LONG-TERM RESULTS OF SURGICAL TREATMENT OF PATIENTS WITH PROXIMAL HUMERUS FRACTURE

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Key words: the proximal humerus fractures, long-term consequences, QuickDASH scale, a method of stable fixation of fragments.

The aim of the study – evaluation of the surgical treatment effectiveness of fractures in the proximal metaepiphysis of the humerus, the analysis and generalization of the surgery long-term results of the surgical intervention.

Materials and methods. The study has examined and analyzed the results of surgical treatment of the proximal humerus fractures in 76 patients who were treated in the traumatology department of the regional municipal institution «Chernivtsi Emergency Hospital» in the period from 2015-2020. The average age of patients was 52 years old. The results of treatment were evaluated clinically, radiologically and by questionnaire (according to the QuickDASH scale) for 1 year after osteosynthesis. In order to eliminate the influence of individual, age and gender factors, the results of treatment of the injured limb were compared with the function of a healthy limb of the patient. The QuickDASH scale (brief scale for assessing the inability to use the upper limb) consists of 11 questions that are offered to the patient. The answer to each question is rated from 0 (best result) to 5 (worst). Using a special formula, the total result is calculated, which can range from 0 (no violations) to 100 (complete inability to use the limb). The QuickDASH scale is a brief version of the DASH scale that retains the representativeness of the full version.

Results. It has been established that the choice of different methods of surgical interventions for fractures of the proximal humerus requires consideration of various factors, including the patient’s age, type of fracture, the presence of comorbidities, osteoporosis and the patient’s social needs. It has been shown that the long-term consequences of surgical interventions may also be due to those factors. A method for ensuring stable fixation of fragments, which involves holding the spokes through three points: acromion-bone fragment-distal metaepiphysis of the humerus, has been proposed and described.

Conclusions. The tactics of surgical treatment of patients with the proximal humerus fractures depends on many factors, including: type of fracture, age of the patient, the presence of comorbidities, the presence of osteoporosis and social needs of the patient. Closed reposition under the control of EOA (Electron-optical X-ray image amplifier) and fixation with needles allows to improve the results of treatment and reduce the duration of disability. Long-term results of treatment of patients with the proximal humerus fractures have shown that closed reposition and fixation of fractures with needles leads to better treatment results compared to bone osteosynthesis.
Introduction

According to statistics, the proximal humerus fractures account for about 5-8% of all limbs fractures and 80% of the humerus fractures [4, 7]. In 15% of cases with the proximal humerus fractures, there is a displacement of the fragments, which requires surgical treatment using the method of osteosynthesis or primary endoprosthesis of the shoulder joint [3, 10, 12]. Restoration of joint function after such injuries is impossible without complete anatomical restoration of bone components and other soft tissue structures with their correct spatial ratio, which makes clear the choice of surgical treatment.

Nowadays, various types of surgical interventions are performed, in particular: closed reposition and fixation with needles or cannulated screws, open reposition and osteosynthesis with bone plates, transosseous suture, blocking intramedullary osteosynthesis [1, 2, 9]. However, despite the variety of surgical techniques, there are a number of unsuccessful treatment outcomes: soft tissue suppuration and postoperative osteomyelitis, post-traumatic osteoarthritis, migration of metal structures, neurological complications, re-displacement of fragments, subacromial dysfunction of a limb [4, 6, 11]. According to a number of authors [1, 5, 8], about 50% of unsatisfactory results of treatment of the proximal shoulder with displacement of fragments are associated with repeated unsuccessful attempts at closed repositioning.

When choosing a method of surgical treatment of a proximal humerus fracture, one should also take into account such important aspects as age and general condition of the injured, presence of combined injuries, type of fracture, number and size of fragments, degree of displacement of fragments, concomitant pathology [4, 5].

The aim of the study

Evaluation of the effectiveness of surgical treatment of fractures in the proximal metaepiphysis of the humerus, the analysis and generalization of the surgery long-term results of the surgical intervention.

