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New Strategies In The Treatment Of Hip Fractures In Patients With Combined Injuries

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Annotation. This article is a study aimed at analyzing and improving the results of surgical treatment of patients with hip fractures in concomitant injuries using modern technologies. Within the framework of the study, the results of treatment of 233 patients with concomitant hip injuries were analyzed, a surgical method - osteosynthesis was used. early period of a traumatic disease. The results of the study made it possible to determine the optimal methods of fixation depending on the patient's condition. The findings of this study are important for improving the results of surgical treatment of patients with concomitant hip injuries and can be used in practical medicine to optimize treatment tactics and reduce complications.

The aim of the study was to improve the results of surgical treatment of patients with hip fractures in concomitant injuries by introducing improved treatment tactics based on the use of modern technologies.

Materials: In the study, which covers the period from 2017 to 2022, 145 patients suffering from hip fractures and related injuries were analyzed. To achieve the goal of the study, two groups of patients were formed: a control group consisting of 80 patients who received treatment between 2017 and 2019, and a core group of 65 patients who received treatment between 2020 and 2022. Those considered in the study were age, gender, social data, clinical signs and severity of injuries. From the data presented, it can be seen that the vast majority of affected patients, accounting for more than 89% in both groups (study and control), were in the age group from 21 to 50 years, which is the most able-bodied part of the population. Men accounted for 84.2% of the victims, while the proportion of women was 15.8%. This can be explained by the peculiarities of professional activity and the high prevalence of alcoholism in this population. Most of the victims (56%) were workers and employees, which indicates their working age (which is 91% of the total number of victims). Particular attention in the study was paid to the analysis of factors that can contribute to the occurrence of serious concomitant mechanical damage. This provided valuable insights and recommendations to further improve treatment procedures and care for patients with hip fractures and related injuries.

Methods: In this scientific article, a detailed analysis of clinical cases including patients with femoral fractures and concomitant trauma was carried out. Various treatment approaches were studied and their results were evaluated. In order to optimize treatment tactics, the introduction of a new integrated approach based on a systematic analysis of clinical data, the use of advanced methods of diagnosis and treatment, as well as taking into account the unique characteristics of each patient, was proposed.

Outcomes. The principle was that all hip fractures should be stabilized using surgical methods in the early period of the traumatic disease. Surgical interventions should be performed after the dominant pathology has been eliminated or hemodynamic stabilization has been developed. The method of fixation depends on the severity of the patient's condition: with a stable or conditionally stable condition (ISS - 11-16 points) submersible intra- and external medullary osteosynthesis was used; in a decompensated state (ISS - 17-36 points), the least traumatic methods of transosseous osteosynthesis were used.

Key words: concomitant trauma, hip fracture, severity of injury, severity of the condition, osteosynthesis.

Introduction. The modern anthropogenic phenomenon of traumatism is characterized by an exponential increase in the severity of lesions, where the overwhelming number has a polypathological, comorbid and multicomponent nature, accompanied by a significant impairment of vital functions of the body, the complexity of differential diagnosis and the multifaceted medical and surgical treatment. In general, in the

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structure of traumatic lesions, the variable proportion of combined and multiple injuries is estimated at range from 5 to 12% [1, 2].

Despite the intense attention paid to this problem at the international level, the mortality rate remains consistently high. Concomitant trauma, according to official data from the World Health Organization (WHO), ranks third in the overall mortality structure, reaching up to 40%, and becomes the leading cause of death among men aged 18 to 40 years. Moreover, permanent disability develops in 25-45% of cases [6, 7, 8].

An increase in the proportion of injuries from high-energy mechanisms has led to the emergence of a significant group of patients with polysegmental fractures of the lower extremities. These injuries have a significant negative impact on the physiological state of the victims, limiting their motor capabilities for a long period of time and being a key factor in the unfavorable results of treatment of traumatic injuries of the musculoskeletal system [9, 10].

Unsatisfactory treatment outcomes for this category of patients are explained not only by the high pathological significance of anatomical deformities and the general condition of patients in the acute phase of the traumatic process, but also by the choice of treatment tactics, the volume and sequence of surgical interventions, especially in relation to the extremities [11, 12].

