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IMPROVING THE DIAGNOSIS AND TREATMENT OF PATIENTS WITH THORACOABDOMINAL TRAUMA

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Abstract:

The incidence of diagnostic thoracotomies and laparotomies remains rather high, with the incidence of diagnostic laparotomies ranging from 24.9% to 33.5%, according to several authors. Moreover, in 30% of cases the penetrating abdominal wounds are not accompanied by internal organ damage. Still the incidence of unwarranted thoracotomies in peacetime chest injuries is at least 12-14%.

Unwarranted surgery can often lead to a breakdown of the body's compensatory capacity and subsequent death.

Keywords: laparoscopy; thoracoscopy; laparotomy; thoracotomy; thoracoabdominal injuries

INTRODUCTION. Among peacetime injuries, thoracoabdominal trauma (TAT) is a special and numerous group and is one of the most severe peacetime and wartime injuries. The diagnosis and treatment of patients with thoracoabdominal injuries is one of the most difficult problems of surgery. This is due not only to the high prevalence of this type of injury, but also to the high frequency of diagnostic errors and complications and treatment.

Diagnostic and tactical errors occur due to the limited capabilities of traditional diagnostic and treatment methods (non-invasive and minimally invasive). The emergence of modern minimally invasive techniques in surgical practice, in particular endovideosurgical thoracoscopy and laparoscopy, has significantly improved the quality of diagnosis and treatment, especially after the introduction of these methods into the 24-hour service of multidisciplinary hospitals dealing with emergency medical care of this kind. However, up to now, very heterogeneous recommendations regarding surgical tactics for thoracoabdominal injuries coexist and differentiated diagnostic and treatment algorithms have not been developed. The indications and contraindications for the use of endovideosurgical techniques in these injuries have not been determined.

The necessity to search for new and improve the existing effective methods of diagnostics and treatment of thoracoabdominal injuries is indisputable. New investigations should combine high informative value and low traumatic effect. Video-endosurgery techniques meet these requirements to a large extent.
In this regard, the aim of our study was to improve the results of diagnosis and treatment of patients with thoracoabdominal injuries by developing a rational

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treatment and diagnostic algorithm using modern minimally invasive techniques.

PURPOSE OF THE STUDY : Improving the diagnosis and treatment of patients with thoracoabdominal trauma

MATERIALS AND METHODS OF RESEARCH: Over a period of 6 years, 190 patients with thoracoabdominal injuries were treated in the emergency surgery department of the Andijan branch of the Republican Scientific Center for Emergency Medical Care from 2017 to 2022. The case histories of 122 (64.86%) patients (in the control group treated from 2017 to 2020), with thoracoabdominal injuries, in which diagnostic and treatment stages were carried out according to the conventional scheme, were retrospectively analyzed. In the main group there were 65 (35.14%) patients with thoracoabdominal injuries, who were treated from 2021 to 2022, and in whom the diagnostic and treatment algorithm we developed was carried out using new technologies.

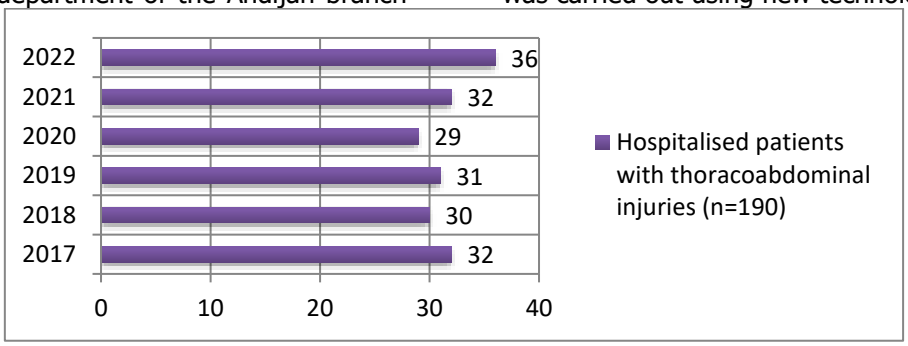

Figure1. Distribution of hospitalised patients with thoracoabdominal injuries by year.

