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DIAGNOSIS AND TREATMENT OF HEART INJURIES

DOI 10.25789/YMJ.2023.82.10

УДК 616.12-001.4-072-089

The main objective of this work is to develop optimal tactics for early diagnosis of heart injuries for the most rapid decision-making on the need to perform therapeutic manipulations. We studied the clinical symptoms found in patients upon admission the most frequent clinical symptoms of heart injuries with ranking them as reliable and probable. Conclusions were drawn about the optimal tactics of managing emergency surgical patients admitted with suspected heart injury. It was determined that the most effective method of treating patients with penetrating heart trauma is emergency surgical treatment.

Keywords: heart injury, surgical treatment of heart injury, additional research methods, videothoracoscopy, thoracotomy, heart wound suturing.

Introduction. The problems associated with heart injuries are currently relevant, since the issues of choosing the optimal tactics for early diagnosis and treatment of these injuries are extremely serious in surgery. Terminal conditions develop very quickly, with traumatic injury to the heart. A combination of factors (cardiac tamponade, damage to the coronary arteries and intracoronary structures, bleeding, combined injuries) increase the likelihood of death in patients with traumatic heart injury, along with this, the progression of terminal states and shock phenomena often contribute to errors in treatment and diagnostic tactics

[3,6,10,11]. Mortality among patients with heart injury during hospitalization according to the last ten-year data was 31.25%, which corresponds to similar mortality data for the previous 30 years [6,11].

The aim of the study was to develop an algorithm for choosing therapeutic measures to improve early diagnosis and the most rapid application of the necessary surgical intervention in patients with penetrating heart injuries.

Material and methods. The study used data on 268 patients admitted to the surgical departments of the Regional Clinical Emergency Hospital, Barnaul, the clinical base of the Department of General Surgery, Operative Surgery and Topographic Anatomy of the Altai State Medical University with penetrating heart injuries since 1990 by 2020. There were 234 men and 34 women. Age ranged from 18 to 69 years. Patients were admitted to the hospital at various time intervals, the largest number within 5-40 minutes from the moment of injury (205 patients). Diagnosis included clinical symptoms and instrumental data (electrocardiographic (ECG), echocardiographic (ECHO-KG), radiography (RG), computed tomography (CT), videothoracoscopy).

In the structure of heart injuries, their different nature was noted (Fig. 1 and Table 1).

Most often, single injuries of the heart occurred in 254 (94.8%) patients, while injuries of the ventricles were most often observed in 230 (86.8%) patients.

Most often, the left ventricle was damaged in 129 (48.1%) patients, less often - the right ventricle in 89 (33.2%) patients, damage to the left atrium was noted in 9 (3.4%) patients, damage to the right atrium - in 26 (9.7%), both ventricles - in 15 (4.8%).

At the same time, in 21 cases, simultaneous damage to two chambers of the heart was noted, of which 6 patients underwent surgical treatment due to gun-

shot wounds, and 15 patients - multiple stab wounds. In relation to the cavities of the heart, penetrating wounds were most often observed (Fig. 2).

At the same time, in patients with non-penetrating wounds of the heart during thoracotomy, various depths of myocardial damage (from 0.1 to 0.3 cm) were determined, which had no connection with the heart cavities.

Results and discussion. Heart injuries were diagnosed on the basis of the analysis of the symptom complex and indicators of additional studies. The clinical signs were based on a number of symptoms (Table 2).

So, in patients, the symptom complex consisted of various combinations of clinical symptoms. In more cases, there was a visible wound in the area of the anatomical projection of the heart in 258 (96.3%) patients, in 6 (2.2%) patients, the wounds were located in the subscapular region and in 4 (1.5%) - in the axillary region.

Among the various clinical manifestations of heart injuries, reliable and probable ones were identified (Table 3).

The diagnosis was made in accordance with the clinical picture in each

Table 1

The nature of the wounds of the heart

Heart wounds	Abs. number	%
isolated	179	66.8
combined:	89	33.2
with lung injury	51	19
thoracoabdominal. of which:	38	14
with liver injury	12	4.5
with spleen injury	12	4.5
with stomach injury	8	2.9
with intestinal injury	6	2

