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COMPARATIVE ASSESSMENT OF THE HOSPITAL LETALITY STRUCTURE DURING SEVERE MECHANICAL INJURY FOR 2005–2006 AND 2014–2015 YEARS

Abstract. The article provides a comparative assessment of data from 131 medical histories and autopsy protocols for those who died from severe mechanical trauma in 2005–2006 in the combined trauma unit of the medical institution “9th City Clinical Hospital” in Minsk with data on 133 case histories and autopsy reports of dead from severe mechanical injury in 2014–2015 in the combined trauma unit of the “City Clinical Emergency Hospital in Minsk”. During the study, general patterns and differences in the structure and dynamics of mortality in combined injuries were determined, which allows us to scientifically substantiate organizational measures to improve medical care for severe mechanical injuries in order to improve the results of diagnosis and treatment of victims at an early hospital stage.

Keywords: severe mechanical trauma, combined injury, polytrauma, mortality, scale assessing the ISS severity

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СРАВНИТЕЛЬНАЯ ОЦЕНКА СТРУКТУРЫ ГОСПИТАЛЬНОЙ ЛЕТАЛЬНОСТИ ПРИ ТЯЖЕЛОЙ МЕХАНИЧЕСКОЙ ТРАВМЕ ЗА 2005–2006 И 2014–2015 гг.

Аннотация. В статье проводится сравнительная оценка данных 131 истории болезни и протоколов вскрытия умерших от тяжелой механической травмы в 2005–2006 гг. в отделении сочетанной травмы УЗ «9-я городская клиническая больница» г. Минска с данными 133 историй болезни и протоколов вскрытия умерших от тяжелой механической травмы в 2014–2015 гг. в отделении сочетанной травмы УЗ «Городская клиническая больница скорой медицинской помощи» г. Минска. В ходе исследования определены общие закономерности и различия в структуре и динамике летальности при сочетанной травме, что позволяет научно обосновать организационные мероприятия по совершенствованию медицинской помощи при тяжелых механических повреждениях с целью улучшения результатов диагностики и лечения пострадавших на раннем госпитальном этапе.

Ключевые слова: тяжелая механическая травма, сочетанная травма, политравма, летальность, шкала оценки тяжести травмы ISS

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Introduction. One of the most pressing problems of modern medicine is the treatment of patients with severe mechanical injury. Hospital mortality with combined trauma still remains at a fairly high level and, according to various authors, ranges from 20 to 60 %. According to WHO statistics, mortality in polytrauma is 11–70 %, and disability 12–66 %. Most victims with combined trauma die at the scene of the accident or during the first days after admission. The main causes of early mortality are swelling and dislocation of the brain, shock and blood loss. After 4 or more days the main causes are infectious complications [1–3].

A major role in the diagnosis and saving the life of the victim is played by time. The speed and quality of diagnostic and therapeutic measures are fundamental in helping victims. Particular attention in case of combined trauma is given to an objective assessment of the severity of the victims conditions and the treatment of, first of all, injuries that threaten the life of the patient – dominant [4–8]. There are no two similar patients with polytrauma; the number of combinations of damage to the anatomical regions and the severity of damage during combined trauma is staggering [9–11]. However, in order to improve the results of treatment, it is necessary to search for general patterns in the formation of optimal tactics in the diagnosis and treatment of patients with severe mechanical trauma.

The aim of the study was to analyze the mortality rate and compare the quality of medical care at an emergency department for victims with severe mechanical trauma in 2005–2006 and in 2014–2015, outline ways to reduce mortality.

Materials and research methods. The article is based on a comparative analysis of 131 case histories and autopsy protocols for those who died from severe mechanical trauma in 2005–2006 in the combined trauma unit of the 9th City Clinical Hospital in Minsk and 133 case histories and autopsy reports of deaths from severe mechanical trauma in 2014–2015 in the combined trauma unit of the City Clinical Emergency Hospital in Minsk. The victims were divided into 2 groups: I (control) – who died in 2005–2006, II (main) – who died in 2014–2015.

The term "polytrauma" was understood as the totality of injuries of two or more anatomical areas of the body while one of them or their combination was an immediate threat to the life of the victim. In assessing the severity of an injury, the generally accepted international ISS (Injury Severity Score) scale was used, which allows a high degree of certainty to objectively express the severity of combined injuries in numbers [12–14]. Thus, the inclusion criteria were defined as: damage by one or more mechanical traumatic agents within two or more anatomical areas of the body and the severity of damage on the ISS ≥ 17 scale. Exclusion criteria were: monoblastic lesions and multidimensional with severity injuries on an ISS scale <17.

