


EFFICIENCY OF LAPAROSCOPY FOR PATIENTS SUFFERING FROM POLYTRAUMA WITH PREVAILING ABDOMINAL AND CHEST INJURIES

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The author analyses the results of diagnostics and treatment of 822 patients suffering from the polytrauma with the prevailing abdominal and thorax injuries. In 428 cases the laparoscopy has been used for diagnosing and treatment. In 150 (35%) cases, no significant injuries have been discovered, and the surgery ended with the abdominal drainage. In 162 (37.9%) cases the laparoscopic surgery was conducted, and in 116 (27.1%) cases the conversion (laparostomy) was done. Operative mortality was 5 (3%) cases.

Keywords: laparoscopy, surgery, injury, polytrauma.

Conference participants

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Introduction

Delivery of medical aid to the injured patients with the polytrauma with the prevailing abdominal and thorax injuries may assume high level of diagnostic errors, post-surgical complications, disability and mortality, which points out the need for further improvement of diagnostic algorithms and surgical treatment of this category of patients [Abacumov and co-authors, 2005; Yartsev and co-authors, 2008]. Minimally invasive operations have been widely applied in the foreign and national surgery during the last years. They have been used even more frequently for the patients with emergency surgical diseases due to the practical implementation of modern technologies. Enhanced life quality of patients, reduced time of their stay in the hospital, as well as the reduced time of their temporary disability and amount of complications are the important advantages of these surgeries.

The aim of our study was to enhance the health care efficiency for patients in case of polytrauma with the prevailing abdominal and thorax injury.

Methods and materials

We observed 822 injured patients with polytrauma with the prevailing pathology of abdominal and thorax injuries. The age of patients varied from 17 to 70. The average age was 43.5 ± 3.45 . There were 487 men (59.25%) and 335 women (40.75%). 281 patients had associated somatic dysfunctions. In particular, 103 patients (12.5%) suffered from the coronary

heart disease accompanied by diffuse and post-infarction cardiosclerosis; 62 patients (7.5%) had chronic bronchitis and pulmonary emphysema; 57 patients (6.9%) had diabetes mellitus; 38 patients (4.6%) had chronic pyelonephritis, and 21 patients (2.6%) – chronic cerebrovascular disorder.

A certain diagnosing algorithm was used, including the laboratory tests, U/S of abdominal cavity organs, multiple-view X-ray imaging, observation catheter setting, CT, MRI, and laparoscopy.

Bleeding of parenchymal organs was stopped by our patented method of U-shaped hemostatic suturing on the mesh implant Rebound HDR with the Nitinol frame. The mesh was introduced to the abdominal cavity through the laparoscopic port, after which it unfolded in the abdominal cavity immediately thanks to the Nitinol frame. Then the mesh was put on the diaphragmatic surface of liver, and a similar mesh – on the visceral surface of liver. U-shaped sutures were put on liver through the meshes. As the mesh was in constant tension due to the Nitinol frame, the suture pressure was spread uniformly over the mesh surface, which prevented the liver tissue from being cut with sutures. This ensured safe hemostasis. For better hemostasis we used fibrin glue TachoComb in combination with the framed mesh, which was applied to the section line and was put under the mesh to the section line. In the latter case the mesh performed the plugging and fixation function.

For the purpose of diagnosing the thorax injuries we used X-ray thorax imaging, computer tomography, and

magnetic resonance imaging. In some cases pleural puncture was done.

Upon detecting a considerable amount of blood in the pleural cavity, thoracoscopy was conducted. During the thoracoscopy we discovered the source of bleeding after the aspiration of blood and blood clots, followed by coagulation of bleeding vessels.

Thoracoscopy was conducted in 48 cases as follows: the patient lies in the lateral position on the healthy side on a roll placed between the 4th and 5th rib, which ensures maximum spreading of ribs from the intervention side and provides good visualization of the pleural cavity, all sections of diaphragm and mediastinum. Based on the data [Om and co-authors, 2005], it has 100% sensitivity, 97% specificity, and 98% accuracy. In order to introduce the thoracoscope we used a point in the fifth or sixth intercoastal space at the midaxillary line. After introducing the thoracoscope we also did two or three additional thorax sections, when necessary, and set ports for introduction of manipulators and instruments.

Results:

We analysed the results of diagnosing and treatment of 822 patients with polytrauma with the abdominal and thorax injuries. No major injuries were discovered in 190 patients during the examination, which allowed to treat them without surgery. In 204 cases major abdominal and thorax injuries were discovered during the examination, which served an indication for emergency laparotomy.

