

**OUR EXPERIENCE IN TREATING DIAPHYSEAL  
METACARPAL FRACTURES OF THE HAND**

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**Аннотация:** *The article presents the experience of surgical treatment of diaphyseal fractures of the metacarpal bones of the hand. Fractures were treated using the technique of closed transossal-interossal osteosynthesis. The treatment of 1,47 patients was analyzed. Excellent and good treatment results were obtained in 142 (9.6, 56,5 %) patients, in 5 (3.5, 5%) – satisfactory, but unsatisfactory results were not observed. Patients with satisfactory results complained of restriction (within 5-10%) of movement in the metacarpophalangeal joint and a slight violation of grip. Satisfactory treatment results were observed in patients with open fractures. Experience shows that the use of transinterossal osteosynthesis can improve the anatomical and functional results of treatment, especially for closed and open metacarpal fractures.*

**Keywords:** *metacarpal fracture, minimally invasive method, Kirschner's needle Киршнера.*

**Relevance.** Metacarpal fractures occur in 30-46 % of all hand fractures and are the main cause of decreased upper limb function [3,4]. According to various authors, closed fractures of the first metacarpal bone account for 25-42%; the second metacarpal bone — 15-20 %; the third metacarpal bone — 6-12 %; the fourth metacarpal bone — 8-12 %; the fifth metacarpal bone — 18-45 %, and the phalanges of the fingers account for up to 37 % [2]. According to the localization of STDs, they are distributed as follows: in the area of the diaphysis — in 31% of patients; in the area of the base — in 21 %; in the area of the head — in 6 %; in

42% of patients subcapital metacarpal fractures occur [3]. Fractures of the metacarpal bones occur mainly as a result of a direct mechanism of injury (a blow to the bone or a blow with the hand on a hard object). But they can also occur with indirect application of force (load along the axis, bending, twisting). At the primary outpatient appointment, the number of patients with hand injuries reaches 15.7-25.3 %, of which 55% of cases have fractures of the medial, middle phalanges and metacarpal bones with the severity of damage up to 10 points according to the Hiss classification [4,5]. In the vast majority of patients (82.6-91.4%), conservative methods of treatment and osteosynthesis with knitting needles are used in 7.0-16.2% of cases. Only 2.5 - 4.0% of patients, mainly with secondary displacement of bone fragments, use extrafocal osteosynthesis and fixation of the damaged bone with bony plates [1,6,7]. The methods of treating this injury are diverse: from closed one-stage reposition followed by the application of a plaster splint, to extra-focal fixation with apparatuses and immersion osteosynthesis, but all of them have both positive and negative aspects – the possibility of secondary displacement of fragments, the development of osteomyelitis, the high trauma of the operation, discomfort in using apparatuses, etc. Despite the success achieved in conservative and operative methods of treatment of metacarpal fractures, specialists are constantly looking for ways to improve surgical methods of treatment that would simultaneously ensure rigid fixation of fragments and early function of the damaged hand. But along with new methods, well-known methods of surgical treatment are constantly being improved. At the same time, most researchers prefer minimally invasive methods of surgical treatment [3,5,8,8].

The Samarkand branch of RSNPMCTO has accumulated quite a lot of experience in the treatment of diaphyseal fractures of the metacarpal bones of the hand using the method of closed transossal-interossal osteosynthesis.

**The aim** of the work is to study the experience of using transossal-interossal osteosynthesis of diaphyseal fractures of the metacarpal bones of the hand.

**Material and methods.** We have experience in treating 135 patients with closed (108 (80.7 %) patients) and open (26 (19.3 %) patients) fractures of the diaphyseal metacarpal bones of the hand aged from 18 to 60 years. The largest number of patients was aged 18 to 45 years (118 (87.4 %) patients), 117 (86.7%) men and 18 (13.3%) women. Injuries of the right limb were diagnosed in 74 (54.8 %), left 57 (42.3 %), both in four (2.9 %) patients, fractures of two or more metacarpal bones were observed in 30 (22.3 %) patients. The main cause of the damage was a fall with support on the brush, a blow to the brush and end impacts of the brush against other solid objects. The time elapsed from the moment of injury was about one to 6 days. All patients were examined using clinical and radiological methods. Radiography was performed in two projections.

