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# REMOTE RESULTS OF SURGICAL TREATMENT OF PATIENTS WITH PROXIMAL HUMERAL FRACTURES

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proximal humeral fractures, surgical treatment, osteosynthesis, upper arm.

## ABSTRACT

Proximal humeral fractures constitute 5-8% of all the fractures of the limbs and 80% of fractures of the upper arm.

To report about remote results of the suggested tactics of surgical treatment of proximal humeral fractures.

Satisfactory results of treatment were found in 21 (80,7%) patients out of 26 (72%), who underwent closed reduction of fractures with pin fixation. This group of patients achieved consolidation in optimal terms, and the function of the shoulder joint was satisfactory with abduction angle of 90°. 2 (7,7%) patients experienced secondary dislocation of fragments and their QuickDASH score was 38.4. 3 (11,6%) patients achieved consolidation of fracture, but stable contracture of the shoulder joint occurred. Their QuickDASH score was 38.4.

Osteosynthesis with plates was performed in 10 patients. 3 (30%) of them developed aseptic necrosis of the humeral bone head, 2 (20%) patients developed suppuration of the soft tissues which produced a negative effect of the patients' ability to work – QuickDASH score 42,7, 5 (50%) patients admitted satisfactory results of treatment – QuickDASH score 21,5. Osteosynthesis with plates was performed in 10 patients. 3 (30%) of them developed aseptic necrosis of the humeral bone head, 2 (20%) patients developed suppuration of the soft tissues which produced a negative effect of the patients' ability to work – QuickDASH score 42,7, 5 (50%) patients admitted satisfactory results of treatment – QuickDASH score 21,5.

The tactics of surgical treatment of patients with proximal humeral fractures depends on the following: type of a fracture, patient's age, concomitant pathology and osteoporosis available, and patient's social needs.

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**Relevance:** proximal humeral fractures constitute 5-8% of all the fractures of the limbs and 80% of fractures of the upper arm [4; 7]. In 15% of proximal humeral fractures fragments are dislocated, which requires surgical treatment in the form of osteosynthesis or primary implants/endoprosthesis of the shoulder joint [3; 10; 12].

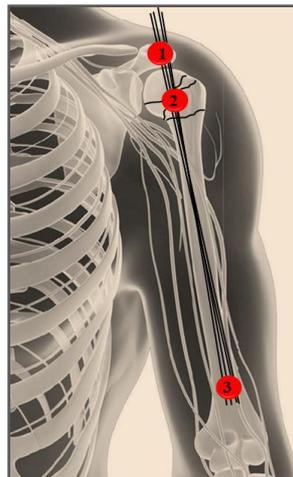
Today various types of surgery are performed: closed reduction and fixation with pins or cannulated screws, open reduction and osteosynthesis with bone plates, transosseous suture, blocking

intramedullary osteosynthesis [1; 2; 9]. Meanwhile, in spite of different types of surgery a number of unsuccessful results of treatment are found: suppuration of the soft tissues and osteomyelitis, posttraumatic osteoarthritis, migration of metal constructions, neurological complications, repeated dislocation of fragments, subacromial impingement syndrome, and contracture of the shoulder joint with functional disorders of the limb [4; 6; 11].

The authors indicate [1; 5; 8] that 40-50% unsatisfactory results of treatment of proximal humeral fractures with dislocation of fragments are associated with numerous unsuccessful attempts of closed reduction. The choice of surgical method of treatment of proximal humeral fractures mostly depends on age, general condition of a victim, associated injuries available, type of fracture, amount and size of fragments, degree of fragment dislocation, and concomitant pathology available [4; 5]

**Objective:** to report about remote results of the suggested tactics of surgical treatment of proximal humeral fractures.

**Materials and methods.** During 2015-2020 period 76 patients with proximal humeral fractures were operated on at the Traumatological Department of the Regional Municipal Institution «Emergency Hospital» in Chernivtsi. An average age of patients was 52 years. 63% of patients were older than 60. To choose the method of treatment the Neer classification of proximal humeral fractures was used, which is probably the most frequently used system (1970). The tactics of surgical treatment of patients depended not only on the type of fracture, but on age, physical activity and motivation of patients, osteoporosis and associated injuries available. While choosing osteosynthesis method the major requirements for surgical treatment of proximal humeral fractures were considered: satisfactory reduction, minimal traumatization around of the articular tissues, minimally traumatic surgery, and stable fixation of a fracture. One of the types of surgical treatment corresponding to the above requirements is closed reduction with fixation by means of pins and cannulated screws. Disadvantages of this kind of surgery are unstable fixation and repeated dislocation of fragments. To ensure a stable fixation of fragments we have suggested to insert pins through the three points: acromion – bone fragment – distal humeral metaepiphysis (Fig. 1).



*Fig. 1. Diagram of inserting pins with osteosynthesis of the proximal humerus:  
1 - acromion; 2 – bone fragment; 3 - distal humeral metaepiphysis.*

Closed reduction and fixation of fragments by means of a bundle of pins were performed under general anaesthesia and X-ray image-converter tube control for 54 (71%) patients, who experienced proximal humeral injuries with 2-3 fragments. The pins were removed 4-5 weeks later, and the limb was immobilized by means of soft Desault's bandage during 6-8 weeks.