In 428 cases laparoscopic diagnosing was done to ascertain the diagnosis. In 150 out of 428 video laparoscopies no major abdominal injuries were discovered, and the intervention ended with the abdominal drainage. In 162 cases laparoscopic surgeries were done. During the laparoscopic surgeries we widely used electrocoagulation in different modifications for the purpose of bleeding control. Besides, to stop bleeding and achieve safe hemostasis we developed and implemented in practice a method of fixation of polypropylene and other kinds of meshes on an elastic Nitinol frame to the rupture line of parenchymal organs (patent dated December 26, 2011, No. 66396).

In some cases TachoComb was put under the mesh to the rupture line to ensure safe hemostasis.

In 41 cases, in the case of live injury degree III according to OIS (Organ Injury Scaling) with the subcapsular hematoma of over 25-50% of liver surface with the continued bleeding, the method of Nitinol frame-based mesh implant application was used. Hemostasis applied according to our methodology (application of a polypropylene mesh on an elastic Nitinol frame) turned out to be very effective in the cases of subcapsular hematomas with the continued bleeding and in the case of intrahepatic hematomas. No recurring bleeding was observed in any of 34 cases. Abdominal cavity was mandatorily drained in the dextral hypochondrium with PVC drainage.

For the purpose of mitigating the

risk of occurrence of irreversible shock and replenishing the circulating blood volume for patients with the apparent medium and heavy blood loss, we have widely used autohemotransfusions using Cell Saver 5 for 43 patients.

Cell Saver 5 allowed extending the list of indications for laparoscopy and laparoscopic surgeries even in case of hemoperitoneum of up to 1,500 ml, and limiting the scope of contraindications for laparoscopic interventions considerably, paying more attention to the state of hemodynamics and cardiovascular disorder. Based on our data we believe that the contraindications to laparoscopy in the case of abdominal injuries include terminal state of patients, multiple injuries of hollow organs, general purulent peritonitis, massive intra-abdominal bleeding (over 1,500 ml of blood), diaphragm injury, and certain combinations of injuries characterised by the crush injury of internal abdominal organs. Therefore, the use of laparoscopic technologies for abdominal injuries is appropriate. Wide diagnostic and treatment opportunities of the method determine not only its expediency, but also the need for the reasonable active surgical tactic. According to our data, laparoscopic surgeries allow to exclude unnecessary laparotomies, to perform a complete surgery in over a half of patients (62%) who need endovideolaparoscopic interventions.

As it does not seem to be possible to compare 162 patients who underwent laparoscopic surgery and 320 patients who underwent laparotomy due to a

different severity level of the general state of patients and different severity of their injuries, we took a group of 50 patients who underwent treatment before the introduction of laparoscopic surgeries and had the injuries of the degree not exceeding I-III according to OIS (which corresponds to the degree of abdominal and thorax injuries of the patients who underwent laparoscopic surgery) in order to evaluate efficiency of laparoscopic surgeries in case of polytrauma with the prevailing abdominal and thorax injuries. In order to assess the efficiency of laparoscopic surgeries we performed a comparative analysis of the duration of laparoscopic surgeries and similar surgeries in the control group of patients who underwent laparotomy. These data are shown in Table 1. Table 1 shows that the duration of video-laparoscopic intervention in most cases was shorter, because opening and closure of the laparotomic access takes more time.

The greatest differences between the video-laparoscopic and traditional laparotomic intervention are observed during the post-surgical period. Treatment duration in the intensive care unit after the video-laparoscopic surgery was 0.84 ± 0.4 days; for patients who underwent laparotomic surgery it was 1.20 ± 0.4 days ($p > 0.05$), and for patients who underwent curative laparotomy it was 2.60 ± 0.7 days. We should also consider the extended period of stay in the intensive care unit up to 3.08 ± 0.7 days in case conversion is needed.

Comparison of post-surgical complications in the control groups

Tab. 1.

Comparison chart of the duration of operative treatment of patients who underwent laparoscopy and laparotomy in the case of abdominal injury

Kinds of surgery	Time of surgery	
	Patients with laparoscopy	Patients with laparotomy
Surgeries in the case of liver injury degree 1-3 according to OIS	70.63±2.54	60±2.64
Surgeries in the case of spleen injury degree 1-2 according to OIS	51.38±1.88	73.25±3.75
Surgeries in the case of stomach injury	62±2.2	59.25±2.58
Surgeries in the case of small intestinal wound	52.88±1.82	48.63±1.82
Surgeries in the case of urinary bladder wound	46.88±0.65	65.38±1.28
Surgeries in the case of mesentery wound	53.38±1.91	55.25±1.26
Total patients	162	50

$p < 0.05$

Tab. 2.

Post-surgical complications of patients who underwent laparoscopic surgeries and laparotomy in the control group

Types of complications	Patients who underwent laparoscopic surgeries n=162	Patients who underwent laparotomy n=50
Bile leak	3	2
Pneumonia	5	6
Eventration	-	2
Post-operative wound infection	-	5
Trocar wound infection	4	
Cystitis	3	1
Total	15	16

p>0.05

Tab. 3.

