# NEGATIVE EXPERIENCE IN BLOCKING INTRAMEDULLARY OSTEOSYNTHESIS
## (REVIEW)

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**Abstract**
Treatment of diaphyseal bone fractures is a complicated, controversial and ambiguous task. Blocking intramedullary osteosynthesis, which became the standard of treatment, is also not perfect and accompanied by a number of complications. The reasons for their occurrence are connected both with defects in the organization of treatment of patients, and with tactical mistakes, the definition, generalization and prevention of which became the purpose of our study.
It was found that typical tactical mistakes were use of the method against the indications, non-compliance with the technology of blocking intramedullary osteosynthesis and the use of unsubstantiated and inadequate "proprietary methods", making their own "modifications" during the surgery and changing the course of operative intervention, excessive drilling of the bone marrow canal, significant intraoperative traumatism of bone fragments and surrounding soft tissues, incorrect type of lock or timely unfulfilled dynamization, lack of consistency and restorative and rehabilitative treatment.
But the most negative effect on the anatomical recovery of the bone and functional recovery of the extremity was the bone marrow canal drilling, performed without the corresponding indications and technical disadvantages. It is obvious that the violation of the endostosis of the endostal negative effect on the reparative capabilities of bone tissue, inhibits the process of bone grafting and delay recovery.
Therefore, there is no doubt that the further study of the effect of bone marrow duct penetration in the course of reparative osteogenesis is relevant and appropriate.
***Key words:*** *blocking intramedullary osteosynthesis, tactical mistakes, fracture, long bones, drilling.*

Orthopedic and trauma pathology is ranked second internationally after cardiovascular diseases and first among the causes of incapacity and primary disability [1]. Extremity injury is the most common injury, most of them (from 50,4 to 72,1% of all injuries of the musculoskeletal system) are the long tubular bone injuries [2], while lower extremity fractures occur twice as often as the upper limb fractures [3].

The majority of the long-bone fractures are diaphyseal fractures [4]. Among the population of Ukraine, diaphyseal fractures make 48.5% of all long-bone fractures [5]. As for the location of long-bone shaft fractures, tibia fractures (40–56%) are on the first place, followed by femur fractures (25–34%); forearm and shoulder fractures 14–20% and 11–17%, respectively [6, 7].

Despite the large number of studies on this topic, management of diaphyseal bone fractures is a complicated, controversial and ambiguous task. Since several different techniques can be used to treat one fracture, it usually results in mistakes which delay the recovery of the patient and affect negatively on the final outcome. Disruption of fracture union process has a serious impact on the quality of life of the patient, the term of disability, increases the risk of development of local and/or systemic complications, and is a

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burden for the health system and the family of the patient [8, 9]. The researchers note the lack of explicit dynamics in reducing the frequency of complications in treatment of extremity fractures [10].

The outcome of long-bone fractures at the present depend on the set of objective and subjective factors: the age of the patient, the type and degree of concomitant pathology, localization and type of fracture, the time elapsed from the moment of trauma to the operation, the method of fixation of fractured bone fragments and many others [11].

Despite the advantages of the operative method, treatment of long-bone fractures is often accompanied by a number of complications. Causes of complications are associated with defects in the management of patients (improper treatment tactics, wrong choice of the method of osteosynthesis, disturbances of recovery regimen in the postoperative period, patients non-compliance of the term of limb loading, etc.), as well as with technical errors associated with the actual performance of the operation (traumatic surgery, instability of osteosynthesis, wrong choice of metal constructions, insufficient hemostasis, etc.) [12].

M.O. Korzh et al. [13] concluded that the most common medical errors are the underestimation of the severity of the damage; inconsistency of the applied method of treating the traumatic injury and the patient's condition; incomplete repositioning of fractured bone fragments; use of implants made of low-quality material; violation of osteosynthesis technique, resulting in lack of stability in "bone-bone" and "bone-implant" systems; lack of consistency throughout all phases of treatment and an unreasonable change in the treatment method; as well as, inadequate medical rehabilitation.

