



Editorial

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Fracture fixation strategy: experience and recommendations

Editorial Comment on the Article by Belenkiy I.G. et al.

“Strategies of Osteosynthesis: Problems and Perspectives”

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The commentary critically analyzes the strategy proposed by the authors of the article for performing osteosynthesis and describes the system of care for patients with fractures in Moscow. Operating rooms are divided into planned and emergency. And they, in turn, are divided into conventional and hybrid, in which it is simultaneously possible to perform endoscopic, endovascular, and open surgery. Surgeries are performed in order of priority. Highest priority: extra-focal fixation of limb bones and/or pelvis with ex-fix devices; surgery on extremities with impaired blood supply in the distal parts; decompressive fasciotomies with simultaneous external fixation of fragments in ex-fix devices with suspected formation of compartment syndrome; surgeries performed in patients with severe combined or multiple trauma. High priority: open fractures of type 3A and 3B according to the Gustillo classification, requiring primary surgical treatment of wounds and external fixation; closed unstable fractures.

Keywords: osteosynthesis, emergency trauma care, healthcare organization.

Редакционная статья

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Стратегия выполнения остеосинтеза: опыт и рекомендации

Редакционный комментарий к статье И.Г. Беленького с соавторами

«Стратегия выполнения остеосинтеза: проблемы и перспективы»

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В комментарии критически анализируется предложенная авторами статьи стратегия выполнения операций остеосинтеза и описывается система оказания помощи пациентам с переломами в г. Москве. Операционные делятся на плановые и экстренные. А они, в свою очередь, подразделяются на обычные и гибридные, в которых одновременно возможно выполнять и эндоскопические, и эндоваскулярные, и открытые вмешательства. Операции выполняются в порядке приоритета. Высочайший приоритет: внеочаговая фиксация костей конечностей и/или таза стержневыми аппаратами; операции на конечностях при нарушении кровоснабжения в дистальных отделах; декомпрессивные фасциотомии с одновременной внешней фиксацией отломков в стержневых аппаратах при подозрении на формирование компартмент-синдрома; операции, выполняемые пациентам с тяжелой сочетанной или множественной травмой. Высокий приоритет: открытые переломы типа 3А и 3В по классификации Gustillo, требующие проведения первичной хирургической обработки ран и внешней фиксации; закрытые нестабильные переломы.

Ключевые слова: остеосинтез, неотложная травматологическая помощь, организация здравоохранения.

After reviewing the manuscript of the article by I.G. Belenkiy et al. “Strategy of Osteosynthesis: Problems and Perspectives,” I could not resist polemics.

Certainly, we (and only jointly!) must create a system for providing care to patients with fractures, but I suppose that the different level of equipment of medical organizations and their provision of per-

sonnel in the regions is unlikely to enable this system to become equally effective in the near future. Nevertheless, it is possible to analyze the work of trauma hospitals in megacities, isolate a rational kernel, and evaluate the method of transfer of the knowledge and experience gained to various levels of care. Moreover, in cities such as Moscow, any hospital in terms of its equipment represents practically a

first-level trauma center. However, even in the capital, it is impossible to provide equal assistance in all these hospitals due to the discrepancy between the number of surgical and anesthetic teams. Therefore, a patient routing system was created in accordance with the capabilities of a medical organization. For example, only six and four hospitals have been sub-specialized for the treatment of patients with severe pelvic trauma and patients with isolated injuries of the hand and upper limb, respectively. Thus, even in the capital, uniform rules cannot be formulated for everyone, especially since many attempts at organizational and staff changes are limited by the order of the Ministry of Health of the Russian Federation of November 12, 2012 No. 901n "On approval of the Procedure for providing medical care to the population in the trauma and orthopedics specializations." Therefore, it has not yet been possible to provide medical organizations in Moscow with full-fledged traumatology and anesthesiology teams on duty to ensure surgical care in accordance with the number of non-specialized hospital beds, but with the number, for example, of operating rooms.