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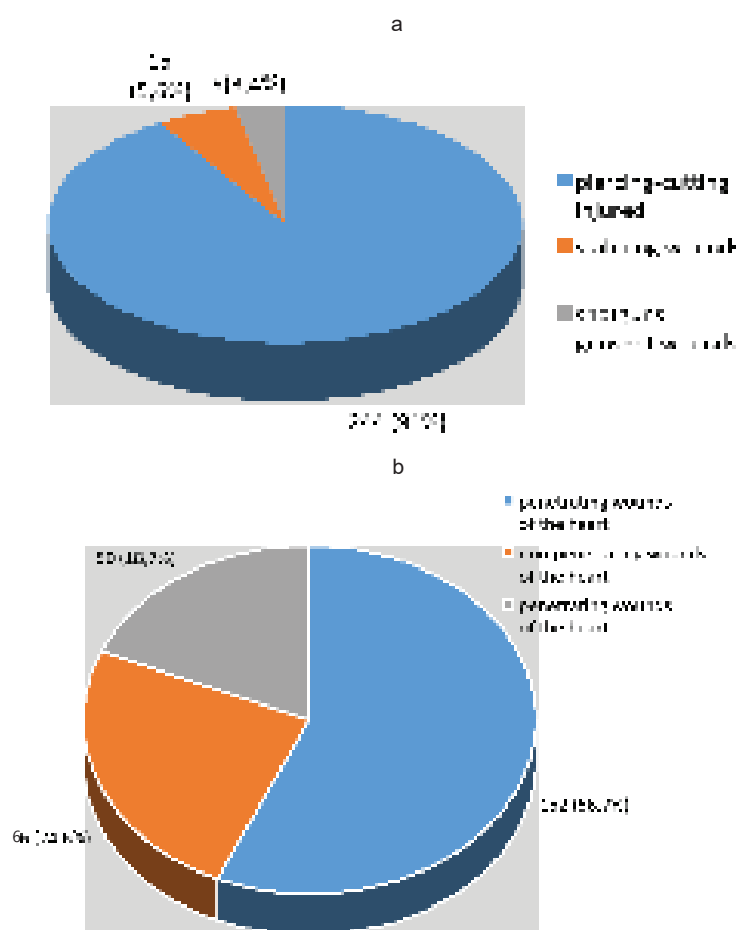


Fig. 1. The nature of heart injuries by the type of damaging agent (a) and in relation to the cavities (b)

individual patient. Thus, it was possible to establish the diagnosis of heart injury in time in 259 (96.6%) patients, which made it possible to perform surgical treatment in 228 (88.0%) patients as soon as possible (10-20 minutes from the moment of admission to the hospital).

Taking into account the experience of treating patients with penetrating heart injuries in our clinic, an algorithm for choosing the method of surgical treatment was compiled (Fig. 3).

In 18 (6.7%) patients there was an error in diagnosis. Such patients underwent surgery 1 to 4 hours after admission to the clinic with a diagnosis of lung injury in 12 (4.5%) patients and heart injury in 6 (2.2%). This group was characterized by a satisfactory general condition of patients, no changes in hemodynamics, the presence of wounds with a deep wound channel in the anatomical region of the heart. At the same time, moderate hemothorax was noted in 10 (3.7%) patients, minor ECG changes (sinus tachycardia) in 12 (4.5%) patients. Surgical intervention was necessary, since all patients were diagnosed with a heart injury of a different nature. In most cases, there was a wound of the heart with penetration into the ventricle on the left or the atrium on the right.

Of course, surgical treatment, performed on an emergency basis, is the correct treatment tactic that allows you to save the life of the victim. Emergency thoracotomy was performed with reliable

Table 2

Frequency of clinical symptoms in heart injury

Clinical sign	Absolute number	%
External or intrapleural bleeding	210	78.4±2.51
Cardiac tamponade syndrome	42	15.7±2.22
Pulse:		
- normal	28	10.5±1.87
- tachycardia	187	69.8±2.81
- bradycardia	32	11.9±1.98
- absent	21	7.8±1.64
Systolic blood pressure:		
- normal	65	24.3±2.62
- 90-70 mm Hg	75	28.0±2.74
- below 70 mm Hg	91	34.0±2.89
- absent	37	13.7±2.10
PExpanding the boundaries of cardiac dullness	33	12.2±2.0
Deafness of heart sounds	186	69.4±2.82

Table 3

Clinical symptoms in heart injury

Credible	Probable
The presence of a wound in the chest (preferably in the anatomical region of the heart) with massive bleeding (external or intrapleural)	The presence of a wound with a deep wound channel in the anatomical localization of the heart without massive bleeding
A significant decrease in blood pressure, or its absence	Moderate decrease in blood pressure and muffled heart sounds
Signs of cardiac tamponade are determined	Signs of cardiac tamponade are not determined
According to the results of the ECG, damage or ischemia of the heart muscle is determined	ECG results show sinus tachycardia
According to the results of X-ray or ECHO-KG, hemopericardium is determined	According to the results of X-ray or ECHO-KG, hemopericardium is determined
	According to the results of fluoroscopy, a decrease in the pulsation of the projection of the shadow of the heart is determined

