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Research paper

Results of treatment of arthrosis of the acromial-clavicular joint in patients with partial rupture of the supraspinatus muscle tendon

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Abstract

Introduction: Very often, partial tear tendons of the superficial shoulder muscle are combined with arthrosis of the clavicular-acromial joint. This is due to violations of the shoulder-patch rhythm, which in turn leads to a chronic overload of the clavicular-acromial joint and the progression of arthrosis in this joint.

Aim: The purpose of the study is to improve the results of treatment of patients with injuries of the supraspinatus tendon against the background of deforming arthrosis of the clavicular-acromial joint.

Material and methods: For the study a clinical group was assembled, which consisted of 84 patients with injuries of the tendon of the supraspinatus and deforming arthrosis of the clavicular-acromial joint 3–4 parts. All patients, depending on the treatment, were divided into two groups.

Results and discussion: The consequences and influence of the arthrosis of the clavicular-acromial joint were determined. Movements of the joint were examined. The shoulder joint function was under control in the post-surgery period, which provided particular results and conclusions according to the comparative analysis of the two groups.

Conclusions: Based on the provided results, it can be concluded that deforming arthrosis of the clavicular acromial joint can cause contracture in the shoulder joint in patients after the suture of the tendon of the abdominal muscle.

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1. INTRODUCTION

Injuries and damages of the clavicular-acromial joint requiring treatment are quite common in medical practice.[1,2] The clavicular-acromial joint is a diarthrodial joint that is formed by the distal clavicle and the medial facet of the acromion. The articular surfaces of the clavicle and acromion are covered with hyaline cartilage. The upper limb is connected to the axial skeleton through the clavicle and its attachment to the acromion and sternum. Consequently, large forces are applied to a relatively small joint.[3] Most conditions that affect the acromioclavicular joint, such as degenerative arthritis and osteolysis, can be treated conservatively.[4] Chronic conditions affecting function may require surgery.[5]

The acromion forms the summit of the shoulder and is a large, somewhat triangular or oblong process, flattened from behind forward, projecting at first lateralward, and then curving forward and upward, to overhang the glenoid cavity. Its superior surface, directed upward, backward, and lateralward, is convex, rough, and gives attachment to some fibers of the Deltoideus, and in the rest of its extent is subcutaneous. Its inferior surface is smooth and concave. Its lateral border is thick and irregular and presents three or four tubercles for the tendinous origins of the Deltoideus. Its medial border, shorter than the lateral, is concave, gives attachment to a portion of the Trapezius, and presents about its center a small, oval surface for articulation with the acromial end of the clavicle. Its apex, which corresponds to the point of meeting of these two borders in front, is thin and has attached to it the coracoacromial ligament.

Asymptomatic degeneration of the clavicular-acromial joints is common and does not always correlate with the presence of symptoms. Selective injection of lidocaine improves diagnostic accuracy and may correlate with the outcome of the surgery. Non-surgical treatment is beneficial for most patients, although, in properly matched patients, open or arthroscopic resection of the distal clavicle is necessary to relieve symptoms.[6] Recent biomechanical and clinical data highlight the importance of preserving the capsule and minimizing bone resection; however, the optimal resection volume for the distal clavicle remains elusive. Patients with the instability of the clavicular-acromial joints usually have poor outcomes after distal clavicle resection.[7]

Very often, the arthrosis of the clavicular-acromial joint[8] accompanied the partial ruptures of the tendon of the supraspinatus muscle of the shoulder. This is due to violating the shoulder-scapular rhythm (even with partial damage to the bladder cancer), which in turn leads to chronic overload of the clavicular-acromial joint and progress the arthrosis in this joint. And vice versa, arthrosis of the clavicular-acromial joint causes pain in the shoulder joint and force the patient the compensatory overload of certain muscles of the shoulder girdle, leading to damage to the tendons of the rotator cuff of the shoulder bladder. Isolated arthrosis of the clavicular-acromial joint with exist pain syndrome, according to the literature, occurs only in 5%–7% of patients.[9,10]

When X-ray examination of the shoulder joint, in patients over 50 years old, for various pathologies of the shoulder joint, arthrosis of the clavicular-acromial joint manifests itself in 54%–57% of patients.[11] Unfortunately, during the surgical repair of a partial rupture of the supraspinatus tendon, most doctors do not pay attention to exist arthrosis of the clavicular-acromial joint, and this leads to appear chronic pain syndrome in the shoulder and clavicular-acromial joints in most due to the overload of the latter.[12,13] According to our data, arthrosis of the clavicular-acromial joint is one of the most common causes of pain in the shoulder joint during rehabilitation in patients after a suture of a partial rupture of the tendon of the supraspinatus muscle of the shoulder.[14–17]

Pain in the clavicular-acromial joint in patients after a suture of the rotator cuff of the shoulder disrupts to development of movements in the shoulder joint, increases the duration of rehabilitation, and worsens the overall results of treatment. In the English-language literature, we did not find works devoted to damage to the tendon of the supraspinatus muscle against the background of deforming arthrosis of the clavicular-acromial joint.

