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Case Report

Nonsurgical removal of a massive calcification of the shoulder ☆,☆☆

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ABSTRACT

Calcific tendinopathy of the shoulder is a prevalent and painful condition marked by calcific deposits in the rotator cuff tendons or subacromial bursa, with an incidence of 2.7% to 20%, predominantly affecting individuals aged 30 to 50. Women are 1.5 times more likely to be affected than men. Deposits are frequently bilateral in 10%-20% of cases and most commonly found in the supraspinatus tendon. The pathogenesis remains unclear, with theories suggesting repetitive strain or ischemic degeneration leading to calcium deposition. The disease progresses through precalcific, calcific, and postcalcific phases, with symptoms ranging from mild pain to severe, disabling pain resistant to medication. Diagnosis primarily involves radiographs or CT scans, with ultrasound aiding in deposit staging. Conservative treatments include medication, physiotherapy, and subacromial corticosteroid injections. Novel nonsurgical treatments like ultrasound-guided needling (UGN) and extracorporeal shock wave therapy (ESWT) have shown promise. When conservative measures fail, surgical options achieve significant improvement. This case report details a 53-year-old woman with a 12 cm calcification treated successfully with UGN, demonstrating the efficacy of this minimally invasive technique for large deposits.

Abbreviations: RC, Rotator Cuff; CT, Computed Tomography; US, Ultrasound; MRI, Magnetic resonance imaging; UGN, Ultrasound-guided needling; ESWT, Extracorporeal shock wave therapy; NSAID, Nonsteroidal anti-inflammatory drugs.

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Introduction

Calcific tendinopathy/tendinitis of the shoulder cuff is a common and painful condition characterized by the presence of either single or multiple calcific deposits in the rotator cuff (RC) tendon or subacromial bursa [1]. Its incidence ranges from 2.7% to 20 % [2], with the majority of those affected falling within the 30 to 50 age range. Women are affected 1.5 times more frequently than men [3,4].

In roughly 10%-20% of cases, the deposits are bilateral [2,5], with approximately 80% occurring in the supraspinatus tendon [4,6,7]. The deposits are also frequently found in the infraspinatus tendon [1,5] and infrequently in the subscapularis and teres minor.

The etiopathogenesis of calcific tendinopathy remains unclear. According to some authors, repetitive strain or overuse of the RC can result in the formation of calcific deposits within the tendon, whereas others hypothesized that degeneration in the tendon occurs due to local ischemia, which subsequently triggers calcium deposition [1].

Uhthoff et al. [8] proposed that the disease passes through 3 phases: precalcific, calcific and postcalcific. In the rarely symptomatic precalcific stage, there is fibrocartilaginous metaplasia in the tendon. The following calcific stage is further divided into formative, resting and reabsorption phases. Patients are mostly symptomatic in the reabsorption phase. Finally, the postcalcific phase is the healing phase, in which there is reabsorption of the deposit.

Recent studies have indicated a potential link between certain thyroid disorders, as well as other endocrine conditions like diabetes, and the development of the disease [9–11]. Furthermore, other authors have found a strong association between calcific tendinopathy and some genetic mutations, specific antigen serotypes and expression of tissue proteins, which are to be understood more deeply [12–14].

Symptoms may vary from low-grade subacute pain that worsen during the night to intense, highly disabling pain resistant to high doses of oral anti-inflammatory drugs and painkillers; a decrease in active range of motion, and loss of muscular strength might also be present [4].

Usually, diagnosis and follow up of calcific tendinopathy are made with standard radiographs or computed tomography (CT), as they allow to show calcification, its extent, shape and contour [7].

Even ultrasound (US) can be useful in the evaluation of calcific tendinopathy because this technique shows RC tears in detail and enables staging of the deposits by correlation of shadow cones [15,16]. At US, calcifications present as hyperechoic foci. In literature, 3 types of deposits have been described, based on their percentage of calcium [7]. Type I deposit is rich in calcium, and it is hyperechoic at US with well-defined acoustic shadowing, corresponding to the first, formative phase. Type II is hyperechoic, with a faint acoustic shadow whereas type III is similar to type II, except the fact it has no acoustic shadow. The last 2 types usually are linked to the resorptive phase in which the calcium deposit may be semiliquid [17]. Type III calcifications may be isoechoic to tendons; therefore, to avoid misinterpretation is important to check the loss in the normal fibrillar tendon pattern, associated with the presence of amorphous hyperechoic foci or to take advantage of anisotropy.

Typically, magnetic resonance imaging (MRI) is not needed, because it does not give any additional information in most cases [18,19]. Calcific deposits have low signal intensity in all MRI sequences.