Efficiency of laparoscopic surgeries compared to traditional surgeries

Group of patients	Number of patients	Average number of bed-days	Post-surgical complications	Mortality rate
Patients who underwent laparoscopic surgeries	162	5.64±0.4	15(9%)	5(3%)
Patients who underwent laparotomy	50	8.25±0.39	16(32%)	4(8%)

p<0.05

of patients is given in Table 2. Having combined these data, we received a reliable (p<0.05) difference of the advantage of laparoscopic surgeries as compared to laparotomic surgeries. Comparison data are given in Table 3.

Conclusions and prospects of further developments

1. It has been ascertained reliably (p<0.05) that the average bed-day after laparoscopic surgeries is less than that after laparotomic surgeries: 5.64±0.4 vs. 8.25±0.39 correspondingly. The average bed-day in the intensive care unit during the post-surgical period after laparoscopic surgeries also decreased to 0.84±0.4 days. Laparoscopic surgeries entail less post-surgical complications (9%) than laparotomic surgeries (32%). The mortality rate after laparoscopic surgeries decreased to 3%, while mortality in case of laparotomic intervention is 9%.

2. Our methods of laparoscopic bleeding control (in case of injury of parenchymal organs) using a polypropylene mesh allow extending the list of indications for laparoscopic surgeries and increasing their efficiency considerably.

3. The application of Cell Saver 5

allows to extend the list of indications for laparoscopic surgeries for patients with stable hemodynamics in case of concomitant abdominal injury, abdominal bleeding; it allows to improve the patient's state of health considerably, to reduce the time of surgery, and to decrease the risk of post-surgical complications and mortality. In some cases donor blood transfusion may be avoided, which allows to prevent transfusion complications and possible infection with the diseases transmitted through blood transfusion.

We plan to continue the development of the treatment and diagnosing algorithm and practical implementation of our methods of laparoscopic surgeries for the patients suffering from polytrauma with the prevailing abdominal and thorax injuries.

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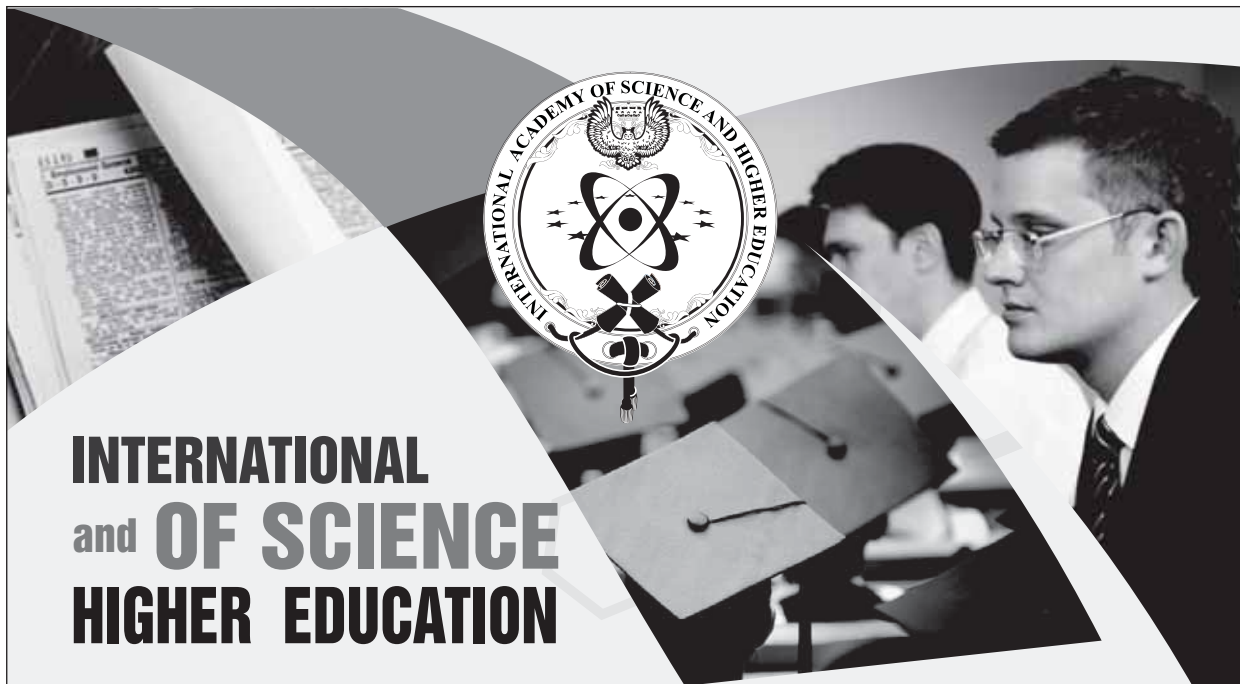
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