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Original article

Assessment of calcific tendonitis of rotator cuff by ultrasonography: Comparison between symptomatic and asymptomatic shoulders

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ABSTRACT

Objective: Calcific tendonitis of rotator cuff is observed on plain radiographs in 10% of adults, but remains asymptomatic in half these cases. We looked for differences on ultrasound (US) and power Doppler findings between symptomatic and asymptomatic cases of shoulder calcific tendonitis.

Methods: US was performed in 62 patients (81 shoulders) with symptomatic ($n = 57$) or asymptomatic ($n = 24$) calcific tendonitis. Calcific plaque morphology, power Doppler signaling, and widening of the subacromial-subdeltoid bursa (SSB) were recorded. US-guided steroid injection into the SSB ($n = 21$) or needle puncture of calcific deposits ($n = 29$) was performed at the end of US evaluation in 50 of the 57 patients, and a questionnaire was sent to each patient after 11 ± 6 months.

Results: Larger ($p = 0.0015$) and fragmented ($p = 0.01$) calcifications were associated with pain. A power Doppler signal and a widening of the SSB was identified in 21 and 17 of the 57 symptomatic calcification respectively, but in none of the cases of asymptomatic calcification ($p < 0{,}005$). At least one of these signs was present in 31 of the 57 (54%) symptomatic shoulders ($p < 0.001$). Long-term outcome was favourable for 60% of our patients after steroid injection. The presence of a SSB widening before bursal steroid injection was associated with an improvement of the symptoms ($p = 0.06$).

Conclusion: Positive power Doppler signal within the calcific deposit and SSB widening are US features strongly associated with pain. Moreover, larger calcifications are also more symptomatic. According to these results, US can help physicians to confirm that calcification is responsible for shoulder pain.

1. Introduction

Calcific tendonitis is a common disorder of the shoulder caused by the deposition of basic calcium phosphate crystals within the rotator cuff tendons. The reasons for these deposits remain unclear. They have been attributed to ischemia, metabolic disturbances and fibro-cartilaginous transformation of the tendon tissue [1]. During the resorption of calcific deposits, patients may experience acute symptoms, including severe pain and restriction of movement, usually for about two weeks. However, pain may also become chronic, if the rotator cuff impinges on the lower surface of the acromion, due to the volume of calcifications [2]. Calcifications are frequent, being reported in 8 to 20% of adults on the basis of X-rays [3]. However, only about half those with calcifications report shoulder pain [4]. Given this high frequency of asymptomatic calcifications, an X-ray alone cannot provide sufficient evidence to conclude that the calcification is indeed responsible for the pain.

Ultrasound (US) has been widely used for the evaluation of the shoulder, mainly for rotator cuff pathology. US also accurately depicts and localizes rotator cuff calcifications without the need to expose the subject to radiation. US has been shown to be as sensitive as plain radiography for the detection of calcification, particularly for large, slurry or bursal calcifications [5,6]. It is also used to predict the consistency of the calcification before puncture on the basis of its pattern on US [7]. Doppler imaging has been shown to be useful for predicting the evolution of calcification [8]. However, few studies have assessed the correlation between US findings and clinical expression in routine practice. We compared US and power Doppler findings for symptomatic and asymptomatic shoulders with rotator cuff calcifications in a cross-sectional study of consecutive patients seen at the rheumatology unit of a tertiary center. The aim of this study was to assess the extent to which US could demonstrate that pain genuinely originated from the tendinous calcific deposits and surrounding bursa.

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2. Patients and methods

2.1. Patients

All patients diagnosed with calcific tendonitis in our unit on the basis of plain radiography or referred for US-guided steroid injection were consecutively enrolled between October 2006 and December 2008. Contralateral X-rays were systematically carried out to detect asymptomatic calcifications. Moreover, all chest X-rays performed in our unit were checked for asymptomatic calcifications of the shoulders. Patients with a history of steroid injection within the last three months, shoulder surgery, percutaneous needle aspiration, shoulder osteoarthritis, rotator cuff tears or inflammatory rheumatic disease were excluded. The US studies carried out were part of the routine workup for patients, so the institutional review board agreed that this study could be carried out without formal application for approval. However, we did inform the patients about the rationale of the study and the procedures to be used. For each patient, age, score on a pain visual analog scale (VAS), date of the onset of pain, dominant hand, and presence of nocturnal pain were recorded prospectively.

