

ANALYSIS OF ACUTE AND EARLY PERIODS COMPLICATIONS OF TRAUMATIC DISEASE IN SEVERE POLYTRAUMA

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Objective of the research is to assess the likelihood of complications in the acute and early periods of Traumatic Disease (TD) and primary condition and reserve capability of hemodynamic and homeostasis in patients with polytrauma.

Materials and methods. A retrospective study was carried out on 32 patients suffering from polytrauma. The group of the study included patients with the severity of injury according to the Injury Severity Score (ISS) more than 25 points and on a scale APACHE II 10–25 points at the time of admission. The estimated blood loss was 30–40 % of blood volume (BV). The individual assessment of blood loss was calculated by Moor.

Results. The study of 20 (62.5 %) men, 12 (37.5 %) women aged 18 to 60 years old (35.22 ± 12.66) were done. The mechanical ventilation was performed for 30 patients (93.75 %), and 2 patients (6.25 %) required oxygen therapy 5 lit per min for 3 days. The duration of mechanical ventilation was in 10 patients - up to 1 day, 8 patients – up to 3 days and at 12 – more than 3 days. Among 12 patients, who used AMV (artificial mechanical ventilation) more than 3 days, 10 patients were tracheostomy in 3d day and 2 patients were extubated on 4th day. Among the patients examined thirty patients (93.7 %) had posthemorrhagic anemia during first day of injury. Infectious complications like purulent tracheobronchitis and pneumonia were observed in 14 (43.75 %) patients. The local infectious complications (abscesses, festering wounds) occurred in 5 (15.6 %) patients and bedsores in 3 (9.375 %) patients. The catheterization of the bladder lead to the development of urinary tract infection in 3 patients (9.3 %).

Conclusion. The most problematic category of victims includes patients with injuries several anatomical regions. Pneumonia, anemia, urinary tract infection and local infectious complications were considered as the most common complications of acute and early periods TD. The factors that influenced the probability of a high degree of complications were AMV, the thoracic component of the injury, more massive blood loss, long-term catheterization of the bladder.

KEY WORDS: polytrauma, traumatic disease, complications, acute period, early period

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INTRODUCTION

On the average, 80–85 % of all deaths in Ukraine can be divided into three main classes of causes of death: cardiovascular diseases, cancer

and caraccidents, poisoning and injuries (impact of external factors) [1, 2].

The leading causes of combined trauma are road traffic accidents (38–65 %), falling from a height (24–32 %) and others (8–14 %) [3, 4].

According to data of the World Health Organization, Ukraine is one of the top 10 European countries with the highest mortality rate as a result of an accident, and 10 people out of 100 thousand people are the victims of traffic accident in Ukraine annually [5].

One of the main components why Ukraine falls behind developed countries is high level of mortality from external causes. The losses Ukraine suffers due to these causes of death are not lower, and in the age groups up to 70 years old – are much higher than the losses from oncological diseases. As for men under the age of 45 at risk of traumatic injuries more than cardiovascular diseases [6]. Considering the traffic safety data a steady mortality rate is known to have increased from 2014 to 2017.

In accordance with various authors, the total mortality of traumatized in Intensive Care Units (ICU) ranges from 5.5 to 10 %, while among patients with lesions in three anatomical sites, the mortality rate is 10–20 %. The highest hospital mortality is observed in victims with competing dominant injuries – 60 % [7, 8].

The structure of deaths from trauma accounts for 66 % of pre-hospital period. Also, a fairly high mortality rate is characteristic for the first 48 hours [9]. The main causes of early lethality in polytrauma are acute blood loss and shock (13.5 %) due to damage of the parenchymal organs of the abdominal cavity, kidneys, great vessels of chest, fractures with displacements of the anterior and posterior semicircles of the pelvis. «Brain death» occurs more often from edema and dislocation of the brain in victims with Trauma Brain Injury (TBI) (17.9 %) in the period from 1 to 3 days. Infection complications (pneumonia, purulent intoxications, sepsis) (28.9 %), and Multiple Organ Dysfunction (MODS)-37 % are more typical for the period till 4 days after trauma [10].

The maintenance of homeostasis in case of severe trauma is based on universal mechanisms, united by the concept of immune distress syndrome. The key links that trigger this reaction are: hypoxia caused by a violation of oxygen delivery to the tissues and an increase in their energy consumption; tissues damages. The most expressed metabolic changes occur on the 5–7-th days and are manifested by organ failure or MODS. Exactly the acute period of traumatic disease (TD) becoming crucial for the formation of the immune response. At the stage of early manifestations TD, the causes of SIRS initiation

followed by the formation of Multiple Dysfunction Syndrome is endogenous intoxication [11].

OBJECTIVE

Objective of the research is to assess the likelihood of complications in the acute and early periods of Traumatic Disease and primary condition and reserve capability of hemodynamic and homeostasis in patients with polytrauma.