The age of the patients ranged from 19 to 88 years. The largest group of patients was aged between 19 and 30 years - 73 patients (38.4%). There were 3.2 times more male than female patients, 76.3% versus 23.7% (Table 1).

Table 1

Age and sex distribution of patients

Group	**Sex**		**Age of patients**					**Total:**		
			19-30	31-40	41-50	51-60	61 и ст.			
Control group	M	N	38	20	18	11	9	96	122	64,2%
		%	20	10,5	9,5	5,7	4,7	50,5		
	w	N	8	6	6	2	4	26		
		%	4,2	3,1	3,1	1,0	2,1	13,7		
Core group	M	N	19	13	8	5	4	49	68	35,8%
		%	10	6,84	4,2	2,66	2,1	25,8		
	w	N	8	4	2	2	3	19		
		%	4,2	2,1	1,0	1,0	1,7	10		

According to the time of arrival, 48 (25,26%) patients were delivered within the first hour of injury, 93 (48,94%) from 1 to 3 h, 16 (8,42%) from 3 to 6 h, 31 (16,3%) after 6 h, and 2 (1,05%) were undetected. The nature and sequence of imaging studies were decided according to the clinical situation. The instrumental examinations were used both to confirm and documenting the nature of injury to the chest and abdomen, as well as diagnosing other complications of trauma, comorbidities, and the degree of compensation for the functions of various organs and systems. Stab wounds predominated in the mechanism of injury in 97 (51%) patients; lacerations with contusions in road traffic accidents in 49 (26%) patients, injuries with rib fragments in closed trauma in 44 (23%) patients.

Depending on the predominance of this or that symptomatology, three groups of patients with different characteristics of injuries were clearly distinguished: (1) the first group - patients with predominant symptoms of thoracic injuries - 66 (34.7%); (2) the second group - patients with predominant symptoms of abdominal injuries - 91 (47.9%); (3) the third group - patients with similar in complexity injuries of thoracic and abdominal cavities - 33 (17.4%) (Fig. 2).

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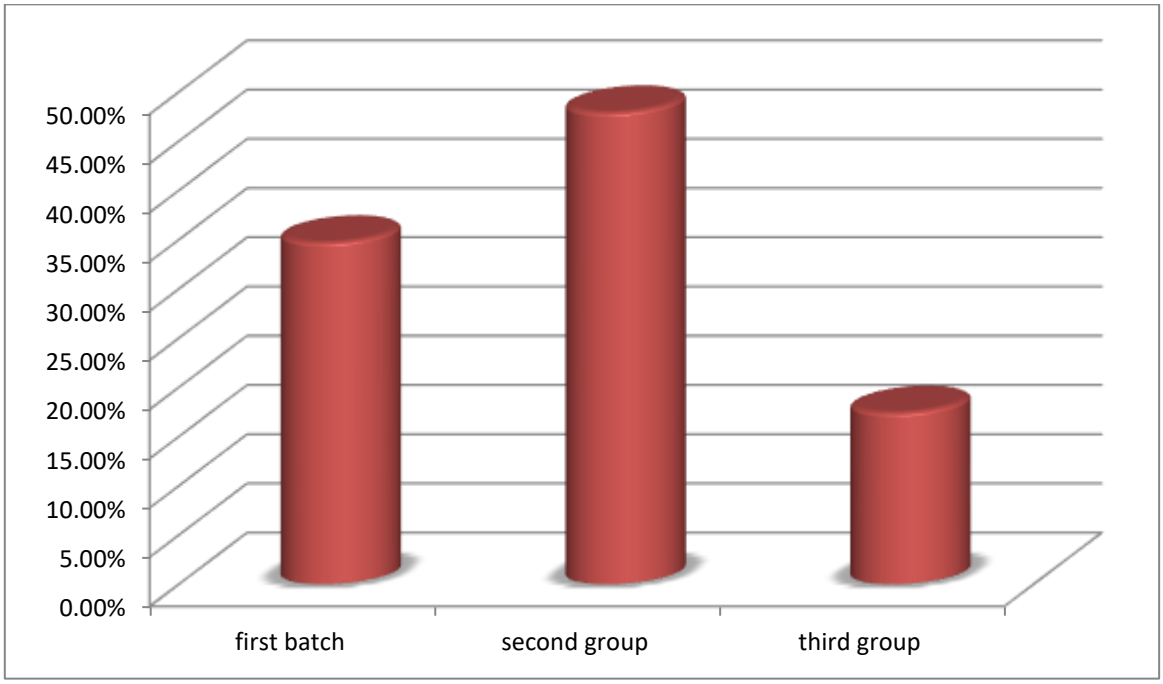

Fig.2. Characterization by symptomatology of patients with thoracoabdominal injuries.