Results and its discussion. A particularly important indicator that can characterize the effectiveness of the treatment of polytrauma is mortality. The number of victims and deaths from combined injuries by groups, as well as mortality are presented in Tab. 1.

Table 1. **Real mortality from combined injury in groups**

Indicator	I (2005–2006)	II (2014–2015)
Amount with associated injury	467	449
Died (absolute numbers)	131	133
Mortality, %	28.1	29.6

Thus, the real mortality rate during combined trauma from 2005 to 2015 remained practically unchanged and averaged 28.8 %.

Interestingly, over the studied period, a change in the structure of injuries occurred due to the circumstances of the injury. So, if in 2005–2006 the majority of those killed as a result of severe mechanical injury were due to an accident, then in 2014–2015 another circumstance comes first – fall from a height. The distribution of deaths with combined trauma due to the circumstances of the injury is presented in Tab. 2.

Table 2. **Distribution of deaths with combined injury due to the circumstances of the injury**

Cause of injury	Number of dead (2005–2006)		Number of dead (2014–2015)	
	absolute	%	absolute	%
RTAs	60	45.8	35	26.3
Catatrauma	48	36.6	71	53.4
Crime (beating)	16	12.2	20	15.1
Train injury	2	1.6	3	2.2
Work injury	5	3.8	4	3.0
Total	131	100	133	100

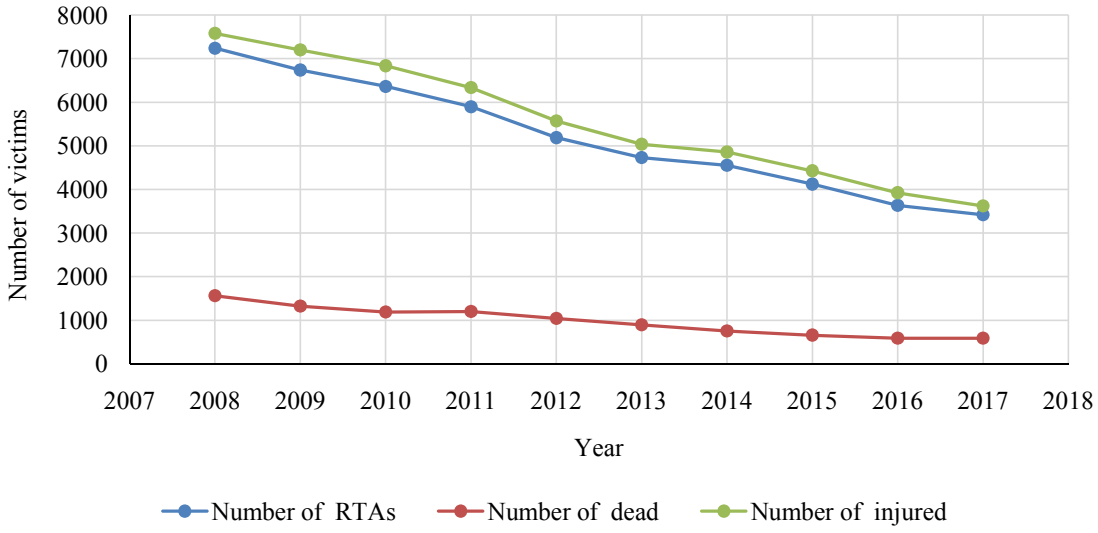

Fig. 1. The dynamics of the number of accidents, dead and wounded

Road traffic injuries are one of the leading causes of direct death of people from injuries due to road traffic accidents (RTAs). Belarus is a country that has been successful in reducing deaths as a result of road accidents, achieved this by improving legislation, as a result of intensified interagency cooperation, including traffic police units with road and municipal organizations into matters of maintaining a street – road network, accident analysis with determining the location of road accident concentrations, monitoring the condition of roads and vehicles, strengthening control over compliance with traffic rules, improving the quality of medical care who gave. The dynamics of the number of accidents, fatalities and injuries from 2008 to 2017 shown in Fig. 1.

About 80 % of accidents occur in the country every year through the fault of drivers, more than 25 % of them occur in accidents involving people under 23 years of age. One of the main causes of road crashes is driving while intoxicated. The level of alcohol in the blood reaching 0.1 ‰ increases the risk of an accident three times, compared with the level of 0.05 ‰. Accidents committed through the fault of drunk drivers have particularly severe consequences. In most incidents, innocent people suffer for this reason. Significant successes have been achieved in reducing accidents involving drunk drivers, but so far, they have not been able to completely get rid of this problem. Statistics of accidents caused by drunk drivers from 2008 to 2017 presented in Fig. 2.

