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Bone Cyst of Proximal Humerus after Local Betamethasone Injection (Case Report)

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Absrtact

A potent anti-inflammatory effect and wide application of corticosteroids were the origin of their extensive use for treatment of diseases and injuries of the shoulder joint. The authors describe a clinical case of tumor-like cyst in the proximal humerus after intra-articular injection of glucocorticosteroid (GCS) in a 43 year old woman. Current medical literature reports various complications following GCS injections but the authors found no other cases of tumor-like cyst in proximal humerus associated with intra-articular GCS injection. This can be an underestimated phenomenon or a unique case. In any case, all physicians performing treatment and diagnostics medication blockades of the large joints should be aware of this occurrence. The authors assume that such complication can be prevented by clear understanding of shoulder joint anatomy and current visualization techniques such as ultrasound navigation.

Keywords: shoulder joint, humerus cyst, rupture of supraspinatus muscle, rotator cuff, bone allografting, glucocorticosteroids.

Introduction

Pain in the shoulder ranks third among all types of musculoskeletal pain [1]. Although, there is a great variation of data on the rate of pain in the literature. Picavet and Schouten reported that up to 20.9% of people in the population suffered from the shoulder pain [2]. Luime et al. found that 4.6 to 47.0% of people experienced chronic pain in the shoulder [3]. The numbers scatter is explained by various causes of pain, the patients, age and gender differences [4, 5, 6, 7]. In the vast majority of cases, such pathological conditions are not always correctly diagnosed and, as a result, are subjected to incorrect treatment. The most common injuries of the shoulder, as a cause of a chronic pain, include the partial ruptures of the rotator cuff tendons of various etiologies. This article is dedicated to the analysis one of such cases.

Case Report

The patient gave an informed consent for the publication of this clinical case.

Patient, 43 years old, a female, was admitted to the hospital with diagnosis of a cyst of the left proximal humerus of unknown etiology, partial damage to the rotator cuff tendons of the left shoulder, and subacromial impingement syndrome.

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An oval-shaped radiolucent lesion 1.5×1.0 cm in size with a peripheral sclerosis zone and signs of calcifying tendonitis of the supraspinatus was visualized on the direct and axial X-ray planes of the left shoulder in the region of the greater tubercle of the humerus (Fig. 1).

The medical history revealed that about a year ago the patient received a household low-energy injury as a result of a jerking action by the left upper limb. After that, the patient noticed a pronounced pain in the shoulder and a limited range of movements in it.

By a clinic doctor, this pathological condition was regarded as left-sided humeroscapular periarthritis. Within a month, the patient was treated conservatively with nonsteroidal anti-inflammatory drugs (topically and internally). Because the pain persistence, the clinic surgeon performed a single left shoulder medical blockade with suspension of betamethasone. The patient noted that at the moment of the drug injection she felt an "unbearable pain at the tip of the needle". After this, the patient felt a temporary relief of the shoulder pain. However, in a month, she began to notice the intense shoulder pain of a different quality, especially at the point of injection. An increasing restriction of movements in the shoulder appeared, and therefore the patient underwent MRI (Fig. 2).

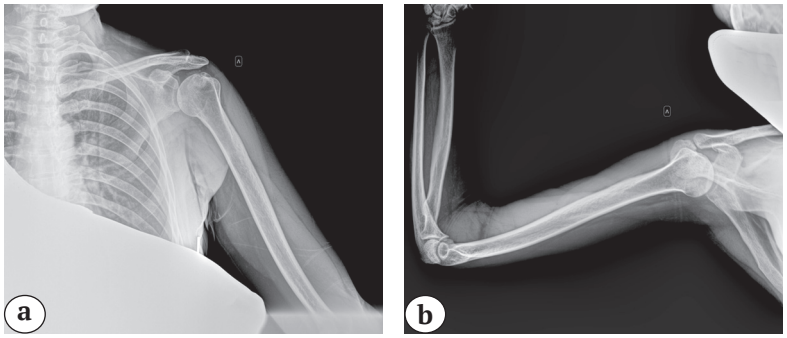

Fig. 1. X-rays of left shoulder of the patient:
a — AP view: a lucent oval shape with dimensions of 1.5×1.0 cm is visualized with a circumferential sclerosis and signs of calcifying tendinitis of supraspinatus muscle;
b — axial view: formation is not seen in this plane due to superposition of acromion

