UDC 617.55-001:617-089.1-021.272
https://doi.org/10.31612/2616-4868.5.2025.07

SURGICAL TREATMENT OF ABDOMINAL INJURIES WITH COMBINED TRAUMA AND POLYTRAUMA: A COMPARATIVE ANALYSIS OF THE STRUCTURE AND COMPONENTS OF THE ABDOMINAL INTERVENTION PHASE (MESSAGE TWO)

Serhii I. Panasenko[1,2,3], Serhii O. Guriev[2], Volodymyr V. Nehoduiko[3,4], Nizar R. Kerbazh[1]

[1]Poltava State Medical University, Poltava, Ukraine
[2]State Institution «Ukrainian Scientific and Practical Center for Emergency Medical Care and Disaster Medicine of the Ministry of Health of Ukraine», Kyiv, Ukraine
[3]Military Medical Clinical Center of the Northern Region of the Command of the Medical Forces of the Armed Forces of Ukraine, Kharkiv, Ukraine
[4]Kharkiv National Medical University, Kharkiv, Ukraine

Abstract

Introduction. Blunt abdominal trauma is recognized as one of the leading causes of preventable death among people of working age. In Ukraine, the system of anatomical and functional prediction of the course of trauma, which determines the time, volume, and sequence of surgical interventions for each specific casualty, is considered to be the most advanced technology for the treatment of polytrauma in general, and particularly of combined thoracoabdominal trauma.
Aim. To research treatment tactics in patients with combined thoracoabdominal trauma through a retrospective expert analysis of the content of abdominal surgery for treatment of abdominal injuries.
Materials and methods. Through a retrospective expert analysis of the operative techniques used to address abdominal injuries in 2009 patients with combined thoracoabdominal trauma, we identified 21 key components of the abdominal intervention. These techniques were applied in 306 (15.2%) abdominal surgeries, which ranged from exploratory laparotomies to various resection procedures.
Results. It was found that 72 (23.5%) of the laparotomies were performed on an exploratory basis. No instances of nonoperative management of solid organs injuries or damage control procedures were observed. A comparative analysis of the distribution of surgical components between patients with combined thoracoabdominal trauma and those with polytrauma revealed a high level of consistency, with a statistically significant difference ($p < 0.01$).
Conclusions. Thus, within the broader clinical context, the system of anatomical and functional prediction played a crucial role in determining the approach for treating abdominal injuries in patients with polytrauma. The optimization of surgical management for abdominal injuries in combined thoracoabdominal trauma hinges on avoiding exploratory laparotomies and incorporating surgical strategies outlined in the concepts of nonoperative management of solid organ injuries and damage control surgery.

Keywords: **combined blunt abdominal trauma, abdominal intervention, combined trauma, polytrauma**

INTRODUCTION

Blunt abdominal trauma (BAT) is recognized as one of the leading causes of preventable death among people of working age [1]. In the last decade, two new medical concepts i.e., damage control (DC) and non-operative treatment of solid abdominal organs injuries (NTI) have played a key role in improving the results of severe polytrauma (PT) with BAT treatment [2, 3]. Although these concepts are considered opposed, they remain basic options when providing care in specialized trauma centers in developed economies. The principles of the above-mentioned concepts have been widely accepted in the Euro-Atlantic medical space among specialists in trauma surgery for a long time, while in Ukraine, these technologies have only begun to be implemented [4].

The concepts of DC and NTI are perceived by Ukrainian surgeons slowly and with mistrust because they violate the established standard surgical practice of one-moment definitive surgery for any hemoperitoneum. In Ukraine, the system of anatomical and functional prediction of the course of trauma, which determines the time, volume, and sequence of surgical interventions for each specific casualty, is considered to be the most advanced technology for the treatment of PT in general and particularly of the combined thoracoabdominal trauma (CTAT) [5].

AIM

To research treatment tactics in patients with CTAT through a retrospective expert analysis of the content of abdominal intervention for the correction of abdominal injuries.

MATERIALS AND METHODS

We reviewed 3,098 medical records of inpatients admitted to the polytrauma department of the Kyiv City Clinical Emergency Medical Hospital between 2002 and 2011. After excluding cases with isolated injuries and blunt combined trauma without thoracoabdominal involvement, the study focused on 2,009 (64.8%) cases of combined thoracoabdominal trauma (CTAT) out of all hospital admissions during the period. The severity of the injuries was objectively assessed using the Injuries of Mechanical Trauma in Military Field Surgery MFS-I(MT) scale, which allowed for reliable categorization of patients with polytrauma (PT). To compare the quantitative data on abdominal surgery components in the CTAT and PT groups, non-parametric statistical methods were applied, including Pearson's $\chi 2$ test and Kendall's concordance coefficient.

