

Injury to the Tendon of the Long Biceps Head and Rotator Cuff of the Shoulder with Instability of the Shoulder Joint

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Abstract

Background: Traumatic instability of a shoulder joint accounts up to 1.7% of all injuries herewith 50% of recurrence of dislocation fall for young people and the results of treatment do not always correspond to neither doctors' nor patients' expectations.

Objective: To assess the types of damages of a rotator- bicipital complex detected at patients with chronic post-traumatic instability of a shoulder joint. Based on the study of preoperative diagnostic data and the results of arthroscopic examination, to describe the damage of the rotator- bicipital complex (rotator cuff of the shoulder, tendon of the long biceps head, pulley) at patients with chronic post-traumatic instability.

Method: We analyzed the results of a survey of 290 patients who applied for admission at the period from 2006 till 2017. The study was agreed with the ethics commissions on the basis of medical institutions and it was absolutely open-minded. Following the goal set, the authors identified 3 clinical variants of post-traumatic instability, depending on the prevailing direction of the dislocation. The authors studied their morphogenesis of lesions in different variants of posttraumatic instability of the shoulder.

Results: While diagnosing the damages of soft-bone structures of a shoulder joint there were detected the changes in all the cases.

Conclusions: Mechanogenesis, underlying the occurrence of the damage, allows us to identify 3 main clinical types of posttraumatic instability of a shoulder joint with characteristic for them anatomomorphological manifestations.

Keywords: Rotator-bicipital complex; Shoulder joint instability; Shoulder rotator cuff damage; Pathology of the long biceps head; Pulley; Traumatology and orthopedics

Abbreviations: RC: Rotational Cuff of the shoulder; MRI: Magnetic Resonance Imaging; RBC: Rotary-Bicipital Complex; SLAP: Superior Labrum Anterior to Posterior; TLHB: Tendon of the Long Biceps Head

Introduction

The dislocation of a shoulder joint according to the data of different authors in the population accounts from 8.2 to 44 cases per 100,000 person-years, herewith, traumatic dislocations of a shoulder joint account for up to 1.7% of all injuries of the skeleton [1-3]. Athletes engaged in contact sports, military personnel and persons of heavy physical labor [1,4-6] suffer from this disease most often. Some authors

point out that in a group with chronic instability of a shoulder joint, patient under 40 years make up 96% [7,8]. Thus, the disease affects the most able-bodied and socially active contingent of the population, this determines its practical, economic and social significance.

According to modern biomechanical concepts, the stability of a shoulder joint is ensured by the stabilizers [9,10], which are static (the shape and orientation of the glenoid, articular lip, etc.) and dynamic stabilizers (elements of the rotator apparatus and tendons of the long biceps head). To date, quite a lot of studies have been accumulated, indicating close relationship in the provision of the function and stability of the shoulder joint of such anatomical formations as the tendon of the long bicep head (TLHB) and the rotator cuff of the shoulder (RC) [9-11]. These soft-tissue elements, according to many authors, belong to the leading dynamic stabilizers. Despite the findings on shoulder biomechanics, orthopedic practitioners often do not take into account the results of these studies when analyzing the causes of post-traumatic instability, planning and performing surgical interventions. Even at the timely diagnosis of lesions in the case of surgical treatment, they are not eliminated, the techniques developed in the early and middle of the 20th century are still used, such as the operation of Bankart and Latarje, which, in our opinion, determines a large percentage of failures in the treatment of instability of the shoulder joint, reaching in some cases 67% [12,13].

The pathology of a shoulder joint, associated with the defeat of the RC and its combination with changes from the TLHB, is the subject of active research [11,12,14,15]. The description of these injuries is the subject of many studies published in modern literature. The given paper reflects the authors' experience in performing complex diagnostics of damage of the elements of the "rotator- bicipital complex" (RBC) in chronic post-traumatic instability of a shoulder joint.

