

SHORT REPORTS AND NOTES FROM PRACTICE

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A rare case of minimally invasive removal of a vertebral foreign body after a gunshot fragment penetrating wound of the chest and spine

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Objective. To demonstrate the possibilities of minimally invasive technologies in the diagnosis and treatment of gunshot wounds of the chest and spine. *Methods.* Patient N., 42, was wounded in the chest during mortar fire. From the diagnosis: gunshot fragment blind penetrating wound chest on the right with a gunshot fracture of the right scapula, III–V ribs on the right, damage to the right lung with the presence of a metal fragment paravertebrally on the right at the level Th_V–Th_{VI} vertebrae, right-sided hemopneumothorax, right-sided post-traumatic pulmonary, spinal cord injury, lower paraplegia. *Results.* The final established diagnosis: gunshot fragment blind penetrating wound chest on the right with a gunshot fracture of the right scapula, III–V ribs on the right, damage to the right lung with the presence of a metal fragment paravertebrally on the right at the level Th_V vertebra, right-sided hemopneumothorax, right-sided post-traumatic pneumonia, spinal cord injury, lower paraplegia. The operation was performed: video-assisted thoracoscopy on the right, revision of the pleural cavity, removal of a metal fragment from the body of the Th_V vertebra, sanitation and re-draining of the right pleural cavity according to Bulau, which lasted 40 min. In the future, after 2 weeks, the stitches and signs were removed neurological deficit regressed, the wounded was sent to the military medical commission and discharged to parts. *Conclusions.* Gunshot wounds to the chest with spinal injury are rare. The use of modern magnetic surgical instrument allows to remove ferromagnetic foreign bodies during vertebral injury. The use of minimally invasive operative interventions for gunshot wounds of the chest with spinal cord injury reduces operative trauma and can be applied to the third level of medical care.

Мета. Показати можливості мініінвазивних технологій під час діагностики та лікування вогнепальних поранень грудей і хребта. *Методи.* Пацієнт Н., 42 р., отримав поранення у груди під час мінометного обстрілу. Із діагноза: вогнепальне осколкове сліпе проникаюче поранення грудей справа з вогнепальним переломом правої лопатки, III–V ребер справа, ушкодженням правої легені з наявністю металевго осколка паравертебрально справа на рівні Th_V–Th_{VI} хребця, правобічний гемопневмоторакс, правобічний післятравматичний пульмоніт, забій спинного мозку, нижня параплегія. *Результати.* Встановлено заключний діагноз: вогнепальне осколкове сліпе проникаюче поранення грудей справа з вогнепальним переломом правої лопатки, III–V ребер справа, ушкодженням правої легені з наявністю металевго осколка паравертебрально справа на рівні Th_V хребця, правобічний гемопневмоторакс, правобічний післятравматичний пульмоніт, забій спинного мозку, нижня параплегія. Виконана операція: відеоасистована торакоскопія справа, ревізія плевральної порожнини, видалення металевго осколка з тіла хребця Th_V, санація та редренування правої плевральної порожнини за Бюлау, яка тривала 40 хв. У подальшому, через 2 тижня зняті шви, ознаки неврологічної недостатності регресували, поранений направлений на військово-лікарську комісію та виписаний до частини. *Висновки.* Вогнепальні поранення грудей з ушкодженням хребта є рідким явищем. Використання сучасного магнітного хірургічного інструмента дозволяє видаляти феромагнітні сторонні тіла під час ушкодження хребців. Застосування мініінвазивних оперативних втручань за вогнепального поранення грудей з ушкодженням хребта зменшують операційну травму та можуть бути застосовані на третьому рівні надання медичної допомоги. *Ключові слова.* Вогнепальне поранення грудей, вогнепальне поранення хребта, мініінвазивні технології.