2.2. Ultrasonography

US scans of both shoulders were taken with a Philips HD11 XE sonography unit, using a multifrequency linear transducer (5 to 12 Mhz) in B mode and power Doppler imaging. For power Doppler imaging, the pulse repetition frequency was set at 500 Hz and the color gain at the most sensitive level before the appearance of noise. All patients were examined with a standardized technique [9], by the same trained ultrasonographer (BLG) with a rheumatological background. Calcification of the rotator cuff was diagnosed if a hyperechogenic focus with or without acoustic shadow was found within the supraspinatus, infraspinatus or subscapularis tendon on US (Fig. 1). Calcific shoulder plaques were classified into four types on the basis of morphology, as previously described [10]: arc-shaped (an echogenic arc with clear shadowing), fragmented or punctate (at least two separated echogenic spots or plaques with or without shadowing), or nodular (an echogenic nodule without shadowing). The transverse and longitudinal dimensions of the calcification were recorded on the US unit during examination. Each calcification was examined three times, and the mean value of the transverse and the longitudinal sizes was used in further calculations. Power Doppler was considered positive if the signal was located within the tendon very close to the calcification. The color flow signal intensity was graded, as previously described [10], on a scale of 0 to 3, where 0 represents no signal, 1 = mild (weak, spot-like color flow signal), 2 = moderate (a few rod-like color flow signals), and 3 = severe (multiple rod-like or linear color flow signals) (Fig. 2). In a patient who was seated during scanning, the widest part of the subacromial-subdeltoid bursa (SSB) was measured in a neutral position (no internal or external rotation), with minimal transducer pressure, in the transverse and longitudinal planes. The measurements obtained were compared with those for the contralateral side. The patient was considered to present bursa effusion or bursitis if the width of the bursa exceeded 2 mm (Fig. 3) [11]. We systematically checked for gleno-humeral (GH) joint effusion. The GH joint were examined with the patient's hand placed on the contralateral shoulder. The transducer was oriented in the axial plane until the head of the humerus was seen adjacent to the posterior glenoid labrum. GH effusion was defined as a hypoechogenic area between the posterior labrum and the infraspinatus tendon.

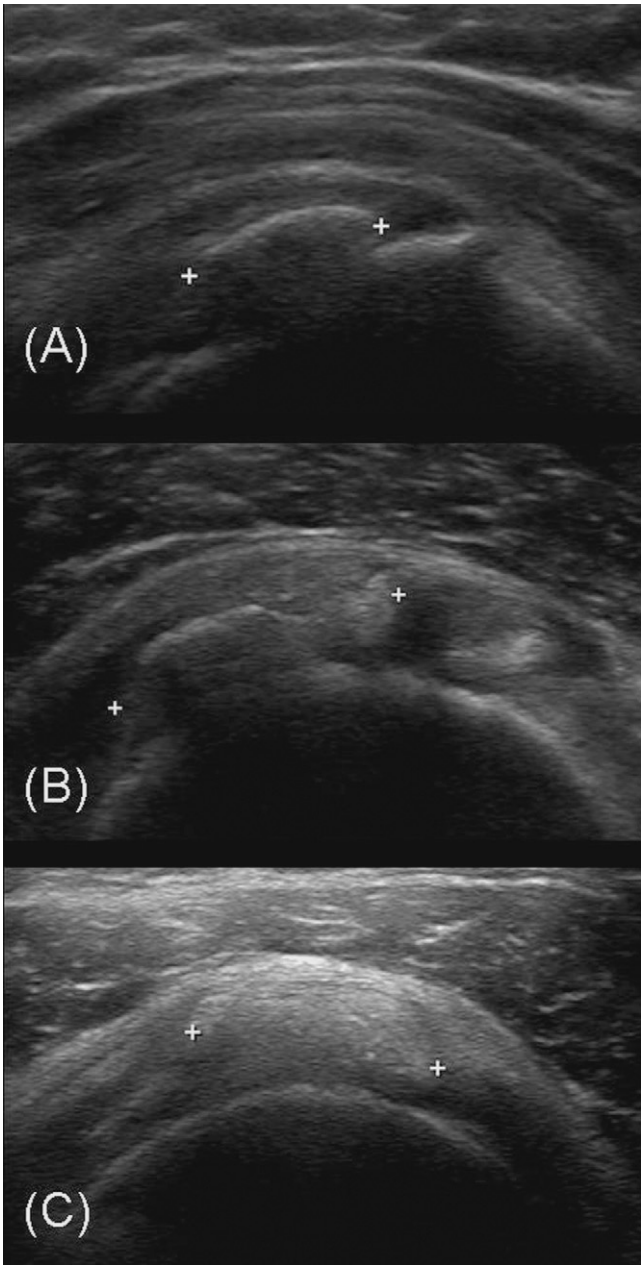

Fig. 1. Transverse US scan of the supraspinatus tendon showing (A) arc-shape calcification with clear shadowing, (B) fragmented appearance without shadowing and (C) nodular calcification.

2.3. Treatment and follow-up

Symptomatic shoulders were treated by US-guided steroid injection (Cortivazol, 3.75 mg/1.5 ml) into the SSD bursa in front of the calcification or by percutaneous needle puncture and aspiration of the calcific deposits if no improvement was observed after previous steroid injections. In the puncture procedure, which was performed by a free-hand method monitored by US, the needle tip (21-gauge) was inserted into the calcific plaque, which was then punctured by moving the needle back and forth with aspiration, as previously described [10]. This procedure was followed by a steroid injection in the SSB bursa (Cortivazol, 3.75 mg/1.5 ml) to prevent acute pain due to the puncture. Patients experiencing a spontaneous significant decrease in pain during the month before US received conservative treatment with non-steroidal anti-inflammatory drugs and physical therapy. At the end of the study,