TREATMENT OF DIAPHYSEAL FRACTURES OF THE METACARPAL BONES

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ABSTRACT

Presented is the experience of the application of stable osteosynthesis by three Kirschner wires on diaphyseal fractures of the metacarpal bones at 74 patients. Indications for osteosynthesis was opened (6%), closed (94%), non-united, mal-united fractures and false joints of metacarpal bones diaphysis. Patients were given intraosseous anesthesia at distal epi-metaphysis area of radial bone. Described is a method of operation extra medullary osteosynthesis using three Kirschner wires. Also, method of wedge osteotomy for full recovery of hand function is described. Good results were obtained in 83.1% of patients, satisfactory at 13.6%, and unsatisfactory results in 3.4% of patients.

UDC CODE & KEYWORDS

■ UDC: 616-001 ■ Diaphyseal fractures ■ Metacarpal bones ■ Treatment ■ Osteosynthesis

INTRODUCTION

Treatment of fractures of the metacarpal bones is still a difficult part of Hand Surgery. At present, there is no single approach to the choice of treatment for different diaphyseal fractures of the metacarpal bones. Conservative treatment is not always a sufficient retention for consolidation of bone fragments and often leads to secondary fragments displacement after reduction [Shihalëva, 2009; Zerdedzhi, 2008; Scheker, 2007].

Basically in surgeries, intra and extramedullary osteosynthesis, extrafocal external fixation and diafixation method is used. Intramedullary osteosynthesis pin allows for reliable fixation of fragments, provides extra-articular holding metal fixating, contributes in less traumatization of interosseous muscles and longitudinal arch brush and can be apply for multiple fractures of metacarpal bones. The disadvantage is the inability of intramedullary nailing in accurate repositioning due to high rigidity, and bending pin curvature mismatch of metacarpal bone and the complexity of its removal after bone fragments consolidation [Beidik, 2006; Scheker, 2007]. As extramedullary stable osteosynthesis of tubular bones of the hand has been used successfully for mono-local extramedullary plate with screws AO system and other similar structures. The disadvantage is the difficulty of the screw to get through the metacarpals and the need for re-operation. Extra focal osteosynthesis external fixation finds a wider application but this method is indicated only at fragmented, peri and intra-articular fractures [Beidik, 2006; Miguleva, 2004; Zerdedzhi, 2008]. Despite the simplicity and reliability of the diafixation method, its application is limited for multiple fracture of the metacarpal bone and does not eliminate the rotational displacement of bone fragments. To eliminate these disadvantages, we have developed a modified diafixation method for bone fragments fracture of the metacarpal bones of the hand.

Material and Methods

We observed 74 patients between 2010 and 2014 in the department of hand surgery with injury of metacarpal bones. Of these, 68 were male, female. Their age ranged from 18 to 53 years, which is the most able-bodied age. 33% street injury, 45% household trauma, and 22% production and other injuries were identified in patients. Injury was observed 93% in the right hand, and 7% in the left hand of patients. The open fractures were 6 and 94% were closed; patients have been admitted with non-united, mal-united fractures and false joints of the metacarpal bones.

The indications for this technique were: opened, closed, non-united, mal-united diaphyseal fractures and false joints of metacarpal bones. This method is not suitable for intra-articular, metadiaphyseal, fragmented and spiral fractures.

Surgical technique: The operation was performed under the intraosseous anesthesia with 0.5% solution of procaine (60-70 ml) through the distal epimetaphysis radius (anesthesia usually occurs within 5-10 minutes after the anesthetic injection and enforce surgery with duration of 1-1.5 hours). A semi oval incision on dorsal radial surface was made to approach the site of fracture I, II, III metacarpal bones, and to approach IV and V metacarpal bone, incision on the dorsal ulnar surface in the projection damaged metacarpal bones was made. The length of the wound was in the range of 3-4 cm. Then, edges of the wound were diluted by a silk skin clamp. After that, sharp and blunt were used to withdraw extensor tendons, the fracture site was exposed, blood clots removed and tissue interposition eliminated. After that repositioned bone fragments and fixed two crossed Kirschner wires through both fragments and one through the distal fragment perpendicular to the axis of the metacarpal bones, which provided a solid fixation and excluded rotary displacement of fragments.

Figure 1: Patient S., 23 years, case # 1618 from 08.12.2011, was admitted to the hospital with the diagnosis: Closed oblique fracture of 4 metacarpal of the right hand.

