
Rotator Cuff Calcific Tendinopathy

EFW Radiology Medical Brief

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Rotator cuff calcification is very common^{1,2} and can be seen in up to 7.5% of healthy asymptomatic shoulders in adults³ and up to 20% of painful shoulders.¹ Calcification can be degenerative or due to calcium hydroxyapatite deposition.¹ The latter is referred to as calcific tendinopathy.^{3,1} Rotator cuff calcification occurs more commonly in women (70% of cases) and most frequently during the 5th decade of life,³ but calcific tendinopathy is not exclusive to this demographic and can be seen in men and in younger patients. The supraspinatus tendon is most commonly affected (80% of cases) followed by the infraspinatus (15% of cases) and subscapularis (5% of cases) tendons.³ This condition is usually associated with an intact rotator cuff³ and mostly occurs in healthy tendons.¹ While there are a number of theories, the etiology of this condition is poorly understood.^{1,2} Calcific tendinopathy may be due to a local decrease in oxygen tension that leads to fibrocartilaginous metaplasia and secondary calcification.^{3,1,2} It has a tendency to recur. There are 4 histological stages: pre-calcific, calcific, resorptive and post-calcific.³ Stage 3, the resorptive stage, is the most clinically important and it is during this stage that patients are most symptomatic. Histologically this correlates with vascular invasion, edema and marked increased intratendinous pressure.³ An association between acute pain attacks and histological evidence of calcium resorption has been previously described.³

Diagnosis

The diagnosis can be made by utilizing X-ray (Figure 1) or ultrasound (Figures 2 and 3). Often these two imaging modalities are complementary, especially when it comes to planning potential image-guided percutaneous therapy. Ultrasound has a high sensitivity and can accurately localize calcific deposits.² MRI has relatively poor sensitivity for detecting calcium hydroxyapatite crystal and CT is not appropriate due to increased radiation burden.

Calcific tendinopathy is a self-limiting, but treatable condition.³ The typical clinical picture is that of subacute low-grade shoulder pain, which commonly increases at night.³ During the resorptive stage, highly disabling sharp acute pain and decreased range of motion occurs^{3,1} which seldom responds to common painkillers.¹ When calcific tendinopathy is incidentally found and the patient is asymptomatic, no treatment is required.^{3,1} If a patient presents with mild symptoms, physical therapy and a course of

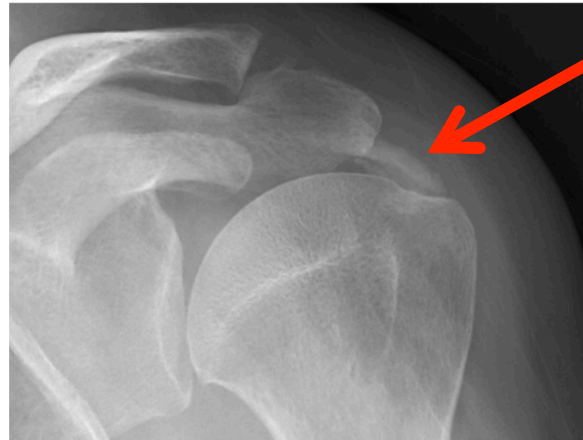


Figure 1

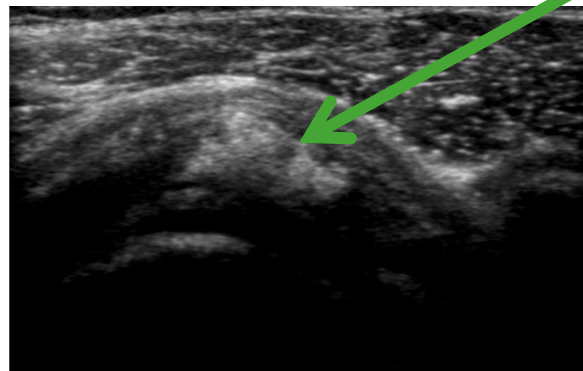


Figure 2

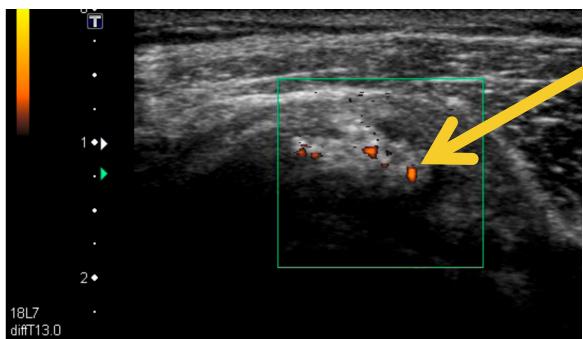


Figure 3

non-steroidal anti-inflammatories is usually sufficient.^{3,1} If symptoms are moderate, subacromial intrabursal corticosteroid injections can be used to augment treatment. When symptoms become moderate to severe, rotator cuff lavage should be considered. This is a safe and effective way to promptly reduce pain and improve shoulder function.³ Rotator cuff lavage is a minimally invasive procedure and can be performed in an outpatient setting.³