The problem of treating hip fractures is especially relevant. In the treatment of this type of injury, the surgeon faces a set of problems, including the shock effect of the injury, immobilization of the patient, the trauma of surgical manipulations and a high risk of complications at all stages of treatment.

Treatment of this group of patients, despite the latest achievements in medicine, is a complex, but at the same time unresolved and priority problem of modern traumatology [21-33]. All this indicates the need to create an improved optimal tactics for the treatment of this contingent of victims.

Based on this, the main focus should be on injury prevention, improving the quality of teaching and training of trauma professionals, and continuously improving diagnostic and treatment methods in order to achieve the best outcomes and improve the prognosis for patients with concomitant hip injury and fractures.

MATERIALS AND METHODS

This study, conducted between 2017 and 2022, analyzed 145 patients suffering from hip fractures and related injuries. The main objective of the study was to evaluate the care provided for such injuries and to improve treatment procedures. To achieve this goal, two patient groups were formed: a control group consisting of 80 patients who received treatment between 2017 and 2019 and a core group consisting of 65 patients who received treatment between 2020 and 2022.

Modern methods were used to diagnose and assess the condition of patients in the first subgroup, while traditional methods were used in the second subgroup. Factors such as age, gender, social data, clinical signs and severity of injuries were taken into account. The distribution of patients by sex and age was presented in Table 1.

Table 1

Distribution of patients by gender

Group	Men	women	Abs. %
Core Group	51 (35,2%)	14(9,6%)	65(44,8%)
Comparison Group	71 (49%)	9 (6,2%)	80 (55,2%)
Total (%)	122 (84,2%)	23 (15.8%)	145 (100%)

From the data presented, it is observed that the vast majority of affected patients, representing more than 89% in both the study and control groups, were in the age group between 21 and 50 years, which is the most able-bodied part of the population. Men accounted for 84.2% of the victims, while the proportion of women was 15.8%. This can be explained by the peculiarities of professional activity and the high prevalence of alcoholism in this population. Most of the victims (56%) were workers and employees, which indicates their working age (which is 91% of the total number of victims).

Particular attention in the study was paid to the analysis of factors that can contribute to the occurrence of serious concomitant mechanical damage, as presented in Table 2.

Table 2

Distribution of patients by the nature of traumatic injury

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Group View Injury	Core Group	Comparison Group
Production	17 (26,1%)	28 (35,0%)
Accident (passenger, driver)	20 (30,8%)	33 (41,2%)
Road accident (pedestrian)	19(29,2%)	12(15,0%)
Railway Transport	3 (4,6%)	1 (1,3%)
Catatrauma	5 (7,7%)	6 (7,5%)
Gunshot	1 (1,5%)	0 (0%)
Total (%)	65 (100%)	80 (100%)

The traumatic conditions to be studied were characterized by a variety of complex injuries, such as fractures of the lower extremities, pelvic injuries, traumatic brain injuries, chest and abdominal injuries. The time spent on surgery depended on the severity of injuries and the presence of traumatic shock in the victims upon admission to the clinic. Of the total number of victims, 11.4% were found in a state of alcoholic intoxication.

An important factor influencing outcomes for victims was the delay in access to health facilities. In the study, patients were divided into groups based on time delay, as presented in Table 3. Most of the victims (77.6%) were taken to the clinic on the first day after the injury. Modes of transportation included the use of hitchhiking vehicles (25.9%), ambulance (28.4%), transportation from other medical facilities (28.4%) and air ambulance (17.3%). Most of the victims (83.3%) were taken from the scene directly by ambulance or hitchhiking. The median time to admission to hospital was 52.4 ± 3.9 minutes for directly delivered patients and 180.6 ± 3.3 minutes for those who arrived from other areas of the region. The maximum delivery time did not exceed 6 hours, except in cases where victims were transferred after an unsuccessful attempt at treatment in other hospitals (average time 1708.9 ± 217.1 minutes). Most injuries were concomitant (54%), but some patients had isolated cases of injury (46%). Open fractures were registered in 49.6% of the total number of victims, mainly in the tibia and foot (see Figure 1).