The patient was operated 10.12.2011, under the intra-osseous anesthesia 0.5% solution of Procaine, after treatment of the surgical field with Betadine, made semi oval incision along the dorsum of the hand at the level of the fracture length of 4 cm layers exposing metacarpal bone. Hand-stage reduction, correction of angular displacement, then fragments of bones strengthened by 2 crossed wires and one carried out through the distal fragment perpendicular to the axis of the metacarpal bone, which provides a solid grip and eliminates the rotational displacement of fragments. After surgery, superimposed

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Figure 1: X-ray after surgery

Source: Authors

plaster splint for 4-5 weeks. Made control radiograph. Sutures are removed after 15 days, and after 3-4 weeks plaster splints are removed.

When non-united wrong fused fractures and false joints of metacarpal bones of the hand were a significant deformation of the metacarpals, limitation of motion of the metacarpal-phalange joints of the fingers was clear. Under these fractures we use the following method.

The objective of the proposed method is the elimination of the defect of the deformed segment, reducing trauma with the exception of postoperative complications, reducing the time of treatment. To solve the problems in method of treating non-united, fused wrong, false joints and fractures of the metacarpals with angular deformity including osteoclasia, we use one-step manual reposition, correction of angular displacement followed by the imposition of plaster splints, characterized in that the front osteoclasia produce osteotomy properly fused bones under angle of 45 degrees and a length of 5-6 mm, and then strengthen the bone fragments 2 crossed spokes and one carried out through the distal fragment perpendicular to the axis of the metacarpal bone, which provides a solid grip and eliminates the rotational displacement of fragments.

When non-united fractures and false joints metacarpal bones is fixed using two crossed Kirschner wires, plastic auto bone is made to improve the regeneration of the damaged bone reposition axis.

This method eliminates the anatomical defect deformed segment and prevent the occurrence of contractures. After 15 days of surgery, remove sutures, and plaster splints are immobilized for 3-4 weeks after surgery. After the X-ray control after 3-4 weeks (this corresponds to the period seam), the plaster splints were removed.

Isolated diaphysis fractures of fresh dates seam fragments were 1-1.2 months and non-united fractures and wrong intergrows consolidation occurs within 1.5-2 months.

Results

Long-term results of treatment in a period of 1 year to 4 years old were studied in 59 (79.7%) patients. The evaluation conducted by an 8-point scale, were taken into account for the consolidation of the fracture, the range of motion in the joints, the presence of pain and return to work. Good results were ascertained in 49 (83.1%) patients, satisfactory in 8 (13.6%), poor in 2 (3.4%). In the study of patients with long-term results, we used the template evaluation criteria of the treatment of patients, which is reflected in the table number 1.

Table 1: Provide table description

Scores of all parameters	Scores			Gross
Consolidation	0	1	2	
The volume of traffic on the CFJ	0	1	2	
Pain syndrome	0	1	2	
Return to work	0	1	2	
Gross				

Source: Authors

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Calculated on a point system with 4 parameters

1. Consolidation
 - a. Full consolidation - 2 points
 - b. Meden coalesce - 1 point
 - c. No Consolidation - 0 points
2. The range of motion
 - a. The volume of traffic on the PPS 90°-180° (range of motion 90°) - 2 points
 - b. The volume of traffic on the PPS 100°-175° (range of motion 75°) - 1 point
 - c. The volume of traffic on the PPS 120°-145° (range of motion of 25° or less) - 0 points
3. Pain Syndrome
 - a. No pain syndrome - 2 points
 - b. Slight pain syndrome - 1 point
 - c. Pain syndrome has 0 - points
4. Return to work
 - a. Return to work - 2 points
 - b. No Return-to-work - 0 points

The results evaluated in following point system:

From 8 to 6 points is good

5 to 3 points is satisfactory

2 points or less is unsatisfactory result

Table 2: Results

	New fractures	Wrong accrete fracture	Non-united fractures	Near throsis	Total
Good	23	14	4	2	43
Satisfactory	1	3	4	1	9
Unsatisfactory		-	1	1	2
Total	24	17	9	4	54

Source: Authors

CONCLUSION

1. For stable fixation of bone fragments diaphysis fractures of the metacarpal bones of the hand, in our opinion, osteosynthesis with three Kirschner wires should be used, providing the possibility of early movements of the joints of the fingers. This method allows you to start active movements in the inter-phalange joints of the hands, and carpal-phalange in the first days after the operation, reducing time disability patients.
2. The advantages of these methods are small trauma surgery, accurate comparison of bone fragments, their reliability and controlled fixation with the possibility of early functional loading of the overwhelming number of patients.
3. In this method we use stable osteosynthesis in fractures of the metacarpal bones of the hand which allows you to get 83% of good results in the vast majority of patients, which gives reason to recommend it for widespread use in the practice of medical institutions.

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