Keywords. Gunshot wound of the chest, gunshot wound of the spine, minimally invasive technologies

Introduction

Chest injuries are one of the leading causes of mortality due to injuries, as well as temporary and permanent disability in people under 40 years old, both in our country and abroad [1, 6]. In modern military conflicts, the frequency of gunshot wounds to the chest is 8–12 %, of which 79.4 % are non-penetrating, and 20.4 % are penetrating with damage to intrathoracic organs. Such injuries of the chest in 80 % of cases include lung injuries; 10–15 % pericardium, heart, large vessels; 5 % trachea, esophagus and diaphragm. Wounded with gunshot lesions of the spine and spinal cord make up 0.5 % of all combat injuries and about 5 % of neurotraumas. During the anti-terrorist operation/military operation in eastern Ukraine, gunshot wounds to the spine and spinal cord accounted for 1.14 % of combat spinal cord injuries, of which gunshot wounds — 39.1 %, mechanical spinal injuries — 60.9 % [4, 5].

X-ray and ultrasound examination of the chest are used for the diagnosis of chest injuries, when using which errors in determining the anatomical characteristics of intrathoracic injuries range from 16.1 to 56.4 %. The most difficult is the choice of tactics for penetrating wounds of the chest due to the impossibility of verifying the anatomical and topographic nature of the wound by non-invasive methods before the operation. Spiral computed tomography (SCT) somewhat expanded the possibilities of studying the structure of tissues and allowed a new look at the process of preoperative examination of the patient [2].

Today, in all fields of surgery, there is a trend towards the widespread use of minimally invasive techniques. The endovideothoracoscopy method is currently experiencing a second birth [3].

Purpose: to demonstrate the possibilities of minimally invasive technologies during the diagnosis and treatment of gunshot wounds of the chest and spine.

Material and methods

The research materials were reviewed and approved by the ethics committee at the Military Medical Clinical Center of the Northern Region (Protocol No. 2/04 dated 07.05.2024).

A 42-year-old patient N. was wounded in the chest during mortar shelling, was brought an hour after the injury to the advanced surgical group in severe condition, where a thoracentesis on the right, drainage of the pleural cavity according to Bülow was performed. After 3 hours he was transferred to the Military Medical Clinical Center of the Northern Region of the Military Medical Center of the Armed Forces, hospitalized in the emergency medical department.

The diagnosis was as follows: gunshot fragment blind penetrating wound of the chest on the right with a gunshot fracture of the right scapula, III, IV, V ribs on the right, damage to the right lung with the presence of a metal fragment paravertebrally on the right at the level of the Th_V–Th_{VI} vertebra, right-sided hemopneumothorax and post-traumatic pulmonitis, contusion of the spinal cord, lower paraplegia. Operations: thoracentesis, drainage of the right pleural cavity according to Bülow, primary surgical treatment (PST) of a gunshot wound.

The wounded patient was hospitalized in a severe condition. An ultrasound examination of the chest and abdominal organs was performed according to the FAST protocol (ultrasound of the thoracic cavity and abdominal cavity). Laboratory studies included general clinical blood tests, urine, biochemical analysis and blood coagulogram, which were performed on Respons 920 (Germany) and Lab Analyt (China), HumaClot Duo Plus (Germany), Labline 40 and Sunrise (Austria) devices with additional BIORAD equipment and BIOSAN. Multispiral spiral computer tomography of the head, chest and abdominal organs, pelvis (MSCT of the head, chest and abdomen, pelvis) was performed on the Revolution EVO device (2021) with a tomograph step of 0.5 mm. Video thoracoscopy was performed on the OLYMPUS VISERA 4K UHD OTV-S400, 2021 video endoscopic stand.

The following operative treatment was performed: video-assisted thoracoscopy on the right, revision of the pleural cavity, removal of a metal fragment from the body of the Th_V vertebra, sanitation and redraining of the right pleural cavity according to Bülow.

The foreign body (metal fragment) was removed using a magnetic tool for endovideoscopic diagnosis and removal of metal ferromagnetic foreign bodies from the abdominal and pleural cavities [8].