A chest X-ray was used to diagnose the extent of the injury (except in extremely severe patients). X-rays were performed in the X-ray room of the emergency department or in the operating room using APELEM X-ray equipment.

To diagnose the dominant injury, ultrasound of abdominal, pleural and pericardial organs using DC-40 Mindray was performed in parallel.

The results of the clinical picture, chest and abdominal X-rays, primary surgical treatment and revision of the wound canal, ultrasound of the chest and abdominal organs allowed us to determine the surgical tactics and surgical access in 90% of cases.

Endoscopic examinations included diagnostic laparoscopy, thoracoscopy, and fibroesophagogastroduodenoscopy (FEGDS). Laparoscopy allowed to confirm, based on direct and indirect signs, not only the presence of blood in the abdominal cavity, but also to determine the source of bleeding, thereby determining the indication for abdominal surgery and surgical access. One of the leading diagnostic methods was emergency thoracoscopy, which was performed in 12 (6, 3%) patients upon admission and in 2 (1, 1%) in the postoperative period for diagnosis and treatment of complications.

Gastrointestinal tract lesions were detected and diagnosed by FEGDS in 13 (6.8%) patients. Mainly FEGDS was conducted in case of suspected wounds and ruptures of hollow organs of the gastroduodenal area, both in the preoperative period and intraoperatively.

General blood and urine tests were performed in all patients on admission to hospital. The remaining laboratory tests (electrolytes, PTI, coagulogram, clotting time, blood enzymes, control of general blood and urine tests) were performed individually during the hospitalisation of the patient.

Injuries to internal organs detected in the victims were also of a different nature. As can be seen from Table 2, the most frequent injuries were observed in the following organs: lungs, liver, spleen, omentum, stomach and large vessels. In our patients, lung and stomach, liver, small intestine and large intestine injuries were more often combined, with multiple traumas.

Table 2
Nature of damage to internal organs

Nature of damage	**Quantities**	**%**
No damage	**17**	**8,9**
Injury to the arteries of the chest wall	**27**	**14,2**

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Pericardial/cardiac injury	**3**	**1,6**
Lung injury/trauma	**42**	**22,1**
Wounds/injury to the diaphragm	**13**	**6,8**
Wounds/injuries to the liver (ruptured capsule, superficial wound up to 3 cm long and 1.5 cm deep, massive injury - lobe tear)	**31**	**16,3**
Injury/trauma to the spleen (rupture of the capsule, damage to the pole, damage to the gate area)	**23**	**12,1**
Gastric trauma/injury (inertial rupture of the visceral peritoneum of the stomach)	**16**	**8,4**
Injury/trauma to small intestine (non-tensioned mesenteric haematoma, rupture of visceral peritoneum, detachment of intestine from mesentery, direct wound)	**6**	**3,2**
Colon injury/trauma (mesenteric haematoma, serous membrane tear, mesenteric tear, direct wound)	**11**	**5,8**
Trauma to the gallbladder	**2**	**1,1**

On admission, 59 (31%) victims were in first-degree shock, 21 (11%) were in second-degree shock, and 31 (16.3%) were in third-degree shock.

The severity of the combined injury was assessed using the Injury SeverityScore (ISS), with a score of 17.8±4.9 in the control group and 18.2±4.2 in the main group.

RESEARCH RESULTS: Clinical experience has shown that to select the most rational treatment with consistent application of surgical and conservative measures, a classification and a certain therapeutic-diagnostic algorithm of actions, which serve as a guide for the actions of practitioners, are necessary.

