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Morphological Aspects of Proximal Humerus Fractures In Different Age Groups

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Abstract

Introduction: Fractures of the proximal humerus are a common trauma to the skeleton, accounting for up to 12% of all fractures of the bones of the skeleton and up to 65% of fractures of the humerus. From 13% to 16% of fractures in this segment have a multi-lobed character with bone tissue imbalance, which significantly complicates the task of internal fixation. Damage to the proximal part of the shoulder often leads to a pronounced impairment of the function of the upper limb. The purpose of this study is to analyze the gender and age structure of patients with fractures of the proximal humerus, as well as the morphological features of lesions of this localization.

Materials and methods: A retrospective analysis of the epidemiological and morphological parameters of patients operated on for injuries to the proximal humerus was carried out on the basis of the Department of Traumatology and Orthopedics of the State Regional Clinical Hospital of the Republic of Bashkortostan № 1 in the city of Oktyabrsky for the period from 2010 to 2016. The total number of observations was 191 patients, including 121 (63.35%) women and 70 (36.65%) men.

Results: As a result of the analysis, it was found that a significant increase in the number of fractures of the proximal humerus is more than 3 times recorded in women in the age group of 50-65 years. Damage of a similar localization requiring surgical treatment is also found in men in the age category of 55-60 years, but an increase in the incidence of this type of injury does not exceed 22.4% compared to the younger age groups. The multiple increase in the number of lesions of the localization in question is undoubtedly due to changes in the bone metabolism in women. Analysis of the character and morphological features of fractures in women of older age groups indicates a greater prevalence of unstable damage of type 1.1.B and 1.1.C in the AO / ASIF classification, which again is due to the demineralization of the segment against the background of concomitant metabolic metabolic systemic abnormalities.

Discussion: Identified epidemiological features indicate the need for re-operative monitoring of parameters of bone metabolism. The choice of optimal surgical tactics should take into account the limited possibilities of both bone tissue regeneration and associated metabolic disturbances of the mineral metabolism, which are significantly inhibited after any type of surgical treatment, due to hypodynamia, pain syndrome, and blood supply disorders.

Conclusion: Thus, we can conclude that the morphology and types of fractures depend on the patient's age and bone quality. A significant increase in this pathology in women of perimenopausal age indicates changes in bone metabolism, which is why monitoring of bone metabolism in the perioperative period is necessary.

Key Words: Fracture, humerus, morphology, epidemiology, perimenopause, perioperative period

I. INTRODUCTION

Proximal humerus fractures are a common skeletal injury, accounting for up to 12% of all skeletal bone fractures and up to 65% of humerus fractures[1,2]. The frequency of fractures and dislocations of the humerus in the structure of damage to the proximal shoulder is from 2.2 to 14.5 %[3]. At the same time, mortality from these injuries according to European authors is up to 10%[4].Young patients most often receive such damage after high-energy exposure[5]. The frequency of these fractures increases with the age of patients, due to impaired bone metabolism, the development of arteriosclerosis and arteriolosclerosis[6]. Radiation monitoring data in the group surveyed over 50 years reflect the demineralization of bone matrix during perimenopause varying severity[7]. Of particular importance in the perioperative period are the parameters of bone metabolism. The perioperative period is inevitably associated with physical inactivity, tissue hypoperfusion, as well as the inefficiency of

enzyme systems, which leads to the redistribution of mineral and organic substrates both within the limb and the body as a whole. Therefore, the rehabilitation component, which ensures the permanent restoration of the muscle tone of the limb, is important[8]. In the Russian literature describes various approaches to postoperative management of patients on the background of subcompensated bone metabolism; since some authors argue for monitoring bone metabolism and the subsequent combination of preventive antiresorptive therapy with calcium supplements, vitamin D3 metabolites, bisphosphonates or strontium ranelate, which in their view significantly reduces the risk of aseptic loosening, while other authors consider that the need for such therapy in the early postoperative as the main role in the short and medium term plays primary stability attained in the bone implant intraoperatively[9,10]. From 13% to 16% of fractures in this segment have a multi-fragmented character with bone tissue impression, which significantly complicates the task of internal fixation[11].

