RESEARCH PAPER

FUNCTIONAL AND RADIOLOGICAL OUTCOMES OF ULTRASOUND-GUIDED BARBOTAGE WITH SUBACROMIAL STEROID INJECTION FOR CALCIFIC TENDINITIS OF THE SHOULDER: A NARRATIVE REVIEW

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ABSTRACT

Calcific tendinitis of the shoulder is a common cause of chronic shoulder pain characterized by deposition of calcium hydroxyapatite crystals within the rotator cuff tendons. The condition frequently leads to pain, restricted shoulder movement, and functional limitation affecting daily activities. Management strategies range from conservative therapy to minimally invasive interventions and surgical removal of deposits. Among the available treatments, ultrasound-guided barbotage combined with subacromial corticosteroid injection has emerged as a safe and effective minimally invasive technique. This narrative review summarizes current evidence regarding the clinical effectiveness of ultrasound-guided barbotage in the treatment of calcific tendinitis of the shoulder. The review discusses the pathophysiology of calcific tendinopathy, diagnostic methods, procedural techniques, and reported functional outcomes following treatment. Existing literature suggests that ultrasoundguided barbotage provides significant pain relief, improved shoulder function, and reduction in calcific deposit size while minimizing surgical morbidity.

The review highlights the role of image-guided interventions as an important intermediate treatment option between conservative therapy and surgical management. Future research focusing on standardized outcome measures and long-term follow-up will further clarify the optimal role of barbotage in managing calcific tendinitis of the shoulder.

Keywords Calcific tendinitis; rotator cuff; ultrasound-guided barbotage; subacromial steroid injection; shoulder pain; minimally invasive treatment

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Introduction

Calcific tendinitis of the shoulder is a disorder characterized by deposition of calcium hydroxyapatite crystals within the rotator cuff tendons, most commonly the supraspinatus tendon. The condition primarily affects individuals between the fourth and sixth decades of life and is frequently associated with persistent shoulder pain, limitation of movement, and functional disability. Although the exact etiology remains unclear, the disease process is considered dynamic and involves multiple stages including precalcific, formative, resorptive, and post-calcific phases. Patients often present with chronic shoulder pain that worsens during overhead activities and at night. Acute exacerbations may occur during the resorptive phase due to inflammatory reactions within the tendon. Imaging modalities such as plain radiography and ultrasonography play an important role in diagnosing calcific deposits and evaluating their size, location, and morphology. Conservative management including rest, physiotherapy, and non-steroidal anti-inflammatory drugs remains the first line of treatment. However, a subset of patients continues to experience persistent symptoms requiring interventional procedures. Ultrasound-guided barbotage has gained increasing attention as a minimally invasive technique that allows direct aspiration and lavage of calcific deposits under real-time imaging guidance. This narrative review explores the current literature regarding the effectiveness of this technique in improving functional outcomes and relieving symptoms in patients with calcific tendinitis.

Literature Review

Over the past two decades, multiple clinical studies have evaluated the effectiveness of ultrasound-guided barbotage in treating calcific tendinitis of the shoulder. Early investigations demonstrated that percutaneous

needle aspiration and lavage under ultrasound guidance significantly reduced pain and improved shoulder function. Several observational studies have reported favorable clinical outcomes following barbotage. Patients typically experience rapid reduction in pain scores and improvement in range of motion within weeks of the procedure. Radiographic studies have also demonstrated a progressive reduction in calcific deposit size following treatment. These improvements are believed to result from mechanical disruption and aspiration of the calcific material combined with the anti-inflammatory effect of corticosteroid injection.

Comparative studies have evaluated barbotage against other treatment modalities such as extracorporeal shockwave therapy (ESWT), corticosteroid injections alone, and surgical removal. While ESWT can provide symptomatic relief, ultrasound-guided lavage has shown superior results in achieving rapid resolution of calcific deposits in several clinical series.