In the course of our research, a therapeutic-diagnostic algorithm of actions was developed which serves as a guide for practical doctors, and new localizations of injuries and complications accompanying this trauma were proposed (certificate DGU No 18223 dated 24.08.2022 of the Agency for Intellectual Property under the Ministry of Justice of the Republic of Uzbekistan). According to the algorithm, all victims with thoracoabdominal injuries underwent wound canal revision followed by primary surgical wound care (PSCC). It should be noted that revision of the wound canal was performed in the emergency room in order to determine the penetrating nature of the wound into the cavity. In case of the penetrating character PCC was carried out in the operating room. It was carried out simultaneously with resuscitation measures, during anesthesia management. To diagnose the dominant injury of the abdominal and pleural cavity organs we performed ultrasound investigation, radiography of the thorax and abdominal cavity organs, used endoscopic methods of examination which helped define the surgical and operative access in 90% of cases.

The operative tactics depended on the nature and severity of the injury and the general condition of the victims. The volume of surgical interventions and accesses in victims with thoracoabdominal injuries and the volume of injuries were performed using the following combinations of accesses: (Table 3)

Table 3
Nature of surgical interventions and accesses

№	Type of access and extent of surgical intervention	Control group		Core group	
		Number of people affected	Number of patients in	Number of people affected	Number of patients

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		and surveyed	%	and surveyed	in %
1	Thoracotomy followed by laparotomy	9	4,7	4	2,1
2	Thoracophrenotomy	2	1,1	3	1,6
3	Laparotomy and pleural drainage without thoracotomy	18	9,5	7	3,7
4	The first stage is a laparotomy, the second a thoracotomy	9	4,7	2	1,1
5	Simultaneous thoracotomy and laparotomy	2	1,1	1	0,5
6	Thoracophrenolaparotomy	1	0,5		
7	Laparotomy	38	20	16	8,4
8	Thoracotomy	10	5,2	3	1,6
9	Laparoscopy	1	0,5	10	5,2
10	Thoracoscopy	0	0	8	4,2
11	Pleural drainage without thoracotomy	18	9,5	12	6,3
12	PCU	13	6,8	2	1,1
Total		122	64,2	68	35,8

Various operative interventions were performed in all patients. It follows from data in the table, firstly thoracotomy followed by laparotomy - 13 (6.8%); thoracotomy and frenotomy - 5 (2.6%) respectively; laparotomy and drainage of pleural cavity without thoracotomy - 25 (13.2%), firstly laparotomy, secondly thoracotomy - 11 (5.8%), thoracophrenolaparotomy-1 (0.5 %). Simultaneous thoracotomy and laparotomy were performed in 3 (1.6%) patients. At the same time, the operation was completed by minimally invasive access without thoraco-laparotomy or laparotomy in 19 (10%) patients. At the same time, it was possible to suture defects of various organs as well as of the diaphragm. Before endovideosurgical treatment methods were introduced the thoracic stage of the operation in 8 (4.2%) patients was limited to drainage of the pleural cavity. Thoracotomy in this category of patients was indicated in case of suspected injury to the heart or large vessels, or in case of continuous bleeding. It should be noted that diagnostic thoracoscopies and laparoscopies, regardless of the presence or absence of internal abdominal injuries, did not produce false negatives in all cases.

During diagnostic thoracoscopy (6(3,2%) of all operations, 8(4,2%) of all thoracoscopies) no thoracic organ pathology was detected in thoracoabdominal trauma, which was confirmed during the follow-up of patients and a true negative result was obtained.

During 2 (1.1%) diagnostic thoracoscopies, an indication for conversion of surgical access - massive intrapleural haemorrhage in stab wound of the chest and lung and in multiple lung injury - was identified. The described causes of massive bleeding were detected only during thoracotomy and did not allow visualisation of these injuries during endovideosurgical diagnostic surgery. Analysis of the results of our studies of endovideosurgical techniques in the diagnosis and treatment of patients with thoracoabdominal trauma (intraoperative, postoperative complications, mortality rate) and the results of operations by thoracotomy or laparotomy allowed us to reveal the degree of clinical effectiveness of endovideosurgical techniques. Thus, 18 (9,5%) out of 19 endovideosurgical diagnostic and treatment operations were considered to be efficient, 26,5% of the number of operations in the group II). Complications were registered in 38 cases (31,2% of the total number of operations, 74,6% of the number of operations in the control group I) and in 2 (2,9%) and 9 (7,4%) cases of lethal outcome respectively in the group of open surgical access.) Clinical effectiveness of endovideosurgical diagnostic and therapeutic operations was on the average 1,1 times higher than that of the open surgeries. Thus, the

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findings indicate a high degree of efficacy of endovideosurgical diagnosis in thoracoabdominal trauma. The results analysis has permitted to determine that endovideosurgical diagnostic methods in thoracoabdominal trauma provide on the average 1.09 times higher sensitivity, 1.68 times higher specificity, and 1.16 times higher accuracy.