The majority of patients can be treated conservatively with pain medication, physiotherapy, and prudent use of subacromial corticosteroid injections. However, approximately 10% of patients are resistant to conservative treatment and appear to remain in a prolonged formative phase with chronic symptoms [20].

In recent years, novel conservative nonsurgical treatment methods like ultrasound-guided needling (UGN) and extracorporeal shock wave therapy (ESWT) have emerged as supplementary management options [1].

When conservative management fails, more invasive therapies are to be taken in consideration. Treatment of such condition varies and is usually left to the clinician to decide which kind of technique is more suitable to the patient. An open or arthroscopic procedure can achieve complete clinical improvement in 80% to 100% [21].

We report the case of a woman with an extensive 12 cm calcification in the shoulder, which, to our knowledge, represents one of the largest deposits documented in the literature. This was successfully treated using a minimally invasive technique like UGN.

Case presentation

A 53-year-old woman came to our attention complaining of severe chronic pain in the right shoulder and of a limited range of motion of the right arm. She reported no history of trauma. She had previously received treatment from her general practitioner with nonsteroidal anti-inflammatory drugs (NSAIDs) and later with steroid tablets on multiple occasions. However, the relief provided by the prescribed medication was only temporary, lasting for a few weeks each time.

An active range of motion of the right shoulder was impossible at clinical examination and any effort to assess passive range-of-motion maneuvers elicited severe pain, rendering evaluation impractical. No sensory deficits in the right upper limb were detected.

Initially, the patient underwent an ultrasound examination which revealed an extensive intratendinous echogenic deposit with features consistent with massive intratendinous calcification in the setting of calcific tendinopathy (Fig. 1).

As the patient was completely unable to move her arm, a CT scan (*Revolution EVO, GE Healthcare*) was performed to assess the extent of the calcification.

CT is the best modality to evaluate erosion and demonstrate calcification and its consistency. The scan showed a thick 12 cm long calcification affecting the supraspinatus tendon (Fig. 2).

Ultrasound-guided needling (UGN) was performed under local anesthesia to remove the aforementioned calcification.

The patient was placed in a supine position with her arm fully extended alongside her body. The skin over the shoul-

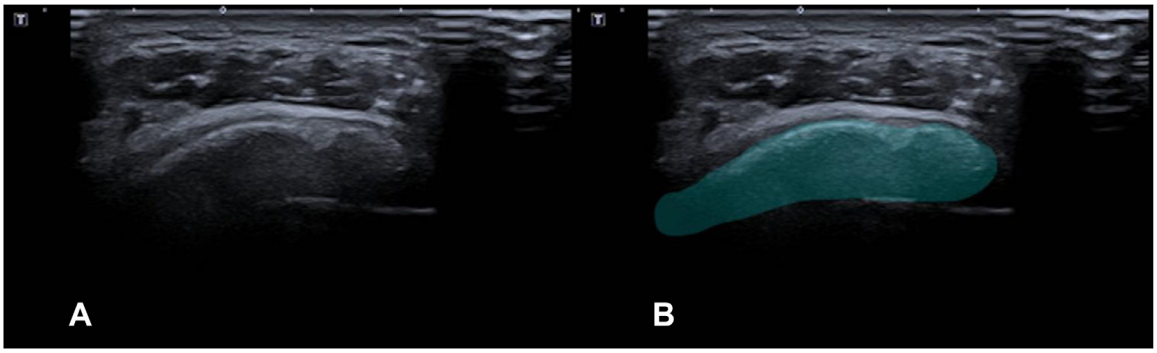

Fig. 1 – (A) Massive calcification within the rotator cuff; (B) in the same image the calcific deposit is highlighted in light blue.

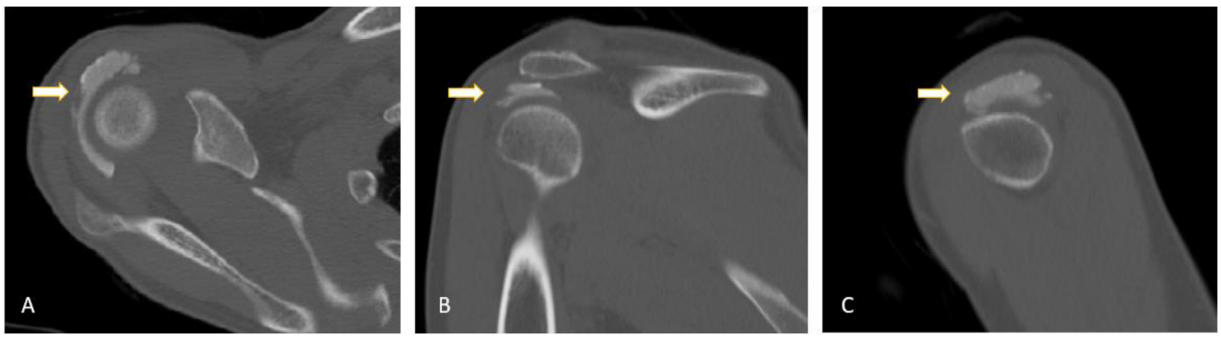

Fig. 2 – Axial (A), coronal (B) and sagittal (C) plane reconstructions showing 12 cm long calcification (white arrow) affecting the supraspinatus tendon.

der was cleansed using a standard antiseptic solution (10% Povidone-Iodine). A sterile cover was placed over the ultrasound transducer, with sterile lubricating gel applied both inside and outside the probe cover.

