Ultrasound-Guided Calcific Tendinitis Lavage: Application, Technique, and Outcome

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Calcific tendinopathy

- Hydroxyapatite deposition in tendons
- Mostly in the rotator cuff, but can involve other tendons
- 2-22% of asymptomatic adults, 7% of painful shoulders
- Most common in 30-60 year olds with a peak in the 5th decade
- 70% female, 10-25% bilateral
- 4 proposed phases:
  - Pre-calcific
  - Calcific – well defined calcifications, can cause subacute low-grade pain
  - Resorptive – irregular calcifications, sharp acute pain and decreased ROM
  - Post-calcific
- Generally self-limited, but can be intractable and can cause substantial morbidity and economic impact from days off work
Calcific tendinitis lavage

- **Benefits:**
  - Reported clinical success in 60-95% of patients
  - Less expensive and invasive than surgery
  - Less time consuming, expensive, and painful than lithotripsy
  - More effective than acetic acid iontophoresis or therapeutic ultrasound (US)
- **US-guidance first described by Farin in 1995**
- **Advantages of US over fluoroscopic guidance:**
  - Real-time, multiplanar imaging without ionizing radiation
  - Ability to identify alternative pain sources including tendon tear
- **Two techniques:**
  - Two needle
    - 1 needle for injection, 1 needle for aspiration
  - One needle (the technique used at our institution)
    - 1 needle for pulsed injection
- **Theoretical complications of infection and tendon injury**
Positioning for rotator cuff lavage

- Position the patient in a semi-upright position on a stretcher.
- Upright positioning is avoided due to published reports of vasovagal phenomenon during the procedure.
- Modified Crass position is preferred over the neutral position for SST imaging if the patient can tolerate it.

Figure 1: Patient in a semi-upright position with hand on the hip and elbow pulled back (modified Crass position).
Pre-procedure imaging

• Pre-procedure US in 2 planes is performed in all cases
• Linear array transducer is utilized, typically 12-5 MHz
• Benefits of pre-procedure imaging:
  – Confirm persistent, treatable calcific tendinopathy
  – Transducer pressure can confirm symptomatic calcific tendinopathy
  – Identify alternative pain sources including tendon tear
  – Plan needle approach (skin marked at planned entry site)

*Figure 2: Pre-procedure ultrasound imaging with a 12-5 MHz linear transducer.*
Figure 3: Long (a) and short axis (b) views of the supraspinatus tendon (SST) show a densely shadowing calcification within the tendon (solid arrow). A recent prior AP view radiograph (c) of the same shoulder shows a well-defined, ovoid, dense calcification superolateral to the humeral head (open arrow). These imaging findings are characteristic of calcific phase calcification.

Figure 4: Long (a) and short axis (b) views of the SST show an irregular, nonshadowing calcification within the SST (solid arrow). A recent prior Grashey view radiograph (c) of the same shoulder shows an irregular, cloud-like area of calcification superolateral to the humeral head (open arrow). These imaging findings are characteristic of resorptive phase calcification.
**Figure 6 (right):** Long axis image of the common extensor tendon (CET) of the elbow. An oblong, well-defined, densely shadowing calcification (arrow) is present within the proximal aspect of the tendon. Radial head (R). Distal humerus (H).

**Figure 5 (left):** Long axis image of the gluteus medius tendon. Linear, nonshadowing calcification (arrow) is present within the distal tendon at its insertion on the greater trochanter (GT).
Procedure kit

- Sterile gloves
- Choraprep
- Sterile drape
- 25 gauge x 1 inch needle
- 23 gauge x 1.5 inch needle
- 18 gauge x 1.5 inch needle
- 1% lidocaine
- 0.5% ropivicaine
- Saline
- Triamcinolone
- 3 x 10 mL syringes
- 5 mL syringe

*Figure 7: Procedure kit.*
Procedure preparation

- Sterilize the skin with a Chloraprep
- Apply a sterile drape
- Fill 3 x 10 mL syringes with 5 mL 1% lidocaine and 5 mL saline
- Fill the 5 mL syringe with 1 mL triamcinolone and 1 mL 0.5% ropivacaine
- Apply local anesthesia with 1% lidocaine:
  - Subcutaneous tissue with 25 ga needle
  - Deep tissue with 23 ga needle with US-guidance
Procedure

- Advance an 18 ga needle to the center of the calcification with real time US-guidance.
- Needle should be advanced along a trajectory that allows the syringe to remain gravity dependent.

**Figure 8**: Typical transducer orientation (black line) and needle entry site (red dot) for lavage.

**Figure 9**: Short axis image of the SST. The tip of the 18 ga needle is located within the center of a calcific deposit prior to injection.
Procedure

• Under US monitoring apply gentle pulsed pressure to the syringe to inject solution into the calcific deposit
• Release of pressure should draw calcium sediment or cloudy fluid into the syringe
  – Typically more successful with resorptive phase calcification
• Continue pulsed pressure until the calcific deposit is fragmented, even if no calcium is withdrawn into the syringe
• If injection is impossible fenestrate the deposit with the needle tip to promote bleeding and reabsorption
  – More common with calcific phase calcification
• Inject a 2 mL solution of 1 mL triamcinolone and 1 mL 0.5% ropivacaine into the subacromial subdeltoid bursa
• Procedure time is typically 10-15 minutes
Figure 10 (above): Short axis views of the SST during lavage. (a) Needle tip within an irregular, nonshadowing SST calcification (solid arrow) prior to injection. (b) Expansion and fragmentation of the calcification with injection (open arrow). Note the fluid-filled hypoechoic center during injection.

Figure 11 (right): Photograph of a syringe utilized during lavage filled with cloudy calcium laden aspirated fluid.
Post-procedure protocol

• Rest the treated extremity for 48 hours
• Ice the extremity and take NSAIDs as needed
• Avoid heavy lifting with the extremity for 2 weeks
• Complete and return (via mail) a 2 week pain survey
Conclusion

- Calcific tendinitis lavage is a quick, cost-effective, minimally invasive, clinically successful management option for calcific tendinitis.
- US provides real time multiplanar imaging for pre-procedure imaging and procedure monitoring without the ionizing radiation of fluoroscopy.
- Theoretical complications of infection and tendon injury are very rare, and our institution has experienced no complications to date.
References

- Lee KS and Rosas HG. Musculoskeletal ultrasound: How to treat calcifying tendinitis of the rotator cuff by ultrasound-guided single-needle lavage technique. AJR. 2010 Sep;195(3):638