The frequency and structure of postoperative complications in comparison between the groups is shown in Figure 3.

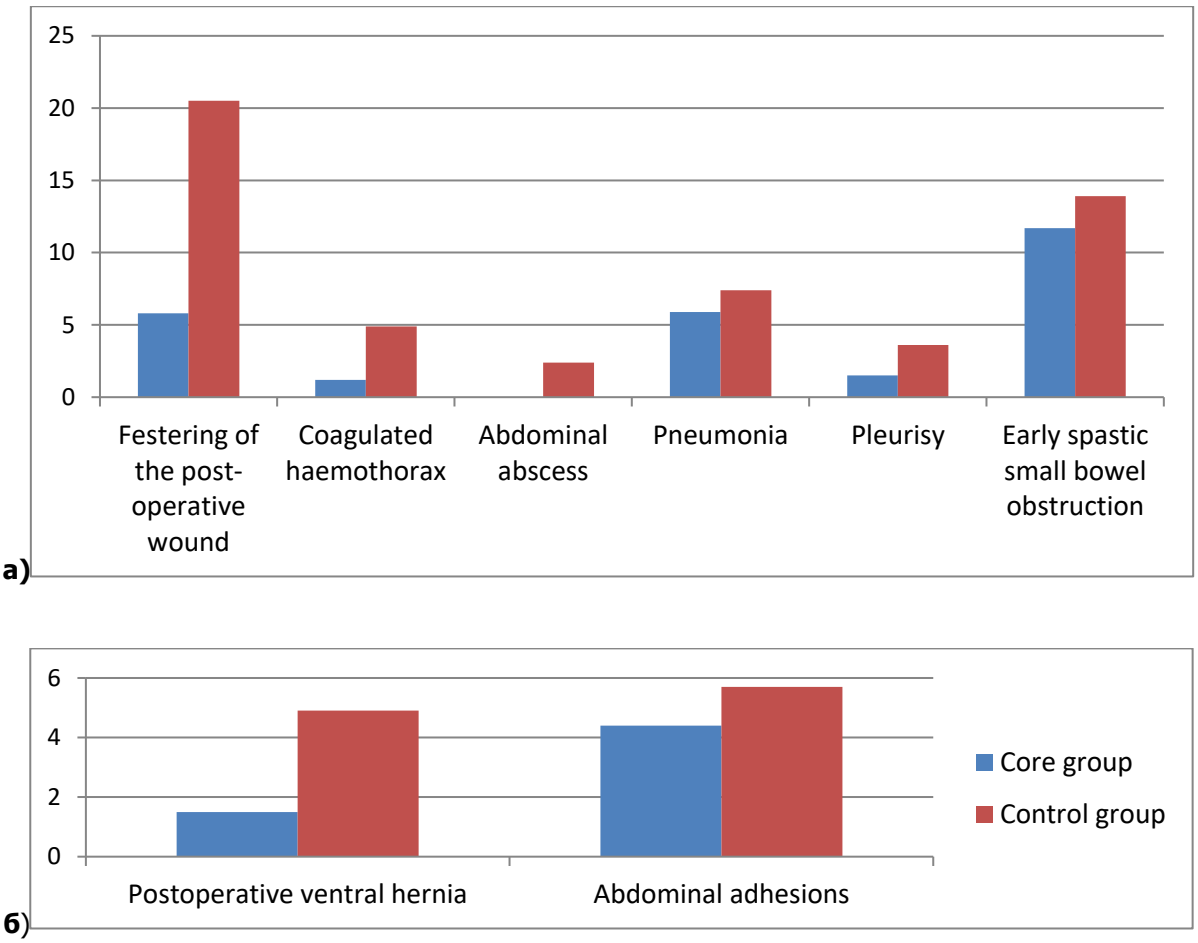

Fig.3. Complications of surgical treatment of victims with thoracoabdominal trauma. a-early postoperative complications; b-remote postoperative complications