Rotator Cuff Lavage Treatment

The decision to perform rotator cuff lavage is multifactorial. First and foremost, the patient should be sufficiently symptomatic. Secondly, x-ray and ultrasound imaging characteristics should be evaluated. The ideal ultrasound appearance is a minimally shadowing, uniformly echogenic calcification associated with significant expansion of the tendon. Importantly, incidental degenerative calcification is not suitable for lavage and usually has the appearance of tiny calcifications at the insertion sites of the cuff.¹

There are two well-described lavage techniques and both have shown good results. These two methods either utilize a double (Figure 4) or single (Figure 5) needle technique, respectively.^{3,1} Broadly speaking and in our experience, the single needle technique is better suited to small calcific deposits, whereas the double needle technique is more suited to larger deposits. There are a number of other considerations when deciding on whether to use a single versus a double needle technique and these are beyond the scope of this medical brief. The single needle technique utilizes a barbotage pulsing syringe action. During the double needle technique, anywhere between 200-400cc of normal saline is flushed through the cuff, dissolving the calcification during the procedure. Double needle cuff lavage is technically more challenging than the single needle technique and correct needle positioning and orientation is critical to the success of the procedure.¹ Warm saline can be used to improve dissolution of calcium.^{4,1} Lavage is always preceded by liberal local anesthetic administration into the subacromial bursa and soft tissues immediately superficial to the cuff. If the patient is in extreme pain at the time of the procedure, we sometimes utilize an ultrasound guided suprascapular nerve block to augment local anesthesia. Strict sterile technique is adhered to at all times. Corticosteroid is always injected into the subacromial bursa following lavage so as to reduce the incidence of procedure related chemical bursitis. Anti-inflammatories, analgesics and application of ice are encouraged in the days following the procedure. On occasion, patients will experience recurrent shoulder pain 2 to 3 months following the procedure. This can be due to a chemical bursitis associated with the procedure and is easily remedied with an image guided intrabursal corticosteroid injection.³

Potential complications of cuff lavage include infection, hematoma and cuff tear. However, complications are extremely uncommon¹ in experienced hands.

Cuff lavage is probably an underutilized technique. It can provide remarkable and immediate pain relief to many patients who suffer from this condition. Rotator cuff lavage should be considered in patients who fail common and more well known management strategies.



Figure 4

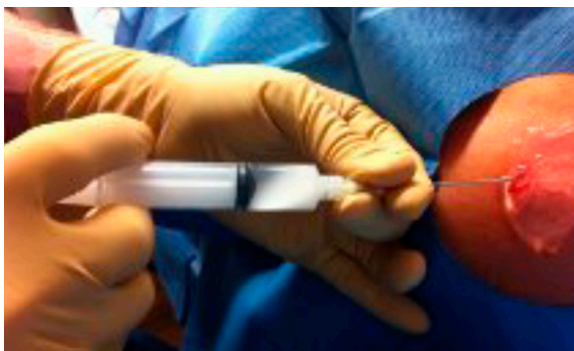


Figure 5

Legends

- Figure 1: Left shoulder frontal x-ray demonstrating typical rotator cuff calcium hydroxyapatite crystal deposition conforming to the contour of the supraspinatus tendon, indicated by the red arrow.
- Figure 2: Short axis grey scale ultrasound image of the supraspinatus tendon demonstrating stage 3 calcific tendinopathy. Note the expansion of the tendon and minimal posterior acoustic shadowing making this deposit suitable for lavage, indicated by the green arrow.
- Figure 3: Short axis power doppler ultrasound image of the supraspinatus tendon (same patient as Figure 2) demonstrating vascular invasion of the calcium deposit, typical of stage 3 calcific tendinopathy, indicated by the yellow arrow.
- Figure 4: Double needle lavage technique (same patient as Figure 4). Extension tubing is attached to the superior needle through which 300-500ml of normal saline is injected. Saline and dissolved calcium exits through the inferior needle.
- Figure 5: Single needle cuff lavage utilizing a 20G spinal needle. A barbatoge pulse technique is used during single needle lavage. Note the cloudy appearance of the solution due to aspiration of calcium hydroxyapatite crystals.

References

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MSK Ultrasound:

Musculoskeletal Ultrasound (MSK Ultrasound) is a dynamic, non-invasive exam that allows high resolution, real-time evaluation of musculoskeletal disorders. It is an excellent complement to MRI and a reliable modality for diagnosing musculoskeletal disorders related to traumatic injury, degeneration and for patients who can't undergo MRI. Non-invasive and dynamic imaging is beneficial when range of motion is lost due to acute or chronic injury to major tendons and other periarticular soft tissue structures, as well as in pain management.

At our MSK Regeneration and Performance Centre location, EFW Radiology uses a sub-specialist team trained in MSK Ultrasound.