

Video-assisted Thoracoscopic Surgery for Harpoon Impalement into the Thoracic Cavity in a Child: A Case Report

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ABSTRACT

Introduction: Penetrating chest wall injuries are rare in the pediatric population in Malaysia. Management options vary according to available local expertise and equipment. We would like to share our experience in managing a child with a penetrating chest wall injury with thoracoscopy video-assisted thoracoscopic surgery (VATS).

Case description: An 8-year-old boy sustained a penetrating chest wall injury while playing with a fishing harpoon at home. He was stabilized at the regional district hospital with a chest drain and transferred to our center immediately. After clinical assessment, a decision was made for a contrast-enhanced computed tomography (CECT) thorax followed by VATS. The procedure was uneventful, and the harpoon was safely removed. The child was monitored in the ICU and recovered well.

Discussion: Penetrating chest wall injuries are rare in Malaysia. Management options include open thoracotomy and VATS, depending on the available expertise and equipment.

Conclusion: Video-assisted thoracoscopic surgery is a viable option in managing penetrating thoracic injuries in children.

Keywords: Case report, Hospital Tengku Ampuan Afzan, Pediatric, Penetrating thoracic trauma, Video-assisted thoracoscopic surgery.

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KEY FINDINGS

For penetrating chest trauma in children, direct removal under visual guidance with video-assisted thoracoscopic surgery (VATS) is an option after careful clinical and computed tomography (CT) evaluation.

Importance of a multi-disciplinary approach in managing rare surgical emergencies, especially in children.

What is new: Removal of penetrating foreign body with VATS is safe in a child in the absence of heart and/or major vascular injury. Video-assisted thoracoscopic surgery in children does not require single lung ventilation.

INTRODUCTION

Penetrating chest wall injuries are rare in the pediatric population here in Malaysia. Management options vary according to available local expertise and equipment. We would like to share our experience in managing a child with a penetrating chest wall injury with minimal access surgery via VATS.

Case Description

Abbreviated patient's name for confidentiality (AA) is an 8-year-old indigenous boy from the rural region (Muadzam, 100 km away) with no known co-morbid. He sustained a penetrating chest wall injury while playing with a fishing harpoon at home. Mother claimed that he tripped and fell forward while holding onto the harpoon at home.

He was alert and orientated. Minimal bleeding from the entry wound; there was no exit wound. He was immediately rushed to the nearest district hospital. On arrival, he was stable in the room, and his vitals were within the normal parameters according to

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his age. Slightly reduced breath sounds on the left side. There is a metal harpoon impaled into his anterior chest wall at the level of the 2nd intercostal space, just slightly left to the sternal edge (Fig. 1). There was no exit wound. Crepitus was felt along the left lateral chest wall.

Chest radiograph revealed a pneumothorax with the impaled object traversing laterally, and the tip is located within the soft tissue of the left chest wall (Fig. 2).

After discussion with the pediatric surgeon, a decision was made to insert a 28Fr chest drain and transfer to the tertiary hospital. Left chest drain insertion was uneventful, and the child was stable for transfer.

Upon arrival at our Emergency Department, the child was stable under nasal cannula oxygen. He complained of pain at the harpoon

entry site but had no difficulty in breathing. He remains well orientated and able to recall the event. Vitals and hemodynamics were within the normal parameters. Clinical findings revealed slightly reduced air entry on the left thorax. Diffused crepitus along the left anterior chest wall and axilla extending down to the left abdominal wall. There was a metal harpoon traversing the anterior chest wall into the left thorax below the clavicle at the 2nd intercostal space lateral to the sternum. There was no exit wound and no active bleeding at the time. Blood investigations were unremarkable, with an arterial blood gas (ABG) showing good oxygenation and normal pCO₂.



Figs 1A and B: Harpoon impalement into the left anterior chest wall

With his stable condition, a decision was made for a contrast-enhanced computed tomography (CECT) thorax (Fig. 3). Findings revealed a metal object penetrating through the left anterior chest wall via the 2nd intercostal space and exiting the 4th intercostal space with the tip within the subcutaneous tissue. The harpoon pierced the left pectoralis major with hemo-pneumothorax. Heart, pericardium, left subclavian, and major vessels are preserved. We requested help from the local Fire Dept to cut the harpoon to a shorter length to facilitate the surgery. The local Fire Dept was able to successfully cut the harpoon with a residual length of 15 cm externally.

A decision was made for VATS and foreign body removal, KIV left thoracotomy. After preoperative preparation, the child was brought immediately to the operating theater (Fig. 4).

