



SURGICAL TACTICS IN POLYTRAUMA WITH DAMAGES MUSCULOSKELETAL SYSTEM

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Purpose - to consider the main modern medical and tactical concepts and principles that determine the timing and scope of surgical interventions for polytrauma with injuries of the musculoskeletal system.

Findings: Early osteosynthesis of long tubular bones and fixation of unstable injuries of the pelvis and spine in polytrauma can reduce mortality, complication rates, and improve functional outcomes of treatment. The timing and scope of surgical interventions for skeletal injuries in polytrauma should be selected taking into account the severity of injuries and the patient's condition, the period of traumatic disease. The operation should not be additional aggression worse the condition of the injured.

Keywords: polytrauma; fractures; osteosynthesis.

Objective - to consider the main modern medical and tactical concepts and principles that define the timing and extent of surgical procedures in polytrauma with musculoskeletal system injuries.

Conclusion: Early fixation of long bones and fixation of unstable pelvic injuries and spine in polytrauma can reduce mortality, the incidence of complications and improve functional outcomes. Timing and extent of surgical interventions for skeletal injuries in polytrauma are chosen based on the severity of injury, the patient's condition and period of traumatic disease. Operation should not present additional aggression worsening the condition of patient.

Injuries of the musculoskeletal system (MA) are observed in 92% of cases of polytrauma and are dominant in 22-43% of patients [7, 9]. In 70% of patients with polytrauma, skeletal injuries are multiple. Fractures of limb bones in 42-64% of patients are complex, belong to types B and C (according to the AO/ASIF classification), and in every third one they are open; pelvic injuries in 44.2% of cases are unstable, with violation of the pelvic ring [3,8]. Combined and multiple skeletal trauma leads to many life-threatening



complications, requires long-term inpatient treatment and labor-intensive rehabilitation, and is the main cause of a decrease in the quality of life and disability.

If the tactics for injuries of internal organs in polytrauma are quite clearly defined, then in relation to skeletal injuries there is a lot of controversy and unresolved. The optimal timing and volume of surgical interventions, the sequence and methods of fixation of fractures of various localizations have not been established.

Numerous data indicate that early osteosynthesis of long bones and unstable pelvic injuries in polytrauma:

- stabilizes the condition of the victim and is an anti-shock measure;
- prevents further damage by fragments of soft tissues, the development of secondary immune reactions, adult respiratory distress syndrome, DIC, fat embolism, multiple organ failure (MOF), phlebothrombosis and local infectious complications;
- allows you to activate patients and prevent hypostatic complications;
- facilitates patient care;
- reduces the rehabilitation period and improves the functional results of treatment [2,6].

The focus on the earliest osteosynthesis primarily concerns fractures of the femur, unstable fractures of the pelvis and spine, which largely determine the patient's mobility [6, 11].

The main task of intensive care in the treatment of polytraumas should be considered to be the removal of the vital functions of the body to an optimal level to ensure the possibility of performing urgent and delayed operations. The timing of delayed operations is substantiated from the standpoint of the concepts of traumatic disease. At the same time, in the periodization of a traumatic disease, the allocation of second and third periods. The second period (from 12 to 48 hours after the injury) is called the "period of relative stabilization of vital functions" and is defined by a number of researchers as the most favorable for the surgical treatment of those injuries that did not directly threaten life in the first hours, but expose it to great danger if such early operations. These include early osteosynthesis for open fractures of long bones, closed fracture of the femur, stabilization of the spine and pelvis. The third period (3-10 days) – period maximum chance of complications. Delayed operations performed during this period have been proven to be additional aggression, increase the likelihood of organ dysfunctions and give the worst results in the treatment of severe trauma.

To date, many therapeutic and tactical schemes have been proposed, in which the choice of timing and scope of interventions for polytrauma is based on various clinical and



laboratory parameters and objective scoring scales for the severity of the injuries received and the severity of the victim's condition.