Closed reduction and fixation of fracture by means of pins were performed in 22 patients (29%) with diagnosed 3 and 4-fragment fractures. The majority of patients from this group underwent open reduction and fixation of fragments with AO and LCP plates after an unsuccessful attempt of closed reduction. A scarf bandage followed by gradual training of movements in the shoulder joint was applied in the postoperative period (Fig. 4).

The results of treatment were assessed clinically, on X-ray and by means of questionnaire (the Disabilities of the Arm, Shoulder and Hand Score – QuickDASH score) on an average during 1 year after osteosynthesis. With the aim to eliminate individual, age and gender factors the results of an injured limb were compared with those of a healthy one of the patient. QuickDASH score (a quick score to assess inability to use the upper arm) consists of 11 items filled in by the patient. Every answer is scored from 0

(the best result) to 5 (to worst). The total sum of items is calculated by means of formula, and after that the total result is calculated that may range from 0 (no disorders) to 100 (complete inability to use the arm). QuickDASH score is a short variant of DASH score, which preserves representativeness of a full version.

**Results of the study:** remote results of treatment of 36 patients were examined. Evaluation criteria of the results were healed fracture, degree of pain syndrome, amount of movements in the shoulder joint.

Satisfactory results of treatment were found in 21 (80,7%) patients out of 26 (72%), who underwent closed reduction of fractures with pin fixation. Their average QuickDASH score was 23,1. This group of patients achieved consolidation in optimal terms, and the function of the shoulder joint was satisfactory with abduction angle of 90°. 2 (7,7%) patients experienced secondary dislocation of fragments and their QuickDASH score was 38.4. 3 (11,6%) patients achieved consolidation of fracture, but stable contracture of the shoulder joint occurred. Their QuickDASH score was 38.4 (Fig. 4).

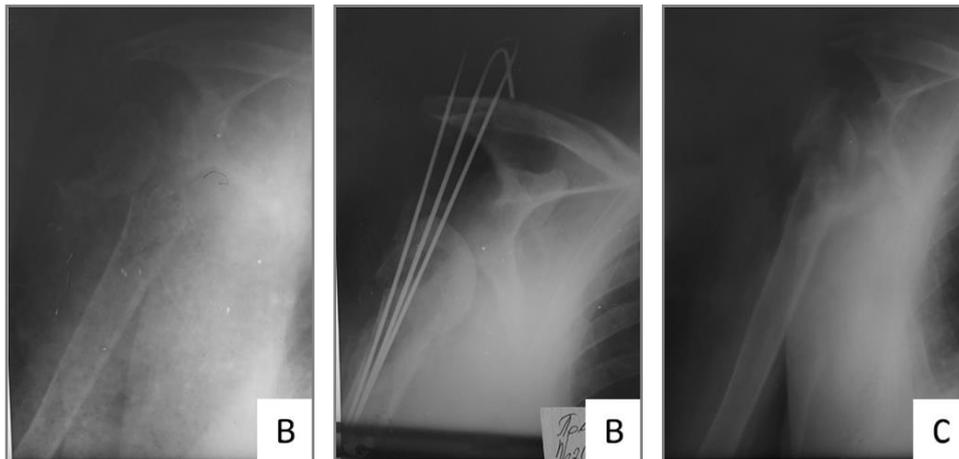


Fig. 2. X-ray of patient M., 63 years, before and after osteosynthesis with pins: before surgery (a), after surgery (b), 3 months later after pins were removed (c).



Fig. 3. Photos of functional results of patient M., 63 years, after osteosynthesis with pins: abduction forward (a), backward (b), aside (c), behind the head (d).

Osteosynthesis with plates was performed in 10 patients. 3 (30%) of them developed aseptic necrosis of the humeral bone head, 2 (20%) patients developed suppuration of the soft tissues which produced a negative effect of the patients' ability to work – QuickDASH score 42,7, 5 (50%) patients admitted satisfactory results of treatment – QuickDASH score 21,5 (Fig. 5).

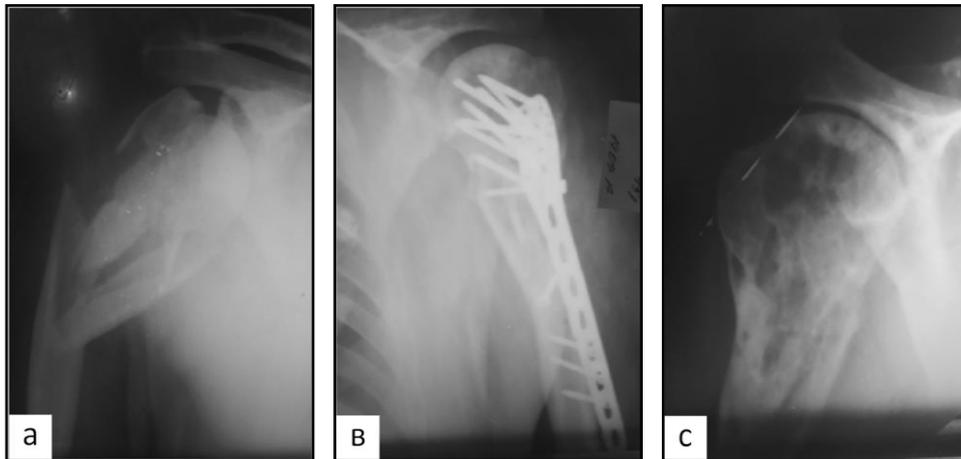


Fig. 4. X-ray of patient D., 45 years, before and after osteosynthesis with screws: before surgery (a), after surgery (b), 4 months later after metal constructions (c).