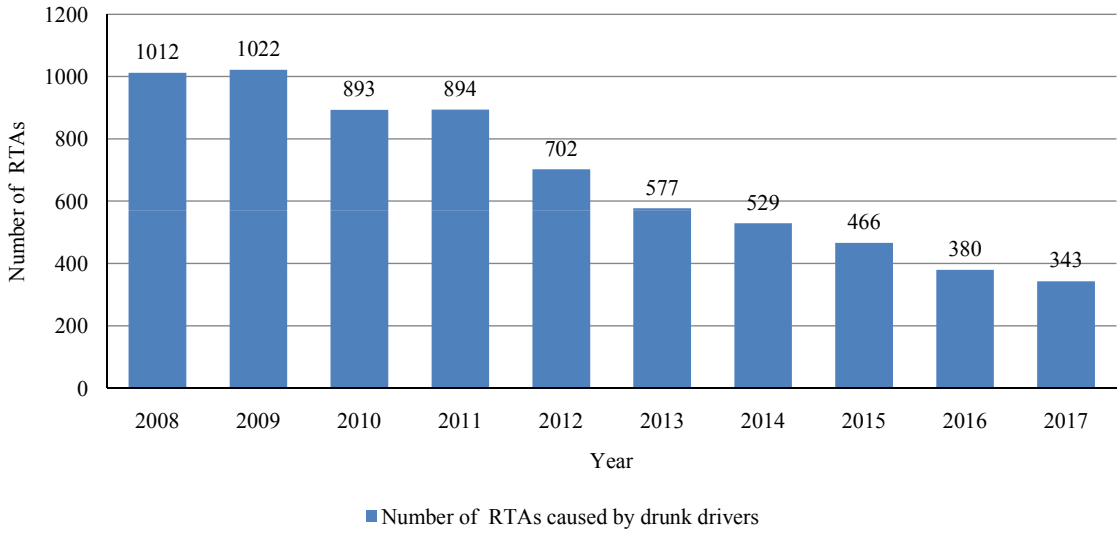

Fig. 2. Statistics of RTAs caused by drunk drivers

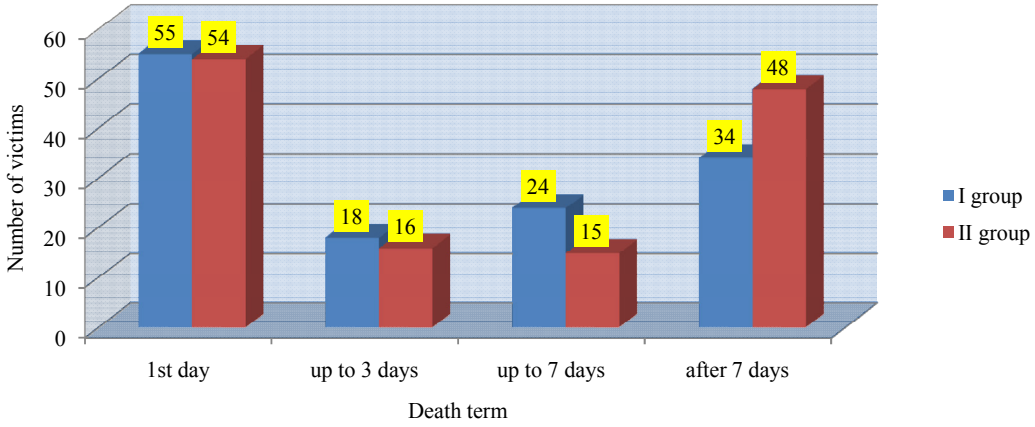

Fig. 3. The distribution of patients by death

The situation with fall from a height is quite acute. It occupies a significant part in the structure of mortality in severe mechanical trauma. This is mainly due to the large number of suicides in the Republic of Belarus. The latest WHO report used statistics for 2016–2042 people died by suicides in our country. 26.2 suicide cases per one hundred thousand people make it 5th highest worldwide. The main way to commit suicide is by hanging, which is 50 % of self-inflicted deaths. The number of deaths resulting from fall from a height is up to 30 % of the total.

Among the victims, men predominated in both groups. The sex distribution was as follows: in group I there were 94 men (71.7 %) and 37 women (28.3 %), in group II there were 91 men (68.4 %) and 42 women (31.6 %). Most often, people of working age from 20 to 60 years old died from severe mechanical injuries: in group I – 88 people out of 131 (67.2 %), in group II – 90 people out of 133 (67.7 %). In 49 people (37.4 %) from group I alcohol intoxication was detected, from II – in 74 (55.6 %).