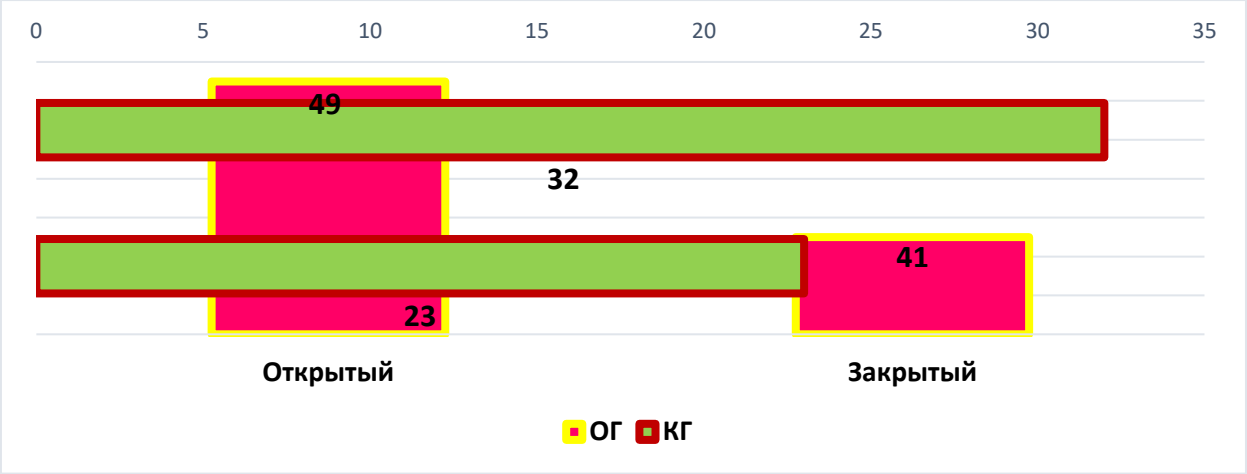

Figure 1. Nature of the injury in both groups

Based on the nature of the injuries resulting in concomitant injuries of bones and large vessels, it is noted that the majority of such injuries are open fractures, which were detected in 72 (49.6%) victims (see Figure 2). On the other hand, closed fractures of the extremities with violation of the integrity of blood vessels, caused by bone fragments, account for 73 cases (51.4%).

61 (84.7%) patients had open fractures of one femur, while 11 (15.3%) patients had an open fracture of both femurs. Taking into account the degree of soft tissue damage, relatively mild soft tissue injuries (type IO 1; IO 2) - 23 cases, in 7 cases severe damage (type IO 4) of soft tissues with damage to the neurovascular bundle was observed.

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Another significant factor that had a significant impact on the choice of treatment tactics and the prediction of outcomes was the general condition of the victims upon admission to the hospital. Among the studied group, 122 (81.1%) victims had signs of shock of varying degrees of severity (see Table 3).

Table 3

Characteristics of victims depending on the severity of shock

Group	Degree of shock				
	I	II	III	IV	**Abs. (%)**
Core Group	14 (7,1%)	18 (14,3%)	13 (9,8%)	5 (4,5%)	**50 (41,0%)**
Control group	12 (10,7%)	31 (27,7%)	20 (17,9%)	9 (8,0%)	**72 (59,0%)**
Total	**26 (21,3%)**	**49 (40,1%)**	**33 (27,0%)**	**14 (11,6%)**	**122 (100%)**

Analysis of the presented table indicates a predominance of patients with severe shock of 2-4 degrees in both groups. This represents 96 cases (78.7%) among patients diagnosed with shock, which is 66.2% of the total of 145 patients.

For an objective assessment of the severity of the condition of the victims upon their admission to a medical institution, the internationally recognized ISS (Injury Severity Score) scale, based on anatomical parameters, as well as the AIS (Abbreviated Injury Severity) scale, designed to assess the severity of injuries, were used. All anatomical injuries were assessed according to the AIS scale.

The victims were divided into three groups depending on the severity of their injuries using a scoring system:

Group 1: Patients with injuries with up to 12 points - 67 people (46.4%).

