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CLINICAL CHARACTERISTICS OF LOWER LIMB WOUNDS IN INJURED PEOPLE IN THE RESULT OF MODERN MILITARY OPERATIONS

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Studying the experience of providing surgical service to the injured people with a mine blast injures in a local armed conflict in the East of Ukraine will allow not only to determine the nature of modern war trauma, but also to make some changes in the formed ideas about the effectiveness of certain measures. The stage of professional medical services was the main one for the injured people with the neuromuscular bundle and the knee joint injuries, which was found in 5.9% and 9.5% respectively and in subsequent stages their number decreased. At the stage of specialized medical services the injured people with lower leg injuries were concentrated. 41.0% were detected at this stage, which is 1.3 times more than at the stage of professional services and almost twice more than at the stage of highly specialized medical services. The stage of highly specialized medical care was the main one for the injured people with injuries of pelvic (4.8%), buttock (7.8%), hips (34.9%), foot (16.5%) traumatic amputation of the lower leg (1.9%) and foot (3.8%).

Keywords: injured people, gunshot wounds, limbs, mine blast injury.

The study is a fragment of the research project "Pathogenetic substantiation of treatment of infectious complications of the traumatic process in injured people in modern military operations", state registration number 0117U003077.

The military medical statistics of local armed conflicts in recent decades confirm the global wars data that the predominant use of conventional firearms, regardless of the military operation scale, causes the prevalence of limb injuries in the structure of combat sanitary losses [1, 4]. Thus, according to the data of Eastridge BJ [6], limbs are affected in 65-70% of all injuries found during counter-terrorism operations in Afghanistan and Iraq. Taking into account the fact that this category of injured people is a huge potential reserve of the opposing armies, it becomes clear how successful and rapid restoration of combat capability will ensure the return to the army of the most experienced and battle-hardened soldiers [8, 9]. According to the Ministry of Defense of Ukraine, at the end of 2016, more than 10 thousand people were killed in the Joint Forces Operation (JFO) area in Eastern Ukraine. For the period 2014-2016, more than 21.000 injured people were reported [2]. In the conditions of hybrid war in the Eastern Ukraine, providing professional medical services to injured military servicemen, their complete treatment and rehabilitation, using the latest technologies, is the highest priority of the state [3]. According to many authors, the organization of providing professional and timely medical services to the wounded, their rapid evacuation, further treatment and rehabilitation provide not only the protection of life, but also the rapid recovery of combat capability in 80% of the injured people in the current armed conflicts [5, 7].

Studying the experience of providing surgical service to the injured people with a mine blast injures in a local armed conflict in the East of Ukraine will allow not only to determine the nature of modern war trauma, but also to make some changes in the formed ideas about the effectiveness of certain measures. This is the purpose of our study.

The purpose of our work was to evaluate the medical characteristics of the lower limbs injures at the stages of medical evacuation in the conditions of JFO and to determine the main directions of optimization of medical services for the injured people.

Materials and methods. In order to fulfill the tasks and purposes of our study, we retrospectively and prospectively analyzed the treatment of 377 injured men with mine blast injuries, which was received during the JFO in 2014-2017. The data were entered into specially designed maps that allowed to analyze the functional and morphological component of mine blast injury, the injuries severity, the injured man condition severity, the surgical interventions nature, the infectious complications type.

For the purpose of qualitative analysis of the actual material of the study, we distributed injured people to the sets according to the place of their treatment at the medical services levels. Set A: the injured people with mine blast injury, who were treated in the Bakhmut (Artemivsk) Central District Hospital, which corresponded to the Level II of medical services. This set included 126 injured people with mine blast injuries, provided medical services corresponded to the Level II and were typical for this level. The injured people's age ranged from 18 to 48 years and averaged 27.7±2.8 years.

