative period. **Conclusion**: Impalement injury to the posterior spine and lungs is rare and presents a management challenge. Proper patient evaluation is important for planning and teamwork with other specialists is crucial for a successful outcome.

Keywords

Impalement Injury, Knife, Thoracic Spine, Lung

1. Introduction

Impalement is an injury from low-velocity penetration with elongated objects into the body which can lead to severe injuries and result in complications such as infection and haemorrhage that can potentially be fatal [1]. Penetrating injuries in the thoracic spine are very rare [2]. When the lung is also impaled, it can be potentially life-threatening. Stabilization of the patient is very important and appropriate radiological investigations must be obtained for proper planning of the treatment [3]. The removal of the impaled object should be in an operating room

theatre. A multi-specialist team approach to manage possible complications like haemothorax, pneumothorax and severe haemorrhage is essential while avoiding any damage to neurovascular structures [3]. We present a case of a 15-year-old male patient who underwent surgical removal of an impaled knife in the body of the T5 vertebra and the right lung.

2. Case Report

Our patient is a 15-year-old boy who presented in our accident and emergency unit with a history of penetrative injury to the mid-back. He was stabbed in the back with a bread knife by his elder sister who is two years older, during a fight. The handle of the knife broke off leaving the blade in-situ in the midback. Physical examination showed the blade at the level of T5 vertebra. The recorded vital signs (Blood pressure, pulse, temperature and SpO_2 were within normal range, and the patient did not show any signs of neurological or vascular deficit). Pre-operative hemoglobin level was 13 g/dl. Chest radiographs (AP and lateral views) showed an inferomedially located object entering the posterior left hemithorax at the level of the 6th posterior rib. It penetrated the T5 vertebral body. This is illustrated Figure 1 (X-ray, AP view) and Figure 2 (X-ray, Lateral view).

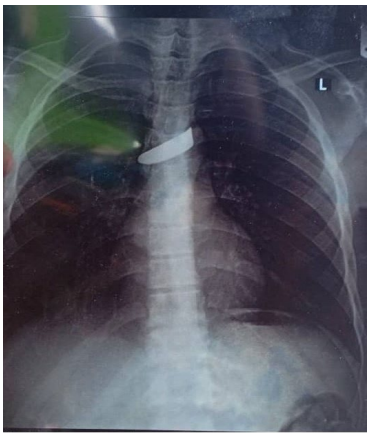

Figure 1. X-ray AP view showing the knife blade penetrating the body of T5.

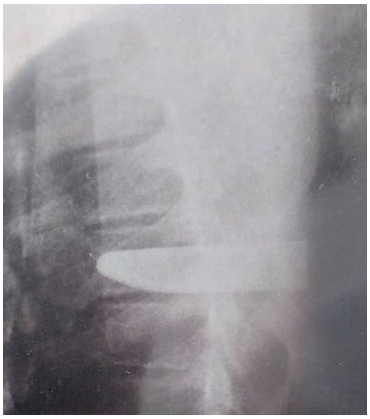

Figure 2. X-ray Lateral zoomed view showing the knife blade penetrating the body of T5.

The CT scan axial cut showed that the tip of the knife was lodged in the adjacent right lung parenchyma with air pockets around the tip. This is as shown in Figure 3.

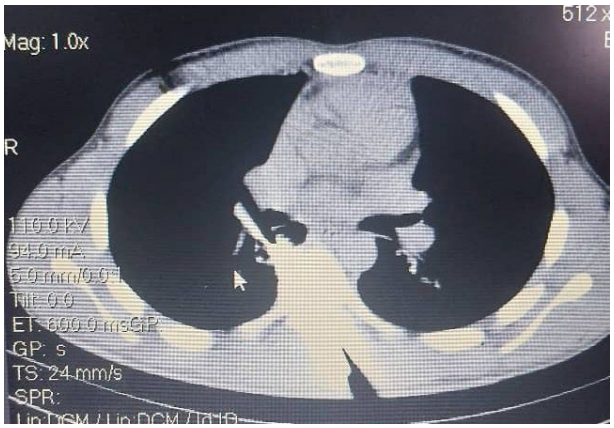

Figure 3. CT scan axial cut showing tip of the knife penetrating the body of T5 vertebra obliquely entering the right lung parenchyma.

It was agreed that the patient would have extraction of the metallic blade, and a chest tube would be passed in the right pleural cavity and patient would be monitored closely in the immediate post-operative period. The surgery was done under general anaesthesia with patient in prone position. IV Ceftriaxone (1 g) and IV Metronidazole (500 mg) were commenced an hour prior to the surgery. Posterior approach to the thoracic spine was done, and the end of the blade was visualized as shown in Figure 4.