Group 2: Patients with injuries who scored from 12 to 22 points - 61 people (42%).

Group 3: Patients with injuries with more than 22 points - 17 people (11.6%).

In patients with injuries who scored up to 12 points, the proportion of men and women was even. At the same time, in patients with more serious injuries scored above 12 points, the number of men exceeded the number of women.

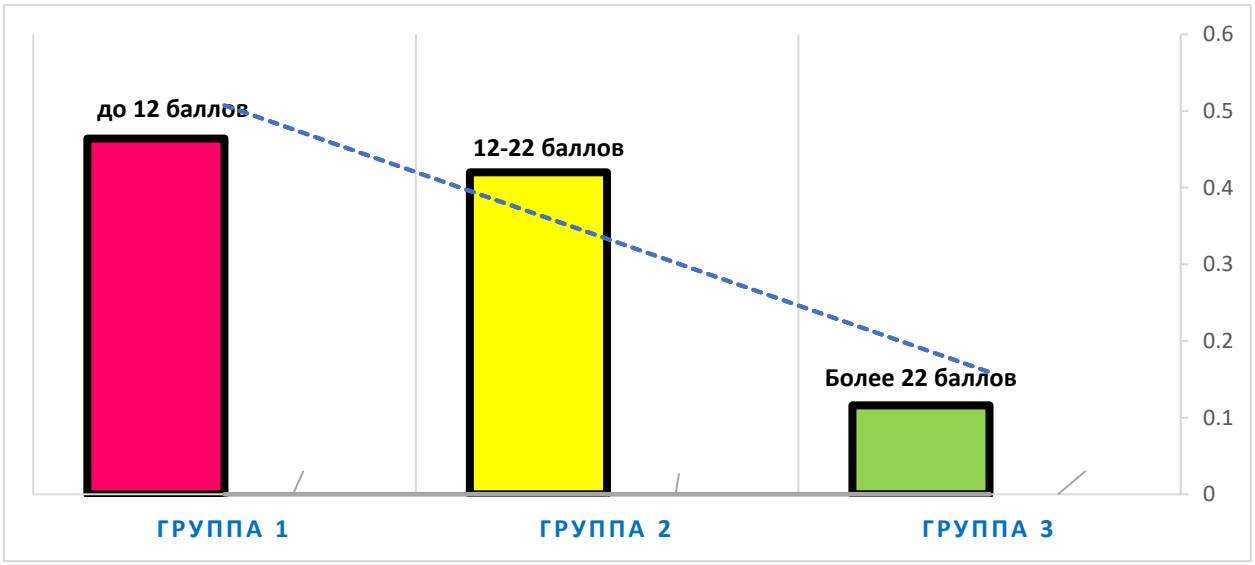

***Figure 4**. Assessment of the severity of patients' condition according to the ISS scale*

To assess the severity of the condition of patients with concomitant injuries, we used the INC-SP scale. By calculating the scores, we divided the patients into three groups based on the results obtained: a group with a score of less than 20, a group with a score between 20 and 30, and a group with a score of more than 31.

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Further, based on the data obtained, we divided the patients into two clinical groups - the group with delayed surgical intervention (DCO) and the group with immediate surgical intervention (UTS).