Fig. 2. MRI of the left shoulder: frontal scans (T1 mode) (a), sagittal scans (T2 mode) (b) and horizontal scans (T2 mode) (c). All planes demonstrate an infrabone formation with dimensions of 1.5×1.0×1.0 cm with clear contours, degenerative injury of supraspinatus tendon. Signs of calcifying tendinitis of supraspinatus muscle

A radiologist's report conclusion. The structural changes in the anterior part of the greater tubercle of the humerus head 1.5×1.0×1.0 cm. MR-signs of supraspinatus damage, probably, of degenerative origin. In all types of MR signal weighting, there are small areas of intensity decrease in the structure of the supraspinatus tendon, probably, due to calcifying tendonitis. Moderate tenosynovitis of the long head of the biceps brachii. Minimum bursitis of the subtendinous bursas of the coracobrachialis and subscapularis. MR signs of the 1st grade left shoulder osteoarthritis with small bone cysts of the humerus head. MR picture of small degenerative changes in the tendons of the subscapularis and infraspinatus, the intraarticular part of the long head of the biceps brachii tendon. MR signs of a linear portion of an increased MR signal in the projection of the anteroposterior glenoid labrum. Its damage can't be ruled out.

After MRI, the patient was consulted in the Petrov National Medical Research Center of Oncology. The oncological nature of the pathology was excluded. Although, to establish the definitive diagnosis, a histological examination of the cyst was recommended.

During hospitalization, the patient underwent a standard clinical examination, which did not reveal any deviations from the reference values. The medical history, laboratory and instrumental studies did not show any deviations from normal indicators, any signs of systemic diseases, or the occupational and other exogenous hazards impact.

On the 21st of November, 2018, the patient underwent the open surgery with arthrotomy, cyst excochleation, bone alloplasty, and supraspinatus suture.

The Surgery, was performed the by the upper lateral access to the shoulder (Bigliani's). The deltoid was bluntly pushed apart, and it was additionally partially separated from the acromian. The subdeltoid bursa was exposed and removed. The supraspinatus was longitudinally dissected, localization of the cyst was determined. A supraspinatus partial rupture was revealed in the area of its fixation to the greater tubercle and the bone cyst projection. The supraspinatus was mobilized from the attachment site at the larger tubercle region and the area of the bone cyst (Fig. 3). At the opening of the cyst, a milky colloidal suspension was released, a white fibrous capsule with crystalline inclusions was visualized along the periphery of the cyst.

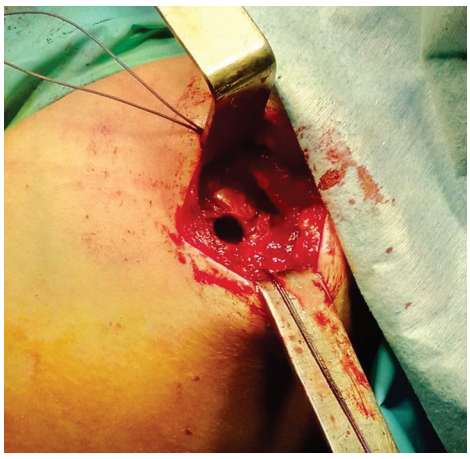

Fig. 3. Surgical wound image. Acromion, borders of deltoid muscle divided between anterior and medial portions.
Sutured supraspinatus tendon moved dorsally.
Wound floor visualizes the opening of removed cyst

The capsule and cyst were excochleated to a healthy bone. Bone alloplasty of the defect was performed. There was used a spongy bone allograft with a cortical plate adapted to the size of the defect and tightly impacted into it. The compensated defect volume was approximately 2.5 cm^3. A suture and fixation of the supraspinatus were performed with an anchor and transosseous suture.