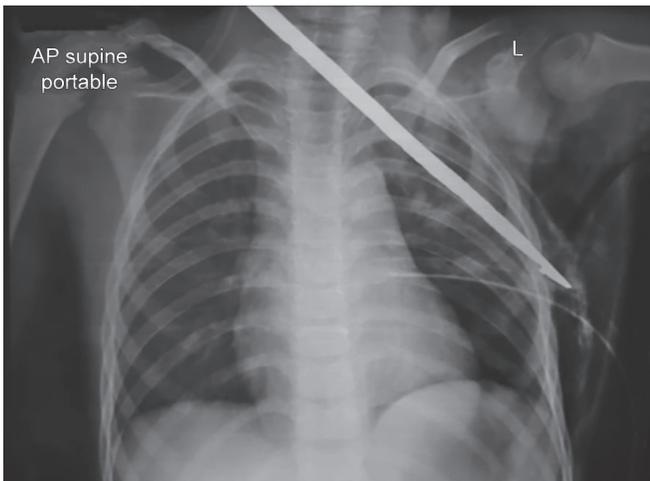
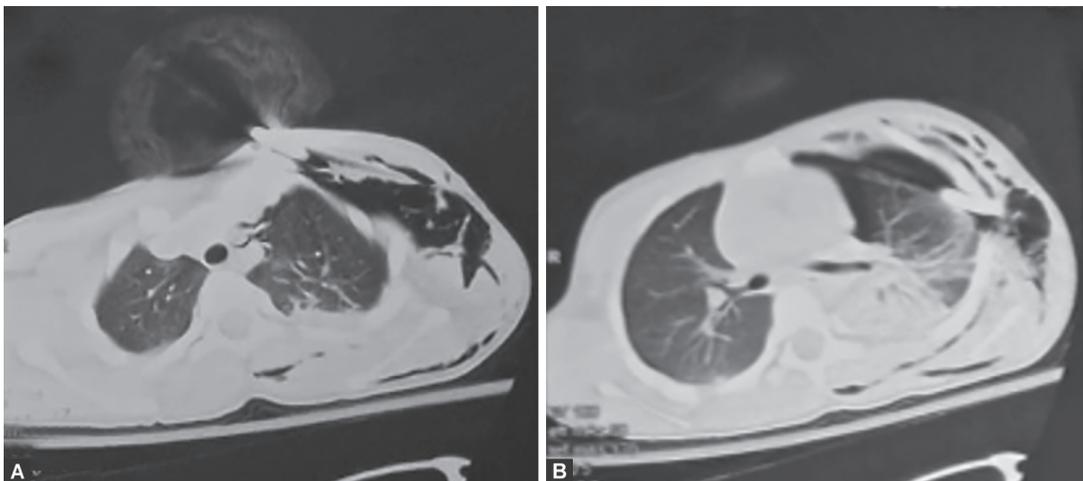


Fig. 2: Anterior posterior (AP) chest radiograph after left chest drain insertion, revealing the impaled harpoon and pneumothorax

He was put under GA with a standard cuffed PVC endotracheal tube. The patient was put into right lateral decubitus. The existing chest drain was removed, and a 5 mm camera port was inserted. Thoracoscopy (5 mm 30 degree) revealed the harpoon traversing through the pleura and exiting immediately (Fig. 5). The antero-lateral surface of the L upper lobe appeared contused and hematoma on the surface, suggesting parenchymal injury. There was no injury to the great vessels.

An additional 5 mm camera port was inserted at the level of the 6th intercostal space along the midaxillary line, and a port-less incision was made at the 4th intercostal space to facilitate a 3 mm instrument, i.e., Maryland. The additional port inferiorly helped provide a vantage view of the harpoon.

An incision was made to facilitate an exit wound, and the harpoon was gently removed under direct vision (Fig. 6). There was no bleeding seen, suggesting a vascular injury. Both entry and exit wounds were irrigated with copious amounts of warm saline.



Figs 3A and B: Axial CT cuts revealing the entry and exit point



Fig. 4: After general anesthesia (GA), positioned into the right decubitus with a harpoon (cut)



