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USE OF MINIMALLY INVASIVE TECHNOLOGIES IN THE TREATMENT OF THE MUSCULOSKELETAL SYSTEM IN PATIENTS WITH POLYTRAUMA

Alisher A. Temurov - assistant
Laziz I. Ziyotov - clinical resident
Samarkand State Medical University (Samarkand, Uzbekistan)
alishertemurov6@gmail.com

Abstract. *The separation of polytrauma into a separate category is associated with the severity of the injuries, which should be taken into account when providing medical care. The combination of injuries to the chest, abdomen, and musculoskeletal system is of particular interest. These combinations of traumatic injuries are accompanied not only by traumatic shock, but also by the development of hemorrhagic and peritoneal syndromes. At the same time, damage to the musculoskeletal system complicates the diagnosis and treatment of victims with damage to the internal organs of the thoracic and abdominal cavities, is a prerequisite for many life-threatening complications (shock, fatty embolism, respiratory distress syndrome, pneumonia) in the 1st and 2nd periods of traumatic diseases.*

One of the most severe and frequent injuries of the musculoskeletal system is bone fractures, which occur in 90-98% of patients with multiple injuries and in 62.0-78.9% of patients with combined injuries. Mortality among victims of polytrauma varies from 3.8 to 45.3%, and the disability rate reaches from 10.3% to 43.4%.

Keywords: *polytrauma, minimally invasive, complications, traumatic shock.*

Introduction. Diagnosis and treatment of polytrauma are often a single process and are carried out simultaneously, which is due to the severity of the victims' condition and the high probability of traumatic shock development. First of all, the patient's general condition is assessed, life-threatening injuries are excluded or identified [2,4, 5].

The scope of diagnostic measures for polytrauma depends on the victim's condition. For example, when traumatic shock is detected, vital studies are carried out, and the diagnosis of minor injuries is made, if possible, secondarily and only if this does not worsen the patient's condition.

Death from injuries is the fate of young and middle-aged individuals, and the death of a young person of 20 years, taking into account their labor potential and the possibilities of population reproduction, does not correspond to the death of an 85-year-old person. Therefore, according to WHO recommendations, in most developed countries of the world, mortality from injuries is calculated not only by the actual number of deaths but also by the years of "unlived" life. For example, the death of a 20-year-old woman in a car accident is equivalent to the death of 50 people if the average life expectancy in the country is equal to 70 years [1, 2, 6].

The vast experience accumulated in global clinical practice has revealed important aspects of this problem, which remains unresolved to date: untimely diagnosis, underestimation of the severity of injuries, high frequency of complications, widespread trauma, and predominantly the involvement of working-age individuals. Most complications find their explanation in untimely and inadequate diagnostics [3, 7, 8].

A wide range of complications arise not only during the acute period but also during rehabilitation and social integration. Practice shows that in severe combined injuries, a portion of the patient's injuries are not established in a timely manner, passing unnoticed, which subsequently leads to the development of complications and extended treatment periods, and often to disability and even death [8,5].

Material and methods of research. According to the results of the analysis of diagnostics and treatment conducted by the Samarkand branch of the Republican Specialized Scientific and Practical Medical Center of Traumatology and Orthopedics in 2021-2025, 460 patients with polytrauma were monitored. Of these, 267 (58%) were men, 193 (41.9%) were women, and 56.3% of the total number of patients were victims aged 21 to 40 years. It is noteworthy that 276 (60%) of the patients received bodily injuries as a result of a traffic accident.