The surgical procedure is as follows: the operative intervention was performed under local anesthesia at the site of the fracture according to Beler Sol. Novocaini 1 % – 5-7 ml, and the site of the spokes with infiltration anesthesia Sol. Novocaini 0,25 % – 15-20 ml. After 7-10 minutes, mixed fractures were repositioned by simultaneous pressure on the top of the angle formed by the mixed fragments in the palmar direction, and the head of the metacarpal bone in the opposite direction, while stretching along its axis. After a closed reposition, two Kirschner spokes are fixed through the proximal and distal fragments of the damaged metacarpal bone to the adjacent healthy metacarpal bones. If the fracture is open, the above manipulations are performed after appropriate primary surgical treatment of the wound. After closed reposition and transossal-interossal fixation with knitting needles, a plaster splint (back or palm) is applied from the middle of the fingers to the upper third of the forearm for up to 4.5-5 weeks. The spokes are removed 5 weeks after a preliminary X-ray examination. After that, physiotherapy procedures, forearm muscle massage, physical therapy are prescribed. The method used for treating metacarpal fractures is the simplest, less traumatic, cost-effective and accessible to any orthopedic traumatologist compared to other surgical interventions. This method of fixing bone fragments avoids secondary mixing of fragments at the fracture site.

Here is a clinical example of treating a patient using the described method.

Patient K., 29 years old, suffered an industrial injury – closed oblique fractures of the diaphysis of the II-III-IV metacarpal bones with mixed fragments (Fig. 1).



***Figure 1. Radiograph of patient K., 29 years old. Closed oblique fractures of the diaphysis of the II-III-IV metacarpal bones with mixed fragments***

Closed reposition of fragments and fixation with two Kirschner spokes through the central and peripheral fragments of damaged metacarpal bones on healthy metacarpal bones located next to each other was performed (Fig. 2). A posterior plaster splint was applied from the middle of the fingers to the upper third of the forearm.



***Рис. 2. Рентгенограмма пациента К., 29 лет. Состояние у пациента Куршнера переломов диафизов II of mixed metacarpal fractures of diaphysis Iiii-IV-IV after Kirschner joint reposition and fixation***

The postoperative period was uneventful. The plaster splint was removed after 4 weeks, and the spokes were removed after 5 weeks after preliminary radiography. Physiotherapy procedures, forearm muscle massage and physical therapy are prescribed.

When examined one year later, the treatment result was found to be good based on a comprehensive assessment of the following indicators: restoration of active movements, all types of grips, hand strength, sensitivity, anatomical integrity and restoration of working capacity (Fig. 3). On the X-ray, the bone axis is correct, and the fracture is fused.



***3. Radiograph of patient K., 29years old. Long-term result one year after Kirschner joint reposition and fixationuuamu Kupunhepaof fracturesof the II–III–IV metacarpal diaphysis with mixed fragments***

**Results.** In all patients, the postoperative period was mostly favorable. Complications in the form of soft tissue inflammation around the spoke were observed in 15 (11.1 %) patients. The inflammation was easily eliminated by antibacterial drugs during outpatient treatment. It did not negatively affect the further outcome of treatment.

Long-term treatment outcomes were studied in 112 (83 %) patients. They underwent a full clinical and genologicalтexamination. The follow-up period for long-term results is from 6 months to 5 years. It is generally accepted that the assessment of the following indicators: the degree of recovery of active finger movements, grips, hand strength, sensitivity, anatomical integrity and ability to work is sufficient to determine the outcome of metacarpal fractures of the hand. The results were evaluated using a 4-step system, taking into account the above indicators. Excellent and good results of treatment were obtained in 106 (94.7 %) patients, in 6 (5.3 %) – satisfactory, but unsatisfactory results were not observed. Patients with satisfactory results complained of restriction (within 5-10%) of movement in the metacarpophalangeal joint and a slight violation of grip. Satisfactory treatment results were observed in patients with open fractures. Experience shows that the use of transinterossal osteosynthesis can improve the anatomical and functional results of treatment, especially for closed and open metacarpal fractures.

**Conclusions.**

1. The use of minimally invasive transossal-interossal fixation of bone fragments of metacarpal fractures of the hand is justified due to less traumatic, high efficiency and accessibility compared to other surgical interventions.
2. The transossal-intraossal osteosynthesis used for the treatment of diaphyseal fractures of the metacarpal bones of the hand allows obtaining

excellent and good treatment results in the vast majority (94.7 %) of patients, which gives reason to recommend it for widespread use in practice.

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