Under US guidance (with a high-frequency linear broadband array transducer), local anesthesia was performed (Lidocaine 2%, 10mL) into the subacromial-subdeltoid bursa and over the calcification. Then, two 18 G needles attached to a 10 mL syringe each were inserted into the calcification, parallel to one another using US guidance (Fig. 3).

A sterile saline solution was injected applying gentle and intermittent pressure on the syringe plunger. Therefore, a washing circuit was established, and an off-white dense fluid started to exit the second syringe. The procedure went on until the fluid became translucent.

The procedure took only 1 session, and it was successful as at follow up, after just 1 week, the patient reported a significant improvement in shoulder mobility with absence of pain.

A new CT scan was performed 1 month after the procedure to assess if there was any residual calcification and if so, how big the residual debris was (Fig. 4). UGN proved to be an effective treatment for this patient, allowing for the removal of most of the calcification.

Discussion

The etiology of calcific tendinitis (CT) remains largely unclear, with several theories proposed. One hypothesis involves the metaplastic transformation of tenocytes into chondrocytes, leading to calcific crystal deposition within tendons. Another theory suggests that reduced intratendinous oxygen supply promotes fibrosis, necrosis, and subsequent calcification. Bosworth proposed that repetitive tendon microtrauma results in fiber degeneration followed by calcification [14].

Rui et al. posited that the erroneous differentiation of tendon-derived stem cells into bone cells leads to chondral metaplasia. Recent research highlights the role of chondro-osteogenic BMPs (BMP-2, BMP-4, BMP-7) in tendon cell metaplasia and calcification [9].

Uhthoff et al. categorized rotator cuff calcific tendinitis (RCCT) into 4 stages: precalcific (metaplastic transformation), calcific formative (crystal deposition), calcific resorptive (vascularity increase and macrophage activity, often with acute symptoms), and postcalcific (fibroblast-mediated tendon repair, associated with severe pain and reduced range of motion) [8].

While calcific tendinopathy is a very common and painful condition, conservative management is always the first line of treatment, including NSAIDs, physiotherapy, ESWT and UGN.

Usually, massive calcifications are refractory to conservative approach and need to be removed with arthroscopy or open surgery, which are expensive, long-rehabilitation requiring and not free of possible operative complications. Often, systematic reviews and meta-analysis concerning calcific tendinopathy of the rotator cuff usually focus on the treatment of much smaller deposits.