Diagram-1

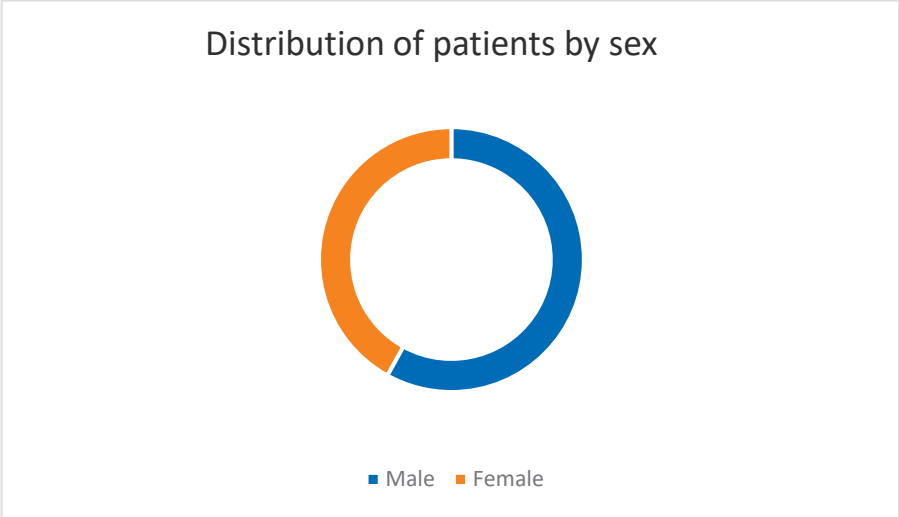


Table-1

Type of injury	Number of patients	Percent
Brain injuries+ limbs	131	28.4%
Chest + limb injury	15	3.2%
Injury of abdominal organs+ limb	61	13.2%
Spine + limb injury	11	2.3%
Injury of pelvis and coccyx + extremities	67	14.5%
Multiple fractures of limb bones	87	18.9%
Injury of two or more anatomical sites with fractures of bones of extremities	88	19.2%

We divided the patients into 7 groups according to the dominant pathology; Brain injuries + limb injuries - 131 (28.4%), chest injuries + limb injuries - 15 (3.2%), abdominal injuries + limb injuries - 61 (13.2%), spine injuries + limb injuries - 11 (2.3%), pelvic and acetabulum injuries + limb injuries - 67 (14.5%), multiple fractures of the bones of the extremities - 87 (18.9%), combined injuries of two or more anatomical areas with fractures of the bones of the extremities - 88 (19.2%). Injuries to the central nervous system and extremities account for the highest percentage.

The severity of the injury was assessed according to the ISS scale.To assess the severity of the injury, the necessary sum of the squares of the 3 highest scores in 6 areas of the body according to the ISS scale is determined: head or neck; face; chest; abdominal and pelvic contents; limbs or pelvic

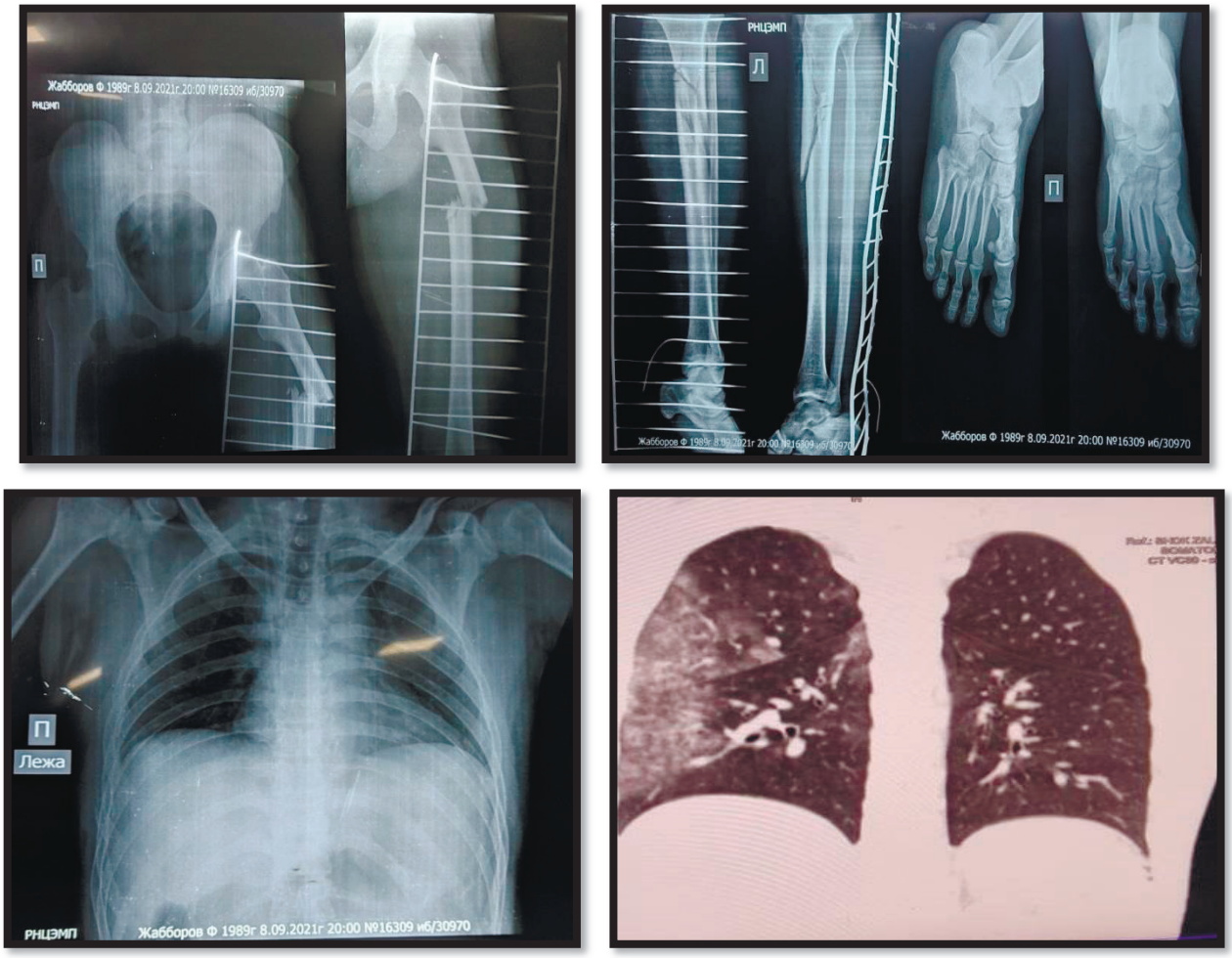
bones; external injuries (skin and soft tissues). Standing in a square allows for more distinct differentiation of severe injuries from moderately severe and even milder ones. The scores received (from 1 to 75 points) numerically reflect the severity of the injury.

