Uniportal VATS treatment of penetrating stab wound of the chest

I. A. Ivanov[1], S. Chakarov[2,3], R. Dimova[1], D. Mitev[1]

[1]Thoracic Surgery Department, Heart and Brain Hospital – Burgas
[2]Department of Diagnostic Imaging, Heart and Brain Hospital – Burgas
[3]Department of Physics, Biophysics, Radiography and Radiology – Burgas, State University – Burgas

Еднопортално торакоскопско лечение на проникващо прободно гръдно нараняване

И. А. Иванов[1], С. Чакъров[2,3], Р. Димова[1], Д. Митев[1]

[1]Отделение по гръдна хирургия – УМБАЛ „Сърце и мозък" – Бургас
[2]Отделение по образна диагностика – УМБАЛ „Сърце и мозък" – Бургас
[3]Катедра по физика, биофизика, рентгенология и радиология – Бургаски държавен университет

Abstract:	Uniportal video-assisted thoracic surgery (UVATS) is a widely used method for minimally-invasive interventions in oncological and non-oncological thoracic diseases. The use of this method in the setting of thoracic trauma is not routinely performed and there are insufficient cases reported in the literature. The presented report describes the case of a 20-year-old male patient who presented with a stab wound in the left chest area and parenchymal tear of the lung with active bleeding and hemopneumothorax. UVATS was performed with hemostasis and primary repair of the lung parenchyma. After the intervention the patient recovered uneventfully in a short period of time and no complications were observed in the perioperative period.
Key words:	uniportal VATS, penetrating chest trauma
Address for correspondence:	*Ivoslav A. Ivanov, MD, e-mail: ivoslavivanov@gmail.com*
Резюме:	Еднопорталната видеоасистирана торакална хирургия (ВАТХ) е все по-широко прилаган метод за минимално инвазивни интервенции при онкологични и неонкологични заболявания. Използването на този метод в условията на гръдна травма не е широко застъпено и няма достатъчно докладвани случаи в литературата. Представяме случай на 20-годишен пациент, постъпил с проникващо прободно нараняване в лява гръдна област, лезия на белодробен паренхим с активно кървене и хемопневмоторакс. Извършена е еднопортална ВАТХ с хемостаза и сутура на белодробния паренхим. След проведената интервенция пациентът се възстанови напълно за кратко време и не се наблюдаваха усложнения в периоперативния период.
Ключови думи:	еднопортална ВАТХ, проникваща гръдна травма
Адрес за кореспонденция:	*Д-р Ивослав А. Иванов, e-mail: ivoslavivanov@gmail.com*

Introduction

In the last decade, minimally invasive thoracic surgery has undergone a significant progress driven by the development of the techniques in video-assisted thoracic surgery (VATS) and robotic thoracic surgery (RATS). One of the most widely used methods is the UVATS which allows performing a wide range of interventions, such as anatomical lung resections, tracheo-bronchial reconstructions, sleeve resections, mediastinal interventions, etc. [1, 2]. This type of surgical approach is a minimally invasive thoracic intervention through a single surgical access with a size of 20-30 mm, through the 5th or 4th intercostal space between the mid- and anterior axillary lines [3]. Many different oncological and non-oncological surgical interventions performed with UVATS have been reported in the literature, but no data are found on its performance in cases of thoracic trauma. Surgical methods used in chest trauma have not developed as rapidly as those used in surgical oncology. Traumatic injury of the chest remains an undeveloped part of modern minimally invasive thoracic surgery.

Clinical case description

We present a case of a 20-year-old male patient admitted to the emergency department with two stab wounds in the chest. The trauma occurred about 2 hours before admission. On admission patient was with clear consciousness, stable hemodynamics, two stab wounds in the area of the 4th intercostal space along the left midclavicular line and parasternal line in the left chest (Fig. 1). No breathing was detected in the affected chest area. Due to the stable condition of the patient a computed tomography scan was performed, which revealed the presence of hemopneumothorax and a wound channel penetrating the pleural cavity, as well as a tear of the lung parenchyma in the area of segment 8 with contrast extravasation (Fig. 2). The patient was taken to the operating room where UVATS was performed through a 25-mm incision in the 5th intercostal space (Fig. 3).