MATERIALS AND METHODS

A retrospective study was carried out on 32 patients suffering from polytrauma, who were treated at the anesthesiology and intensive care unit (AICU) for patients with combined trauma in the Kharkiv City Clinical Hospital of Emergency Medicine in the period from 2015 to 2016.

All victims were divided into the groups considering body injured regions: head, chest, abdomen, and skeletal trauma. The group of the study included patients with the severity of injury according to the Injury Severity Score (ISS) more than 25 points and on a scale APACHE II 10–25 points at the time of admission. The patients with severe TBI – Glasgow Coma Scale (GCS \leq 13) were excluded from the study group. The estimated blood loss was 30–40 % of blood volume (BV). The individual assessment of blood loss was calculated by Moor [12]. The standard indicators of clinical and biochemical analyzes were evaluated. In addition, was estimated number and type of complications. Also, the incidence of purulent tracheobronchitis and pneumonia were analyzed depending on the severity of injury and using of artificial mechanical ventilation (AMV).

All patients received traditional intensive care according to the local clinical protocol of Polytrauma management (Dnipro, in 2016 a review by prof. H. Klyhunenko). Depending on the severity of the injuries and condition they were administered infusion-transfusion, analgesic, anti-inflammatory, antibacterial and metabolic drugs, was provided prevention of gastrointestinal ulcers.

All the data were processed by methods of mathematical statistics and presented as: mean \pm standard deviation.

RESULTS

The study of 20 (62.5 %) men, 12 (37.5 %) women aged 18 to 60 years old (35.22 ± 12.66) were done. The causes of polytrauma were car accidents – in 20 (62.5 %) patients, falling from the height – 8 (25 %) and domestic trauma – 4 (12.5 %).

The most of the patients arrived at the hospital rather quickly. 23 (71.8 %) patients were delivered to hospital for 1 hours from the time of injuries, 6 (18.7 %) – for 2 hours, and 3 (9.3 %) – late than 2 hours.

The structure of Multiply injuries included:

- 13 patients with closed chest injury and skeletal trauma,
- 2 patients with closed abdominal trauma and pelvis trauma,
- 5 patients with closed abdominal and skeletal trauma,
- 1 patient with closed chest injury, closed abdominal trauma and pelvis trauma,

- 4 patients with closed chest injury, pelvis trauma, and skeletal trauma,

- 2 patients with closed abdominal injury, pelvis trauma and skeletal trauma.

The severity of injuries graded by the ISS scale was 26.84 ± 4.1 . The level of consciousness by the GCS was 13.5 ± 0.5 points. In assessing the severity scale for patients with APACHE II was 14.97 ± 2.78 points. The degree of blood loss in the surveyed group corresponded to the III class according to the classification of the American college of surgeons and amounted to 35.21 ± 4.52 % of the BV (tab. 1).

Table 1

The characteristics of the victims

Investigated index	Retrospective group
The total number of patients	(n = 32)
Gender composition	
Male	20 (62,5 %)
Female	12 (37,5 %)
Middle age, years	$35,22 \pm 12,66$
Body weight, kg	$73,84 \pm 11,86$
ISS, point	$26,84 \pm 4,1$
GCS, point	$13,5 \pm 0,5$
APACHE-II, point	$14,97 \pm 2,78$
Blood loss, %	$35,21 \pm 4,52$

Most of the patients required support of the respiratory function (tab. 2). The mechanical ventilation was performed for 30 patients (93.75 %), and 2 patients (6.25 %) required oxygen therapy 5 lit per min for 3 days. The duration of

mechanical ventilation was in 10 patients – up to 1 day, 8 patients - up to 3 days and at 12 – more than 3 days. Among 12 patients, who used AMV more than 3 days, 10 patients were tracheostomy in 3d day and 2 patients were extubated on 4th day.

Table 2.

Distribution of the patients depending on the type of respiratory support

The type of respiratory support	Duration	Number, n	Tracheostomy	ISS, point	GCS, point	APACHE II, point	Amount of blood loss, ml
Oxygen therapy without AMV	up to 3 days	2	0	22 ± 0	14 ± 0	$11,5 \pm 0,7$	2229 ± 24
AMV	within 1 day	10	0	$24 \pm 1,94$	$13,9 \pm 0,3$	$13,5 \pm 2,83$	$2351,7 \pm 147,52$
	up to 3 days	8	0	$25,75 \pm 2,49$	$13,38 \pm 0,52$	$15,25 \pm 2,12$	$2237 \pm 162,15$
	more than 3 days	12	10	$30,75 \pm 3,36$	$13,16 \pm 0,34$	$16,58 \pm 2,27$	2912 ± 88

Pneumonia, anemia, urinary tract infection and local infectious complications were considered as the most common complications of acute and early periods of TD.

