



Results of Treatment of Fractures of the Distal End of the Humerus

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Abstract: This article presents the results of treatment of 62 patients with intraarticular fractures of the distal end of the humerus. The patients were divided into the following groups: The 1st group consisted of patients with Ilizarov apparatus compression-distraction osteosynthesis; the 2nd group consisted of patients with spokes osteosynthesis; the 3rd group consisted of patients in whom the muscular pedicle of each fragment had to be dissected, the epiphysis fracture "collected", and then the epiphysis was matched to the proximal fracture for accurate matching of the epiphysis bony fragments and then to the proximal fracture. Such an approach was usually used for C2, C3 comminuted fractures of the humerus. Using the Broberg-Morrey functional index and the Casselbaum treatment outcome assessment system modified by Jupiter J.B. et al. (1985), we evaluated the treatment outcomes in all patient groups in combination. This approach to estimating treatment outcomes was more revealing. Accordingly, we evaluated excellent treatment results in 32 (51.6%) patients, good results in 24 (38.7%) patients and satisfactory results in 6 (9.7%).

Keywords: distal end of humerus, osteosynthesis.

Relevance. Among intraarticular fractures, injuries to the elbow joint account for 79.5-89.0% [1]. Preservation of motion in multifragmental fractures of the distal humerus metaepiphysis determines the priority of methods allowing early restorative treatment of the injured joint. This will avoid complications due to limited joint function [2]. The literature suggests that fractures of the condyle of the humerus make up 0.5-2.0% of musculoskeletal injuries, 6.5-15.0% of humeral fractures, and 30% of ulnar fractures [1-4]. Despite certain advances in the treatment of this category of victims, the rate of poor treatment outcomes remains high and is in the range of 40-50%. The need for prolonged immobilization leading to contracture and ankylosis in 20-29.9% of cases is associated with 10-18% of complications [2,6]. One of the most common complications of intraarticular fractures is the formation of contractures in the elbow joint (85%), which are caused by prolonged immobilization of the joint [4,8].

Purpose of work. To describe the results of combined osteosynthesis of intraarticular fractures of the distal epimetaphysis of the humerus.

Materials and Methods. Our report is based on the results of treatment of 64 patients with A3, CI, C2, NW group (according to AO/ASIF classification) distal humeral end fractures, who received treatment in 2020-2022. Men comprised 35 (54.7%) and women comprised 29 (45.3%). By age, they were distributed as follows: 18-29 years - 20 (31.3%), 30-49 years - 28 (43.8%), 50 years and above - 16 (24.9%).

The patients were divided into the following groups according to the operative treatment: Group 1 patients underwent compression-distraction osteosynthesis with Ilizarov apparatus; Group 2 patients underwent osteosynthesis with spokes; Group 3 patients in whom for accurate matching of the epiphysis bone fragments to each other and then to the proximal fragment had to dissect the muscular pedicle of each fragment, "collect" the epiphysis fragment, and then the epiphysis to be

matched to the proximal fragment. This action was commonly used in C2, C3 comminuted fractures of the humerus.

In patients with CI, C2, NW fractures (44 patients in total), we first matched and fixed 2-3 bone fragments of the epiphysis with spokes (reconstructed or reconstructed), then the end of the central fragment was brought into the wound, the reconstructed epiphysis was matched to the end of the central fragment and the epiphysis was fixed with spokes on each side. Sometimes a single bone fragment of the metaphyseal fragment had to be matched and fixed with one, two spokes. The strength and stability of the fixation was studied. The distal end of the shoulder was then repositioned. The dissected epiphyseal muscles were carefully sutured. The Ilizarov apparatus was additionally used for external fixation in 20 patients. External immobilization with a plaster cast was used in the remaining 24 patients.

The results of treatment were analysed using the methods of outcome evaluation - 1) the method described by Broberg and Morrey [5]; 2) the method described by Casselbaum, modified by Jupiter J.B. et al. [7]. These techniques take into account such parameters as pain factor; range of motion (flexion, pronation, supination); strength of the muscles of the operated limb; and stability of the operated elbow joint. According to the Broberg and Morrey Pain Rating Scale, the pain factor has the highest value (maximum 35 points), muscle strength is assessed as 20 points, and the stability of the joint is assessed as 5 points. For the evaluation of the range of motion, movement volume scores are calculated as follows: flexion - flexion volume in degrees is multiplied by the factor 0.2; pronation - pronation volume in degrees is multiplied by the factor 0.1; supination - supination volume in degrees is multiplied by the factor 0.1, scores are added together. The maximum amount of flexion is 135° (27 points), pronation is 60° (6 points) and supination is 70° (7 points). Thus, the maximum number of points assessing the volume of movement is 40 points. A detailed description of the functional outcome assessment of fractures of the distal humerus metaepiphysis according to the Broberg and Morrey scale is given in Table 1. The maximum possible score that a patient can score is 100. Therefore, the functional outcome was assessed in relative terms. The assessment of the quality of recovery of elbow joint function as a function of the score is shown in Table 2. At the same time, the outcome assessment system for patients with distal humerus fractures, as described by Casselbaum and modified by Jupiter J.B. et al., is easier to use in clinical practice, but is more subjective. It assesses only three parameters - the amplitude of movement in the elbow joint, the severity of pain syndrome, and limitation of daily activities (Table 3). We used both assessment scales. Firstly, in order to increase the objectivity of the results obtained. Second, to compare the scales themselves. Note that we did not observe any discrepancies in the results of treatment using the two scales. These characteristics made it possible to evaluate the treatment outcomes of patients with multifragmental fractures of the distal humerus metaepiphysis with the presence of small fragments. Using the Broberg-Morrey functional index, as well as the Casselbaum treatment outcome scoring system modified by Jupiter J.B. et al. (1985), we evaluated the treatment outcomes in all groups of patients. This approach to estimating treatment outcomes was, in our opinion, more revealing. Accordingly, we evaluated excellent treatment results in 30 (46,9%) patients, good results in 26 (40,6%) patients and satisfactory results in 8 (12,5%).

Table 1 Broberg and Morrey scoring of functional outcomes of fractures of the distal humerus metaepiphysis

Parameter	Description	Points
Strength	Normal	20
	Slight decrease (no less than 80% of the opposite side)	13
	Moderate reduction (restriction to 50% of the opposite side)	5
	Severe reduction (inability to function at home)	0
Stability	Normal	5
	Slight instability without functional limitation	4
	Moderate instability with limited life activity	2
	Severe instability with inability to lead a normal life	0
Pain	No	35

	Minor, without need for analgesics	28
	Moderate, during or after exertion	15
	Significant (even at rest requires continued use of analgesics)	0
Movement volume	Maximum	40

Table 2 Outcome assessment of fractures of the distal humerus metaepiphysis according to the Broberg and Morrey scale

Points	Exodus
95–100	excellent
80–94	Good
60–79	not enough
0–59	Poor

Table 3 Outcome assessment of patients with distal humerus fractures according to Casselbaum

	Result	Pain syndrome	Movement volume	Activity limitation
4	Great	No	115° or more	no
3	Good	Sometimes	90-115°	minimal
2	Satisfactory	while moving	50-100°	moderate
1	Poor	At rest	less than 50°	pronounced

Conclusion. Thus, combined osteosynthesis solves the problem of reposition and stabilization of small bone fragments and enables early movements in the operated joint, which provides good treatment results. Combined osteosynthesis of fractures of the distal humerus metaepiphysis showed high efficiency. The average score was 82.67 ± 5.59 , which corresponds to a good treatment outcome in this category of patients.

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