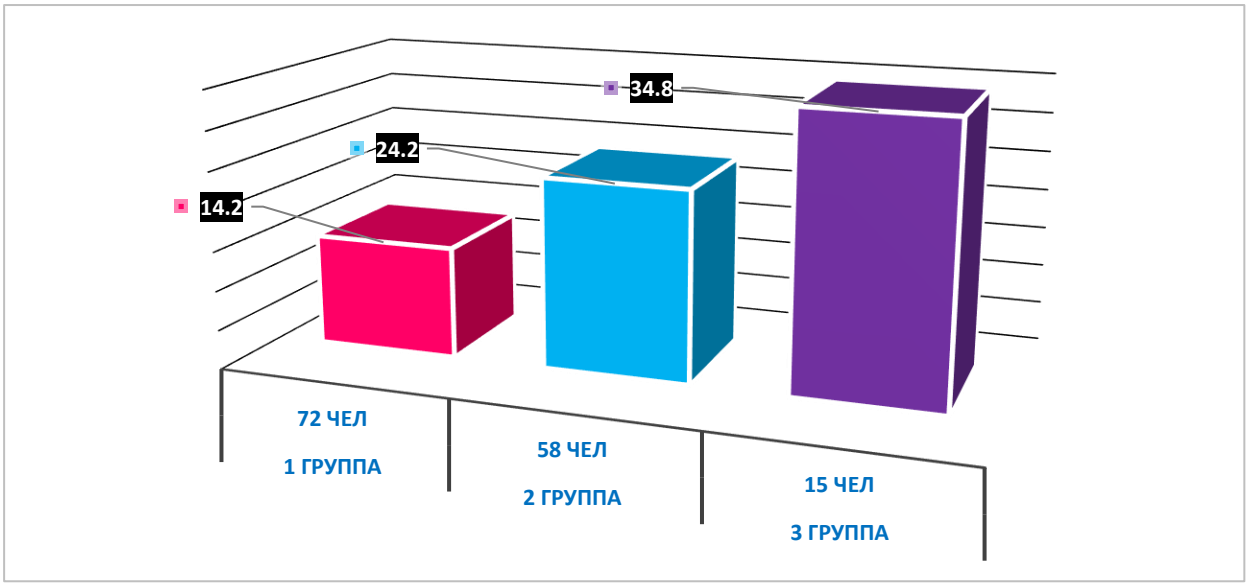

Figure 5. *The average score in all three groups of victims on the ERF-SP scale*

During the study, we used a sampling method based on the patient's condition and data obtained using the IIS (Injury Severity Score) and WHC-SP (Comprehensive Pathophysiological Characterization of the Patient's Condition) scales. Using this method, we divided the patients into two clinical groups.

The first group included 90 patients for whom the DCO (Damage Control Orthopedics) tactic was chosen. This approach aims to provide temporary stabilization of damaged areas and prioritize the treatment of life-threatening conditions in patients.

The second group included 55 patients for whom UTS (Early Total Care) was chosen. In this case, the main emphasis is on the immediate implementation of a full-fledged surgical intervention in order to restore damaged tissues and functionality.

Thus, the use of these sampling methods allowed us to divide patients into two clinical groups and apply the appropriate treatment tactics - DCO and UTS - to achieve optimal results in their medical care.

Results And Discussion

The DCO strategy, part of the Early Differentiated Trauma Care, is a method of surgical treatment of DTC fractures in patients suffering from severe concomitant injuries. Delayed operations are performed after urgent operations in the first period of traumatic disease. DCO tactics are used in cases where patients experience severe conditions such as organ and system damage, traumatic shock, traumatic cerebral coma, acute respiratory or heart failure. The use of resuscitation methods, including intensive care and emergency surgery, is aimed at eliminating conditions associated with severe polytraumas. Early delayed surgery is necessary to prevent factors that can cause and enhance the systemic inflammatory response.

In our study, the strategy of "Early Differentiated Trauma Care" was applied, in which the DCO tactic was applied to a group of 90 victims. This group included 13 patients with extremely severe polytrauma, 47 patients with polytrauma, and 30 patients with joint and skeletal injuries in whom the ISS (Injury Severity Index) did not decrease to 10 points after intensive care. The average ISS of patients in this group ranged from 11 to 35 points.

Thus, within the framework of this study, we applied the strategy of "Early Differentiated Trauma Care", including the DCO tactics, to a group of 90 victims who had different levels of severity of polytrauma. This allowed us to more accurately determine when and how to perform surgical treatment in order to prevent possible negative consequences and ensure the best outcomes for patients with severe co-trauma.

Table 4.