There are many methods of surgical and conservative treatment of fractures of the proximal humerus, but none of the methods can be recognized as universal[12,13]. At the same time, modern types of treatment for the lesions under investigation lead in many cases to undesirable consequences, which include constant pain, impaired limb function[14] .That is, the choice of optimal treatment remains a controversial issue in our country[15]. Damage to the proximal shoulder often leads to severe impairment of upper limb function due to the development of shoulder joint contracture, damage to the rotator cuff, damage such as Hill-Sachs and Bankart, as well as to long-term pain syndrome, which makes life extremely difficult for the patient[16,17,18]. The aim of this study is to analyze the gender and age structure of patients with fractures of the proximal humerus, as well as morphological features of injuries of this localization.

II. MATERIALS AND METHODS

A retrospective analysis of epidemiological and morphological parameters of patients operated on for injuries of the proximal humerus based on the Department of Traumatology and Orthopedics of the State budgetary institution of health care of the Republic of Bashkortostan City hospital No. 1, Oktyabrsky for the period from 2010 to 2016 was carried out.

The total number of observations left 191 patients, including 121 (63.35%) women and 70 (36.65%) men. A total 191 adult subjects (both male and females) of aged ≥ 18, years were for in this study.

Mechanisms of injuries included a low-energy component, including in persons older than 45 years, which was more than 74.2%, high-energy nature of injuries in persons younger than 45 years was noted in 25.8 % of patients.

Case studies were carried out using a thorough retrospective study of clinical, radiological (anteroposterior and axial projections), CT, MRI and laboratory tests. The following methods are used for operative stabilization of fractures of the proximal humerus: open reduction, closed reduction, internal fixation, interstitial fixation with needles, osteosynthesis with LCP-plates, osteosynthesis with L-shaped plates, osteosynthesis with T-shaped plates.

Study Design: retrospective open label observational study
Study Location: Department of Traumatology and Orthopedics of the State budgetary institution of health care of the Republic of Bashkortostan City hospital No. 1, Oktyabrsky
Study Duration: November 2010 to November 2016.
Sample size: 191 patients.
Statistical analysis: For statistical processing of the obtained results were used packages application programs Microsoft Excel and STATISTICA 10.0 (StatSoft, USA). Used nonparametric methods of statistical analysis. Research results presented in the form of a median and interquartile range with an indication of 25 and 75 percentiles or mean and standard deviation. Rating differences between groups were performed using the Mann-Whitney test. The differences were considered statistically significant at $p < 0.05$.

III. RESULTS

Fractures of the proximal humerus are often the result of an indirect injury or as a result of a fall on an outstretched arm. Patients 60 years or more have fractures of the proximal humerus, which account for 18% of all fractures and occur most often against the background of the phenomena of osteoporosis.

The analysis revealed that the average age of patients (N - 191) was 58.5 ± 14.06 years.

The average age of women operated on for proximal humerus fracture was 63.5 ± 15.5 years. (N - 121). (Figure no 1).

The structure of injuries is dominated by two and three fragmentary fractures 26,5% and 27,5 %, respectively, four-fragmentary fractures 13%, fractures and dislocations 12%. (Figure no 3,4,5)

The median age in men (N-70) was 50.1 ± 15.1 years. (Figure no 2).

In our study, we also used the classification of CS Neer, 1970, in which the lesions under study are classified into the following groups: - with displaced two fragments, with four-component ones - with three displaced

fragments. Horizontally when the angle of inclination is greater than 45 degrees, or the angle of inclination is greater than 1 centimeter.