122 injured people with mine blast injuries receiving treatment at the I.I. Mechnikov Dnipropetrovsk Regional Clinical Hospital were attributed to the Set B, which corresponded to the Level III of medical evacuation. Medical services to these injured corresponded to the Level III and was typical for this level. The injured people's age ranged from 18 to 50 years and averaged 29.0±3.4 years.

129 injured people with mine blast injuries receiving treatment at the Military Medical Clinical Center of the Central Region, Vinnytsia, were attributed to the Set C, which corresponded to the Level IV of medical evacuation. The injured people's age ranged from 19 to 48 years and averaged 28.4±3.2 years.

Mathematical methods of nonparametric statistics were applied to estimate the statistical probability of materials obtained during the study, due to the considerable variability of wounds in a mine-blast injury. Considering the number of analyzed features and the need to ensure the uniformity of the performance indicators, we used Pearson's polychoric correlation for the correct comparison. The correlation analysis between the mine-blast injury signs of injured in the modern military operations, studied by this method was performed both within the groups and between the groups, which allowed to unify the results of statistical analysis and to ensure correct comparison with the application of formal logic laws.

Results of the study and their discussion. The study revealed 309 injuries of the lower limbs, accounting for 82.0% of the set. Among injured of the Set A, lower limbs injures were detected in 84 cases, which was 66.7% of the Set. In the Set B these injuries were registered in 122 injured, which was 100.0%, and in the Set C – in 103 injured, which was 79.8% of cases. Among the studied injured patients, the following lower limbs injuries were found: pelvic injuries (PI), buttocks injuries (BI), neurovascular bundle injuries (NVBI), hip injuries (HI), knee joint injuries (KJI), lower leg injuries (LLI), foot injuries (FI), traumatic foot amputation (TFA), traumatic lower leg amputation (TLLA). To determine the structure of lower limbs injuries, we performed the analysis, which results are shown in table 1.

Table 1

Distribution analysis of the injured on the lower limbs injuries basis

Anatomical location	Number of injured								
	A			B			C		
	abs.	%	Ri	abs.	%	Ri	abs.	%	Ri
PI	2	2.4	7	4	3.3	7	5	4.8	6
BI	3	3.6	6	5	4.1	6	8	7.8	4
NVBI	5	5.9	5	7	5.7	5	2	1.9	8
HI	24	28.6	2	30	24.6	2	36	34.9	1
KJI	8	9.5	4	8	6.6	4	7	6.8	5
LLI	27	32.1	1	50	41.0	1	22	21.3	2
FI	11	13.1	3	14	11.5	3	17	16.5	3
TLLA	1	1.2	8	1	0.8	9	2	1.9	8
TFA	3	3.6	6	3	2.4	8	4	3.8	7
Total	84	100.0	-	122	100.0	-	103	100.0	-

Analysis of table 1 data indicated that injured with lower leg injuries were most commonly found in the Set A. Such injuries were detected in 32.1% of cases in the Set A. It was these injured who occupied the first place in the Set A. Injured with lower leg injures were found in the Set B in 41.0% of the cases, which is 1.3 times more than in the Set A. As in the Set A, injured with lower leg injures occupied the first place in the Set B. A slightly different situation was observed in the Set C, where such injured were only 21.3% and they occupied the second place (fig. 1). Thus, the analysis indicated that the injured people with lower leg injuries are most concentrated at the specialized medical service stage and that it is the main stage in providing medical services to the injured with these wounds.

The second place in the Set A was occupied by the injured with hip injures. This injury type was registered in 28.6% of the injured. In the Set A, this injury was reported slightly less frequently, in 24.6% of cases, and occupied the second place in the ranking distribution. Hip injuries were most common in the Set C. This injury was found in 34.9% of injured, which is 1.2 times more frequent than in Set A and 1.4 times more frequent than in Set B. At the stage of highly specialized medical services, the basic treatment of hip injuries in injured of modern military operations is organized. Injured with foot injuries occupied the third place in the Set A, where they were identified in 13.1% of cases. The number of injured with foot injuries was slightly less – 11.5%, and in the ranking distribution they also occupied the third place. They also occupied the third place in the Set C. However, it is worth noting that the data of this injured was larger in the Set C compared to both the Set A and B. Based on the analysis data, it was found that the stage of highly specialized medical services is the main stage in the treatment of injured with foot wounds.

