Removal of an impaled knife under thoracoscopic guidance

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Thoracoscopy is being increasingly utilized in stable patients to manage both blunt and penetrating injuries. The case of a patient who presented with a knife impaled in the chest is reported. The knife was able to be removed under thoracoscopic guidance, avoiding thoracotomy.

Key Words: *Impalement; Pleuroscopy; Thoracoscopy*

Thoracoscopy has been used acutely and in the subacute setting to both diagnose and manage thoracic injuries and their complications (1). The primary advantage is that by avoiding thoracotomy, postprocedure pain and resulting morbidity may be prevented (2,3). Traditionally, objects impaled in the chest are stabilized until they can be pulled in the operating room under direct visualization. We present a case that illustrates the principles of airway management, patient positioning and the potential role of thoracoscopy.

CASE PRESENTATION

A 37-year-old woman presented 20 min after being stabbed in the left posterior chest with a long-bladed knife. The entrance was at the level of the fifth intercostal space in the posterior midclavicular line. The knife was still in situ and had been stabilized by the paramedics who had been called to the scene. She was transported with her left side down. On arrival, she had stable vital signs and no gross respiratory distress, and she was taken immediately to the shock/trauma operating suite, where chest radiographs were performed (Figure 1). There was minimal bleeding and air leak from the wound, although the patient had a small amount of subcutaneous emphysema. The decision was made immediately to remove the knife under thoracoscopic guidance, while being prepared to perform thoracotomy. Because of the absence of any respiratory distress, a chest tube was not placed; it was believed that this would delay intubation, add pain, complicate repositioning, and not add to the proposed immediate thoracoscopic evacuation of any hemo- and/or pneumothorax. The patient was intubated with a single-lumen endotracheal tube while still lying on her left side, and was turned sequentially onto her stomach and then onto her right side. The patient was ready for operation within 15 min of arrival. Thoracoscopy was performed using two ports and a 10 mm, 30° camera, assisted by placement of a left-sided bronchial

Retrait d'un couteau sous thoroscopie

La thoroscopie est de plus en plus utilisée chez les patients stables, tant pour les traumatismes fermés que pour les traumatismes ouverts. On décrit ici le cas d'une patiente qui a été poignardée et qui a été amenée alors que le couteau se trouvait toujours dans la plaie. Le couteau a pu être retiré sous thoroscopie, ce qui a permis d'éviter la thoracotomie.

Figure 1) **A** Cross-table chest radiograph with the patient lying on her left side. The position of the knife suggested that the subclavian artery or proximal descending thoracic aorta might have been at risk. **B** Lateral chest radiograph, taken from above, with the patient lying on her left side. The path of the knife was cephalad and anterior, which implied that, assuming this was the path taken during the initial assault, the proximal descending aorta was uninjured. However, there still remained the possibility that a subclavian artery or vein may have been injured

blocker. The visualization was made somewhat difficult by the lung not totally deflating, but it was clear that no major vascular structures had been injured and the pericardium was clear. The video thoracoscopy was replaced by a mediastinoscope, and pleuroscopy was completed. The tip of the knife was in the superior segment of the left lower lobe, there was no bleeding from the aorta or chest wall, and the esophagus and pericardium had not been violated. The knife was removed under visualization, and the lung expanded well, with minimal air leak, which was controlled with biological glue. A residual hemothorax of 400 mL to 500 mL was evacuated. The patient's chest tube was removed on postoperative day 2, and she was discharged the following day.

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DISCUSSION

Thoracoscopy is being increasingly utilized for advanced thoracic procedures, including lung resection, with some centres reporting dramatic reductions in morbidity and lengths of hospital stay compared with formal thoracotomy (4). Thoracoscopy has been utilized in the trauma setting both diagnostically and therapeutically (1-3,5,6). It has been argued that thoracoscopy is associated with reduced morbidity and, in selected patients, with a reduction in nontherapeutic thoracotomy (2,3). Thoracoscopy for removal of intrathoracic foreign bodies has been relatively well documented (7-9). However, there are few reports of thoracoscopy being used as an adjunct for managing thoracic impalement injuries when the object is still in situ (10).

Video thoracoscopy offers the advantage of a panoramic view, as well as the ability to repair or treat lung and diaphragmatic injuries. Both the 0° and 30° cameras are useful, with the latter permitting easier visualization of the posteromedial mediastinal structures. Pleuroscopy with a mediastinoscope ('rigid' thoracoscopy) permits drainage of hemothorax and pleural exploration without the need for lung isolation (11). At times, such as in the present case, they can be complementary. Some centres argue that if thoracoscopy can be performed with minimal delay, there is no need for tube thoracostomy, which may simply further delay intervention, as well as increase associated pain and morbidity (1). There are, however, a number of critical requirements: the first is that the patient be stable (12), and the second is that there be minimal delay to operation. If there is any doubt as to respiratory or hemodynamic stability, tube thoracostomy must immediately be performed.

The standard, accepted approach to managing a patient with an impalement injury – in whom the foreign object remains in situ – is to stabilize the object until it can be removed under circumstances in which any vascular injury can be controlled. It is believed that the object may tamponade any bleeding. This also makes following the tract of the injury easier to discern. Whether this applies to knives has not been proven, but this has still become the standard of care. Practically, spreading the ribs often results in the impaled object being dislodged or put under tension. When a patient presents with an impaled object in the posterior chest near the midline, structures at risk (other than the lung) on the right side include the diaphragm, liver and heart; on the left, they include the diaphragm, spleen, viscera, heart, aorta and/or esophagus, among others. Airway management can be difficult. Options include intubation with the patient lying on his or her side (as in the present case) or supine between two stretchers. Once

intubated, lung isolation can be achieved using an endobronchial blocker system that does not require reintubation.

Thoracoscopy appears to be a useful alternative to thoracotomy in the removal of impaled foreign objects (9,10). It avoids thoracotomy, and the knife (in this case) is not disturbed by the rib retraction required to perform thoracotomy.

CONCLUSIONS

In patients who present with impalement injuries and who are stable, thoracoscopy allows removal under direct visualization in a rapid and safe manner. This avoids added morbidity and hastens recovery. Key requirements include patient stability, rapid access to the operating suite, the ability to intubate in an awkward position, and experience with both video thoracoscopic and rigid pleuroscopic techniques.

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