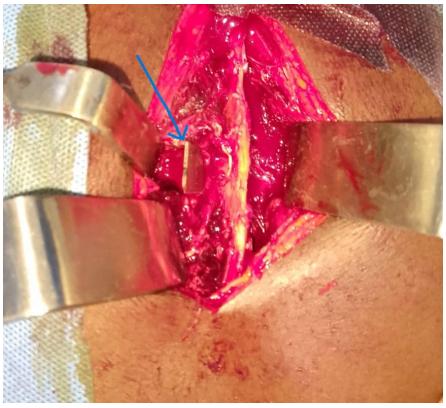

Figure 4. Posterior approach to the spine showing the knife end (blue arrow).

The knife was extracted, with minimal bleeding. The wound was thoroughly irrigated with normal saline. No haemorrhage or leakage of CSF was observed. The duration of the surgery was about one hour. The extracted knife blade is shown in Figure 5. The antibiotic protocol was continued at the recommended dosages for 5 days because of possible wound contamination from the impaled knife. Chest physiotherapy started on full recovery from anaesthesia.

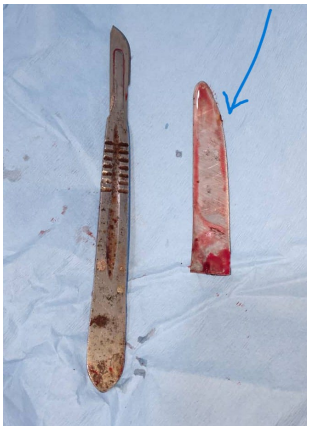

Figure 5. The extracted knife blade (arrow) compared to the size of a surgical knife.

A chest tube was passed after wound closure of the surgical site, and the patient was stable in the immediate post-operative period. Broad-spectrum antibiotics were continued for two weeks post-operatively. He had no neurological or vascular deficits. A chest X-ray was done after 24 hours and there was no evidence of fluid in the pleural cavity, as shown in **Figure 6**.

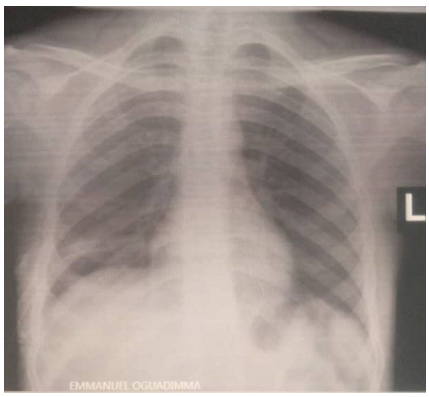

Figure 6. Immediate post operative X-ray with chest tube in-situ and no evidence of fluid the pleural cavity.

The chest tube was removed after 72 hours, and he mobilized fully thereafter. The effluent was less than 50 ml and patient was discharged home in good condition for subsequent outpatient follow-up. He was last seen after 6 weeks in the outpatient clinic in optimal health condition.

3. Discussion

There are a few reported cases of impalement injury in the spine and thoracic cavity that recover without any sequelae [4]. Our case is one of those. It should be noted that in cases such as ours, the in-situ foreign body should not be removed at the scene of the injury because of the possibility of worsening the injury and the potential to remove their tamponading effect on major blood vessels which can result in fatal haemorrhage [5]. The right-sided impalements are common than

left and also less fatal due to reduced risk of penetrating injury to the heart and major blood vessels like the aorta [6]. The impaled knife did not penetrate the spinal canal, nor the neural foraminae hence there was no neurological injury. There are very few reported cases of an in-situ knife blade in the thoracic spine, Sadrzadeh et al reported a similar case of home violence of stab injury in the back with a bread knife at the T4/T5 level without any neurological deficit after extraction of the impaled object [7]. In managing patients with impalement injuries in the thoracic spine, after resuscitation and thorough physical and neurological assessment, radiological assessments like X-ray and multi-planar CT-scan are essential to define the trajectory of the knife which could be perpendicular to the vertebral body or as in our case oblique and avoiding the spinal canal. The density of the vertebral body likely limited the energy of the sharp knife preventing it from damaging other vital organs beyond it. [8] In order to get an optimal outcome, removal of all impaled knives should be done under direct vision in the operating room which must be fully prepared to handle possible complications like bleeding from major vessels which could be fatal and injury to other surrounding body organs must be ruled out. [9] After removal of the knife blade, there must be proper wound debridement as well as thorough lavage with normal saline and broad-spectrum antibiotics must be administered as the risk of post operative wound infection from the contaminated impaled object is high [10]. Thoracostomy was done in our case for drainage of possible fluid collection in the pleural cavity to allow m lung expansion. The tube was removed after 72 hours with patient in stable condition.

4. Conclusion

Impalement injuries in the thoracic spine must be thoroughly evaluated clinically and radiologically. Removal should be done in an operating room. Penetration into the lung parenchyma requires chest tube thoracotomy for proper lung expansion. Broad-spectrum antibiotic prophylaxis is important to prevent post operative wound infection.

Acknowledgements

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Conflicts of Interest

The authors declare no conflicts of interest.

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