The separated part of the deltoid was refixed to the acromion via the bone tissue. The wound drainage was not performed. The left upper limb was immobilized by an orthosis with abduction up to 40–45°. The postoperative period was uneventful. The wound healed by primary intention. The patient was discharged on the 7th day. The postoperative management protocol was similar to that for supraspinatus damage. The postoperative X-rays performed the next day after the operation, the complete filling of the bone defect was visualized (Fig. 4).

A histological examination of the tissue biopsy revealed a picture resembling the initial stage of gout. There were homogeneous masses of a lobular structure and crystals inclusions with a weak perifocal cell response. According to the preliminary pathomorphologist's conclusion, these inclusions resembled the uric acid crystals. Although the picture was not that typical for gouty lesion. In gout, the tissue infiltration is significantly more pronounced (Fig. 5).

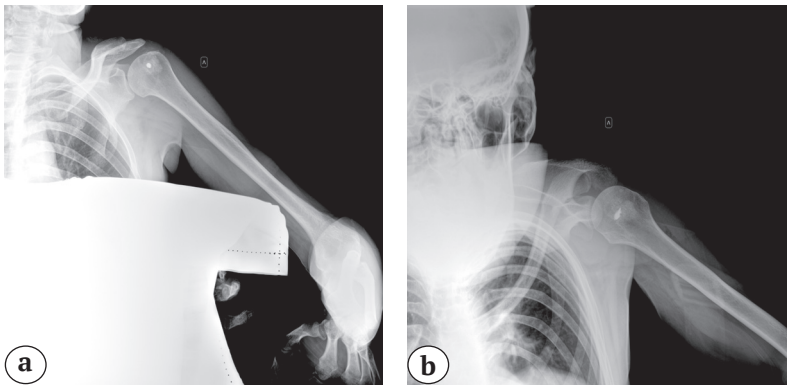

Fig. 4. Shoulder X-rays in AP (a) and axial (b) views; impacted bone graft and titanium anchor fixator

