

Removal of cardiothoracic war-related shrapnel using video-assisted thoracoscopic surgery

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ABSTRACT

This is the first report in the literature to describe removing war-related cardiothoracic shrapnel using video-assisted thoracoscopic surgery (VATS). War blast caused penetrating thoracic and extremity injuries in 30-year-old man. He was referred to our hospital after stabilization. Magnetic resonance imaging was required to evaluate brachial plexus injury. Large, penetrating shrapnel fragment in the right posterior chest wall, retained shrapnel in apex of the right lung, and another fragment in the pericardium were removed using VATS in staged approach. Postoperative period was uneventful. VATS is useful in managing complex, war-related cardiothoracic injuries.

Keywords: Blast; shrapnel; video assisted thoracoscopy; war.

INTRODUCTION

Video-assisted thoracoscopic surgery (VATS) is commonly used to evaluate the diaphragm in penetrating injuries, remove retained hemothorax, evacuate empyema, and treat persistent pneumothorax in trauma patients.^[1,2] It has also been used to remove bullets and other foreign bodies from the pleural cavities^[1-3] and the pericardium.^[4] Presently described is the first case in the literature in which VATS was used to treat war-related shrapnel injuries to the chest wall, pericardium, lung, and pleural space in a single patient.

CASE REPORT

A 30-year-old man was injured in a war-related blast. Inter-costal chest tube was inserted for right hemopneumothorax. The patient was transferred to our hospital 8 days after the injury for further management. On arrival, he had complete loss of right upper limb function.

Computed tomography (CT) revealed laceration of upper lobe of the right lung combined with loculated right pleural space. There were multiple shrapnel fragments in the right upper chest wall and left side of the mediastinum. Lower lobe of the left lung was collapsed. Right second through fifth ribs were shattered. Largest fragment was embedded within the soft tissue of the right scapula and appeared to have traversed the chest, smashing the ribs, and lacerating the right upper lobe (Fig. 1a).

Left mediastinal foreign body was not initially a concern. Electrocardiogram was normal. Management of the right-sided lung laceration and hemopneumothorax, and collapsed left lower lobe were priority. Large chest wall fragment was causing a lot of pain and was an infection risk. Large blood-stained mucous plug was removed from the left lower lobe with rigid bronchoscopy. Right-sided VATS with anterior 3-port approach using 30°, 10-mm scope (Endocameleon Hopkins telescope; Karl Storz GmbH & Co. KG, Tuttlingen, Germany) was performed. The pleural space was thoroughly cleaned. The right upper lobe was lacerated in posterior segment and bleeding continuously. This was controlled with wedge resection using Echelon endostapler (Ethicon, Inc., Somerville, NJ, USA). Extensive chest wall hematoma was observed. Fluoroscopy screening revealed large fragment in the posterior chest wall, which was removed using VATS in order to avoid another incision (Fig. 1b). A 28-F chest tube was inserted through I port and remaining ports were closed in layers.

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Postoperatively, shoulder pain of the patient resolved, and chest wounds completely healed. Drain was removed while the left lower lobe remained inflated. Histopathology of resected posterior segment demonstrated intra alveolar hemorrhage and hyperplasia of Type II pneumocytes with clear cytoplasm, typical of blast injury (Fig. 1c).