Figure no 1. The prevalence of type 1.1 damage by AO. ASIF in women

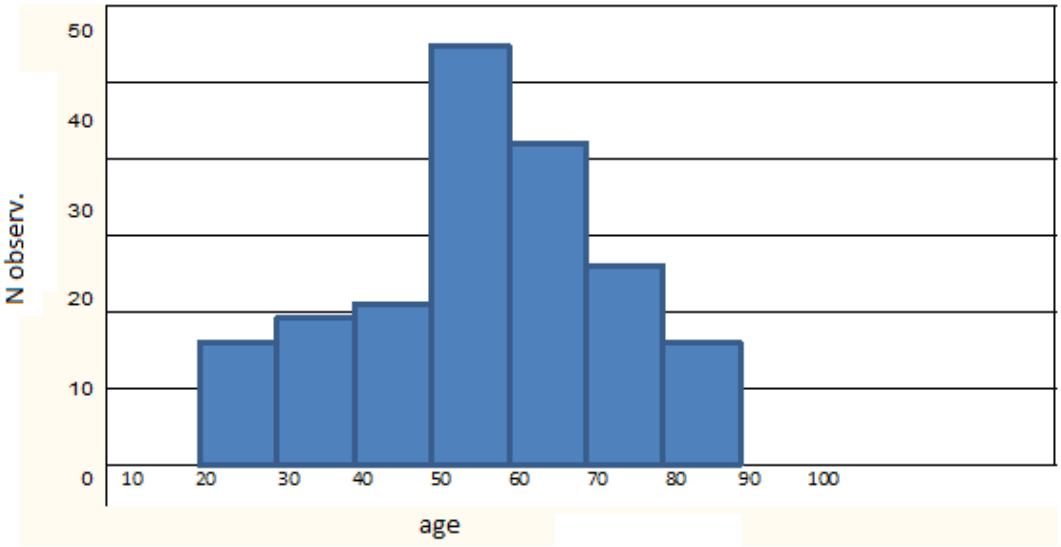

Figure no 2. The prevalence of type 11 damage in AO. ASIF in men

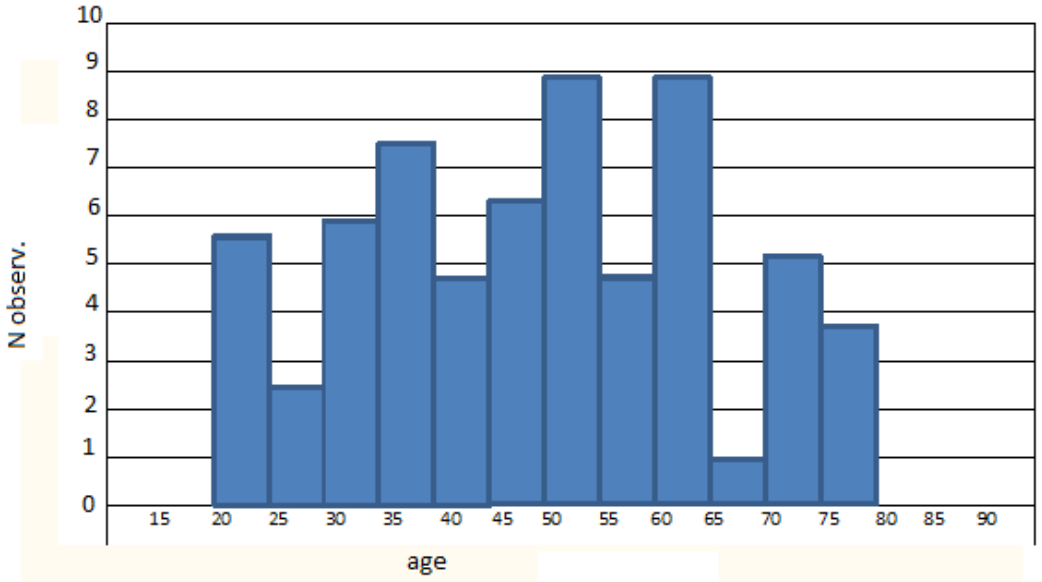

Figure no 3. Type of fracture classification Neer.