Characteristics of victims with polytrauma and extremely severe polytrauma who used the DCO tactic (90 people)

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Characteristics of the group	Segments of the musculoskeletal system						The whole group	
	Upper limb		Lower limb		Multiple fractures			
	Abs.	%	Abs.	%	Abs.	%	Abs.	%
Moderate severity of injuries and severity of condition								
Moderate severity of injuries	28.7±4.9		35.2±0.6		38.2±0.9		36.6±0.7	
Moderate severity of the condition	24.8±4.1		29.2±0.3		36.5±0.6		32.5±0.4	
Nature of fractures								
Open fracture	-	-	19	22,2	30	33,3	49	54,4
Closed fracture	2	100,0	13	14,4	28	31,1	41	45,6
Total	**2**	**100,0**	**32**	**100,0**	**58**	**100,0**	**90**	**100,0**

Using the DCO strategy used to treat polytrauma, three stages have been identified, each of which plays an important role in ensuring effective and complete recovery of patients' health. At the first stage, temporary methods of fixing hip fractures are used using minimally invasive approaches. In the case of open fractures, primary surgical debridement of the wound and fixation of fractures with rod devices are also carried out. At the second stage, intensive therapy is carried out aimed at stabilizing body functions. Finally, at the third stage, the fractures are accurately repositioned and finally fixed.

As a result of the study, encouraging results were obtained in the use of DCO tactics in the treatment of polytraumas. The average duration of inpatient treatment was about 28.5 days. This indicates the effectiveness and success of this strategy in providing an optimal outcome for patients suffering from polytrauma.

Thus, the DCO strategy, consisting of three stages, demonstrates its effectiveness in the treatment of polytrauma. It includes minimally invasive methods of fracture fixation, initial surgical debridement of the wound, intensive care for stabilization of the body, precise reduction and final fixation of fractures. This study confirms the positive results of the DCO strategy, which allows achieving optimal indicators of the duration of inpatient treatment, which is an important factor in ensuring the full recovery of patients with polytrauma.

Table 5.

Duration of inpatient treatment of victims with polytrauma and extremely severe polytrauma

Duration of inpatient treatment	Polytrauma		Extremely severe polytrauma		Altogether	
	Abs.	%	Abs.	%	Abs.	%
Up to 20 days	2	2,2	-	-	2	2,2
20 - 30 days	21	23,3	18	20,0	39	43,3
31 - 40 days	9	10,0	24	26,6	33	36,7
41 - 50 days	3	3,4	10	11,1	13	14,4
51 - 60 days	-	-	3	3,4	3	3,4
Total	35	100,0	55	100,0	90	100,0
Medium term	25,3+2,3		31,7+2,2		28,5+2,5	

Early total care (ETC)

The ETC strategy, known as "early complete surgical management of DTC fractures in victims with severe co-trauma", is an integrated approach that involves the use of minimally invasive osteosynthesis techniques such as closed intramedullary osteosynthesis and osseous osteosynthesis through mini-accesses. The goal of the ETC strategy is to achieve a good functional outcome and improve the quality of life of those affected.

There are important prerequisites for the successful application of the ETC tactic. Initially, it is necessary to correctly select victims in whom this strategy can be safely applied. In addition, an objective and

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comprehensive evaluation of the indications is required to determine when it is appropriate to use ETC tactics. Finally, the successful implementation of the ETC strategy requires appropriate conditions that will ensure the effective implementation of the procedures.

The main conditions for the use of ETC tactics are:

Objectively matching suitable victims who can safely pass ETC tactics.

Careful and comprehensive determination of indications for the choice of this strategy.

The availability of the appropriate conditions necessary for the successful implementation of ETC tactics.

Thus, the ETC strategy, which includes early complete surgical treatment of DTC fractures in victims with severe concomitant trauma, is based on the use of minimally invasive osteosynthesis techniques. Its goal is to achieve a good functional result and improve the quality of life of those affected. The correct selection of victims, the determination of testimony and the availability of appropriate conditions are indispensable conditions for the successful implementation of this strategy.

Table 7.