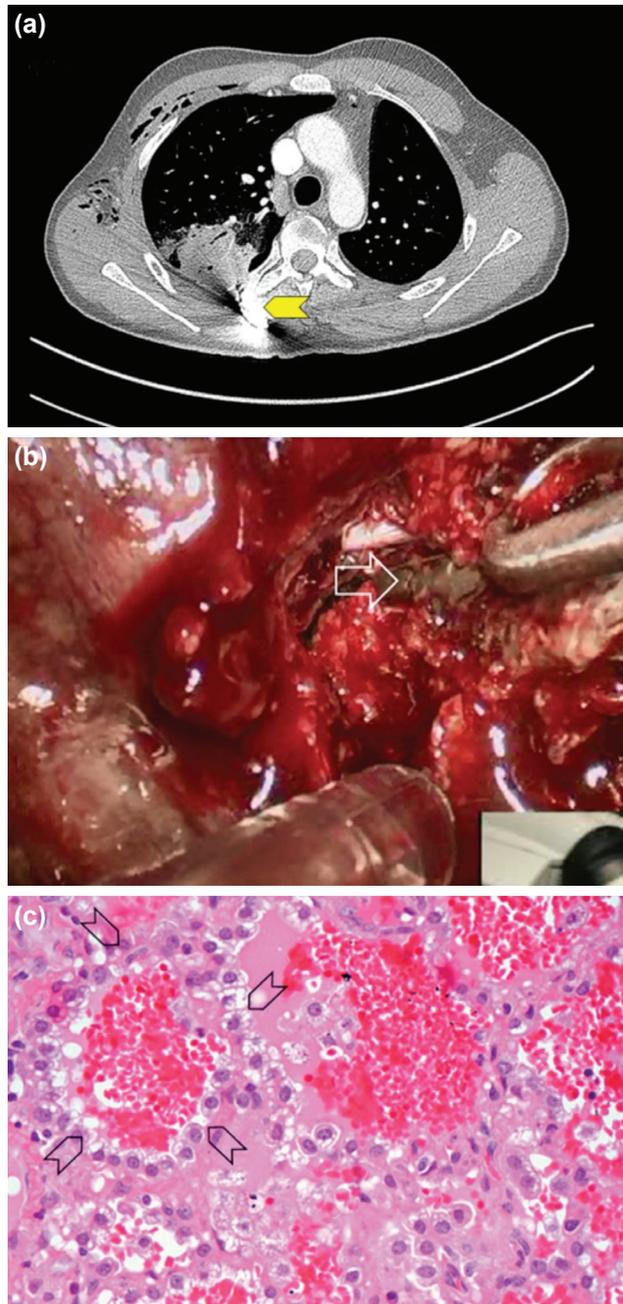


Figure 1. (a) Chest computed tomography with intravenous contrast reveals foreign body in the right chest (closed arrow head), associated rib fractures, and contusion of the right lung. This shrapnel fragment was removed through the pleura. (b) Metallic foreign body (arrow) is removed with forceps using video-assisted thoracoscopy. (c) Histopathology of the resected posterior segment of the right upper lobe illustrating intra alveolar hemorrhage and hyperplasia of Type II pneumocytes with clear cytoplasm (open arrow heads) (hematoxylin-eosin, x40).

Electromyography suggested brachial plexus injury. Therefore, magnetic resonance imaging (MRI) was recommended. Accordingly, it was necessary to remove left-sided shrapnel. On repeat chest X-ray, fragment appeared to have moved. Transthoracic echocardiogram showed moving reverberation artifact posterior to the left of the aorta (Fig. 2a), indicating