Among the patients examined thirty patients (93.7 %) had posthemorrhagic anemia during first day of injury. On the 3rd day the number of patients with anemia slightly decreased to 25

(78.1 %). On the 5th day – it became for 13 (50 %), and by the end of the early period TD it decreased to 3 (9.3 %) people. Anemia was occurred in the case of hemoglobin decrease less than 100 g/l, which affected on postponed orthopedic correction schedule.

Infectious complications like purulent tracheobronchitis and pneumonia were observed in 14 (43.75 %) patients. The factor that influenced the probability of a high degree of complications was AMV. All of the patients with pneumonia and purulent tracheobronchitis were performed AMV for 3 days or more, which was due to the presence of the thoracic component of the injury and more massive blood loss (2770 ± 354 ml). Unlike the patients who did not have infectious pulmonary complications and had ISS of 23.94 ± 2.04 points, the middle score by the ISS scale for the group with complications was 30.35 ± 3.27 points. The severity of the patients with complications according to APACHE II scale was 16.93 ± 1.98 points, in contrast to the patients without these complications – 13.4 ± 2.4 points.

The local infectious complications (abscesses, festering wounds) occurred in 5 (15.6 %) patients and bedsores in 3 (9.375 %) patients. The catheterization of the bladder lead to the development of urinary tract infection in 3 patients (9.3 %). Patients in this group were characterized by long-term catheterization of the bladder (longer than 3 days) associated with the damage of the pelvic bones with rotational and vertical instability and the complete rupture of the pelvic ring. 4 patients had no complications, one complication was observed in 59.3 % (19 patients), two – in 18.7 % (6 patients), and three – in 9.3 % (3 patients).

DISCUSSION

The most problematic category of victims includes patients with injuries several anatomical regions. On the one hand, each site requires the correction of its anatomical integrity. On the other hand, these lesions lead to severe physiological changes and almost depletion of the physiological reserve. It can prevent the definitive surgical recovery of all injuries simultaneously. According to the principles of «damage control» balance between anatomical and physiological restoration always occurs.

This study describes the clinical characteristics and outcomes for patients admitted to the AICU for patients with combined trauma in the Kharkiv City Clinical Hospital of Emergency Medicine after

traumatic injury. We found that hospital complications developed in more than half of the cases and associated with a higher severity of injury (ISS 26.84 ± 4.1) and more massive blood loss (2770 ± 354 ml). It was established that the most common complications of acute hospital period of TD with combined trauma were pneumonia (43.75 %), anemia (93.75 %), urinary tract infection (15.6 %) and local infectious complications (9.375 %). This is similar to the experience of Pankov I.O. [13].

Meghan Prin and Guo Hua Li described lower level of complications such as pneumonia and urinary tract infections in trauma patients treated in intensive care units in the United States, 2013 [14]. However, the data of Khubutia and Shabanov demonstrate a significantly higher level of pulmonary complications [15]. In our study the level of posthemorrhagic anemia and local infectious complications is comparable to the data of Perm State Medical University [16] and Ong AW [17].

The factors that influenced the likelihood of a high degree of complications can be considered – severe primary injuries, severe massive blood loss, long period of AMV.

The main task of resuscitation and intensive care in treating TD should be the restore vital functions of the body so they can be ready to performing urgent and postponed surgeries. The actual factor nowadays is searching for the ways to improve Intensive Care. That will reduce the number of complications and optimize the order of surgery correction

CONCLUSION

The most common complications of acute and early periods of TD with combined trauma were pneumonia, anemia, urinary tract infection and local infectious complications.

The severe primary injuries, severe massive blood loss, long period of AMV can be considered. The factors that influenced the likelihood of a high degree of complications.

The main task of resuscitation and intensive care in treating TD should be the restore vital functions of the body so they can be ready to performing urgent and postponed surgeries. The actual factor nowadays is searching for the ways to improve Intensive Care. That will reduce the number of complications and optimize the order of surgery correction.

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АНАЛІЗ УСКЛАДНЕНЬ ГОСТРОГО ТА РАНЬОГО ПЕРІОДУ ТРАВМАТИЧНОЇ ХВОРОБИ ПРИ ПОЛІТРАВМІ

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Метою даного дослідження є оцінка ймовірності ускладнень в гострому і ранньому періодах травматичної хвороби (ТБ) і первинного стану, а також резервних можливостей гемодинаміки і гомеостазу у пацієнтів з політравмою.

Матеріали та методи. Ретроспективне дослідження було проведено на 32 пацієнтах, що страждають політравмою. До групи дослідження увійшли пацієнти з тяжкістю травми згідно шкали Injury Severity Score (ISS) більше 25 балів і за шкалою APACHE II на 10–25 балів на момент надходження. Передбачувана крововтрата становила 30–40 % об'єму циркулюючої крові (ОЦК). Оцінювали стандартні показники клінічних та біохімічних аналізів. Аналізували частоту розвитку ускладнень.