2. AIM

The aim of the study is to improve the results of treatment of patients with injuries of the supraspinatus tendon against the background of deforming arthrosis of the clavicular-acromial joint.

3. MATERIAL AND METHODS

The clinical group consisted of 84 patients with injuries of the supraspinatus tendon and deforming arthrosis of the clavicular-acromial joint of grade 3–4. (According to Kellgren), who from January 2013 to January 2018 were on outpatient and inpatient treatment in the department of reconstructive surgery of the upper limb of the State Institution – Institute of Traumatology and Orthopedics of the Academy of Medical Sciences of Ukraine (Kyiv). The patients' age ranged from 40 to 60 years (mean age 49.6 ± 5.1 years), there were 54 men (64.3%), 30 women (35.7%). The average time of injury to the start of treatment was 29 ± 37.8 days.

All patients were divided into two groups depending on the treatment:

(1) group A – conservative treatment of deforming arthrosis of the clavicular-acromial joint after arthroscopic suture of the supraspinatus tendon;
(2) group B – resection of the acromial end of the clavicle at the arthroscopic suture of the supraspinatus tendon.

Conservative treatment included: local (ointments) and general (NSAIDs) anti-inflammatory therapy, local injections of homeopathic anti-inflammatory drugs No. 5 once every 3–4 days, and physical methods. Surgical treatment included: resection of the acromial end of the clavicle up to 5 mm.

We excluded from the study patients who had injuries of the supraspinatus tendon for more than 90 days, deforming arthrosis of the clavicular-acromial joint 0–2°, and concomitant injuries or diseases of the shoulder joint (damage to the

articular lip, deforming arthrosis of the shoulder joint, etc.), which made it possible to create more homogeneous groups. All patients underwent clinical, X-ray, and MRI examinations. Clinical examination was carried out in a standard way with special tests: O'Brian slap test, Compression rotation test, Andrews test, Ludington test.[18]

X-ray examination was carried out in the posterior, axillary, lateral projections and with the withdrawal of the acromial process of the scapula. The relationship of the articular ends, subacromial distance, the presence of calcifications, marginal bone growths, and the morphological type of the acromial process behind Bighliani were taken into account. The stage of arthrosis of the clavicular-acromial joint was assessed using the Kellgren scale.[18] Standard magnetic resonance imaging was performed on devices with a magnetic field strength of 1.5 Tesla in sagittal, coronal, and frontal projections. The study of the anatomical structures of the shoulder joint was carried out in T_1, T_2, Pd, and Pd_{fatsat} modes. Intraoperative diagnostics were performed using an arthroscope with a diameter of 4.5 mm with an inclination of the optics of 30°. The joint review was performed using the standard 21-point technique.[19]

The function of the shoulder joint was assessed using the Oxford Shoulder Score (OSS) and Constant Shoulder Score (CSS) in 6 months and 12 months after surgery. According to the CSS, 6 ± 1.2 months after surgery, the study was carried out with care to exclude possible re-injury of the supraspinatus tendon during the test with a dynamometer. The OSS is a subjective scale for assessing the functional state of the shoulder joint, where the patient answered 12 questions, each of which was rated from 0 to 4 points. The maximum number of points is 48, and the minimum is 0. The unsatisfactory result assessed the number of points from 0 to 19, a satisfactory result – from 20 to 29 points, a good result – from 30 to 39 points, an excellent result – from 40 to 48 points. CSS scale – has 8 points. The maximum number of points was 100, and the minimum was 8. The sick and healthy upper limbs were compared. The unsatisfactory result considered a difference of more than 30 points, a satisfactory result – from 21 to 30 points, a good result – from 11 to 20 points, and excellent – less than 11 points. All patients used a standard rehabilitation program, which was developed based on our clinic.

4. RESULTS AND DISCUSSION

Table 1 shows the distribution of patients with arthrosis of the clavicular-acromial joint and damage to the supraspinatus tendon, who underwent surgical or conservative treatment.

Significantly fewer patients had grade 4 deforming arthrosis. In the majority of patients, 46 (54.8%) underwent conservative treatment of deforming arthrosis of the clavicular-acromial joint. In other patients, 38 (45.2%) underwent resection of the acromial end of the clavicle (Figures 2–3).