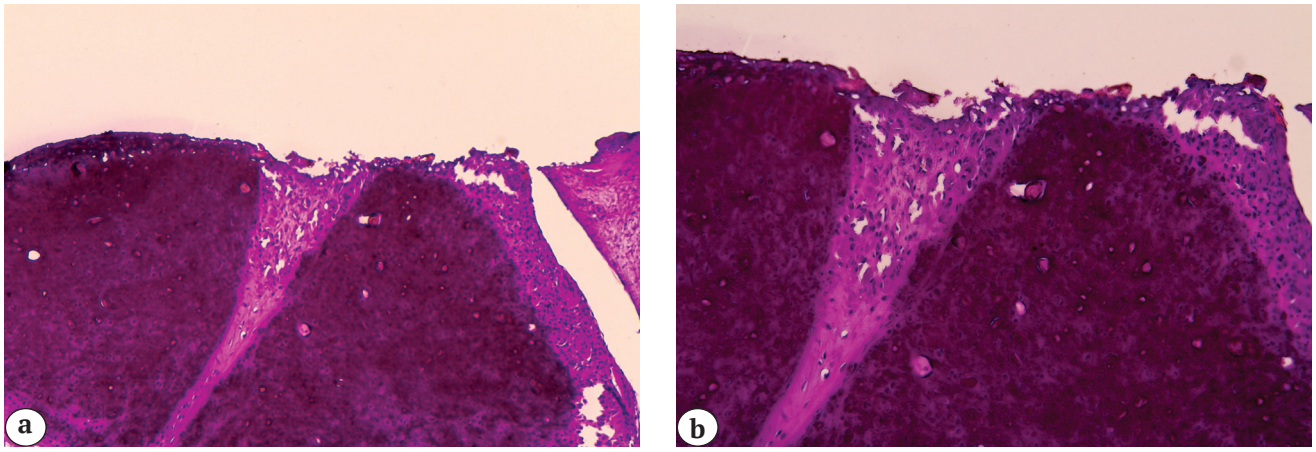

Fig. 5. Homogenous mass with speckles of white crystals. Lobulated tissue structure is clearly visualized together with minor infiltration. Staining by hematoxylin and eosin.
Mag. ×200 (a), ×250 (b)

Given the mixed conclusions, a repeated study of the biopsy sample was performed with taking into account intraoperative, clinical, laboratory and instrumental data. Homogeneous masses could be interpreted as necrotic detritus with inclusions of betamethasone dipropionate crystals. Given the immunosuppressive effect of the latter, this may explain the weak perifocal cell response.

At a month follow-up, the range of movements in the shoulder after removal of the abduction splint was: flexion 40°, extension 0°, abduction 35°, adduction 0°, internal rotation 10°, external rotation 5°. The postoperative scar was unremarkable. There were no peripheral neurological and vascular disorders. The patient noted a minor pain and amplitude limitation in the shoulder during movements with a change in pain quality. X-ray did not show any signs of allograft lysis (Fig. 6). At a two-month follow-up, the patient did not have any complaints. The pain was absent. There were a good functional result and a complete range of movements. The Constant score was 92 points.

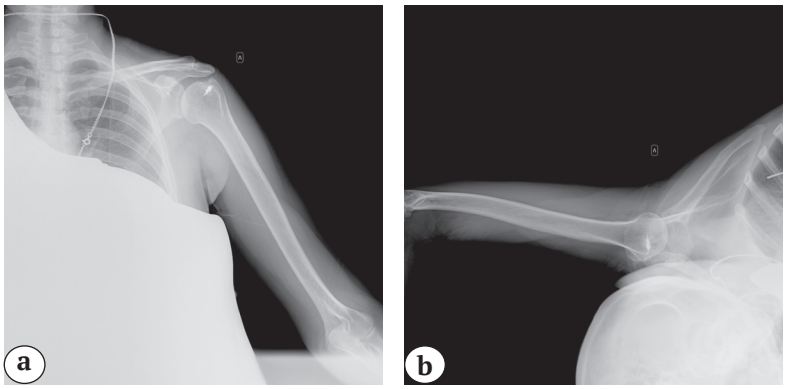

Fig. 6. AP (a) and axial (b) view X-rays of the shoulder. Partial graft restructuring and no instability sign of anchor fixator

Discussion

Conservative treatment of various pathological conditions affecting the shoulder is aimed to eliminate a pain syndrome, reduce inflammation and restore movements amplitude [8, 9]. Currently, the drugs of choice for pain and inflammatory process treatment are non-steroidal and steroidal drugs [10]. The most commonly prescribing glucocorticosteroid is fluorinated glucocorticosteroid betamethasone. It is characterized by good tolerance and rapid therapeutic effect. Although there is evidence that the systemic use of large doses can result in osteonecrosis and myolysis of tissues [11]. According to 2018 recommendations by leading Russian specialists in pain management, this drug does not cause local microcrystalline reactions and dystrophic changes [12]. However, in the professional orthopedic community, there is an unofficial opinion that intraarticular injections of corticosteroids, which are not controlled by additional visualization tools (such as ultrasound), are dangerous and can lead to the development of local lytic processes in tissues.

Among pain management specialists, the choice has been made in favor of the precise administration of drugs. This reduces the risk of concomitant complications. At the end of 2018, the clinical recommendations of the Association for Interventional Pain Management “Interventional treatment of patients with chronic pain syndrome” were published. According to these recommendations, all injection procedures must be performed using fluoroscopy and / or ultrasound. However, at the moment, these clini-

cal recommendations are not finally approved, being finalized [13].