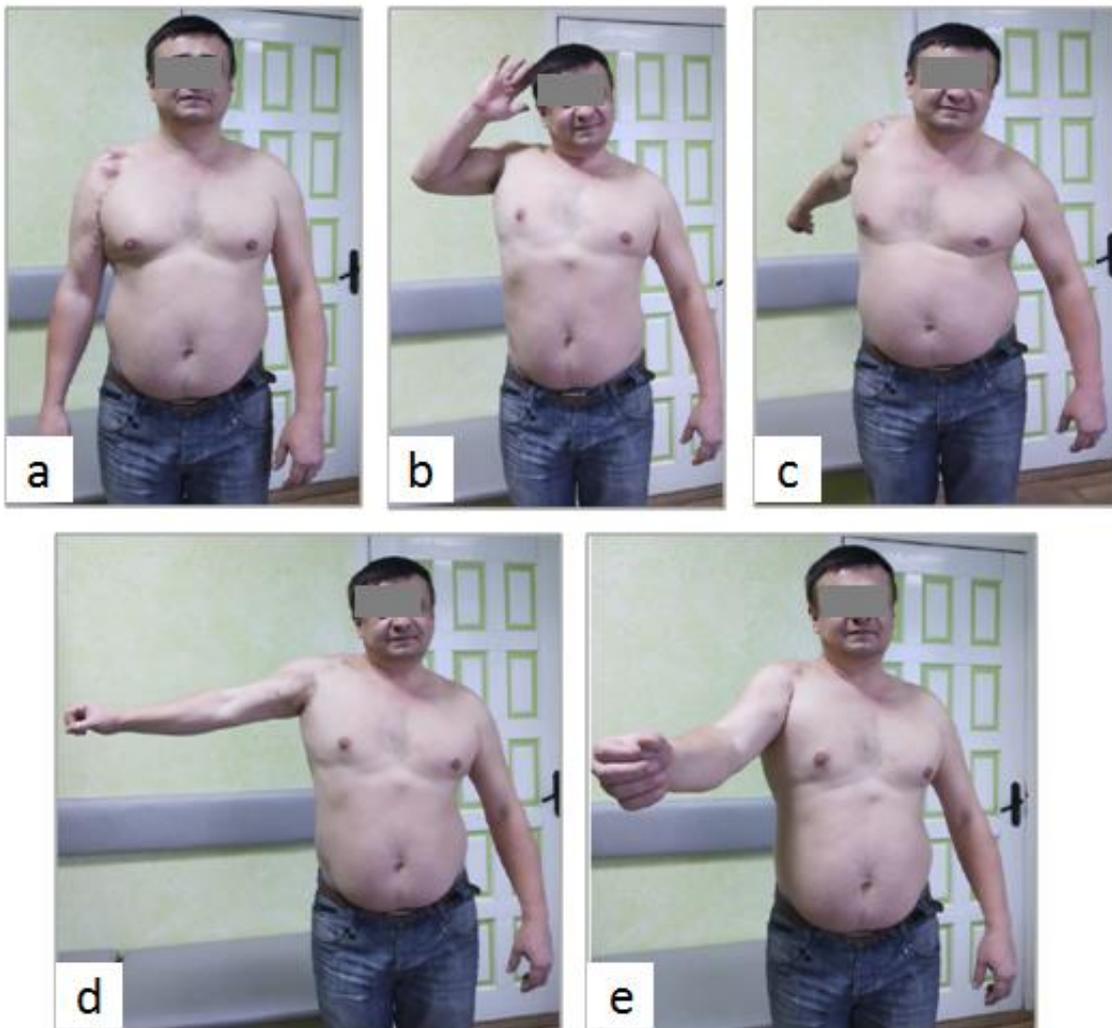


Fig. 4. Photos of functional results of patient M., 45 years, after osteosynthesis with a plate and screws: general view (a), behind the head (b), backward (c), aside (d), abduction forward (e).

### Conclusions:

1. The tactics of surgical treatment of patients with proximal humeral fractures depends on the following: type of a fracture, patient's age, concomitant pathology and osteoporosis available, and patient's social needs.

2. Closed reduction under X-ray image-converter tube control and fixation with pins enabled to improve results of treatment and reduce the period of disability.

3. Remote results of treatment of patients with proximal humeral fractures showed that closed reduction and fixation of fractures with pins result in better results of treatment in 80,7% of cases (an average QuickDASH score was 23,1) in comparison with bone osteosynthesis – in 50% (QuickDASH score was 21,5).

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