We conducted a study of the causes of contracture of the shoulder joint in 50 patients who came to us after arthroscopic suture of the supraspinatus tendon (Table 2).

Table 1. Distribution of patients with supraspinatus tendon injury and arthrosis of the clavicular-acromial joint.

Stage of arthrosis	Conservative treatment		Surgical treatment	
	Men	Women	Men	Women
3	24	10	18	10
4	4	8	8	2
Total	28	18	26	12

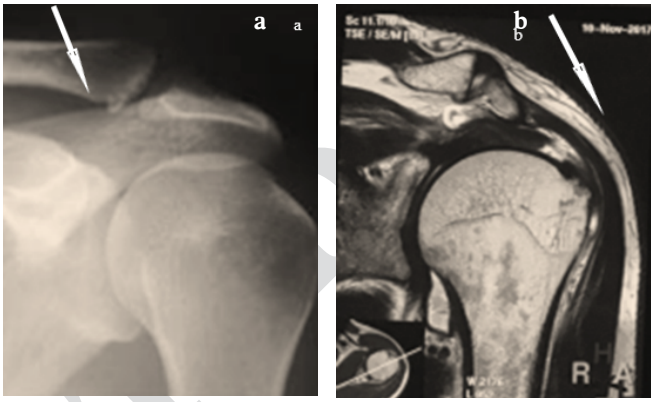

Figure 1. Rupture of the supraspinatus tendon and deforming arthrosis of the clavicular-acromial joint: (a) radiography (direct projection); (b) MRI (frontal section). The arrow shows the marginal bone growth.

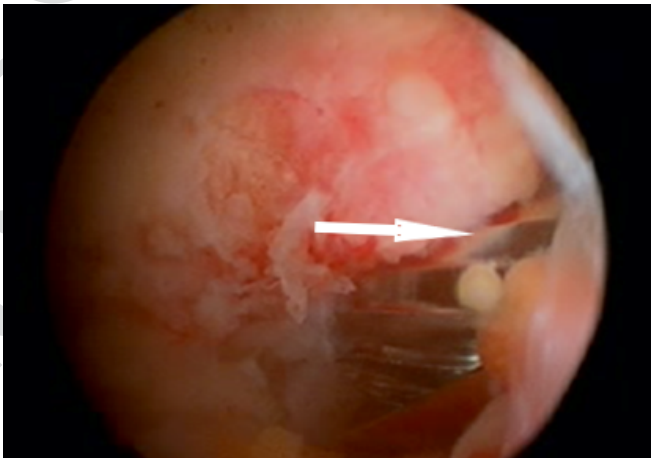

Figure 2. The clavicular-acromial joint with deforming arthrosis 3 Tbsp (from the subacromial space). The arrow shows the bony growth of the clavicle.

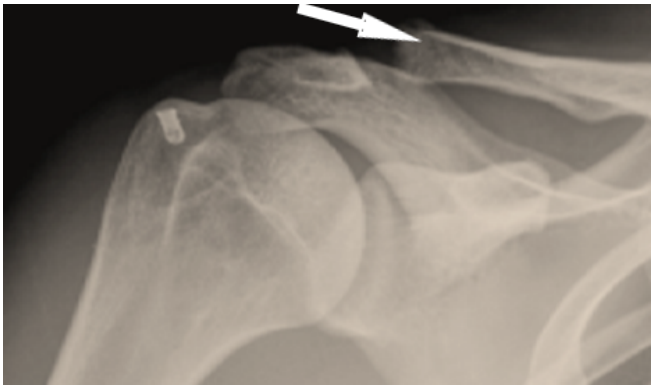

Figure 3. X-ray of the patient after the suture of the supraspinatus tendon and resection of the acromial end of the clavicle. The arrow shows the edge of the clavicle after resection.

Table 2. Causes of contracture of the shoulder joint after the suture of the supraspinatus tendon in their retrospective analysis.