In modern Russian literature, one can find some information concerning the likelihood of soft tissues lytic complications after corticosteroids injections. However, we couldn't find fined any publications describing the similar data on the specific local changes in the bone tissue of the humerus. In the foreign and domestic literature there are descriptions of similar pathological conditions localized in the proximal humerus: solitary bone cysts [14, 15, 16, 17, 18, 19, 20, 21, 22], cysts due to greater tubercle physical overloading with damage to the rotator cuff and omarthrosis [14, 23, 24, 25], enchondromas [21, 26, 27 , 28, 29, 30, 31], chondroblastomas of the proximal humerus [27, 28, 29, 32, 33], chondromyxoid fibromas [18, 21, 34, 35, 36, 37], proximal humerus aneurysmal bone cysts [27, 28, 29, 38], a giant cell tumors [27, 28, 29, 39, 40]. The above benign tumors and tumor-like lesions have a similar X-ray picture, with the exception of aneurysmal bone cysts and giant cell tumor. In terms of volume, the optimal surgery volume is cyst excohleation followed by bone defect autoplasty, which we did. The aneurysmal bone cysts and giant cell tumor have different x-ray picture, and therefore were excluded from the differential diagnosis.

Some scientific articles on intraosseous gouty tophi described the clinical picture of gout with laboratory confirmation. But they did not trace any connection of the cyst formation with glucocorticosteroid injection [41, 42, 43, 44, 45, 46, 47, 48, 49]. We did not find any articles described tophi in the proximal humerus. There are publications described cystic formations of the proximal humerus in neuropathic shoulder arthropathy (Charcot) [50, 51]. However, we did not observed any neurological deficit in our patient. There are a lot of literature data on the complications of glucocorticosteroid injections, but each of them has its own etiological agent. Acute scapular osteomyelitis [52], necrotizing fasciitis [53], gas gangrene [54] have a bacterial cause. Nicolau syndrome occurs as a result of medical skin embolization [55], candidal arthritis [56] is a fungal lesion. Degenerative damage to the supraspinatus and tendon of the biceps, damage to the suprascapular and axillary nerves, chondromalacia [57, 58], have a mechanical cause. Most of the above mentioned pathological entities have a similar radiological picture.

In their study, W. Zink and B.M. Graf found that the use of local anesthetics of prolonged action in combination with glucocorticosteroid was a risk factor of soft tissue damage, namely the development of myonecrosis [59].

Considering the above, our clinical case, although may not be that rare itself, however, is the first that documented the complications after local betamethasone injection.

It is rather difficult to make unambiguous conclusions concerning the above presented clinical case. However, we believe that one of the reasons for the formation of a cyst with contents histologically similar to gout in a patient without gout confirmation may be the result of a corticosteroids injection into the proximal humerus bone tissue.

In our opinion, the routine administration of corticosteroids into the shoulder without ultrasound guidance requires rethinking the indications and techniques for performing manipulations. An uncontrolled intervention can not only reduce the effectiveness of the method, but also in some cases may worsen the course of the disease, resulting in adverse effects and iatrogenic complications.

Publication ethics

The patient had given the voluntary informed consents for this clinical case publication.

Competing interests: The authors declare that there are no competing interests.

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Authors' contributions

P.G. Kogan — research concept and design, clinical material collection, analysis and interpretation of the data, text editing.

I.Sh. Kurbanov — literature data collection, systematization, processing and analysis, text preparation and editing.

S.A. Lasunsky — coordination of study participants.

D.V. Chugaev — literature data collection, systematization and editing.

E.P. Sorokin — literature data collection, systematization and editing.

A.I. Gudz — literature data collection and editing.

M.A. Lis'kov — literature data collection and editing.

V.V. Trushnikov — histological part of the study conduction, data interpretation.

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