Gumanenko E.K. (2009) on the scales of HC-SP and HC-SH determined the intervals of severity of the patient's condition with a concomitant injury with gradation into compensated, subcompensated and decompensated. In a compensated state, any surgical interventions are possible, in a subcompensated state, delayed operations are possible in accordance with the concept of "surgical resuscitation", in a decompensated state, the "Damage Control" tactic is shown.

Berezka N.I. (2014) proposes to use the concept of "Early Total Care" in patients with multiple and combined injuries of the ODA with ISS < 25 points; with ISS 25-40 points - the concept of "surgical resuscitation"; with ISS > 40 points - tactics "Damage Control Orthopedics". At the same time, in patients with ISS 25-40 points, the tactics are specified according to the CVH-SP scale, supplemented by age indicators. With the severity of the condition on the scale of the IPH-SP, adjusted for age less than 22 points, any extrafocal and intramedullary blocking can be used, osteosynthesis, submersible osteosynthesis is excluded. If the severity of the condition is more than 22 points, one should adhere to the concept of "Damage Control Orthopedics" [5].

Many domestic authors promote low-traumatic transosseous osteosynthesis as the method of choice and the final method of osteosynthesis in polytrauma. Most adherents of transosseous osteosynthesis insist on accurate reposition and rigid fixation of fractures with devices on the operating table. Only in severe condition of the victim, the authors recommend in the acute period of polytrauma to limit the use of devices in a simplified layout without repositioning fragments in order to reduce the duration and trauma of the operation, and at the second stagerewire the device. Such tactics D.V. Samusenko (2014) suggested calling it "damage control Ilizarov". According to foreign literature, transosseous osteosynthesis is rarely used for multiple fractures. The disadvantages of the method are the need for constant medical supervision and long periods of inpatient treatment; the difficulty of closed reposition in the apparatus in multi-comminuted, near- and intra-articular fractures, the high frequency of transfixation contractures of adjacent joints, thromboembolic and infectious complications [4]. Disadvantages of hardware fixation of the pelvis, in addition, there are insufficient strength of fixation of injuries of the posterior semiring of the pelvis. The devices make it difficult to perform surgical interventions on the organs of the abdomen, pelvis, and thighs, as well as to perform a number of diagnostic procedures (CT, MRI) [9].

The advantages of internal osteosynthesis are the ability to accurately reposition bone fragments, restore the correct configuration of the pelvic ring in case of pelvic injuries, and functionally stable fixation of injuries [4]. Meanwhile, osteosynthesis with plates is traumatic, is accompanied by significant blood loss, and therefore, is not feasible in the early stages in patients with polytrauma. Osteosynthesis with the introduction of a bridge-like plate with angular stability from two small incisions outside the fracture zone is less



traumatic and is an alternative in the treatment of fractures of the bones of the lower extremities. But the plates do not allow achieving interfragmentary compression in comminuted fractures, which predominate in patients with polytrauma. Diastasis remaining between fragments and long periods of fusion comminuted fractures lead to fatigue fractures of the plates [8].

At the same time, extrafocal osteosynthesis is the method of choice in the treatment of many multi-comminuted and open fractures with extensive damage to soft tissues [7].

However, with long periods of fixation, often necessary for the consolidation of multiple fractures, the negative aspects of extrafocal osteosynthesis prevail over the positive ones. Therefore, many traumatologists successfully use a two-stage method of treatment in severe patients with polytrauma. At the first stage, a low-traumatic, quickly feasible and technically uncomplicated procedure is performed, transosseous osteosynthesis of long tubular bones and pelvic bones with rod or wire-rod devices as an integral part of the anti-shock complex and prevention of complications [4]. At the second stage, at different times from 3-10 days to 2-3 weeks, after complete stabilization of impaired functions, before or after complete wound healing and in the absence of infectious complications, the devices are dismantled and internal osteosynthesis is performed [1,3]. In critically ill patients with polytrauma, the combination of two methods, external fixation at the first stage and its replacement by internal osteosynthesis at the second stage, allows using the advantages of both and corresponds to the tactics of "Damage Control Orthopedics" [1]. External fixation is considered to be a necessary temporary measure in critically ill patients, but may also remain the definitive treatment if there are contraindications to internal fixation [1,5].