Materials and Methods

We analyzed the results of a survey of 290 patients who applied for admission from 2004 till 2017. The study was agreed with the ethics commissions on the basis of medical institutions and had a continuous open character. The exclusion criteria of the study were as follows: sizes of an impression defect of type 2 or more according to the Rowe classification, connective tissue dysplasia syndrome, proven mental and behavioral disorders of patients diagnosed by a specialist as a psychiatrist, pregnancy regardless of the timing, established syndrome of dependence on alcohol and drugs, symptomatic and primary epilepsy with the presence of seizures and attacks, concomitant diseases in decompensation stage.

In the structure of patients, men predominated - 187 (64.48%). In the study group, the minimum age was 16 years old, and the maximum age was 88 years old. The mean age of the study group was 46.1 year, Me [Q25; Q75]. The distribution by age was as follows: from 16 to 65 years - 235 (81.03%), over 65 years - 55 (18.97%). When forming approaches to diagnosing and describing the damages arising from instability from the RBC position, we divided it into 3 types: horizontal, vertical, combined. To determine the extent and nature of damage of RBC elements and to assess the size of the defect in preoperative examination, radiography and MRI were performed for all patients (100%), ultrasound - 59 (20.3%). MRI made it possible not only to clarify the diagnosis, the size of the impression, but also to plan the scope of the forthcoming surgical intervention. Ultrasonography was performed of patients with suspected co-instability of TLHB.

Based on the results of the diagnostic activities, all patients were divided into 3 subgroups: 1 subgroup (n = 15) - patients with prevailing

vertical component of instability, 2 subgroup (n = 62) - with prevailing horizontal component and 3 subgroup (n = 213) - with combined version of instability. Each variant of instability was accompanied by characteristic changes in certain areas of the shoulder joint, which we distributed by sector, in analogy with the classification of Habermeyer P. (2006): sector 1 - tendon of the scapular muscle, extraarticular part of the biceps tendon, bicipital furrow; sector 2 - rotator cuff interval, articular part of the tendon of the long biceps head, tendons of the supraspinatus; sector 3 - tendon of the subacromiatus, the tendon of the small round muscle.

Results and Debates

In the analysis of MRI data and subsequent arthroscopy of the joint, the patients of subgroup 1 showed damage to the rotator cuff of the shoulder, the bicipital element, and an impression defect of the head of the humerus, localized in the region of the superior facet of the large tubercle, not exceeding in size 1 the Rowe type in all cases.

When examining the patients of subgroup 1, SLAP damage was identified, signs of lateral instability of the tendon of the long biceps head, damage to the rotator element and pulley were identified in all cases.

Changes on the part of the rotator element in group 1 represented a complete or partial separation from the attachment site in the zone of the supraspinatus and stretching the tendons of the subscapular and subacromiatus muscles in the lower part. The lesions of the extraarticular part of the biceps in sector 1 were lateral instability in four patients' cases.

The pattern of the revealed lesions in the patients of the 2nd subgroup had significant differences from 1 subgroup. SLAP damage according to MRI data was detected at 43 (69.4%) patients, with Snyder type 1 and type 2 lesions being the most common among those subjected to arthroscopy. A significant difference was observed in the nature of damage to the rotator apparatus.

MRI and arthroscopic picture identifies at patients in this subgroup partial or total damage to the cicatricial lengthening of the tendon of the subscapularis muscle, the gap between the humeral head in the area of the greater tuberosity infrapinatus muscles and partial damage to the anterior supraspinatus muscle instability TLHB different types with a break pulley, and 15 cases - the Rotator cuff interval break.