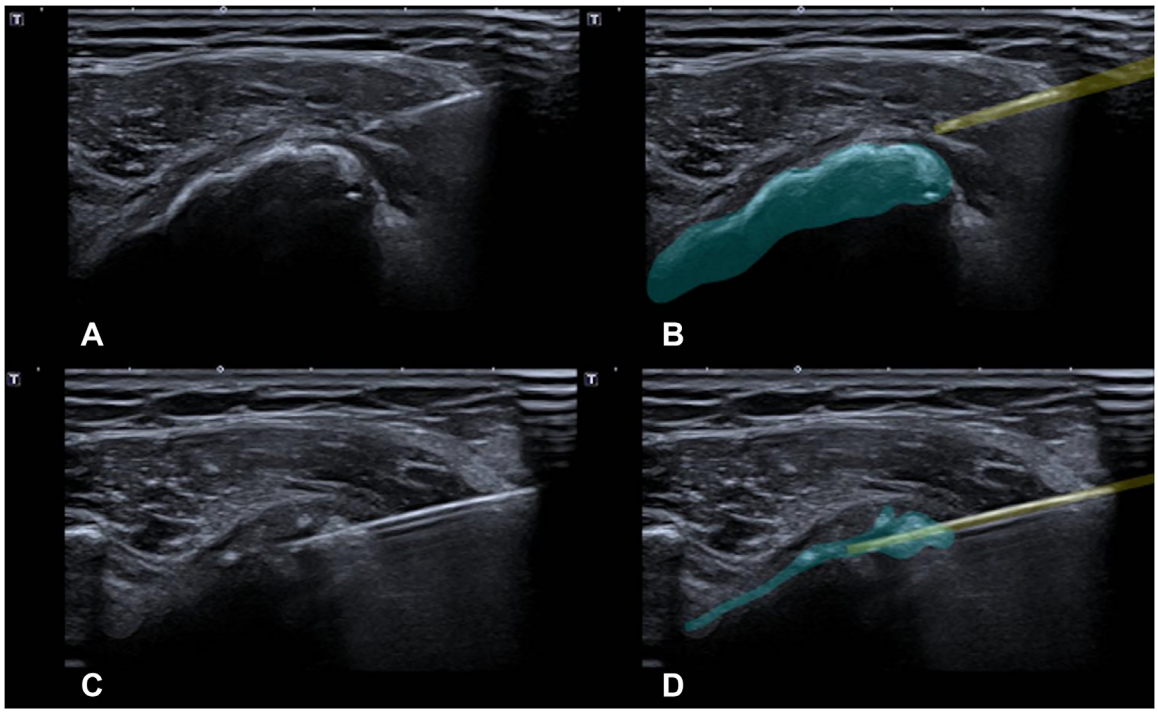

Fig. 3 – (A,B) calcification highlighted in light blue before removal; (C,D) calcific remnants highlighted in light blue at the end of the procedure. The needle is also visible in the right part of the 4 images, highlighted in yellow.

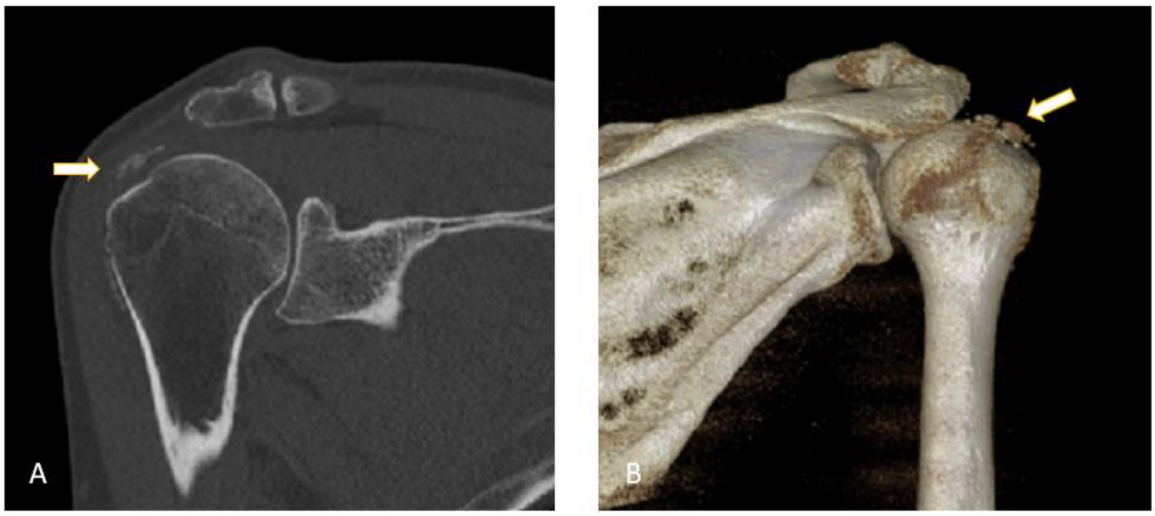

Fig. 4 – Coronal (A) plane CT image showing just little debris of the original calcification (white arrow) after UGN treatment. In (B), Volume Rendering reconstruction allows a 3-dimensional representation of data.

As far as we know, the calcification we reported is one of the largest successfully treated with UGN.

Comfort et al. [22] first demonstrated UGN under fluoroscopy control and then, in 1995, Farin et al. [17] first described the use of US in bursal lavage and needling for the treatment of RC calcifications.

Since then, it has been a commonly used intervention, as it is low-cost and can be carried out under local anesthesia. Recent studies have reported satisfactory results about calcific tendinopathy treatment with UGN [23]. de Witte et al. [24] carried out a randomized controlled trial between UGN with subacromial injection and subacromial injection alone; both groups showed improvement, but the UGN group fared better as compared with injection alone.

Conclusions

Our case report pinpoints the possibility to successfully treat also massive calcifications with a minimally invasive ap-

proach such as UGN. This technique is considered a safe and effective treatment that brings significant pain improvement and a very low rate of minor complications (vasovagal reaction, bursitis).

Author contributions

E.A.G.: Conceptualization; S.M., M.C.: Writing-original draft preparation; S.M., V.C., M.C., Z.V. L.C.: Writing—review and editing; E.A.G.: Supervision. All authors have read and agreed to the published version of the manuscript.

Patient consent

Informed consent was obtained from the subject involved in our case report.

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