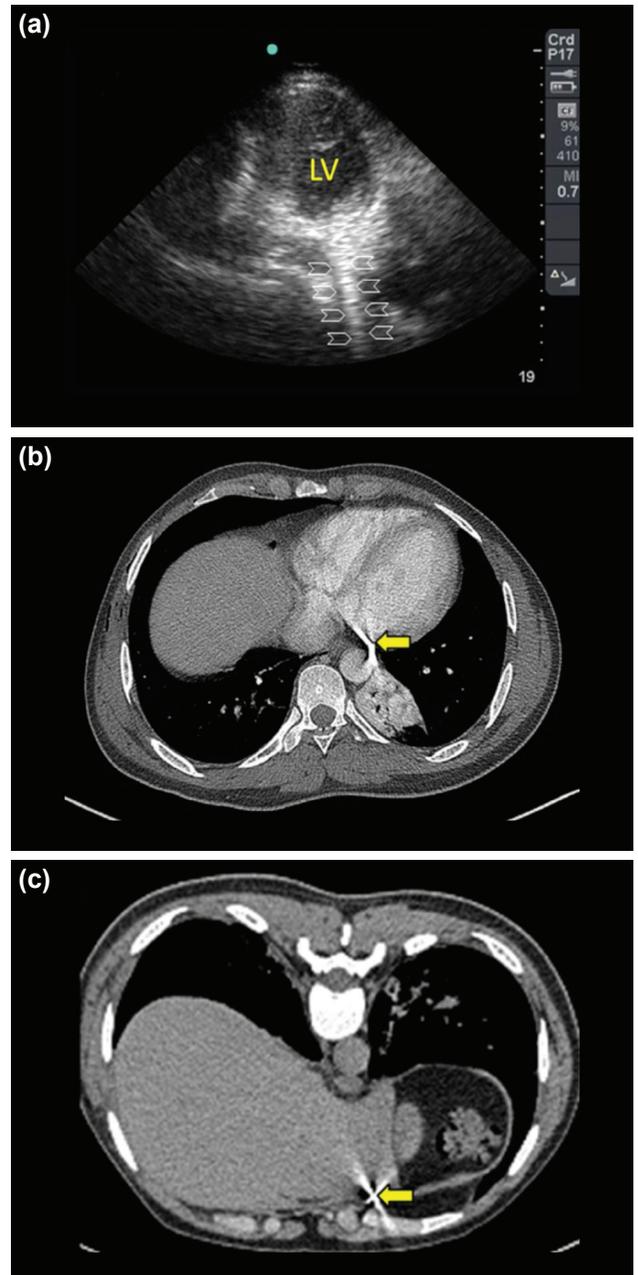


Figure 2. (a) Transthoracic point-of-care ultrasound image taken using portable machine and convex array probe with frequency of 3-5 MHz illustrates 4-chamber apical view of the heart while the patient was in supine position. Consistent moving reverberation artifact posterior to left of the aorta (arrow heads) indicates presence of foreign body. It was difficult to define whether foreign body was in the pericardium or in the cardiac wall. (b) Computed tomography scan of the chest with intravenous contrast showed shrapnel to be in exactly the same position in supine position (arrow). (c) Foreign body moved anteriorly when the patient was put in prone position (arrow).

presence of foreign body, which was confirmed by chest CT scan (Fig. 2b). CT scan was repeated in prone position and confirmed that foreign body was freely mobile in the pericardium (Fig. 2c).

Left-sided VATS in supine position was performed with aid of fluoroscopy screening. Supine position was chosen to control movement of mobile fragment within operative field. Zero degree, 10-mm, 3-dimensional VATS scope was used. The foreign body was easily found and removed through 1 cm pericardial incision anterior to inferior pulmonary vein. This small pericardial incision did not require closure. Chest drain was not required. The patient completely recovered without complications.

DISCUSSION

Majority of war-related shrapnel injuries can be treated conservatively or with chest tube insertion.^[5] Metallic foreign bodies inside the chest are usually not removed unless they are large, sharp, or present risk of further injury or embolization. They usually become encased in fibrous tissue and become harmless.^[1,2,5] In this patient, there was a large foreign body causing pain and another that was mobile in the pericardial sac. There was risk of cardiac injury if MRI was performed.

Villavicencio et al.^[6] reviewed more than 500 patients and found that thoracoscopy prevented need for thoracotomy or laparotomy in 62% of trauma patients. They also reported procedure had complication rate of only 2% and missed injury rate of 0.8%. Similarly, VATS reduces postoperative pain and hospitalization and allows earlier return to work compared with thoracotomy.^[1,2]

Type of lung injury encountered in this case and procedure used to remove chest foreign body is very similar to those reported by Stafman et al.,^[3] although they removed fragment

of beaker glass following laboratory explosion. First VATS operation in our patient facilitated removing foreign body, assessing lung injury, cleaning the pleura properly, and ensuring good drain placement and lung expansion.

Correct preoperative anatomical localization of left-side shrapnel and recognizing that it was mobile within the pericardium was essential for success. Positioning the patient properly reduced chance of shrapnel moving into the pericardial sinuses, which would have made extraction of the fragment more difficult. Intraoperative imaging was useful in localizing the shrapnel and minimizing pericardial incision.^[2,4] Small, 1-cm incision in the pericardium reduced risk of cardiac herniation. There was no need to close this incision of the pericardium or to insert chest tube in second VATS procedure.

The patient gave written consent to report this case.

Conflict of interest: None declared.

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OLGU SUNUMU - ÖZET

Savaş yaralanmalarından kalan kardiyotorasik şarapnelerin çıkartılması video yardımcı torakoskopik cerrahi yoluyla

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Bu yazıda, video yardımcı torakoskopik cerrahi (VYTC) yoluyla savaş yaralanmalarında, kalan kardiyotorasik şarapnelerin çıkartılmasına dair literatürdeki ilk olgu raporlandı. Penetran torasik ve ekstremitte yaralanmalarına neden olan patlama sonucu yaralanmış 30 yaşında bir erkek, stabilize olduktan sonra hastanemize sevk edildi. Brakiyal pleksus yaralanmasını değerlendirmek için bir manyetik rezonans görüntülemeye gerek vardı. Aşamalı bir yaklaşımla VYTC kullanarak sağ göğüs arka duvarında geniş penetran bir şarapnel, sağ akciğer apeksinde takılı kalmış bir şarapnel ve perikart içindeki başka bir şarapnel çıkartıldı. Ameliyat sonrası dönem olaysız geçti. Kompleks kardiyotorasik savaş yaralanmalarıyla baş etmek için VYTC yararlıdır.

Anahtar sözcükler: Patlama; savaş, şarapnel; video yardımcı torakoskopi; VYTC.

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