RESULTS AND DISCUSSION

The technology of anatomical and functional prediction of the course of trauma provided for the determination of various (depending on the specific system) functional parameters of the individual response to trauma with grading the severity of injuries. Subsequently, the comparison of functional and morphological parameters allowed us to stratify patients into three groups with «favorable», «doubtful» and «unfavorable» prognoses. For casualties from each of the specified groups, the most optimal type, volume, and term of surgical interventions were selected.

In compensated patients with a «favorable» prognosis, surgical treatment did not represent a particular risk. As a rule, abdominal surgeries consisted of a single full-volume intervention. Surgical interventions on other anatomical and functional areas (AFA) were performed consecutively during the same anesthesia.

In sub-compensated casualties with a relatively stable function of vital systems and a «doubtful» prognosis, the choice of surgical treatment tactics was carried out individually. During laparotomies, we refrained from radical surgical procedures, and in some cases, they were performed in a staged manner. Surgeries on other AFAs were performed sequentially with a gap in time after stabilization of vital signs.

In cases where the condition of the casualty was considered as decompensated with instability of vital functions and an «unfavorable» prognosis of the course of the traumatic process, surgical treatment was based on the principles of surgical tactics of DC.

As a result of the conducted retrospective cohort study, it was established that the consequences of treatment of patients with thoracoabdominal PT are unsatisfactory as the mortality rate among patients with a dominant extremely severe BAT was 75%. In a retrospective expert analysis of the content of the surgical procedure for abdominal injuries in 2009 patients with CTAT, we identified 21 components of the abdominal surgical intervention, which was performed in 306 (15.2%) abdominal surgeries (Table 1).

Analysis of the data presented in Table 1 showed that the distribution of components of abdominal surgical intervention in the groups of patients with CTAT and PT had a high consistency, and the revealed patterns were statistically significant ($p<0.01$). Thus, in the general clinical array, the system of anatomical and functional prediction of the course of injury significantly influenced the choice of diagnostic and treatment tactics for BAT in the group of patients with PT.

In all clinical situations, abdominal surgery was preceded by laparocentesis, including cases when the diagnosis of BAT was established by other diagnostic tests (sonography, CT). Laparocentesis was performed by a semi-open trocar method with an examination of the abdominal cavity by the explorative catheter. If the initial catheter diagnosis was negative, 400-500 ml of saline solution was injected into the abdominal cavity with a dynamic reassessment of the character of peritoneal cavity contents. In all cases, the surgical access was an upper-middle median laparotomy, which was expanded to a total median laparotomy if necessary. The abdominal surgical technique varied from abdominal exploration to resection methods.

According to Table 1, the most frequent component of abdominal surgery was a diagnostic revision of the extra-organ structures of the abdomen (mesentery, retroperitoneal fat, etc.), used in 145 (47.4%) cases. The second most frequent component of abdominal surgery was hemostasis due to bleedings from extra-organ structures – 122 (39.9%) cases.

Table 1

Types of the abdominal surgery in case of combined thoracoabdominal injury

The type of the abdominal surgery	CTAT		PT		Total	
	abs.	%	abs.	%	abs.	%
Revision of extra-organ structures	124	40,5	21	6,9	145	47,4
Hemostasis in extra-organ structures	102	33,3	20	6,5	122	39,9
Splenectomy	101	33,0	15	4,9	116	37,9
Hepatorrhaphy	67	21,9	16	5,2	83	27,1
Exploration	42	13,7	-	0,0	42	13,7
Enterorrhaphy	26	8,5	9	2,9	35	11,4
Omentorrhaphy	10	3,3	-	0,0	10	3,3
Nephrorrhaphy	5	1,6	2	0,7	7	2,3
Cholecystectomy	7	2,3	-	0,0	7	2,3
Colorrhaphy	4	1,3	1	0,3	5	1,6
Surgical treatment of abdominal wall wounds	4	1,3	-	0,0	4	1,3
Cystorrhaphy	1	0,3	3	1,0	4	1,3
Resection of the small intestine	2	0,7	2	0,7	4	1,3
Resection of the great omentum	2	0,7	1	0,3	3	1,0
Atypical liver resection	2	0,7	1	0,3	3	1,0
Nephrectomy	3	1,0	-	0,0	3	1,0
Gastrorrhaphy	3	1,0	-	0,0	3	1,0
Pancreatorrhaphy	3	1,0	-	0,0	3	1,0
Phrenorrhaphy	2	0,7	1	0,3	3	1,0
Splenorrhaphy	1	0,3	1	0,3	2	0,7

Note: χ^2=14,2222; w=0,7; p=0,00016.