The choice of the method of surgical treatment for heart injury (own data)

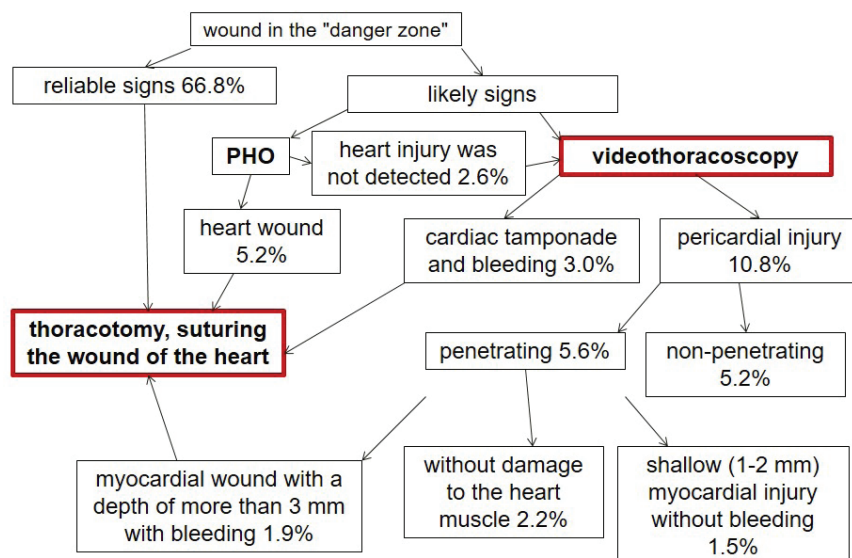


Fig. 3. Algorithm for choosing the method of surgical treatment

signs of heart damage in 210 (66.8%) patients: hypotension - 144 (53.7%); pericardial tamponade syndrome - 42 (15.7%); myocardial damage according to ECG - 186 (69.4%); X-ray and echocardiographic signs of hemopericardium - 164 (61.2%). Primary surgical debridement was performed in 21 (7.8%) patients. The diagnosis of heart injury was confirmed in 14 (5.2%) patients and they underwent thoracotomy. In 7 (2.6%) cases, during the revision of the wound, no convincing evidence for a heart injury was obtained, given the stable hemodynamics in these patients, they underwent videothoracoscopy. Videothoracoscopy in case of suspected heart injury was performed in 37 (13.8%) patients: in 8 (3.0%) cases, cardiac tamponade or intrapleural bleeding was detected during surgery, these patients underwent emergency thoracotomy; in 29 (10.8%) patients, damage to the pericardium was found (of which 14 (5.2%) had non-penetrating into the cavity of the heart bag and 15 (5.6%) had penetrating, which required pericardiotomy). Of 15 (5.6%) patients, thoracoscopic revision of the pericardium revealed: 4 (1.5%) patients had tangential ("lateral") damage to the heart muscle 1-2 mm deep without ongoing bleeding; in 6 (2.2%) - no damage to the heart muscle was detected; 5 (1.9%) patients had myocardial wounds more than 3 mm deep with ongoing bleeding, which required emergency thoracotomy with suturing of the heart muscle. In 24 (9.0%) cases (out of 268 patients), videothoracoscopy allowed to refrain from

thoracotomy, ending the operation with drainage of the pleural cavity.

U-shaped sutures were placed on the wound of the heart in 59 (22.0%) patients, interrupted in 209 (78.0%). Suturing was performed with atraumatic suture material, without endocardial suturing. The method of closing the wound defect must be chosen according to the nature and localization of the wound. Thus, interrupted sutures should be used to close penetrating wounds of the ventricles and small wounds of the atria, or non-penetrating wounds. With these wounds, this type of seam creates the desired tightness. Large-sized atrial wounds should be sutured with U-shaped sutures, since this type of suture is preferable for a thinned atrial wall or flabby myocardium. Most patients (240 patients (89.6%) were discharged from the hospital for outpatient observation, 11 patients (4.1%) were transferred to the cardiology department for treatment, 17 (6.3%) died.

Death during surgery or a few hours after it was observed in 17 (6.3%) patients due to injuries incompatible with life or acute cardiovascular failure due to acute blood loss and hemorrhagic shock, and in 3 (1.1%) patients - due to acute renal failure in the early postoperative period with combined damage to internal organs (heart, lungs, liver). At the same time, extracorporeal hemodialysis did not bring a positive result (after 9–12 days, the patients died).

Analyzing the long-term effects of treatment (period from 1 to 10 years) of patients (38 people) with heart injuries

(25 - penetrating and 13 - non-penetrating), who were discharged for outpatient observation in a satisfactory condition, it was noted that the ability to perform heavy physical activity was preserved in 19 people, and the presence of cicatricial changes in the heart muscle according to ECG in 9 people.