Results

According to our data, chest injuries occur in 13 % of cases, spinal injuries in up to 2 % of cases, and their combination is much less common.

The final diagnosis was established: gunshot fragment blind penetrating wound of the chest on the right with a gunshot fracture of the right scapula, III, IV, V ribs on the right, injury to the right lung with the presence of a metal fragment paravertebrally on the right at the level of the Th_V vertebra, right-sided hemopneumothorax and post-traumatic pulmonitis, contusion of the spinal cord, lower paraplegia.

Operations: thoracentesis, drainage of the right pleural cavity according to Bülow; PST of the gunshot wound.

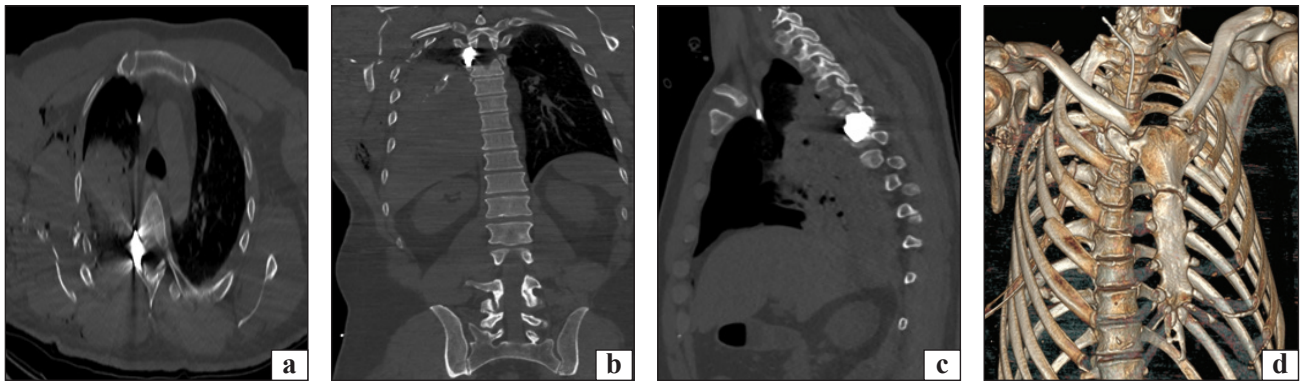


Fig. 1. Photoscans of the SCT of the chest organs during the hospitalization of the wounded: gunshot fracture of the body of the right scapula, III–V ribs on the right, bone fragments in the parenchyma of the right lung and lying freely in the right pleural cavity, a metal fragment 2×1 cm in the body of the Th_v vertebra, post-traumatic pneumonitis of the upper parts of the right lung, pleural drainage in the pleural cavity, signs of a small hemopneumothorax: a) axial plane; b) coronal projection; c) sagittal projection; d) 3D modeling

