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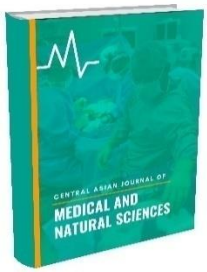

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Treatment of Gunshot Injuries of the Chest

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Abstract. The pathomorphology of gunshot wounds, diagnostic and treatment tactics have been well studied, although not completely. Currently, gunshot wounds of the chest occupy second or third place behind wounds of the head and extremities. The issues of diagnostic scope and surgical activity remain unresolved. This article is devoted to studying the effectiveness of treatment of gunshot wounds of the chest and includes 109 patients. Issues of diagnostic and treatment tactics, treatment results are considered.

Key words: gunshot injury of the chest, chest gunshot injury, thorax gunshot injury, chest gunshot wound.

INTRODUCTION

Gunshot wounds of the chest are the most severe type of combat injury, due to the location of the heart, great vessels, lungs, trachea and esophagus in the chest cavity. During the First World War, up to 6% of wounds occurred in the chest [2]. In World War II, fatal chest wounds ranged from 30% to 40%, not counting the wounded taken to medical care who later died from complications, and in the Korean War (1951-1953) the number of those killed in the chest on the battlefield ranged from 1/3 to 1/2 of all deaths [2, 3, 5]. According to the experience of British troops in Afghanistan in 2003-2012, the proportion of chest wounds among the total number of gunshot injuries varies from 9% to 24% [6]. Although according to B.W. Propper et al. (2010) in their analysis of thoracic injuries during combat operations in Iraq and Afghanistan among military personnel of the joint coalition forces (USA, UK, etc.) in 40% of cases, chest injuries were penetrating [7].

Chest injuries accounted for 12.5% and ranked second after limb injuries during combat operations in Benghazi (2011) [1]. Mametov R.R. et al. (2017) indicate that gunshot wounds to the chest accounted for 16.6% during the Osh events of 1990, ranking second after gunshot wounds to the abdomen, and 11% during the Armed Conflict in the South of the Kyrgyz Republic in 2010, after head wounds [10]. According to different authors, the frequency of thoracotomies varies widely. Kristek J. et al. (2012) in the war in Croatia (1991-1995), the frequency of thoracotomies reached 91.7% [4]. During the Lebanon War (1982) Zakharia A.T. performed thoracotomies on 71% of chest wounds and recommends, along with resuscitation measures, to adhere to aggressive thoracic procedures in patients admitted in a state of shock [8]. Ivchenko D.R. et al. (2000), when analyzing military personnel

wounded in the chest in a state of shock, note that every third had a small hemothorax and a small hemothorax in itself cannot lead to shock from blood loss [9].

Most surgeons during the Second World War believed that wide thoracotomies were indicated only in 7-13% of cases of gunshot penetrating chest wounds. In the Vietnam War, thoracotomies accounted for 11%. In recent years, thanks to advances in anesthesiology and resuscitation, many surgeons have expanded the indications for thoracotomy for chest wounds. Despite the improvement of diagnostic and treatment methods, gunshot combat trauma to the chest remains one of the main causes of death and complications in thoracic surgery.

THE AIM OF THE STUDY

To improve the results of treatment of patients with a gunshot wound to the chest based on an analysis of the features of diagnostic and treatment tactics at the hospital (qualified and specialized) stage of medical care.

MATERIAL AND METHODS

The study included cases of 109 patients with a gunshot wound to the chest, who were treated in period 2000-2022 y. in the department of thoracic surgery of the Central Military Clinical Hospital of the Ministry of Defense of the Republic of Uzbekistan. Of the 109 cases, 72 (66.06%) were bullet wounds, 37 (33.94%) were shrapnel wounds. Penetrating chest wounds was present in 95 cases, non-penetrating in 14. This study included patients with penetrating chest wounds. Depending on the treatment and diagnostic tactics, the patients were divided into two groups. The control (I) group included 65 patients, all of whom, underwent thoracotomy. In this group, patients upon admission to the emergency department were immediately sent to the operating room, without preliminary diagnostic measures. The main (II) group included 30 patients who underwent an integrated approach. Upon admission to the emergency department, a general clinical examination, preliminary determination of the extent of damage, computed tomography (CT) of the chest was performed, if impossible - chest radiography, ultrasound examination of the pleural cavities and abdominal cavity. After the examination, all patients underwent drainage of the pleural cavity in the 4^{th} or 5^{th} intercostal space at a point between the anterior and middle axillary lines. If there were signs of ongoing bleeding, they underwent urgent video thoracoscopy (VTS). The criteria for ongoing bleeding are the following: 800 ml of hemorrhagic discharge after drainage of the pleural cavity or 300 ml/hour for the next 2 hours after drainage. The criteria for the effectiveness of the treatment were the number of repeated surgical interventions, the duration of drainage of the pleural cavities, complications, and bed days in the hospital. Jamovi 2.2.5 software for Windows was used for statistical data processing. The following methods of statistical analysis were used: x2 test, Shapiro-Wilk, Mann-Whitney.