Conclusions:

1. Injuries to the heart remain an extremely serious problem in surgery. Very quickly, the victims develop terminal conditions, which increases the likelihood of death. At the same time, timely diagnosis of heart injuries is difficult in some cases.

2. A complex of symptoms, consisting of reliable signs (the presence of a wound in the chest area with profuse bleeding, a pronounced drop in blood pressure, up to its absence, signs of cardiac tamponade, damage or ischemia of the heart muscle, hemopericardium) are determined in most patients. Videothoracoscopy allows to detect the presence of damage to the heart in cases of difficulty in diagnosis and determine its nature in the shortest possible time.

3. Emergency surgery is the only effective treatment for patients with heart injuries. Interrupted sutures should be used to close penetrating wounds of the ventricles and small wounds of the atria, or non-penetrating wounds. With these wounds, this type of seam creates the desired tightness. Large-sized atrial wounds should be sutured with U-shaped sutures, since this type of suture is preferable with a thinned wall or flabby myocardium.

4. The algorithm presented in the paper using videothoracoscopy allows you to choose the optimal tactics for early diagnosis of heart injuries for an early decision on surgical treatment of the patient.

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DOI 10.25789/YMJ.2023.82.11

УДК 617-089

EVALUATION OF THE INFORMATIVE VALUE OF TRANSTHORACIC TREPAN LUNG BIOPSY UNDER THE CONTROL OF MULTISLICE COMPUTED TOMOGRAPHY OF INTRATHORACIC FORMATIONS IN THE DIAGNOSIS OF LUNG FORMATIONS

As of today, minimally invasive interventional diagnostic and therapeutic methods play a crucial role in modern medicine. Percutaneous transthoracic biopsy (TTB) is a minimally invasive and highly effective procedure that allows for histological verification of intrathoracic neoplasms. The aim of the study was to evaluate the information content of the method of percutaneous transthoracic trephine lung biopsy under the control of multislice computed tomography in the diagnosis of intrathoracic lesions in patients with suspected malignant neoplasm of the lung. The study included 155 patients who underwent TTB of intrathoracic formations under MSCT guidance between 2021 and 2022 at the Oncology and Radiology Hospital of the Republic of Sakha (Yakutia). Of these, 94 (60.65%) were male and 61 (39.35%) were female. The average patient age was 65.4 years (range 44-89). As a result of the study, malignancy was detected in 118 patients (76.13%), with primary lung malignancies identified in 102 (65.81%) patients, secondary lung malignancies in 16 (10.32%), and benign lung neoplasms in 27 (17.42%). Non-informative material (scarce material) was obtained in 10 (6.45%) cases. Perioperative complications were identified and included pneumothorax requiring Bülow pleural cavity drainage in 25 patients (16.67%), which occurred in patients with concurrent upper respiratory tract pathology such as bullous emphysema, interstitial changes, giant bullae, and hemoptysis developed in 16 patients (10.67%). Thus, it was determined that the application of percutaneous TTB of the lung under multislice computed tomography guidance in lung cancer has significant diagnostic value.

Keywords: percutaneous transthoracic trephine biopsy, lung trephine biopsy, computed tomography, biopsy under MSCT guidance, lung biopsy, non-small cell lung cancer.

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Introduction. Currently, according to statistical data in the Russian Federation for 2020, lung cancer ranks first among malignant neoplasms in men and first in mortality among both men and women in Russia and globally [2]. This problem is also prevalent in the oncology service in the Sakha Republic. It has been established that in the period from 2013 to 2022, there has been an increase in lung cancer incidence among the population by 22.1% [2].

Considering the growing trend in detecting new focal lung neoplasms in patients, one of the most pressing tasks in thoracic surgery and oncology is the timely and safest diagnosis of intrathoracic lung neoplasms [1, 11, 13]. Numerous methods for obtaining morphological materials from intrathoracic tumors have

been described in domestic and foreign literature [3, 4, 12].

For tumors located in the trachea and bronchi, bronchoscopy is used, which allows obtaining material from exophytic bronchial tumors. For central lung tumors, the endobronchial ultrasonography method is used [6, 7]. The aforementioned methods do not allow obtaining material from peripherally located lung tissue neoplasms. To diagnose these formations, clinicians often resort to performing diagnostic invasive operations, such as diagnostic thoracotomy, video thoracoscopy, and mediastinoscopy [6, 8, 14]. The application of these methods implies hospitalization, significant intraoperative trauma, and considering that the highest percentage of oncology patients are elderly and senile individu-