A promising direction in the treatment of unstable pelvic injuries in polytrauma is a combination of minimally invasive technologies. If the anterior half-ring of the pelvis can be reliably stabilized by most devices, then to fix the posterior half-ring, it is necessary to use submersible technologies. In the early stages of polytrauma, after stabilization of the victim's condition, low-traumatic technologies for primary fixation of the sacroiliac joints with cannulated screws are possible, and the pubic joint with external fixation devices or plate through a mini-access. Stable fixation of both the anterior and posterior pelvic half rings allows for early activation without the risk of loss of reposition, which is most important for patients with polytrauma [1,2].

More and more authors in our country and abroad use closed intramedullary osteosynthesis of long tubular bones with locking rods in patients with polytrauma. Due to the low trauma and insignificant intraoperative blood loss, blocking osteosynthesis can be performed in the first days after the injury, without waiting for the final normalization of the general condition, as well as in open fractures with moderate tissue damage until the wound heals. Significant strength of fixation with a high anti-rotation effect, no need for additional fixation with a plaster cast allows for early activation of the patient and restoration of limb function.



Minimally invasive osteosynthesis of a femoral neck fracture with three cannulated spongy screws through small skin incisions and closed blocking PFN osteosynthesis with a nail in trochanteric and subtrochanteric fractures is the method of choice for polytrauma in patients of all age groups in order to activate them early.

In polytrauma, the choice of osteosynthesis method depends not only on the location and type of fracture, but also on the presence of fractures of neighboring and distant segments. It is not recommended to combine osteosynthesis with plates and external fixation devices for ipsilateral fractures [8].

The sequence of simultaneous operations is important. If it is chosen correctly, then the performance of one operation does not interfere with the performance of another and does not violate the already done osteosynthesis. For example, with ipsilateral supracondylar fractures of the distal femur and fractures of the diaphysis of the tibia, called the "floating knee" (floating knee), indicate the advantages of one-stage antegrade osteosynthesis of the tibia first with a UTN locking pin, and then retrograde osteosynthesis of the femur with a DFN pin from one surgical approach in the area knee joint.

It is important to determine the priority of surgical treatment of certain injuries. A number of authors reasonably believe that urgent fixation of unstable fractures of the pelvic bones, then a fracture of the femur, and then the bones of the lower leg, shoulder, forearm, foot, and hand should be in the first place [8]. At the same time, with polytrauma, often the main attention is paid to fractures of the long bones of the limbs, and the so-called "secondary" fractures of the bones of the hand, foot, ankles are often not diagnosed, or their treatment does not meet the necessary requirements. This further leads to a decrease in the quality of life and the patient's ability to work [10].

Despite the obvious advantages of one-stage simultaneous osteosynthesis by several surgical teams in multiple fractures, it is extremely important to assess the degree of surgical risk and, if there is the slightest doubt, to abandon simultaneous operations in favor of sequential one-stage or multi-stage operations with an interval of 5-7 days [8].

CONCLUSION: The problem of surgical tactics in relation to skeletal injuries in polytrauma is one of the key ones and is far from being finally resolved. This is evidenced by numerous publications indomestic and foreign literature, numerous proposed treatment and tactical schemes and concepts. Early osteosynthesis of long tubular bones and fixation of unstable injuries of the pelvis and spine in polytrauma can reduce mortality, complication rates, and improve functional outcomes of treatment. The timing and scope of surgical interventions for skeletal injuries in polytrauma should be selected taking into account the severity of injuries and the patient's condition, the period of traumatic disease. The operation should not be an additional aggression that worsens the condition of the injured. Promising directions for optimizing surgical tactics in polytrauma with injuries of the musculoskeletal system are the improvement of systems for an objective assessment of the severity of the victims, the further development and implementation of a staged treatment of skeletal



injuries in critical patients. In polytrauma, minimally invasive technologies are preferred: extrafocal osteosynthesis, blocked intramedullary osteosynthesis, osteosynthesis with cannulated screws and bridge-like plates with angular stability, which do not aggravate the severity of the condition and can be used at the resuscitation stage of treatment.

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