Characteristics of victims with TST who used ETC tactics (55 people)

Characteristics of the group	**Segments of the musculoskeletal system**						**The whole group**	
	Upper limb		**Lower limb**		**Multiple fractures**			
	Abs.	**%**	**Abs.**	**%**	**Abs.**	**%**	**Abs.**	**%**
Moderate severity of injuries and severity of condition								
Moderate severity of injuries	9.6±0.2		12.3±0.1		15.6±0.7		12.5±0.3	
Moderate severity of the condition	13.2±0.1		13.8±0.1		14.1±0.8		13.7±0.4	
Nature of DTK fractures								
Open fracture	2	1,1	6	3,3	16	8,2	23	41,8
Closed fracture	1	1,1	10	5,5	21	11,5	32	58,2
Total	**3**	**100,0**	**16**	**100,0**	**36**	**100,0**	**55**	**100,0**

In the analyzed sample, there is an average severity of injuries, estimated at 12-13 points, which makes this category of injuries the least serious among all cases studied in the study. The average severity of the condition of the victims was also the lowest and amounted to 13-14 points, which indicates the success of the response to the severity of the condition. Victims with nonmultiple fractures of the upper extremity had the lowest severity indicators, while victims with multiple fractures had the highest severity indicators.

The ETC tactics provide emergency specialized surgical care to victims with concomitant injuries and polytraumas. In this study, 55 patients with less severe polytrauma were not subjected to urgent surgery, as they did not have serious injuries to the head, spine, thorax, abdomen, and pelvis, multiple rib and sternum fractures, unstable pelvic bone fractures, large vessel injuries, and limb destruction.

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The main criterion for the use of ETC tactics was the severity of the victim's condition, not exceeding 15 points on the HTF-SP scale. This group included 55 victims who were used ETC tactics in the first 6 hours after admission. The time frame of the surgical intervention varied within 24 hours.

Thus, the study demonstrates that in the sample under consideration, there is a relatively low severity of injuries and condition in victims. The ETC tactic, which provides for emergency surgical care, is used in cases where the severity of the condition does not exceed a certain threshold and there are no serious injuries and complications. Surgical intervention within the framework of the ETC tactic is carried out in the first 6 hours after admission and can be performed within 24 hours.

Table 8.

Terms of inpatient treatment of victims with TST

Term of inpatient treatment	Segments of the musculoskeletal system						The whole group	
	Upper limb		Lower limb		Multiple fractures			
	Abs.	%	Abs.	%	Abs.	%	Abs.	%
Up to 14 days	1	1,8	-	-	-	-	1	1,8
14 - 20 days	1	1,8	32	58,1	-	-	33	60,0
21 - 30 days	-	-	8	14,6	-	-	8	14,6
>30 days	-	-	-	-	13	100,0	11	23,6
Medium term 19,3+0,4								
Total	**2**	**100,0**	**40**	**100,0**	**13**	**100,0**	**55**	**100,0**

Most of the victims who underwent surgery on the lower extremities and who were treated according to the ETC tactics stayed in the hospital for no more than 30 days. However, in all patients with multiple fractures, the period of inpatient treatment exceeded 30 days.

All patients treated according to the ETC tactics underwent only minimally invasive osteosynthesis of distal tremor complex (DTC) fractures in specialized surgical traumatology. Table 10 provides information on the various types of minimally invasive osteosynthesis that was performed in these patients.

Table 10.

Methods of fixing fractures according to the ETC tactics

Method of fixing DTK fractures	Number of victims		Duration of surgery	Duration of inpatient treatment
	Abs.	%	clock	day
Intramedullary Küntscher osteosynthesis with	28	51,0	1,2+0,2	18,9+0,3
Osseous osteosynthesis with plates with a locking system	25	45,5	1.1±0.3	19,2+0,2
Combination of fixation methods +	2	3,5	2,0+0,5	22,3+0,3
Total	**55**	**100,0**	**-**	**19,1+0,4**

The use of ETC tactics in the treatment of patients with musculoskeletal fractures included various methods of osteosynthesis. In 51% of cases, intramedullary osteosynthesis with a Küncher pin with a blocking system was used, and in 45.5% of cases, osseous osteosynthesis with plates with a blocking system was used. The observed difference in the types of osteosynthesis did not affect the duration of inpatient treatment.

There are different points of view regarding the surgical treatment of multitraumatized patients with injuries of the musculoskeletal system. Many factors, such as blood flow, reparative processes, autoaggression, endotoxicosis and energy supply of the body, affect the choice of fracture treatment strategy.

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A classification of urgent and delayed operations has been developed, and the choice of tactics depends on the general condition of the patient and the nature of the damage to the musculoskeletal system.