Causes of contracture	*n*(%)
Repeated rupture of the supraspinatus tendon.	3(6)
Secondary adhesive capsulitis.	6(12)
Insufficiency of the supraspinatus muscle due to hypotrophy with the development of subacromial conflict syndrome.	6(12)
Deforming arthrosis of the shoulder joint	3(6)
Arthrosis of the clavicular-acromial joint	14(28)
Associated reasons are indicated in paragraphs 1–5	18(36)
Total	50(100)

As you see from Table 2, arthrosis of the clavicular-acromial joint is one of the common causes of contracture in the shoulder joint in patients after the suture of the supraspinatus tendon 28%. Considering the biomechanics of movements in the shoulder joint Figure 4, we can conclude that the clavicular-acromial joint experiences the greatest load during lifting and flexion of the shoulder in the range from 90° to 180°, since in this range of motion, not only the displacement of the clavicle in the sagittal plane, occurs, but also its rotation, which in its turn causes an overload of the articular cartilage and pain syndrome in the clavicular-acromial joint in the presence of deforming arthrosis in it. It is arthrosis of the clavicular-acromial joint that can cause contracture in the shoulder joint in patients after the suture of the supraspinatus tendon.

The main manifestation of bursitis is a significant round swelling that can spring on palpation. Also, in many cases, patients suffer from throbbing pain, which may increase during the night. Sometimes this pain causes stiffness. In the area of inflammation, the affected skin may become red. Also during the accumulation of fluid, the swelling increases in size. In the future there are changes in the general condition of the person: the lymph nodes begin to increase, the procedure rises. In some cases, nausea and even vomiting occur. Bursitis can be of two types of acute – the symptoms appear quite suddenly and grow rapidly; chronic.

The severity of symptoms depends on the activity of the inflammatory process. In the acute course of the disease, a person's general condition deteriorates sharply, and signs of the disease appear quickly. In the case of chronic bursitis, the symptoms are disturbing from time to time, mainly after exercise. At an early stage to remove the inflammatory process of bursitis is not recommended paraffin-ozokerite application. In severe disease, injecting medication is recommended. The development of purulent bursitis requires surgery. In surgery, the doctor opens the synovial sac, removes the pus, treats the tissues with an antiseptic solution, and leaves a drain to drain the remnants of the pus.

Figure 5 shows the change in the average indicators of the function of the shoulder joint (in points) 6 and 12 months after surgery according to the OSS in groups A and B.

As seen from Figure 5, by surgery, the mean indicators of the function of the shoulder joint according to the OSS in groups A and B did not practically differ and were within 20 points. 6 months after surgery, the average indicators of the function of the shoulder joint in group B were slightly better (40 points) than in group A (36 points), which is associated with the absence of pain in the clavicular-acromial joint. In patients of group A, pain in the clavicular-acromial joint was present despite the ongoing conservative treatment. After surgery (12 months), the mean indicators of the function of the shoulder