In addition, the concepts differ. For example, medical organizations in Moscow lack units such as an anti-shock operating room. We subdivide operating rooms into elective and emergency ones, which, in turn, are subdivided into conventional and hybrid ones, where endoscopic, endovascular, and open interventions can be performed simultaneously. In some hospitals, there is no division at all into emergency and elective operating rooms due to the possibility of full-fledged processing of the premises between interventions. Indeed, surgeries such as external fixation, hemostasis, and emergency tracheostomy are (and should be) performed in an intensive care unit that is not an operating room but allows various procedures to be performed simultaneously for several patients without violating sanitary and epidemiological rules.

Therefore, I do not understand the desire to perform urgent surgical interventions in rooms

that are not adapted for this. It is unclear why it is impossible to place a full-fledged orthopedic table together with an electron-optical image intensifier in an emergency operating room, and it is unclear why an orthopedic table is needed when conducting anti-shock measures.

In Moscow, an approach has been adopted, somewhat different when compared with the I.I. Dzhanelidze Research Institute of Emergency Medicine, to the distribution of the emergency of osteosynthesis.

Surgeries of the highest priority

1. Osteosynthesis surgeries performed in the resuscitation room of the intensive care unit as a resuscitation aid without bringing the patient to the operating room. These include only extrafocal fixation of the bones of the extremities and/or pelvis with the use of rod devices (Table 1).

2. Surgeries on extremities in the case of impaired blood supply in the distal sections are not only surgeries of simultaneous revascularization and osteosynthesis of bone fragments in fractures with impaired main blood flow but also surgeries of osteosynthesis in the replantation of disconnected segments or the imposition of rod devices in severe soft tissue injuries.

3. Decompressive fasciotomy with simultaneous external fixation of fragments in rod-type apparatus in the case of suspected formation of a compartment syndrome.

4. Surgeries performed on patients with severe concomitant or multiple traumas simultaneously (or sequentially) with surgical or neurosurgical interventions.

High priority surgeries

1. Open fractures of type 3A and 3B according to the Gustillo classification that require primary debridement and external fixation.

2. Closed unstable fractures (most often of the ankles and distal metaepiphyzes of the forearm

Table 1

Number of extrafocal fixations using external fixation device, performed upon admission

Localization	Year				
	2017	2018	2019	2020	2021
Upper limb	378	365	363	335	494
Lower limb	865	1028	1170	1158	1527
Pelvis	332	325	392	268	346

bones), especially in the case of a threat to the viability or integrity of the skin. In this case, either stable internal osteosynthesis is performed at any time of the day or (with a shortage of personnel, mass admissions, etc.) external fixation of the segment is performed using rod devices, followed by conversion of the fragment fixation method. Despite a significant annual increase in cases of surgical treatment of fractures of the distal metaepiphysis of the radial bone, there was a clear tendency to perform this type of treatment in the first 48 h after injury, but not on an emergency basis (Table 2).

Thus, it is necessary to emphasize that diaphyseal fractures and some epimetaphyseal fractures of the lower extremities in Moscow in cases where emergency surgery is not possible upon admission are an indication not for skeletal traction but for external fixation with rod devices, including bridge-like ones. In cases where the surgery on the lower limb is planned to be performed only a few hours after admission, immobilization at this time is implemented using external fixation devices, vacuum splints or mattresses, or in extreme cases, plaster casts or plastic adaptive splints, but not with skeletal traction. It is of fundamental importance that the duration of osteosynthesis surgery of fragments of diaphyseal fractures is determined in accordance with the concepts of Early Total Care,

Damage Control Orthopedics, or Early Appropriate Care, depending on objective indicators of the severity of the patient's condition. Therefore, for us, it is incomprehensible and surprising that the proportion of the use of external fixation devices in the I.I. Dzhanelidze Research Institute of Emergency Medicine is extremely low in comparison with internal osteosynthesis.