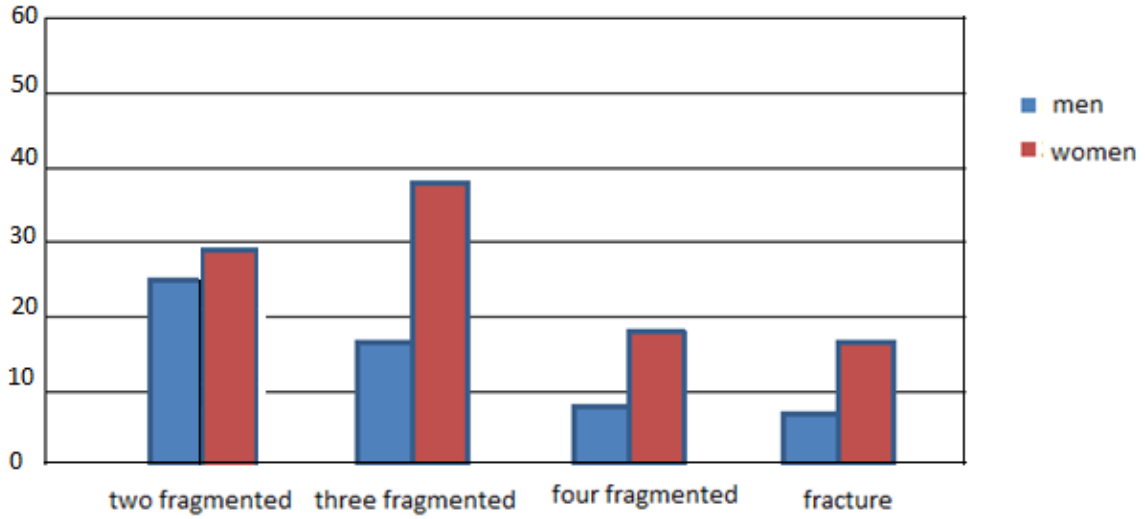

Figure no 4. The results of the analysis of the morphology of damage in women

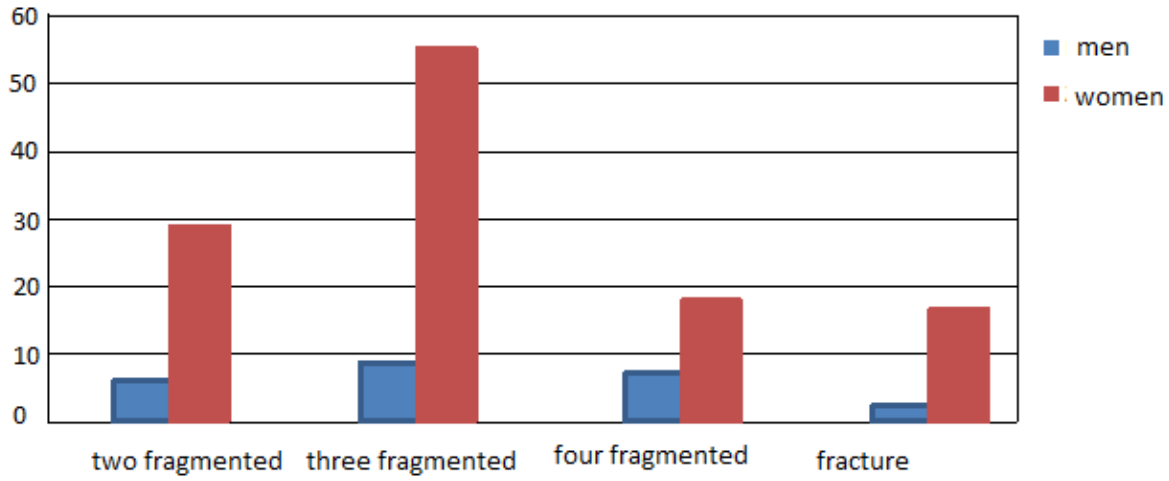