Fig. 1 Injured person with a mine blast limb injury at a stage of professional medical service.

Knee joint injuries occupied the fourth place in the Set A. This injury occurred in 9.5% of cases. Similar to the Set A, injured with knee joint injuries also ranked fourth in the Set B, but in the relative value of the indicator they were 1.4% less. The number of injured with knee joint injuries in the Set C was about the same as in the Set B, but in the rank distribution this injury ranked fifth. According to the analysis of the knee joint injuries cases, the main stage of providing medical services to the injured was the stage of professional medical services.

The fifth place in the Set A was occupied by the injured with injuries to the lower limb neurovascular bundle. This wound was found in 5.9% of the injured with lower limbs injuries.

The similar number of injured with the neurovascular bundle injuries were found in the Set B, where they are also on the fifth place. In the Set C, a sharp decrease (3 times) of the injured with these wounds was observed. At the stage of highly specialized medical services, the injured with the neurovascular bundles injuries occupied the last eighth place. As indicated by the analysis data, the main stage in the treatment of injured with the neurovascular bundle injuries was the stage of professional medical services, where the concentration of such injured occurred. 3.6% of the injured in the Set A were diagnosed with buttock injuries. These injured occupied the sixth place in the Set A. Moreover, in 4.1% of cases, this injury was diagnosed in the Set B, where it also occupied the sixth place. In the Set C, there was a significant increase in the number of injured with buttock injuries. Here they were detected in 7.8% of cases, which is more than twice as much as in the Set A. Rank analysis placed them in the fourth place. The data concentration on injured at the stage of highly specialized services indicates that this stage is essential in the treatment of injured with the buttock wounds. Another injury that occupied the sixth place in the Set A was a traumatic foot amputation. This injury was also found in 3.6% of cases. In the Set B, there was some decrease in their level and they occupied the eighth place. In the Set C, these injured were occupied the seventh place, and the relative value of the indicator almost corresponded to the level of the Set A. The main place of treatment for injured with traumatic foot amputation was the stage of highly specialized medical services.

The seventh place in the Set A was occupied by the injured with pelvic wounds. This injury was registered in 2.4% of cases. There were 3.3% of such injured in the Set B, but in the rank distribution they also occupied the seventh place. At the stage of highly specialized medical services, there was an increase in the pelvic injuries level up to 4.8%, which is twice more than in the Set A and 1.5 times more than in the Set B. This statement indicates that the main stage in providing medical care to injured with pelvic injuries is the stage of highly specialized medical services.

The last place in all the Sets was occupied by the traumatic lower leg amputation. This injury was reported in 1.2% of injured of the Set A, in 0.8% of injured of the Set B and in 1.9% of injured of the Set C. The main treatment stage was the stage of highly specialized medical services.

To determine the correlation coefficients and the results reliability, we performed a polychoric analysis, which results are summarized in table 2.

Table 2

Estimated values of the correlation coefficients probability

Coefficient	Value of coefficient	Reliability
Cross-correlation coefficient φ^2	0.11	+
Polychoric correlation coefficient C	0.31	+
Pearson correlation coefficient x^2	33.9	+

Estimated values of polychoric analysis showed that a direct positive expressed binding force was detected between the sign of lower limbs injury and the course of traumatic process in the injured in modern military operations in the stages of medical services, and the indicated positions are within the probability field ($\chi^2 = 33{,}9 \geq \chi^2_{st} = 15{,}5$, $p \leq 0{,}05\%$).