In the admission department, in the anti-shock therapy department, a patient operated on with polytrauma was examined by the duty team doctors, surgeon, resuscitator, traumatologist, neurosurgeon, urologist according to the standard. Simultaneously, instrumental diagnostic analyses were performed (laboratory examination, ECG, Fibroendoscopy, ultrasound, X-ray, MSCT).

We distributed surgical interventions on the musculoskeletal system, open osteosynthesis was performed in 195 (42.3%) patients, external fixation apparatus in 121 (26.3%) patients, and combined osteosynthesis in 144 (31.2%) patients.

Clinical example. Patient J.F., born in 1989, was injured in a traffic accident.

Diagnosis: Road traffic accident. Polytrauma. Closed abdominal injury. Multiple ruptures of the right lobe of the liver. Hemoperitoneum. A closed fragmented fracture of the middle third of the left femur with displacement of bone fragments. Open fragmented fracture of the middle-upper left tibia and lateral malleolus of the left tibia, satisfactory location of bone fragments. A closed fracture of the base of the 1st metacarpal bone of the right leg with satisfactory location of the bone fragments. A closed fracture of the base of the 1st metacarpal bone of the left foot without displacement of bone fragments. A closed fracture of the phalanx of the first toe of the right foot without displacement of bone fragments. Closed chest trauma. Closed fracture 6 - right ribs are not displaced. Right lung contusion. Injuries and lacerations in the area of both lower legs and left heel. Multiple abrasions of the face, torso, and extremities. Traumatic shock 3rd degree. ISS-34 Figure 6.



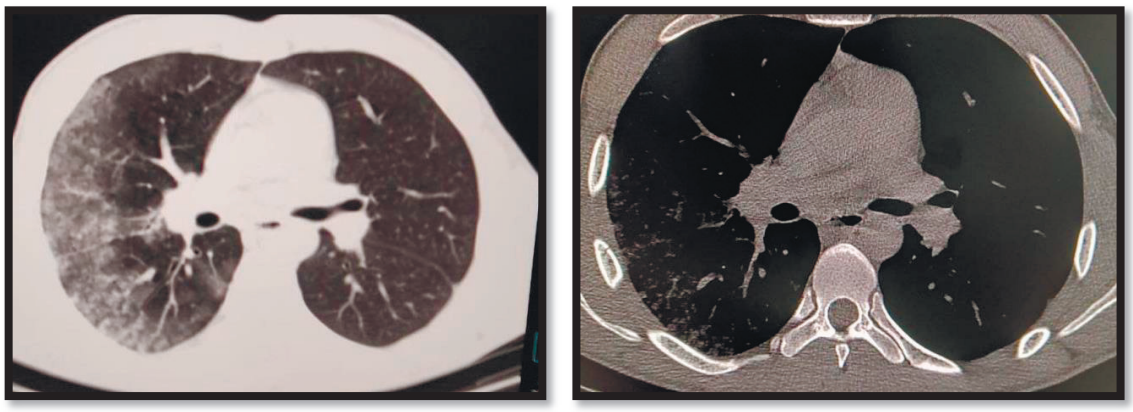


Fig. 7. Chest X-ray and MSCT.

Fig. 8. Foot view during admission

Our actions in the first stage were aimed at urgent elimination of dominant damage by the abdominal and thoracic organs, laparoscopic coagulation of liver ruptures, sanitation and drainage of the abdominal cavity. Figure 9.