Figure no 5. The results of the analysis of the morphology of damage in men

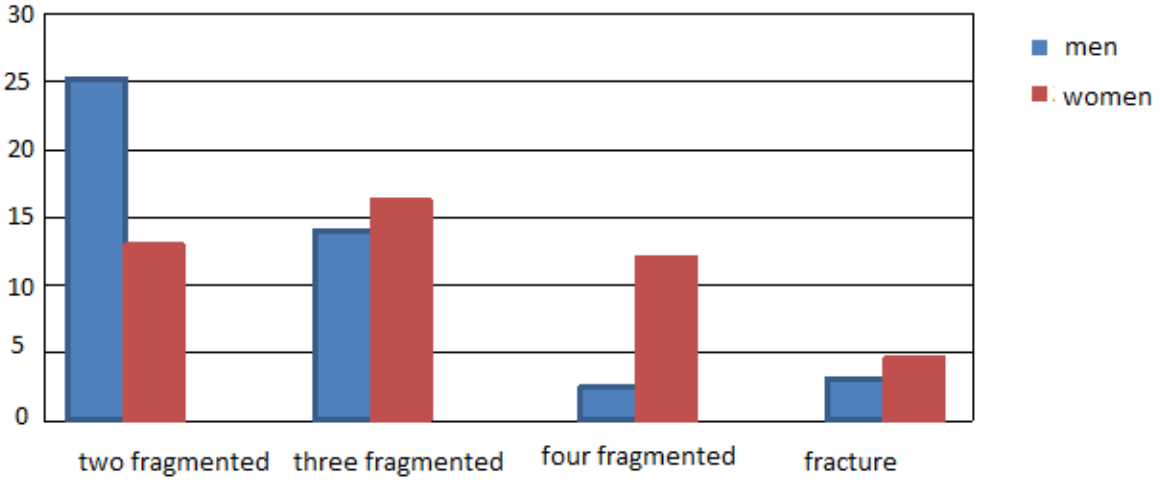

Figure no 6. Functional result after 12 months from the day of surgery after internal fixation.