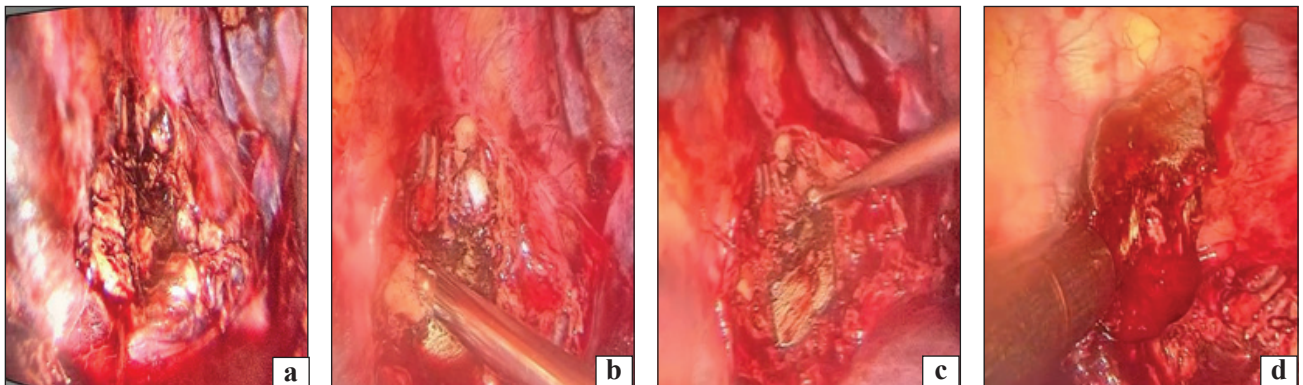


Fig. 2. Stages of surgical intervention: a) appearance of a foreign body (metal fragment) in a vertebra; b) removal of a foreign body using a shaver; c) removal of a foreign body using a curette; d) removal of a foreign body using a magnetic tool for endovideoscopic diagnosis and removal of metal ferromagnetic foreign bodies from the abdominal and pleural cavities



Fig. 3. Removed foreign body (metal fragment)

Ultrasound examination showed free fluid and air in the right pleural cavity. The patient was examined by a neurosurgeon.

A photo of a multispiral CT scan of the injured patient during admission is shown in Fig. 1.

The patient underwent video-assisted thoracoscopy on the right, revision of the pleural cavity, removal

of a metal fragment from the body of the Th_v vertebra, sanitation and re-drainage of the right pleural cavity according to Büla.

After treatment of the operative field with antiseptic solutions, under general anesthesia with one-lung intubation and artificial lung ventilation (ALV), the first thoracoport for 10 mm oblique optics was installed in the 6th intercostal space along the middle axillary line on the right. Working thoracoports were installed in typical places. Revision: a collapsed hemothorax with a volume of up to 300 ml was sanitized. A metal fragment up to 2×1 cm was found in the body of the 5th thoracic vertebra, which was removed using a shaver, curette and a magnetic tool for endovideoscopic diagnosis and removal of metal ferromagnetic foreign bodies from the abdominal and pleural cavities. Hemostasis control was dry. Aerostasis control was satisfactory. The right pleural cavity was re-drained with a 24Fr tubular PCV drain, inserted to the apex of the lung. Drainage according

to Bülau was set. Drainage control functioned satisfactorily. Wounds were sutured. Aseptic stickers were applied.

Thoracoscopic stage of surgery is shown in Fig. 2.

The operative intervention lasted 40 minutes, the foreign body (metal fragment) was removed (Fig. 3). On the 3rd day, drainage from the pleural cavity was removed, stitches were removed in 2 weeks; signs of neurological insufficiency regressed, the wounded patient was sent to the military medical board and discharged to the unit.

Discussion

Study of literary sources [4–6] showed that gunshot wounds of the chest with damage to the spine are not a frequent injury, so the given clinical case once again allows us to pay attention to the peculiarities of diagnosis, tactics and treatment of this condition.

In this case, a spinal injury was diagnosed with a spinal cord trauma, the presence of a large foreign body (a metal fragment) [6] in the spine, which was an indication for surgical treatment.

The use of a modern magnetic surgical tool for diagnosis and removal of ferromagnetic foreign bodies during thoracoscopic surgical interventions has been used in practice for a long time and significantly minimizes intervention time and operative trauma [7, 9, 10].

Conclusions

Gunshot wounds to the chest with damage to the spine are rare. The use of modern magnetic surgical instruments allows the removal of ferromagnetic foreign bodies in case of damage to the vertebrae.

The use of minimally invasive operative interventions for gunshot wounds of the chest with spinal cord injury reduces operative trauma and can be applied at the third level of medical care.

Conflict of interest. The authors declare no conflict of interest.

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A RARE CASE OF MINIMALLY INVASIVE REMOVAL OF A VERTEBRAL FOREIGN BODY AFTER A GUNSHOT FRAGMENT PENETRATING WOUND OF THE CHEST AND SPINE

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