RESULTS AND DISCUSSION

In the first group, during thoracotomy and revision, from 250 to 1000 ml of fresh blood with clots were found in the pleural cavity, on average 527.7 ± 208.5 ml. Non-penetrating wounds of the heart were combined with a marginal wound of the lower lobe of the left lung in 3 cases, in the remaining 8 cases there were marginal wounds of the lung parenchyma. In addition, the sources of bleeding were damaged intercostal vessels in 25 cases, the internal mammary artery - 8. Thus, damage to internal organs from gunshot wounds of the chest was discovered during thoracotomy in 16.9% of cases.

Patients of II group (n=30) upon admission to the emergency department, depending on hemodynamic parameters, were divided into two subgroups: unstable (group IIA - 9 patients) and stable (group IIB - 21 patients). In 1 of 9 cases of subgroup IA, thoracotomy was performed after establishing the presence of hemopericardium after pericardial fenestration. During inspection of the

pleural cavity, about 1000 ml of fresh blood was discovered, a non-penetrating wound of the left atrium and a marginal wound of the lower lobe of the left lung; the wounds were sutured. For the remaining 8 patients who were delivered in >20 minutes ultrasound examination and polipositional Xray was performed directly in the operating room using revealed signs of hemopneumothorax in 8 cases, and signs of hemopericardium were excluded in 3 cases. In 8 patients of subgroup IA, drainage tubes were installed in the pleural cavities. There were no signs of ongoing intrapleural bleeding. All 9 patients, after stabilizing their general condition and excluding signs of ongoing intrapleural bleeding, underwent CT and chest radiography, and then were transferred to the intensive care unit.

21 patients with stable hemodynamics (group IIB) underwent CT scanning of the chest in 7 cases, and radiography of the chest in 14 cases upon admission to the emergency department. Hemopneumothorax was found in all (n=21) cases of subgroup IB, of which in 8 cases with the presence of foreign bodies (fragments and bullets): in the left pleural cavity 2 cases, in the right pleural cavity - 2, in the upper anterior mediastinum - 1, in the upper lobe of the left lung - 1, in the upper lobe of the right lung - 1, foreign bodies from 4 to 8 mm in the amount of 3 in the anterior mediastinum and in the pericardial sac - 1. After studies, 21 patients of the IIB group underwent tube thoracostomy; signs of low-intensity (up to 200 ml/hour of blood through pleural drainage for 4 hours with a positive Rouvilois-Gregoire test) ongoing intrapleural bleeding were only in 3 cases, including two with the presence of FB in the pleural cavity and lung, which underwent diagnostic video thoracoscopy. During inspection, a clotted hemothorax with a volume of about 600 and 800 ml was discovered in the pleural cavity in two cases, and it was also revealed that the sources of bleeding were marginal wounds of the lung parenchyma (n=2) and intercostal vessels (n=3), for which the wounds were sutured lung, ligation and coagulation of intercostal vessels. Along with this, FBs measuring 3.0x1.0 cm and 2.8x2.1 cm were removed from the left pleural cavity and the upper lobe of the right lung.

A comparative analysis of the effectiveness of the treatment was carried out based on the duration of hospital stay and temporary disability (in days). In group II of patients, the length of hospital stays averaged 16.4±8.1 days, while in group I it was 25.1±18.2 days (U-test=697; $p<0.05$), which is significantly lower. The number of days of temporary disability averaged 56.1±8.7 days in the second group, and 65.4±18.2 in the first group (U-test=673; $p<0.05$).

CONCLUSIONS

The use of a differentiated, integrated approach in the selection of diagnosis and treatment of gunshot wounds of the chest reduces surgical aggression and shortens the patient's recovery time. Patients should be carefully selected for thoracotomy, since experience shows that in most cases thoracotomy is, of course, a comprehensive operation, but unnecessary.

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