Treatment of hip fractures and other fractures is based on an assessment of the patient's condition, the degree of soft tissue damage and the dynamics of their condition. Various methods are used to perform osteosynthesis, such as internal and external osteosynthesis, each with its own advantages and limitations.

The use of various methods of osteosynthesis and joint technologies was used to repair injuries of the musculoskeletal system in victims. For transosseous osteosynthesis of the femur, the Küntcher methods and the Universal Rod Apparatus were used. Bleeding was controlled using electrocoagulators, and patients gave written consent to the operation. The choice of the type of anesthesia depended on the extent of the operation and the physical condition of the patient. Metal structures were used to fix bone fragments, and the choice of implant size was made on the basis of preoperative examination and measurements. The deployment was carried out using reamers connected to a drill, and the wires were inserted into the bone using an electric drill for transosseous osteosynthesis. The study focused on early repair of musculoskeletal injuries, including unstable pelvic injuries and "non-major" fractures, in patients with low levels of shock and suitable clinical conditions.

Osteosynthesis and surgical interventions were carried out to restore injuries to the musculoskeletal system in victims with a compensated and subcompensated state after antishock measures. Simultaneous operations were performed to repair open fractures of the shoulder and collarbone, as well as other injuries. Surgeries were performed sequentially or simultaneously by multiple teams of surgeons, and the surgery time averaged 4.5 hours for consecutive surgeries and 3.6 hours for simultaneous surgeries. No complications were reported. A technique of controlled rod external fixation of the femur has been developed, which provides accurate reduction and reliable fixation of bone fragments, as well as early and full-fledged functional treatment. This technique minimizes the trauma of the procedure, simplifies the design and ensures the versatility of the device elements. It also allows you to control the stretching and movement of bone fragments, preserving the motor function of the limb and ensuring simplicity and versatility of structures.

The universal technology of transosseous fixation includes external structures (semi-annular, 1/4 circumference and arc bars) and rod osteofixators (diameter 4.5-6 mm, length 60-150 mm). The rods are inserted into the metaphyseal parts of the thigh by twisting or puncture and are fixed with a nut or plate. This technology allows you to achieve stable fixation of bone fragments, accelerates the healing process and facilitates early activation of the patient.

One of the advantages of the universal technology of transosseous fixation is the possibility of using it in various cases of injuries of the musculoskeletal system, including fractures of the hip, lower leg, shoulder, clavicle and other bones. Due to the flexibility and versatility of this technology, the surgeon can choose the best fixation option depending on the characteristics of the injury and the needs of the patient.

It is also worth noting that the restoration of injuries to the musculoskeletal system requires an integrated approach, including not only surgery, but also rehabilitation measures after surgery. Physiotherapy, therapeutic exercises, massage and other methods can be prescribed to restore functionality and reduce the risk of complications.

Findings

The results of the study indicate the following:

The use of rod devices for external fixation for the treatment of hip fractures has demonstrated significant positive results.

The mean period of fracture fixation was acceptable, and most patients achieved firm or definitive fusion.

Although some patients experienced limited mobility and pain in the fracture area, vascular, neurological, and purulent complications were not identified.

Most patients were able to regain their activity and return to daily activities.

The overall success rate was 93.3%, which highlights the effectiveness of this approach in the treatment of hip fractures.

Various osteosynthesis techniques, such as the Küntscher Method and the Universal Rod Apparatus, are used to repair musculoskeletal injuries, including hip fractures.

Bleeding is controlled using electrocoagulators, and patients provide written consent to the operation.

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The choice of the type of anesthesia depends on the extent of the operation and the physical condition of the patient.

Metal structures are used to fix bone fragments, and the size of the implants is selected based on preoperative examination and measurements.

A technique of controlled rod external fixation of the femur has been developed, which provides accurate reduction and reliable fixation of bone fragments, as well as early and full functional treatment.

The versatile technology of transosseous fixation, including external structures and rod osteofixators, can be applied to various cases of musculoskeletal injuries, providing a stable fixation and accelerating the healing process.

Restoration of injuries to the musculoskeletal system requires an integrated approach, including not only surgery, but also rehabilitation measures after surgery.

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