In general, complications after osteosynthesis of long bones extremity are divided into local (in the location of the surgery) and general; as well as the infectious and noninfectious [14]. The following complications in the process of treatment by osteosynthesis are described in the literature: operative wound abscess, delayed consolidation, malunion, pseudoarthrosis, soft tissue irritation in the location of fixator or plate, fracture of the metal constructions, the false joint formation, debris syndrome, compartment syndrome, osteomyelitis [15, 16].

Other complications include intraoperative (secondary) fractures, delayed union, reduced contact strength of screw carvings with bone, secondary displacement of bone fragments, migration and fracture of structures [17, 18].

Instability of the bone damage zone, especially in the presence of a metal implant, can have the most severe destructive effects, namely the formation of a large periosteal callus, which calls fracture consolidation into question; widespread resorption of bone tissue, resulting in the formation of a false joint. Conversely, in the conditions of stable osteosynthesis and the preservation of the property of a fixing metal anchor and bone fragments, an osteoinductive effect of the implant was detected.

Literature data analysis shows that the issue of complications after treatment of long-bone fractures has captured the attention of many researchers. Complications undoubtedly influence both the outcome and the patient's life quality. The prognosis of the development of complications after long-bone surgery is possible, but in most cases, it is carried out on the basis of subjective experience of traumatologists. In general, when analyzing data from domestic and foreign literature it is clear that the incidence of complications in the treatment of long-bones fractures is still rather high. To prevent adverse treatment outcomes is possible on the basis of predicting and preventing system. However, in the literature such information so far can be found in separate publications only [19].

At the present stage, the gold standard for the treatment of diaphyseal bone fractures is de facto blocking intramedullary osteosynthesis. The main advantage is its low traumaticity, since the nail in the marrow canal is introduced far from the seat of fracture, which makes it possible to preserve the source of periosteal blood supply, which is important in the process of subsequent fracture consolidation [20, 21]. The promising outcome, the creation of unified tools and sparing techniques contributed to the rapid spread of closed blocking intramedullary osteosynthesis in the number of developed countries [22].

Significant advantages of blocking intramedullary osteosynthesis, such as low invasiveness, lack of intraoperative blood loss, significant stiffness of fixation, high quality of life, the absence of need for regular physical therapy for the development of joint movements practically minimize the risk of complications in the treatment process, make this technique optimal for the treatment of diaphyseal long-bone fractures [23].

The philosophy of operative therapy with the use of closed intramedullary osteosynthesis with blocking provides the possibility of stable fixation of bone fragments in an anatomically correct position without intervention in the place of fracture; the implementation of early dosed

physical exertion on the operated extremity, the implementation of passive and active movements in adjacent joints without any additional external immobilization [24, 25]. The advantages of intramedullary osteosynthesis include the lack of discomfort, the possibility of self-sustaining self-care and an independent move, and a reduction in the length of stay in a medical facility [26].

The undeniable advantages of closed blocking intramedullary osteosynthesis are also relative simplicity of surgical intervention and primary stability of fractured bone fragments [27, 28]. All these factors contribute to the consolidation of fractured bone fragments, rapid household and social adaptation of the patient with the possibility of a quick return to work [22]. According to [7, 29], currently blocking intramedullary osteosynthesis with diaphyseal fractures has the right to be considered as the classical treatment method of this category of damage. It should be noted that this treatment method allowed 95% of patients to receive positive outcome [30].

However, it is known that, like any other treatment method, blocking intramedullary osteosynthesis is not devoid of deficiencies and is accompanied by a number of complications [31]. Unsatisfactory results can be explained as separate shortcomings of operational techniques – inadequate selection of clamps, incorrect technique of osteosynthesis, insufficient repositioning of fragments, etc., especially, and tactical mistakes, such as, the inconsistency of the fracture with this method of osteosynthesis, the choice of an incorrect method of blocking, the presence of related injuries, which may influence the choice of the method and the term of osteosynthesis, marrow canal drilling without indications or, conversely, a refusal to drill in the shown for these cases.

Further study of the effect of bone marrow drilling in the course of reparative osteogenesis is relevant and appropriate. Knowledge of typical tactical mistakes and adherence to the method of blocking intramedullary osteosynthesis may reduce the number of poor anatomical and functional results and avoid complications.

**Conflict of interests**

The authors state that there is no conflict of interest in the preparation of this article.

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