Splenectomy was performed in 116 (37.9%) patients, and hepatorrhaphy was carried out in 83 (27.1%) cases.

The fifth most frequent manipulation was the exploratory laparotomy which did not include any surgical manipulations in the abdominal cavity – 42 (13.7%) cases.

The abdominal intervention consisted of one component in 102 (33.3%) cases, two components in 56 (18.3%) cases, three components in 76 (24.8%) cases, and four tactical and technical components were performed simultaneously in 30 (9.8%) cases of surgical procedures.

The low frequency of organ-preserving operations in cases of spleen injuries is noteworthy – only 2 (0.7%) cases, which reflects a significant dissonance with the available data. Laparostomy used in 1 (0.3%) case was not related to the DC tactics but to the significant damage to the colon.

Thus, no cases of using NTI and DC tactics were identified.

Additional qualitative analysis of the content of abdominal intervention allowed us to establish that 72 (23.5%) laparotomies were exploratory. At the same time, in 28 (9.2%) cases, a revision of extra-organ structures was performed, which in 18 (5.9%) cases subsequently required certain hemostatic measures. The volume of the hemoperitoneum varied between 300-500 ml. None of these cases revealed continuous bleeding, highlighting the need to develop criteria for preventing unnecessary exploratory laparotomies in PT.

CONCLUSIONS

The scope and nature of abdominal surgery in patients with combined abdominal trauma and polytrauma had significant differences, which was due to the use of the system of anatomical and functional prediction of the course of trauma.

Determining the scope of abdominal intervention based on the system of anatomical and functional prediction of the course of injury does not meet modern requirements for the treatment of abdominal injuries, as it causes a significant number (23.5%) of exploratory laparotomies and is practically not in line with non-operative treatment of injuries of solid organs and damage control techniques.

The obvious ways for optimizing the surgical treatment of combined abdominal trauma are the prevention of unnecessary exploratory laparotomies and the introduction of tactical surgical approaches declared in the non-operative treatment of injuries of solid organs and damage control concepts.

Prospects for further research. Tactical coordination of the abdominal intervention with chest surgery phase in casualties with dominant abdominal injury in combined thoracoabdominal trauma and polytrauma should be considered the main direction of improving treatment results.

COMPLIANCE WITH ETHICAL REQUIREMENTS

The study was conducted in accordance with the main provisions and Rules of humane treatment of patients in accordance with the requirements of the Tokyo Declaration of the World Medical Association, the International Recommendations of the Helsinki Declaration on Human Rights, the Council of Europe

Convention on Human Rights and Biomedicine, the Laws of Ukraine, the orders of the Ministry of Health of Ukraine and the requirements of the Medical Code of Ethics of Ukraine.

All patients included in the research signed a standardized informed consent to treatment, and the use of their medical data in the clinical investigation.

FUNDING AND CONFLICT OF INTEREST

The authors declare that they did not get any financial support from other people or organizations in order to conduct or publish the following work.

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

AUTHOR CONTRIBUTIONS

Panasenko S. O.[A, B, C, D]

Guriev S. O.[E, F]

Nehoduiko V. V.[D, E]

Kerbazh N. R.[D, E]

All authors reviewed the results and approved the final version of the manuscript.