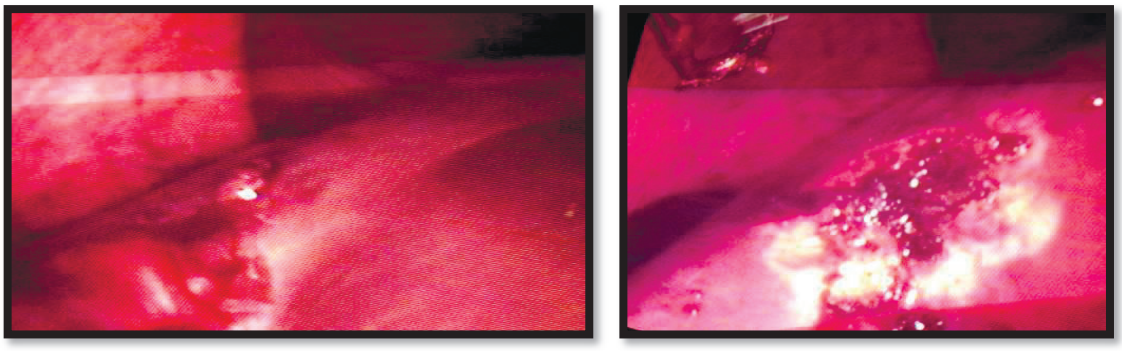


Fig. 9. Laparoscopic coagulation of a rupture of the 6th-7th segments of the liver.The next tactic of the first stage consists of urgent closed stabilization of the left femur and tibia with an external fixation apparatus.

Fig. 10. Osteosynthesis of rods by incision. X-ray monitoring.

The second stage of surgical treatment of the musculoskeletal system begins on day 12, with dismantling of the left femur and tibia in an external fixation apparatus, open extramedullary osteosynthesis of the left tibia with a plate, intramedullary osteosynthesis of the left femur with a locking pin, as well as closed osteosynthesis of the 1st metatarsal bone of the left foot with a spike. Figure 11.

Fig. 11. Preoperative and postoperative radiographs.

Results and discussion. The study of treatment outcomes in patients with polytrauma showed that the increase in the effectiveness of treatment of patients depends on complications arising in the post-traumatic period. Most complications occurred mainly in injuries of the abdominal cavity, chest organs, after pelvic bone fractures, and were observed in a total of 193 patients. Of these, complications such as multiple organ failure, fat embolism, brain edema, postoperative wound suppuration, peritonitis, aspiration syndrome, sepsis, osteomyelitis, limb thrombosis, and acute respiratory distress syndrome were observed in our patients. The following complications and their proportion are presented in the table.

Table-2

Complications	Number of patients	In percent
Polyorgan failure	44	9.56%
Fat embolism	33	7.1%
Brain oedema	17	3.6%
Infectious complications	19	4.1%
Peritonitis	20	4.3%
Aspiration syndrome	8	1.7%
Sepsis	12	2.6%
Osteomyelitis	15	3.2%
Thrombosis of limbs	14	3%
Acute respiratory distress syndrome	11	2.3%
TOTAL	193	100%

Retrospective analysis of clinical data, taking into account the identified causes of death in patients, allows for a more objective assessment of the accuracy of diagnostics, the timeliness and quality of the applied therapeutic measures. In this contingent of patients, 17 deaths were registered.

The severity of the injury in the observed patients corresponded to ISS 0-14 minor injuries, 16-66 major injuries, and 75 extremely severe injuries. The ISS scale allows for a more objective numerical representation of the severity of combined and multiple injuries. In our study, out of 460 patients, 133 (29%) had an ISS score <25, 255 (55.4%) had an ISS score >25-48, and 70 (15.3%) had an ISS score >49.

In accordance with the goal of the study, good results were achieved between early treatment of patients by minimally invasive methods. Patients were examined for up to 6 months after surgery, their condition was assessed, and the sum of the results was considered. Good results were recorded in 141 out of 460 people, satisfactory - in 203, unsatisfactory - in 99 patients, and 17 fatal cases.

Table-3

Results	Number of patients	In percentage
Good	141	30.6%
Satisfactory	203	44.3%
Unsatisfied	99	21.5%
Mortality	17	3.6%

Conclusion:

1. Tested tactics of treating patients with limb injuries in polytrauma, based on assessing the severity of the condition and the severity of the injury, early stabilization of injuries using minimally invasive treatment methods in the acute period of traumatic disease, allow improving treatment outcomes in each specific case.
2. Measures to prevent possible complications in patients in the post-traumatic period also reduce the duration of treatment of patients and the likelihood of death.
3. Taking into account the patient's condition, the proportion of good and satisfactory results increased due to the correct choice of treatment tactics and the application of minimally invasive treatment measures.

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