Результати. Було проведено дослідження 20 (62,5 %) чоловіків, 12 (37,5 %) жінок у віці від 18 до 60 років (35,22 ± 12,66). Механічна вентиляція була виконана 30 пацієнтам (93,75 %), а 2 пацієнтам (6,25 %) потрібна була киснева терапія 5 л / хв протягом 3 днів. Тривалість штучної вентиляції легенів склала у 10 пацієнтів – до 1 дня, у 8 пацієнтів – до 3 днів і у 12 – понад 3 дні. Серед 12 пацієнтів, які використовували ШВЛ більше 3 днів, 10 пацієнтів були трахеостомовані на 3-й день і 2 пацієнти були екстубовані на 4-й день. Серед обстежених пацієнтів 30 (93,7 %) мали постгеморагічну анемію

протягом першого дня травми. Інфекційні ускладнення, такі як гнійний трахеобронхіт і пневмонія, спостерігалися у 14 (43,75 %) пацієнтів. Місцеві інфекційні ускладнення (абсцеси, гнійні рани) мали місце у 5 (15,6 %) пацієнтів і пролежні у 3 (9,375 %) пацієнтів. Катетеризація сечового міхура ускладнилася розвитком інфекції сечовивідних шляхів у 3 пацієнтів (9,3 %).

Висновок. Найбільш проблемна категорія постраждалих включає пацієнтів з травмами кількох анатомічних областей. Пневмонія, анемія, інфекція сечовивідних шляхів і місцеві інфекційні ускладнення вважалися найбільш поширеними ускладненнями гострого та раннього періодів ТБ. Факторами, що вплинули на ймовірність високого ступеня ускладнень, були ШВЛ, наявність торакального компонента травми, більш масивна крововтрата, тривала катетеризація сечового міхура.

КЛЮЧОВІ СЛОВА: політравма, травматична хвороба, ускладнення, гострий період, ранній період

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АНАЛИЗ ОСЛОЖНЕНИЙ ОСТРОГО И РАННЕГО ПЕРИОДОВ ТРАВМАТИЧЕСКОЙ БОЛЕЗНИ ПРИ ПОЛИТРАВМЕ

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Целью данного исследования является оценка вероятности осложнений в остром и раннем периодах травматической болезни (ТБ) и первичного состояния, а также резервных возможностей гемодинамики и гомеостаза у пациентов с политравмой.

Материалы и методы. Ретроспективное исследование было проведено на 32 пациентах, страдающих политравмой. В группу исследования вошли пациенты с тяжестью травмы согласно шкале Injury Severity Score (ISS) более 25 баллов и по шкале APACHE II на 10–25 баллов на момент поступления. Предполагаемая кровопотеря составляла 30–40 % объема циркулирующей крови (ОЦК). Оценивали стандартные показатели клинических и биохимических анализов. Анализировали частоту развития осложнений.

Результаты. Было проведено исследование 20 (62,5 %) мужчин, 12 (37,5 %) женщин в возрасте от 18 до 60 лет ($35,22 \pm 12,66$). Механическая вентиляция была выполнена 30 пациентам (93,75 %), а 2 пациентам (6,25 %) потребовалась кислородотерапия 5 л/мин в течение 3 дней. Длительность искусственной вентиляции легких составила у 10 пациентов – до 1 дня, у 8 пациентов – до 3 дней и у 12 – более 3 дней. Среди 12 пациентов, которые использовали ИВЛ более 3 дней, 10 пациентов были трахеостомированы на 3-й день и 2 пациента были экстубированы на 4-й день. Среди обследованных пациентов 30 (93,7 %) имели постгеморрагическую анемию в течение первого дня травмы. Инфекционные осложнения, такие как гнойный трахеобронхит и пневмония, наблюдались у 14 (43,75 %) пациентов. Местные инфекционные осложнения (абсцессы, гнойные раны) имели место у 5 (15,6 %) пациентов и пролежни у 3 (9,375 %) пациентов. Катетеризация мочевого пузыря осложнилась развитием инфекции мочевыводящих путей у 3 пациентов (9,3 %).

Заключение. Наиболее проблемная категория пострадавших включает пациентов с травмами нескольких анатомических областей. Пневмония, анемия, инфекция мочевыводящих путей и местные инфекционные осложнения считались наиболее распространенными осложнениями острого и раннего

периодов ТБ. Факторами, повлиявшими на вероятность высокой степени осложнений, были ИВЛ, наличие торакального компонента травмы, более массивная кровопотеря, длительная катетеризация мочевого пузыря.

КЛЮЧЕВЫЕ СЛОВА: политравма, травматическая болезнь, осложнения, острый период, ранний период

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