The number of deaths during the first days from the moment of admission in group I was 55 (42 %), of which 27 (20.6 %) died during the first 3 hours, up to three days – 18 (13.7 %), up to 7 days – 24 (18.3 %). The number of resuscitation "long–livers" (died after 7 days) – 34 (26 %). In group II – during the first days from the moment of receipt – 54 (40.6 %), of which during the first 3 hours – 36 (27.1 %), up to three days – 16 (12.0 %), up to 7 days – 15 (11.3 %), after 7 days – 48 (36.1 %). The distribution of the deaths, depending on the timing of the lethal outcome, is shown in Fig. 3.

As can be seen from the above data, the number of resuscitation "long-livers" has increased, which indicates the improvement of the healthcare organization, the improvement of the quality of diagnosis and timely started and continuous intensive care. Those who died within the next 3 hours and during the first day had, as a rule, critical injuries, the survival of which was initially regarded as dubious (ISS ≥ 50). The distribution of the dead depending on the severity of the damage is presented in Tab. 3.

T a b l e 3. **Distribution of deaths depending on the severity of the damage**

ISS scores	Number of dead (2005–2006)		Number of dead (2014–2015)	
	absolute	%	absolute	%
Up to 20	10	7.6	9	6.8
21–35	45	34.4	35	26.3
36–50	28	21.4	27	20.3
Over 50	48	36.6	62	46.6
Total	131	100	133	100

The largest group of dead was victims with a severity of injury of more than 50 points, with a mortality rate of 75 %, with a severity level of 36 to 50 – 50 %, and with a total score of up to 20, mortality reaches 10 %. From the above data it is seen that for a selected period there is a tendency to increase the number of victims with a higher severity of damage. Mortality from concomitant injury is largely characterized by dominant damage. The distribution of the dominant damage in the dead was as follows (Tab. 4).

T a b l e 4. **Distribution of deaths by dominant damage**

Type of damage	Number of dead (2005–2006)		Number of dead (2014–2015)	
	absolute	%	absolute	%
Head and neck injury	31	23.7	60	45.1
Chest injury	26	19.8	16	12.0
Abdominal injury	22	16.8	23	17.3
Musculoskeletal injury	3	2.3	11	8.3
Trauma to two or more areas	49	37.4	23	17.3
Total	131	100	133	100

In group I, among the dead, the victims with damage to two or more anatomical areas, head and neck injuries, and abdomen were predominant. In group II, damage to the head and neck comes first, then two or more anatomical areas of the body and trauma to the abdomen. The immediate cause of death in the early period was severe multiple injuries to internal organs, bones and soft tissues, causing acute blood loss and shock, swelling and dislocation of the brain. Over a period of more than 3 days, pneumonia, embolism, and multiple organ failures were the immediate causes of the injury (Tab. 5).

T a b l e 5. **Mortality depending on the immediate cause of death**

Cause of death	Number of dead (2005–2006)		Number of dead (2014–2015)	
	absolute	%	absolute	%
Swelling and dislocation of the brain	34	25.9	43	32.3
Shock and acute blood loss	31	23.7	34	25.6
Pneumonia	39	29.9	21	15.8
Purulent intoxication and sepsis	12	9.2	10	7.5
Embolism	5	3.8	13	9.7
Multiple organ failure	10	7.6	12	9.1
Total	131	100	133	100

Death from edema and dislocation of the brain prevailed in the group with a dominant head injury. Pneumonia was also the main cause in patients with leading head injury, which is associated with aspiration of blood, cerebrospinal fluid and gastric contents during prolonged mechanical ventilation. Acute hemorrhage and shock most often developed in cases of damage where the source of bleeding was the liver, spleen, retroperitoneal vessels and pelvis. Thrombotic and fat embolism were observed in patients with musculoskeletal damage (mainly the pelvis, thigh and lower leg).

Conclusions

1. Data indicate a high level of hospital mortality in severe mechanical trauma.
2. The number of victims with a higher severity of injuries increased (ISS> 50).
3. Significant successes have been achieved in reducing road traffic injuries, and a fall from the top comes first because of injuries.
4. There is an increase in the number of resuscitation “long–livers”, which indicates the improvement of the healthcare organization for such patients.
5. Despite the fairly high level of care for patients with polytrauma, it is necessary to further improve the system of medical care for victims.

Conflict of interests. The authors declare no conflict of interest.

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