3. On the day of admission, we strive to perform surgeries for fractures of the proximal femur in elderly patients. As shown in Tables 3 and 4, there is an annual increase in the amount of surgeries performed in the first 48 h from the moment of admission.

If the patient's condition is satisfactory, especially if osteosynthesis is possible, we strive to perform the surgery within the next few hours from the moment of admission. Moreover, there is not a single medical organization in Moscow that could not use an electron-optical image intensifier and an orthopedic table 24 h straight.

4. We also include interventions for injuries of the extensor apparatus of the knee and elbow joints, metacarpal bones, and phalanges of the fingers to urgent surgeries within the first hours from the moment of admission, since progressing edema worsens inevitably the results of late interventions, with number also increasing every year (Table 5).

Table 2

Number of emergency and elective osteosynthesis surgeries of the distal radius, performed in Moscow

Surgery time	Year				
	2017	2018	2019	2020	2021
Emergency osteosynthesis	228	287	215	184	189
Elective osteosynthesis	1237	1374	2755	1349	1835

Table 3

Distribution of surgeries for proximal femur fractures by time intervals from the moment of admission

Year	Osteosynthesis					Endoprosthesis				
	up to 6 h	6–12 h	12–24 h	24–48 h	> 48 h	up to 6 h	6–12 h	12–24 h	24–48 h	> 48 h
2019	224	705	1310	1282	960	13	56	321	938	1446
2020	281	530	835	826	569	5	24	250	940	1310
2021	409	588	997	1093	539	19	89	436	1097	1467

Table 4

Proportion of surgeries for proximal femur fractures depending on the timing of surgical treatment, %

Year	Osteosynthesis		Endoprosthetics	
	up to 48 h	> 48 h	up to 48 h	> 48 h
2019	79.0	21.0	47.9	52.1
2020	81.3	18.7	48.2	51.8
2021	85.2	14.8	52.8	47.2

Table 5

Number of emergency surgeries performed for extensor apparatus of the knee, elbow joints, and hand injuries

Surgery type	Year			
	2018	2019	2020	2021
Olecranon osteosynthesis	603	549	513	661
Surgeries for injuries of the extensor apparatus of the knee joint:				
–Injury of the quadriceps	59	87	58	73
–Fracture of the patella	374	398	333	440
–Patella ligament rupture	62	64	46	53
Surgeries for injuries of the hand tendons	386	668	845	1860
Osteosynthesis of hand bones	916	1270	1257	2397

Injuries in which internal osteosynthesis surgeries are not recommended for emergency indications (but only external fixation of the segment is allowed) include peri-implant fractures of any location, trans-acetabular fractures, calcaneal bone fractures, and intra-articular fractures of the elbow joint.

Surgeries, such as osteosynthesis of fragments of the clavicle, ankles, foot bones, distal metaepiphysis of the radial bone, and proximal metaepiphysis of the humerus, are performed according to emergency indications only if there are free operating rooms, teams of anesthesiologists and orthopedic traumatologists, and only at a time sufficiently comfortable for surgeons and anesthesiologists. Indeed, performing these surgeries on an emergency basis reduces significantly the duration of the patient's hospital stay, but the desire to comply with the economic interests of the healthcare system does not always lead

to an increase in the quality of care provided at night by a tired surgeon, not to mention the possibility of free choice and selection of hardware in this time of the day. In these cases, we try to prioritize the order of surgeries to elderly patients first. For example, with the simultaneous admission of an elderly patient with a fracture type 32 A, B, and C according to AO-Müller/Orthopaedic Trauma Association classification and a young patient with a multi-fragmentary fracture of the patella, assistance will be provided first to that elderly patient. However, if a young patient with an open fracture of the ankles of type 44-B3 is admitted along with such an elderly patient, priority is given to the patient with a fracture in the ankle joint.

It took decades to create this system, since from our point of view; it is not the number of surgeries that should be evaluated, but their long-term results.

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