Changes most characteristic instability of the shoulder joint with predominant horizontal component, localized at the 1st and 3rd sectors of Habermeyer. At horizontal type of instability (anterior variant), damage and cicatricial lengthening of the tendon of the scapular muscle were detected, a detachment in the zone of the large tubercle of the subacromiatus muscle and an overgrowth of the anterior sections of the subscapular muscle, instability of TLHB of different types, and in some cases, intertrotal interval fracture, articular lip damage in the anterior department, SLAP-damage. In the forward version, a partial detachment of the anterior portion of the tendon of the scapular muscle and pulley rupture, SLAP-lesion, TLHB lateral instability, the Bankart injury in the anterior part of the joint are formed, the impression defect is localized in the zone of the large tubercle along the posterior surface.

The most numerous was group 3 of the patients with combined instability of the shoulder joint, where a combination of lesions was identified by sector, depending on the prevalence of vertical or horizontal instability components. A significant difference was observed in the nature of damage of the rotator apparatus.

MRI and arthroscopic picture revealed partial partial cicatricial lengthening in these patients or complete damage to the tendon of the scapular muscle, detachment from the head of the humerus in the zone of the large lump of the subacromiatus muscle and partial damage to the forelimbs of the supraspinatus, instability of TLHB of different types with rupture of pulley, and also in In some cases, the intertrotal interval is broken. Damage to pulley is noted in all cases.

Patients with combined instability of the shoulder joint are most common. Mechanogenesis of damage is caused by the direction of dislocation and represents a combination of damage by sector, depending on the severity of the vertical or horizontal components of instability. The impression defect of the head of the humerus, as a rule, was located in the posterior surface of the large tubercle. In the most frequent variant of the anterior dislocation, injury of the tendon of the subscapular muscle in its lower part was noted, but it was more often less marked than with vertical instability, the tendon of the supraspinatus and subacromiatus muscle was damaged in the attachment zone to the superior facet of the large tubercle with the transition to its posterior part.

Discussion

Thus, according to our ideas, which are supported by biomechanical studies of recent years, the rotator cuff of the shoulder and TLHB have a stabilizing impact on both the vertical and the horizontal components of the shoulder joint stability, varying depending on the position of the limbs, to a greater extent on its rotation and abduction. In the most frequent embodiment of the combined (anteroinferior dislocation) instability tendon damage subscapularis muscle in its lower section occurs, though it is less obvious according to our observations, than when an isolated vertical component of instability, the supraspinatus tendon separates in the attachment zone to the upper facets of large hillocks with the transition to its back part. TLHB with this variant of dislocation undergoes maximum load at the zone of its attachment and, while stretching, quite often tears the holding device in the lateral department and the medial portion of the tendon of the supraspinatus, which leads to lateral instability of TLHB.

At embodiment instability with prevailing vertical component the following complex of lesions is typical: cicatricial elongation bottom of tendons subscapularis, infrapinatus and small round muscles partial separation over from the top facet greater tuberosity supraspinatus tendon, impression defect in the tendon area of the long head of the biceps, partial tear with cicatricial elongation and lateral dislocation of the latter, detachment of the joint lip in the lower segment.

The following damages are typical for the embodiment of instability with predominant horizontal component: at the front embodiment - partial separation front portion tendon subscapularis muscle rupture, damage pulley, SLAP, lateral instability TLHB damage Bankart and labrum in front of the joint section, impression defect localized in zone of the large tubercle on the posterior surface; in the back version - the damage was mirrored.

Conclusions

Chronic posttraumatic instability of the shoulder joint is the most common of people of working age, which determines the social significance of this problem.

Damage to the rotator cuff of the shoulder and tendon of the long biceps head in different departments is revealed in all cases of instability of the shoulder joint.

Mechanogenesis, underlying the occurrence of damage, allows us to identify 3 main clinical types of posttraumatic instability of a shoulder joint with characteristic anatomomorphological manifestations.

Ethics Approval and Consent to Participate

Approved by the ethics commissions of medical institutions Mogilev Regional Hospital and the 6th City Clinical Hospital, Minsk (20 September 2004 № 23).

Informed Consent

Informed consent was obtained from all individual participants included in the study.

Human and Animal Rights

During the study, the rights of people were not violated; each study was carried out with the written consent of the patient. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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