World experience in military medicine, including of the twentieth century wars in Korea (1950-1953), Vietnam (1965-1973), Afghanistan (1979-1989), became the basis of the development of modern principles of organization and tactics in the medical service of the Armed Forces aimed at providing

emergency medical care for the sick and injured at the stages of medical service [2,6]. The experience of international military conflicts in recent years points to the lack or absence of a public health protection concept in many participants. The use of modern weapons of mass destruction, the use of new warfare methods has led to a crisis of outdated methods in therapeutic and diagnostic tactics in the injured, which has certainly led to the search for more optimal measures to protect the population from the most striking factors of military operations [1]. The construction of a modern system of medical and diagnostic measures is carried out with the use of medical military units and formations, mobile and stationary military medical institutions and wide involvement of the existing network of civilian healthcare institutions. Characteristic features of combat injures in the JFO are most of the combined and multiple wounds — 32.1%, which lead to injuries of moderate severity — 37.4% and severe — 14.5%; prevalence of shrapnel wounds — 62,9% and mine injuries — 25,6%, which are caused by the impact of mine blast weapon [3]. In such conditions, the injured treatment tactics have to be determined by the minimal amount of diagnostic manipulations, technical and medical equipment, knowing full well that the treatment effectiveness of severe injury largely depends on the timeliness of the diagnosis and the performed medical measures in the first hours from the moment of injury.

Conclusions

1. The stage of professional medical services was the main one for the injured people with the neuromuscular bundle and the knee joint injuries, which was found in 5.9% and 9.5% respectively and in subsequent stages their number decreased.

2. At the stage of specialized medical services the injured with lower leg injuries were concentrated. 41.0% were detected at this stage, which is 1.3 times more than at the stage of professional services and almost twice more than at the stage of highly specialized medical services.

3. The stage of highly specialized medical care was the main one for the injured people with injuries of pelvic (4.8%), buttock (7.8%), hips (34.9%), foot (16.5%) traumatic amputation of the lower leg (1.9%) and foot (3.8%).

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Реферати

КЛІНІЧНА ХАРАКТЕРИСТИКА ПОШКОДЖЕНЬ ПОЯСУ НИЖНЬОЇ КІНЦІВКИ У ПОСТРАЖДАЛИХ В РЕЗУЛЬТАТІ СУЧАСНИХ БОЙОВИХ ДІЙ

Гур'єв С.О., Танасієнко П.В., Панасенко С.І., Марцинковський І.П., Філь А.Ю.

Вивчення досвіду надання хірургічної допомоги поранених з мінно-вибуховою травмою в локальному збройному конфлікті на Сході України дозволить не тільки визначити характер сучасної бойової травми, а і внести деякі зміни в сформовані уявлення про ефективність тих чи інших заходів. Етап кваліфікованої

КЛИНИЧЕСКАЯ ХАРАКТЕРИСТИКА ПОВРЕЖДЕНИЙ ПОЯСА НИЖНЕЙ КОНЕЧНОСТИ У ПОСТРАДАВШИХ В РЕЗУЛЬТАТЕ СОВРЕМЕННЫХ БОЕВЫХ ДЕЙСТВИЙ

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Изучение опыта оказания хирургической помощи раненых с минно-взрывной травмой в локальном вооруженном конфликте на Востоке Украины позволит не только определить характер современной боевой травмы, а и внести некоторые изменения в сложившиеся представления об эффективности тех или иных мероприятий. Этап

медичної допомоги був основним для постраждалих з пошкодженнями нервово-судинного пучка та пораненнями колінного суглобу, що було виявлено у 5,9% та 9,5% відповідно і на подальших етапах їх кількість зменшувалась. На етапі спеціалізованої медичної допомоги концентрувались постраждалі з пораненнями гомілки, яких на цьому етапі було виявлено у 41,0%, що у 1,3 рази більше ніж на етапі кваліфікованої допомоги та майже удвічі більше ніж на етапі високоспеціалізованої медичної допомоги. Етап високоспеціалізованої медичної допомоги був основним для постраждалих з пораненнями тазу (4,8%), сідниці (7,8%), стегна (34,9%), стопи (16,5%) та травматичними відривами гомілки (1,9%) та стопи (3,8%).