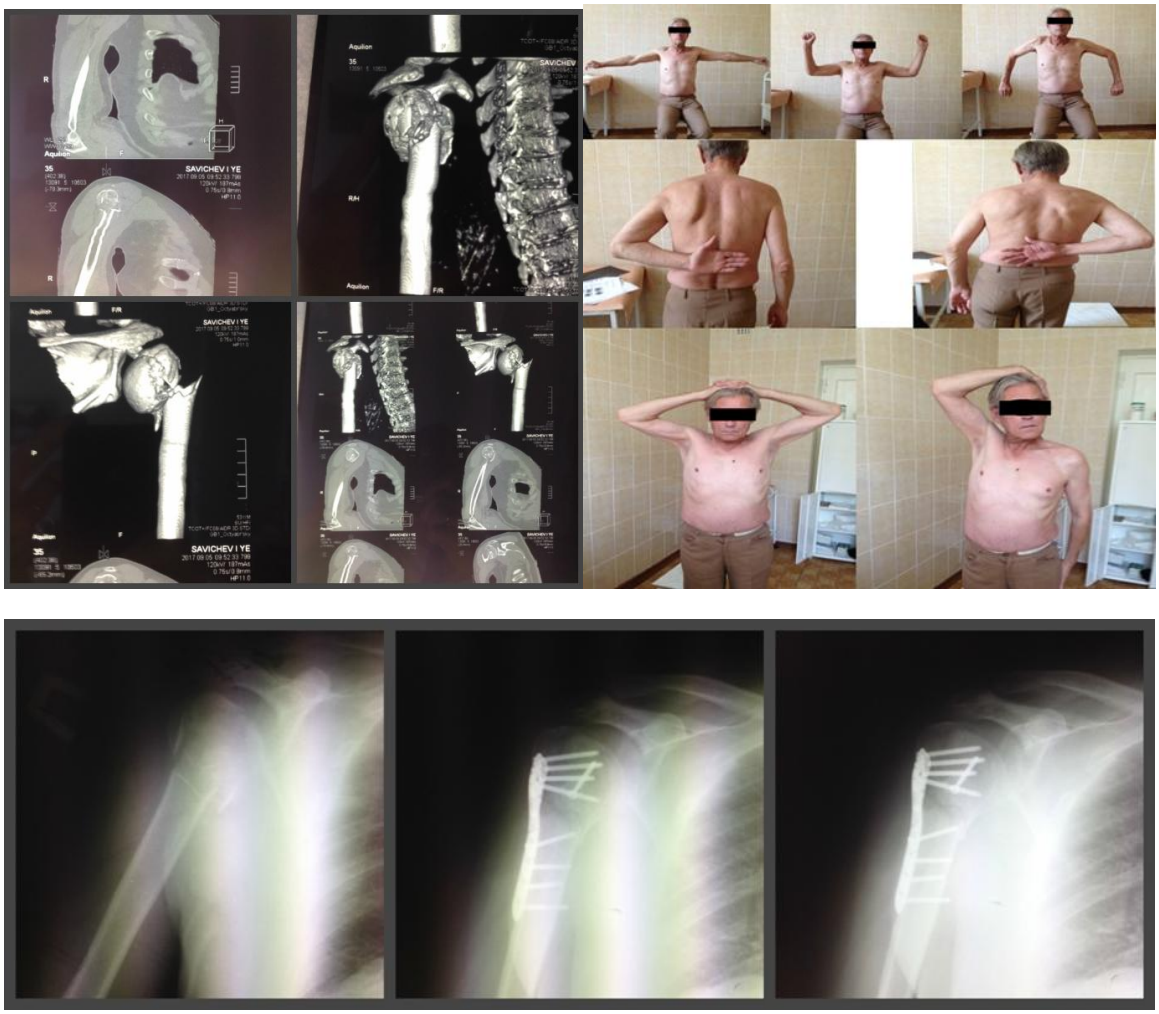

Figure no 6 shows a clinical example of a 65-year-old patient with type 1.1.B.2 AO/ASIF damage. Through the anterior deltoid-pectoral access, open reposition was performed, bone osteosynthesis with a fixator with angular stability, then intraoperative revision of the rotator cuff components, the detachment of the supraspinatus muscle from the attachment site was revealed, and refixation was performed. On computed tomography, the multifragmental nature of the destruction and deficiency of bone tissue is determined.
After surgery, antibacterial and analgesic treatment was performed. On the second day, an x-ray of the operated shoulder joint was performed. On the second day, finger movements, movements in the elbow, as well as in the wrist joint are allowed. Patients were given a retention splint.

IV. DISCUSSION

As a result of the analysis, it was revealed that a significant increase in the number of fractures of the proximal humerus more than 3 times is registered in women in the age group of 50-65 years. Damage of similar localization, requiring surgical treatment, occur in men in the age group 55-60 years, but the increase in the frequency of occurrence of this type of damage does not exceed 22.4% compared to younger age groups.

In patients of both sexes over 70 years of age, the total number of injuries is reduced compared to the age range of 55 – 65 years.

The multiple increase in the number of lesions of the considered localization in women is undoubtedly due to menopausal changes in bone metabolism. Analysis of the nature and morphological features of fractures in women of older age groups indicates a greater prevalence of unstable injuries of type 1.1.B and 1.1.C according to the classification of AO/ASIF, which is again due to the demineralization of the segment against the background of concomitant metabolic disorders of a systemic nature.

V. CONCLUSION

Thus we can conclude that morphology and fracture types depend on patient age and bone quality.
The revealed epidemiological features indicate the need for re-operative monitoring of bone metabolism parameters. The choice of optimal surgical tactics should take into account the limited possibilities of both bone regeneration and associated metabolic disorders of mineral metabolism, which are significantly suppressed after any type of surgical treatment, due to lack of exercise, pain and blood supply disorders.

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