A good clinical effect was achieved by treating patients in the main group of patients using endovideosurgical interventions. Thus, in the postoperative period, the pain syndrome was less pronounced, there was no need for long-term observation and treatment in the intensive care and reanimation unit. Besides, we revealed 32 % less postoperative complications (including early by 26,1 % and late by 5,9 %), good cosmetic effect, reduced an average stay in the hospital by 4,3±0,34 bed-days and decreased postoperative mortality by 11,7 %. There was no cosmetic defect on the chest and abdominal wall.

The mortality rate was one of the main indicators of the treatment outcome, which was 25.6%. 7 (6.4%) people died of shock, 13- (10.6%) of multiple organ failure, 5 (4.1%) - of TELA (Fig. 4.).

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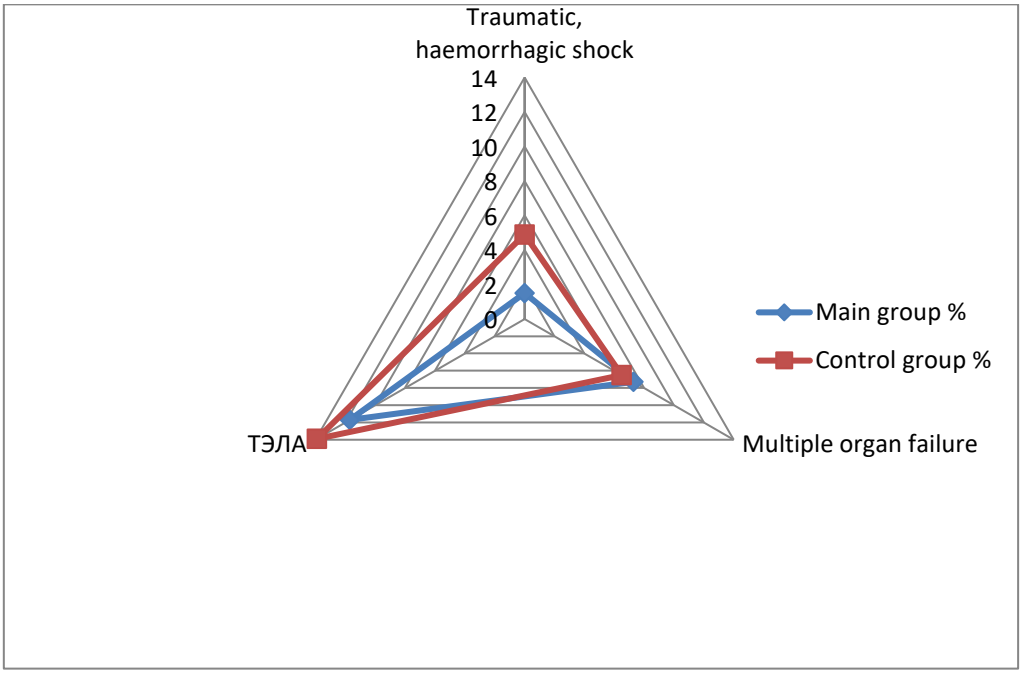

Figure 4. Causes of mortality in thoracoabdominal injuries

The success of any surgical treatment for thoracoabdominal wounds is determined by a number of objective circumstances and their indicators.

The most important of these are the amount of blood loss, the number and structure of postoperative complications, the mortality rate, and the duration of hospital treatment, reflecting the economic aspect of the problem. At the same time, to estimate the results reliably it is necessary to take into account the fact that the main and the control groups of the patients should be randomized in comparison.

Thus, the therapeutic and diagnostic algorithm and surgical tactics developed by us can be used in the diagnosis and treatment of thoracoabdominal trauma victims.

CONCLUSIONS: Application of the developed therapeutic and diagnostic algorithm makes it possible to reduce the number of unwarranted laparotomies (5.2%) or the consequent traumatism of the operation. Also, the clinical effectiveness of endovideosurgery in thoracoabdominal trauma is on average 1.1 times higher than the effectiveness of diagnostic and therapeutic surgical techniques using open surgical access.

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