Materials and methods

During the period from 2015-2020, surgical treatment of 76 patients with the proximal humerus fractures were performed in the traumatology department of the regional municipal institution «Chernivtsi Emergency Hospital». The average age of patients was 52 years. In 63% of patients the age was more than 60 years. To select a method of treatment, we used the conventional classification of the proximal humerus fractures, proposed by C. S. Neer (1970). The tactics of surgical treatment of patients depended not only on the type of fracture, but also on age, physical activity and motivation of patients, the presence of osteoporosis and combined injuries. The choice of osteosynthesis method took into account the main requirements for surgery for the proximal humerus fractures such as: satisfactory repositioning, minimal trauma around the joint tissues, minimal traumatic surgery, stable fixation of the fracture. One of the types of surgical treatment that meets these requirements is closed repositioning with needle fixation and cannulated screws. The disadvantage of this surgery is the unstable fixation and secondary displacement of the fragments. To ensure stable fixation of the fragments, we proposed to position the spores through three points: acromion – bone fragment – distal metaepiphysis of the humerus (Fig. 1).
Fig. 1. The scheme of the spokes in osteosynthesis of the proximal humerus: 1 – acromion; 2 – bone fragment; 3 – distal metapetalys of the humerus.

In 54 (71%) patients, who had 2-3 fragmentary injuries of the proximal humerus, closed repositioning and fixation of fragments with a spoke bundle was performed under general anesthesia and EOA-control. The needles were removed after 4-5 weeks, and the limb was immobilized with a soft Deso bandage for 6-8 weeks.

In 22 patients (29%), where 3 and 4 fragmentary fractures were diagnosed, surgical interventions began with closed reposition and fixation of the fracture with needles. In most cases, this group of patients has been performed open repositioning and fixation of fragments with AO and LCP plates after unsuccessful attempt at closed repositioning. In the postoperative period, a scarf bandage was used, followed by the gradual development of movements in the shoulder joint.

The results of treatment were evaluated clinically, radiologically and by means of a questionnaire (on the QuickDASH scale) approximately for 1 year after osteosynthesis. In order to eliminate individual, age and gender factors, we compared the results of the injured limb with the healthy limb of the patient. The QuickDASH scale (brief scale for assessing the inability to use the upper limb) consists of 11 questions answered by the patient. The answer to each question is rated from 0 (best result) to 5 (worst). The sum of the answers is substituted into the formula, after which the total result is calculated, which can range from 0 (no violations) to 100 (complete inability to use the limb). The QuickDASH scale is a brief version of the DASH scale that retains the representativeness of the full version.

Study results and discussion
Long-term results have been studied in 36 patients. Criteria for evaluating the results of treatment were the presence of fracture fusion, the severity of pain, the volume of movements of the shoulder joint.

Among 26 (72%) patients who underwent closed repositioning of fractures with needle fixation, good treatment results have been observed in 21 (80.7%) patients, the average score on the QuickDASH scale was 23.1 points. In this group of patients, consolidation has been achieved in the optimal time, there has been sufficient function of the shoulder joint with a diversion angle of up to 90°. Secondary displacement of fragments and 38.4 points on the QuickDASH scale have occurred in 2 (7.7%) patients. In 3 (11.6%) patients, fracture consolidation has been achieved, but there has been a stable contracture of the shoulder joint – 38.4 points (Fig. 2, 3).

Fig. 2. Radiographs of patient M., 63 years old, before and after osteosynthesis with needles: before surgery (a), after surgery (b), 3 months after removal of the needles (c).
Among 10 patients who underwent plate osteosynthesis, 3 patients (30%) have developed aseptic necrosis of the humeral head, 2 patients (20%) have had soft tissue suppuration, which prolonged the incapacity of patients – 42.7 points, 5 patients (50%) have had good treatment results – 21.5 points (Fig.4, 5).

Fig. 3. Photographs of the functional results of patient M., 63 years old, after osteosynthesis with needles: moving forward (a), backward (b), sideways (c), behind the head (d).

Fig. 4. Radiographs of patient D., 45 years old, before and after osteosynthesis with a plate and screws: before surgery (a), after surgery (b), 4 months after removal of metal structures (c).
**Fig. 5.** Photographs of the functional results of patient M., 45 years old, after osteosynthesis with a plate and screws: general view (a), behind the head (b), back (c), to the side (d), moving forward (e).

**Conclusions**

Thus, the tactics of surgical treatment of patients with the proximal humerus fractures depends on the type of fracture, the patient’s age, the presence of concomitant pathology, the presence of osteoporosis and the social needs of the patient. Closed reposition under the control of EOA and fixation with needles allow to improve the results of treatment and reduce the duration of disability. Long-term results of treatment of patients with the proximal humerus fractures have shown that closed repositioning and fixation of fractures with needles lead to better treatment results in 80.7% of cases (average score on the QuickDASH scale was 23.1 points) compared with bone osteosynthesis 50% (21, 5 points).

**Prospects for further research**

To continue the analytical work on the processing of long-term results of surgical treatment of patients with the proximal humerus fractures in order to choose reasonably the tactics of treating this pathology.

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