Fig. 6: Harpoon

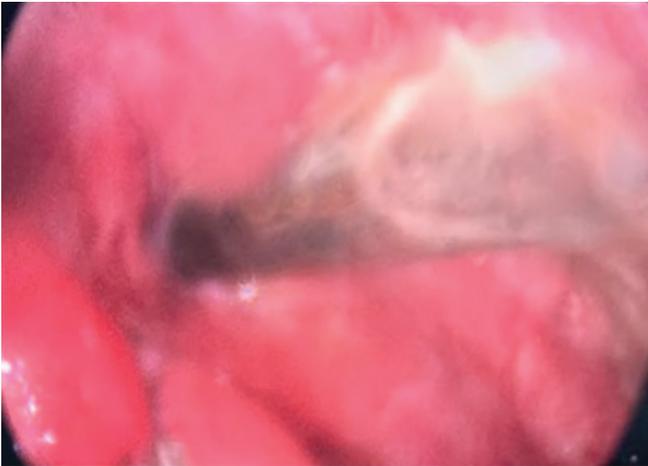


Fig. 5: Thoracoscopic view of the harpoon

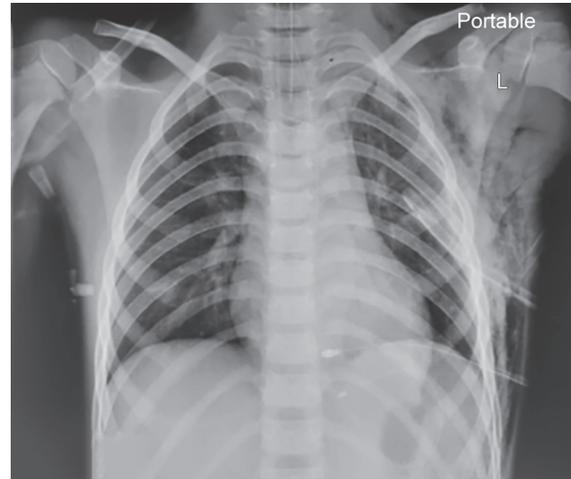


Fig. 7: Postoperative chest radiograph

Hemostasis was secured, and reassessment of the anterior surface of the lung parenchyma was unremarkable. Two new chest drains were inserted, sizes 20 and 12, at the port sites.

Postoperatively, the child was managed in the ICU. He was ventilated at low conventional settings for 2 days and was successfully extubated to room air and subsequently transferred to the general pediatric surgical ward on day 3. Nasogastric tube (NG) tube feeding was initiated on postoperative day 1 onward, and oral feedings commenced after extubation. Initial chest radiograph (Fig. 7) showed resolved pneumothorax with residual emphysema.

He was then transferred back to our general pediatric surgical ward for an additional 5 days. The child's general condition improved, and the emphysema subsided. The chest drains were removed on days 5 and 8 postoperatively. The child was sent home on day 9 postoperatively. He was well under room air and had no features of surgical site infection (SSI), especially at both entry and exit wounds.

DISCUSSION

Thoracic trauma accounts for up to 10% of all trauma admissions in most series, and this number is even smaller in the pediatric

population.^{1,2} The incidence of penetrating thoracic injury in children is relatively low here in Pahang.

Initial management with resuscitation and chest drain (tube thoracostomy) insertion is vital based on the clinical findings and trauma guidelines. Some surgeons may opt to proceed with surgical intervention immediately; however, in our case, we decided on a CECT thorax for a thorough assessment of the injury as the child was hemodynamically stable.¹⁻³

Most surgeons prefer doing an open thoracotomy as the standard of managing a penetrating thoracic injury, quoting better access, exposure of the cavity, and overall safety.⁴ However, this includes a larger incision, higher postoperative analgesic requirement, prolonged recovery, and hospital stay with significant morbidity. Thoracotomy is recommended in hemodynamically unstable patients.⁵

The advent of minimally invasive surgery has certainly contributed to the change of practice among the current generation of surgeons. This has had a direct effect, leading to the development and improvement of thoracoscopy. In recent times, VATS has become a popular alternative to most thoracic diseases. This technique may be applied in thoracic trauma, especially in stable patients in the absence of great vessels and cardiac injuries.

The use of VATS for diagnostic assessment and removal of hemothorax, foreign bodies, or impaled sharp objects has been described in several case reports. In the absence of major vessel injury, removal of the object under direct vision can be safely done.⁶

Ben-Nun et al. advised on three major criteria when managing thoracic injuries with VATS, which are as follows:⁷

- Hemodynamically stable patients.
- Preoperative Imaging with the absence of indications for open surgery.
- Accurate medical history ascertaining absolute contraindications to VATS.

CONCLUSION

Penetrating chest wall injuries are rare in the pediatric population, and they are associated with considerable morbidity or mortality. Communication between the emergency physicians, pediatricians, and anesthesiologists is equally important in the preoperative surgical planning. A CECT thorax is a necessity in dealing with penetrating thoracic injuries to formulate plans and avoid intraoperative delays.

Video-assisted thoracoscopic surgery for penetrating thoracic injuries in children is a viable option to the traditional open thoracotomy, with a good outcome heavily dependent on the clinical findings, imaging, and preoperative planning. Postoperative morbidities are decreased, shorter hospitalization, and greater patient satisfaction with minimal access surgery.

One of the key factors leading to a good outcome was the successful teamwork coordination from the point of referral, beginning from the regional hospital.

Ethics

The authors would like to thank the Director General of Health Malaysia for the permission to publish this paper.

This study has been registered with the National Medical Research Register (NMRR) with the ID number NMRR ID-25-02009-WNS.

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