Fig. 1. Entry of stab wounds from a knife on the anterior chest wall

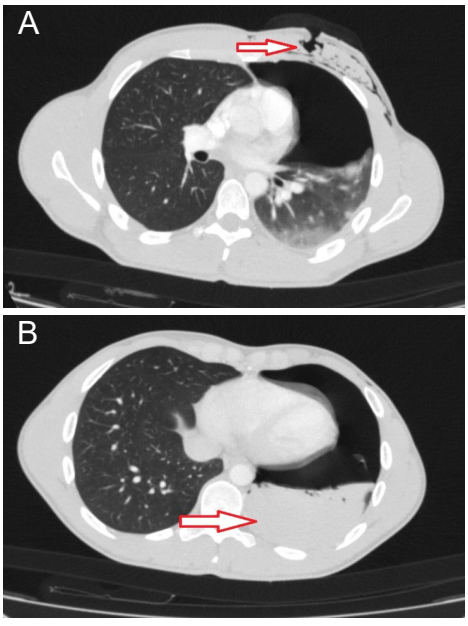

Fig. 2 A-B. A. Wound course from a stab wound in the left pectoral region. B. Hemopneumothorax with supradiaphragmatic blood clot

Fig. 3. Incisional access for UVATS, 25 mm through which a wound protector is placed after opening the pleural cavity

The following damages were found during the examination of the pleural cavity: hemopneumothorax with the presence of large blood clot, a superficial non-penetrating lesion of pericardial fat tissue and the presence of intrapleural bleeding from the entry wounds (Fig. 3A). During the inspection of the lung the laceration described by the CT scan was found in the lower lobe, also with the presence of active parenchymal bleeding (Fig. 3B). Endoscopic suture of the lesion was performed with absorbable polyfilament suture 3/0 to achieve hemostasis and aerostasis (Fig. 4). A 24 French (24 F) chest tube was placed and the incision was closed (Fig. 5). The patient had an uneventful postoperative recovery. The drain was removed on the 48th hour and the patient was discharged on the 4th postoperative day.

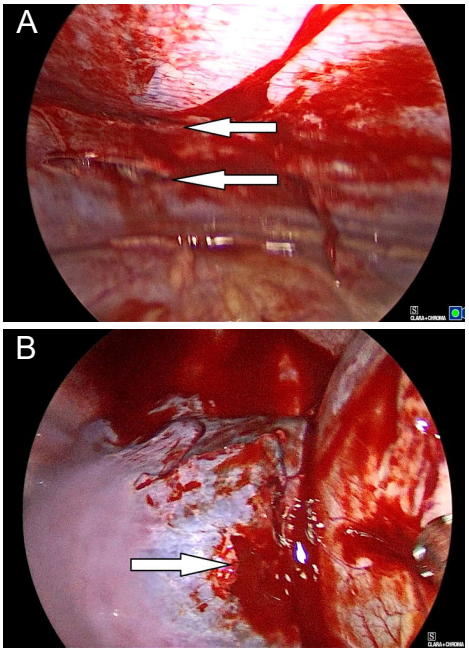

Fig. 3 A-B. A. Entry of the stab wounds B. Pulmonary tear in the 8th segment (lower lobe) with active bleeding

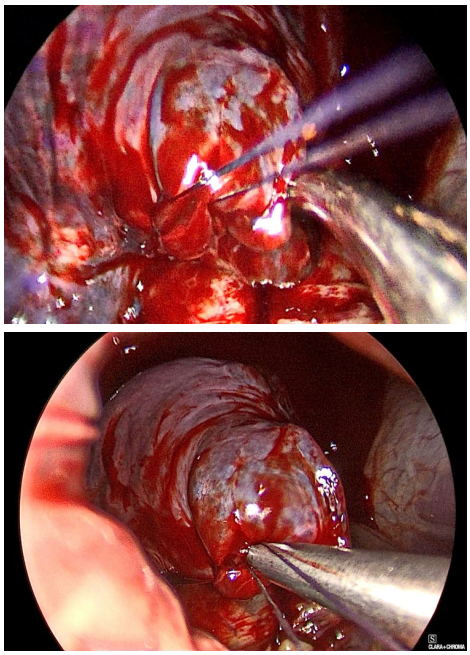

Fig. 4. Pulmonary parenchymal lesion with suture application for hemostasis and aerostasis. The knot is applied extracorporeally using an instrument – Knot pusher, 5 mm