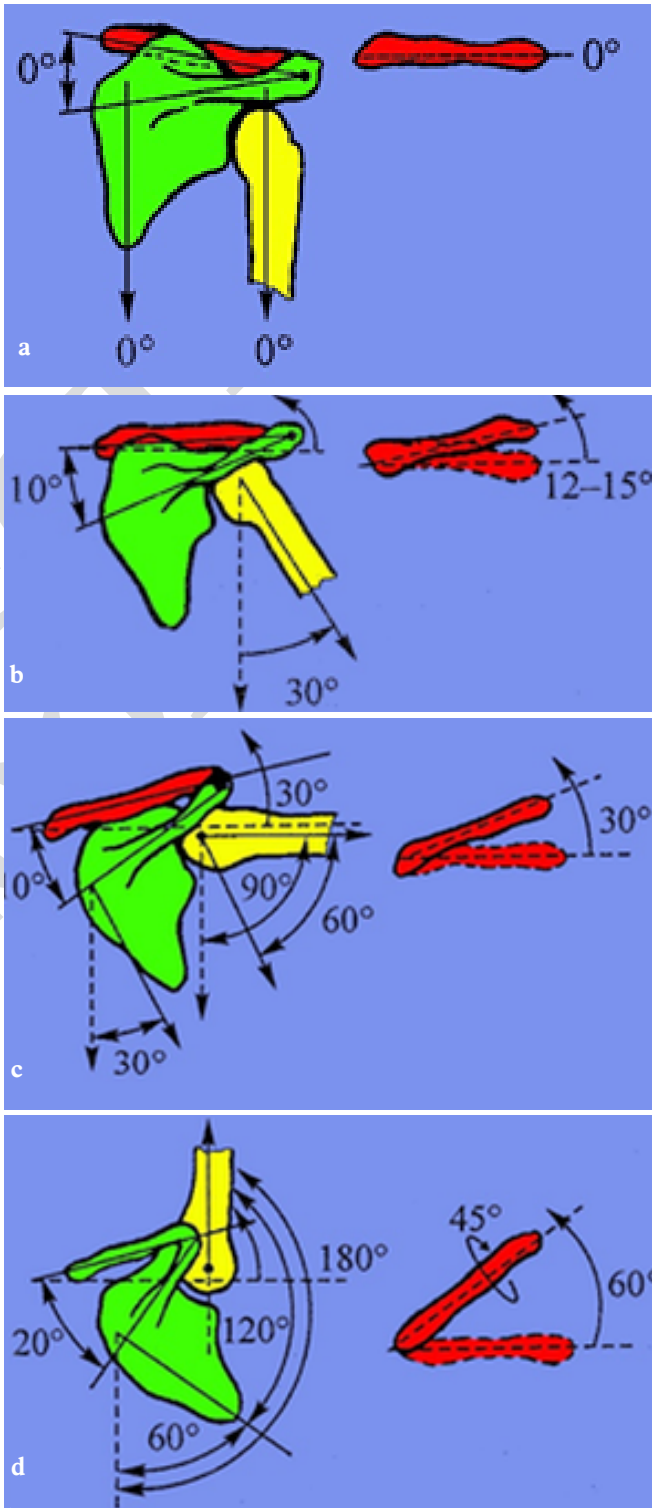

Figure 4. Schematic representation of the movements of the clavicle (marked in black) at different angles of shoulder elevation: (a) 0°; (b) 30°; (c) 90°; (d) 180°.

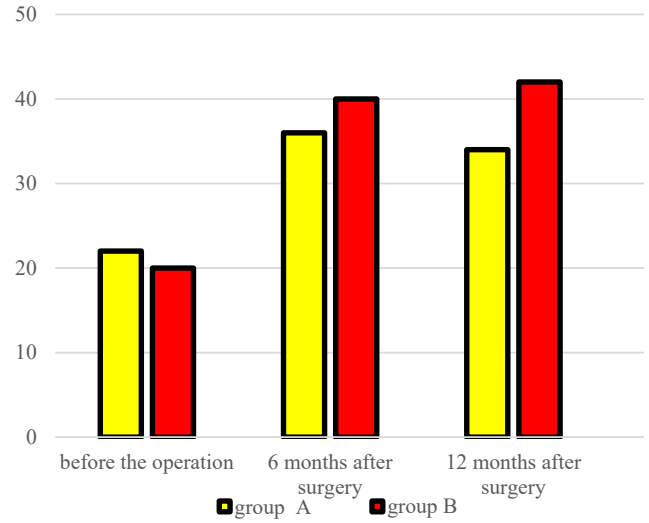

Figure 5. Changes in mean indicators of shoulder joint function (in points) 6 and 12 months after surgery according to the OSS in groups A and B.

joint according to the OSS in group B became even better (42 points), in contrast to patients in group A, where the mean indicators of the function of the shoulder joint slightly decreased to 34 points ($P \leq 0.05$). This is probably due to the progression of deforming arthrosis of the clavicular-acromial joint against the background of its overload during development.

When evaluating the results of treatment of patients on the CSS 6 and 12 months after surgery, results were obtained similarly to those obtained when evaluating patients on the OSS (Table 3).

As seen from Table 3, in patients of group A, the number of unsatisfactory and satisfactory results 6 months after surgery was 9.54%, after 12 months – 11.9%, which is probably associated with pain in the clavicular-acromial joint, since in there were no unsatisfactory and satisfactory results in group B patients. Then 6 months and 12 months after surgery, the number of excellent results was significantly greater in patients of group B – 35.7%, in patients of group A the number of excellent results was 21.44% ($P \leq 0.05$).

5. CONCLUSIONS

Arthrosis of the clavicular-acromial joint can cause contracture in the shoulder joint in patients after the suture of the supraspinatus tendon. Pain in the clavicular-acromial joint in patients after a suture of the rotator cuff of the shoulder disrupts to develop movements in the shoulder joint, increases the duration of rehabilitation and worsens the overall results of treatment. The clavicular-acromial joint experiences the greatest load during lifting and flexion of the shoulder in the range from 90° to 180°. Since in this range of motion, not only the displacement of the clavicle in the sagittal plane, occurs, but also its rotation, which in its own turn causes an overload of the articular cartilage and pain syndrome in the clavicular-acromial joint in the presence of deforming arthrosis in it.

Table 3. Results of treatment of patients according to the CSS in 6 and 12 months after surgery.

The result of treatment	After 6 months p / o		After 12 months p / o	
	A (%)	B (%)	A (%)	B (%)
Excellent	18 (21.44)	28 (33.32)	18 (21.44)	30 (35.7)
Good	20 (23.8)	10 (11.9)	18(21.44)	8(9.52)
Satisfactory	7 (8.35)	0	9 (10.71)	0
Unsatisfactory	1 (1.19)	0	1 (1.19)	0

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