Ключові слова: Постраждалі, вогнепальні поранення, кінцівки, мінно-вибухова травма.

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квалифицированной медицинской помощи был основным для пострадавших с повреждениями нервно-сосудистого пучка и ранениями коленного сустава, что было выявлено в 5,9% и 9,5% соответственно и на последующих этапах их количество уменьшалось. На этапе специализированной медицинской помощи концентрировались пострадавшие с ранениями голени, которых на этом этапе было выявлено в 41,0%, что в 1,3 раза больше чем на этапе квалифицированной помощи и вдвое больше чем на этапе высокоспециализированной медицинской помощи. Этап высокоспециализированной медицинской помощи был основным для пострадавших с ранениями таза (4,8%), ягодицы (7,8%), бедра (34,9%), стопы (16,5%) и травматическими отрывами голени (1,9%) и стопы (3,8%).

Ключевые слова: Пострадавшие, огнестрельные ранения, конечности, минно-взрывная травма.

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PERINATAL CONSEQUENCES OF ADAPTATION DISORDER WITH BURDENED OBSTETRIC HISTORY

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Stress experienced against the background of perinatal losses (PL) can adversely affect the course of subsequent pregnancy. The study of the heart rate variability (HRV) of the fetus by cardiointervalography (CIG) of the fetus in women with burdened obstetric history (PL in anamnesis) at 32-34 weeks of pregnancy was performed. The total of 200 pregnant women with PL and 100 pregnant women without PL in the history were examined. Comparison of the cardiotocography and dopplerometry results with fetal CIG data showed that when the adaptation of the fetal regulatory systems was disrupted, distress was diagnosed in 90.0% of women, and when the fetal regulatory systems showed marked stress in 27.3%, i.e. results of the fetus CIG after 32 weeks of pregnancy may be diagnostic markers of its distress. The overwhelming majority (76.1%) of infants from mothers with PL in the history after intrauterine distress are born in a state of asphyxiation, that causes a high incidence of disadaptation syndromes, often including CNS disorders (73.9%) and the cardiovascular system disadaptosis (41, 3%).

Key words: perinatal losses, cadiointervalography, adaptation, distress of the fetus, newborn.

The work is a fragment of the research project "Reducing the incidence of major obstetric syndromes in high-risk pregnancies from a single genesis position by implementing a pathogenetically targeted prevention and treatment complex", state registration No. 0118U001138.

Perinatal losses (PL), such as pre-natal fetal death and stillbirth, account for 2.65 million cases per year worldwide [9]. Unfortunately, the risk of recurrence in subsequent pregnancies grows up to ten times depending on the cause of stillbirth [11].

Complications of obstetric history with perinatal losses are accompanied by depletion of the body's adaptation reserves against the background of prolonged and intense influence of psycho-emotional stress, causing the development of psycho-emotional diseases and disorder of neurovegetative regulation. The stress experienced against the background of PL can negatively affect the course of the next pregnancy [1, 3, 4].

Despite advances in the diagnosis and treatment of many gestational complications, only in 20-30% of newborns timely started treatment of post-hypoxic CNS changes ensure complete recovery, and treatment of fetal distress after diagnosis due to profound pathomorphological changes is ineffective. As a result, the morbidity and mortality of such infants is steadily increasing [2, 10]. Therefore, the prognosis and the possibility of prevention, rather than the diagnosis of the already disturbed fetal state, is a reserve for reducing perinatal morbidity and mortality [5, 6].

Cardiointervalography is an efficient screening method that can be used to assess the fetal status. By studying variability of maternal and fetal heart rhythm in real time, it is possible to obtain information on the state of energy supply, humoral and neurovegetative regulation, their changes in stress and other conditions, the adaptive capability and reserves of the mother-placenta-fetus system [7, 8].

The purpose of the study was to assess the impaired fetal and infant adaptation, to determine the perinatal consequences of a burdened obstetric history.