REFERENCES

1. Fahmi KSE, Refaat DO, Ali KA, Elghafar MNA. Diagnostic Evaluation of Blunt Abdominal Trauma Scoring System (BATSS). Egyptian Journal of Hospital Medicine. 2022;86(1):871-6. https://dx.doi.org/10.21608/ejhm.2022.218041
2. Willms A, Güsgen C, Schwab R, Lefering R, Schaaf S, Lock J, et al. Status quo of the use of DCS concepts and outcome with focus on blunt abdominal trauma: A registry-based analysis from the TraumaRegister DGU®. Langenbecks Arch Surg. 2022;407(2):1-13. https://doi.org/10.1007/s00423-021-02344-0
3. Leppäniemi A. Nonoperative management of solid abdominal organ injuries: From past to present. Scandinavian Journal of Surgery. 2019 108(2):95-100. https://doi.org/10.1177/1457496919833220
4. Panasenko S. I. Torakoabdominal′na politravma iz dominuyuchym ushkodzhennyam hrudey (kliniko-epidemiolohichne, kliniko-eksperymental′ne ta klinichne doslidzhennya) [Thoracoabdominal polytrauma with dominant chest injury (clinical-epidemiological, clinical-experimental and clinical research)]: dys. … doktora med. nauk: 14.01.03 / S. I. Panasenko. – Kyyiv, 2018. – 369 s.
5. Guryev SO, Kushnir VA, Solovyov OS. Clinico–anatomical characteristic of the traffic trauma in the megapolis environment.Second report: anatomical verification of injuries. Klin Khir. 2022;89(11-12):28-33. https://doi.org/10.26779/2522-1396.2022.11-12.28

Резюме

ОПЕРАТИВНЕ ЛІКУВАННЯ ТРАВМ ЖИВОТА ПРИ ПОЄДНАНІЙ ТРАВМІ ТА ПОЛІТРАВМІ: ПОРІВНЯЛЬНИЙ АНАЛІЗ СТРУКТУРИ І КОМПОНЕНТІВ АБДОМІНАЛЬНОГО ОПЕРАТИВНОГО ПРИЙОМУ (ПОВІДОМЛЕННЯ ДРУГЕ)

Сергій І. Панасенко[1,2,3], Сергій О. Гур'єв[2], Володимир В. Негодуйко[3,4], Нізар Р. Кербаж[1]

[1]Полтавський державний медичний університет, м. Полтава, Україна
[2]Державний заклад «Український науково-практичний центр екстреної медичної допомоги та медицини катастроф Міністерства охорони здоров'я України», м. Київ, Україна
[3]Військово-медичний клінічний центр Північного регіону Командування Медичних сил Збройних сил України, м. Харків, Україна
[4]Харківський національний медичний університет, м. Харків, Україна

Вступ. Закрита травма живота визнана однією з основних причин смертності людей працездатного віку, якій можна запобігти. В Україні на даний час найбільш прогресивною технологією лікування політравми в цілому і поєднаної торакоабдомінальної травми зокрема, вважається система анатомо-функціонального прогнозування перебігу травми, яка визначає час, об'єм і послідовність оперативних втручань у кожного конкретного постраждалого.

Мета. Аудит лікувальної тактики у постраждалих із поєднаною торакоабдомінальною травмою шляхом ретроспективного експертного аналізу змісту абдомінального оперативного прийому при корекції травм живота.

Матеріали та методи. При ретроспективному експертному аналізі змісту оперативного прийому щодо корекції ушкоджень при закритій травмі живота у 2009 постраждалих із поєднаною торакоабдомінальною травмою ми виділили 21 компонент абдомінального оперативного прийому, який було виконано при 306 (15,2%) операціях на животі. Абдомінальний оперативний прийом варіював від експлорації живота до резекційних методик.

Результати. Було встановлено, що 72 (23,5%) лапаротомії мали експлоративний характер, а випадків застосування хірургічних технологій неоперативного лікування травм паренхіматозних органів живота та контролю ушкоджень не виявлено. Порівняльний аналіз розподілу компонентів абдомінального оперативного прийому у групах пацієнтів із поєднаною торакоабдомінальною травмою і торакоабдомінальною політравмою мав високу узгодженість і статистично значущу різницю ($p<0,01$).

Висновки. Таким чином, у загальному клінічному масиві система анатомо-функціонального прогнозування перебігу травми суттєво впливала на визначення лікувальної тактики щодо корекції закритої травми живота у групі постраждалих із політравмою. Оптимізація хірургічного лікування закритої травми живота при поєднаній торакоабдомінальній травмі полягає у запобіганні експлоративним лапаротоміям та запровадженні хірургічних тактичних підходів, декларованих у концепціях неоперативного лікування травм паренхіматозних органів живота та контролю ушкоджень.

Ключові слова: **закрита поєднана травма живота, абдомінальний оперативний прийом, поєднана травма, політравма**

Received: 13.03.2025
Accepted: 14.04.2025