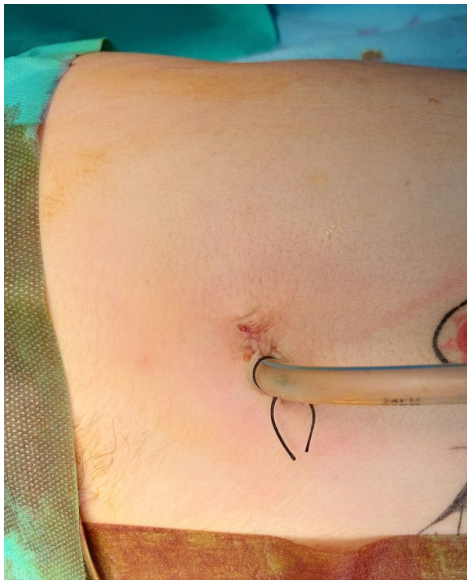

Fig. 5. Postoperative view of the incisional access for UVATS with a chest tube inserted

Discussion

Regardless of their etiology and pathogenesis, penetrating chest injuries usually have similar clinical presentation – hemopneumothorax, hemorrhagic shock, acute respiratory failure. The severity of the pathophysiological disorders at admission of the patient to a hospital may vary. At that point the patient approach may differ from the usual guidelines for trauma, such as intubation technique (double-lumen), lung decompression (thoracocentesis, pleural drainage, thoracoscopy), hemostasis and/or damage control through wide thoracotomy. Penetrating chest injuries, such as stab wounds, are particularly dangerous and unpredictable. This is due to the unclear morphology of the injury which has no exit wound and it is difficult to localize the end of the wound channel. Damage to chest wall vessels that are direct branches of the aorta and are fixed in a connective tissue bed is possible. The intercostal arteries in the costal groove cannot do vasospasm after injury and because of that the bleeding from them does not stop spontaneously [4, 5].

According to a multicenter study in Australia in 2001, the mortality rate reaches 37% [6]. This leads to the conclusion that adequate and rapid surgical treatment is necessary for this kind of trauma with particular attention to penetrating chest injury from a stab wound with a weapon that is pulled out from the wound. In recent decades VATS has revealed and proven its benefits compared to open surgery, such as less postoperative pain, improved lung function parameters and shorter hospital stay. All of the benefits lead to rapid postoperative recovery of patients and improved quality of life in a shorter period of time. In recent years numerous comparative analyses have been performed between uniportal and multiportal VATS. At the moment several meta-analyses have been reported that compare the perioperative results of both types of VATS. Some of them report better perioperative results of UVATS. Yang X.Y. et al. reported that patients in the UVATS group had less blood loss, shorter hospital stay and less postoperative pain compared to the multiportal VATS group [7]. On the other hand, Yueren Yan et al. did not find a significant difference in the two methods [8]. In the case of hemorrhagic shock or pneumothorax caused by an injury of a large mediastinal or parenchymal vessel, as well as in the case of a tear of a bronchus with a larger diameter, emergency thoracotomy remains the only method of choice for surgical access in penetrating thoracic injury [9, 10].

Conclusion

The use of UVATS as a technique in selected cases in emergency thoracic surgery is a method of choice when determining the surgical approach. It provides opportunities for less postoperative pain, rapid patient recovery and shorter hospital stay. Despite the advantages of VATS described above, in many situations thoracotomy remains the only meth-

od of access for penetrating thoracic injuries, especially in the presence of an unstable patient with severe shock due to penetrating thoracic injuries.

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