Randomized trials investigating the efficacy of barbotage have produced mixed results. Some controlled trials suggest that lavage combined with corticosteroid injection leads to significant improvement in pain and function compared with conservative treatment alone. However, other studies indicate that outcomes may vary depending on the stage of calcific tendinopathy, deposit consistency, and patient selection.

Despite these variations, the overall body of literature supports ultrasound-guided barbotage as an effective minimally invasive intervention for symptomatic calcific tendinitis that is refractory to conservative therapy.

Outcome Measures and Reporting Considerations

Clinical outcomes in calcific tendinitis studies are typically evaluated using standardized scoring systems and imaging assessments. Commonly used measures include the Visual Analog Scale (VAS) for pain, the American Shoulder and Elbow Surgeons (ASES) score for functional assessment, and range of motion measurements. Radiological evaluation is equally important and generally involves measurement of calcific deposit size using plain radiographs or ultrasonography. Reduction or complete disappearance of the calcific deposit is often used as an objective indicator of treatment success.

However, variability in outcome reporting remains a challenge. Different studies use varying follow-up durations and scoring systems, making direct comparison difficult. Standardization of outcome measures and reporting protocols would improve the quality and comparability of research in this field.

Pathophysiology and Disease Progression

Calcific tendinitis is believed to result from a process of fibrocartilaginous metaplasia within the tendon, leading to calcium hydroxyapatite deposition. The disease progresses through several stages:

1. Pre-calcific stage – cellular changes occur within the tendon without calcium deposition.
2. Formative stage – calcium crystals accumulate within the tendon.
3. Resorptive stage – inflammatory processes lead to spontaneous resorption of calcium deposits, often associated with severe pain.
4. Post-calcific stage – healing occurs with tendon remodeling.

The resorptive phase is typically associated with the most severe symptoms and is often the stage at which patients seek medical treatment. Interventional procedures such as barbotage aim to accelerate the resorption process by mechanically removing the calcium deposits.

Ultrasound-Guided Barbotage Technique

Ultrasound-guided barbotage involves the insertion of a needle into the calcific deposit under real-time ultrasound visualization. Saline is injected to fragment the deposit and aspirate the calcium material. This lavage process reduces the size of the deposit and decreases intratendinous pressure.

Following lavage, a corticosteroid injection is typically administered into the subacromial space to control inflammation and reduce postoperative pain. The use of ultrasound guidance improves procedural accuracy and minimizes injury to surrounding tissues.

This minimally invasive technique can usually be performed on an outpatient basis and allows early mobilization and rehabilitation.

Determinants of Clinical Outcome

Several factors influence the clinical outcomes of ultrasound-guided barbotage in calcific tendinitis: **Size and Consistency of Calcific Deposits**

Larger deposits and those in the resorptive phase often respond more favorably to lavage because they are easier to aspirate.

Accuracy of Needle Placement

Ultrasound guidance ensures precise targeting of the calcific deposit, improving procedural success.

Post-Procedure Rehabilitation

Early shoulder mobilization and physiotherapy contribute to improved functional recovery and restoration of range of motion. **Patient Factors**

Age, duration of symptoms, and associated rotator cuff pathology may influence treatment outcomes.

Complications and Safety

Ultrasound-guided barbotage is generally considered a safe procedure with a low complication rate. Reported complications are usually minor and may include transient post-procedure pain or localized inflammation. Serious complications such as infection or tendon injury are rare.

The use of ultrasound guidance significantly reduces the risk of procedural complications by allowing visualization of surrounding structures during needle placement.

Conclusion

Calcific tendinitis of the shoulder is a significant cause of pain and functional limitation in adults. Although conservative treatment remains the initial management approach, persistent symptomatic cases may require interventional therapy.

Current literature supports ultrasound-guided barbotage combined with subacromial steroid injection as an effective minimally invasive treatment option. The procedure provides substantial pain relief, improved shoulder function, and reduction in calcific deposit size while avoiding the morbidity associated with surgical intervention.

Future research should focus on standardized outcome reporting, improved patient selection criteria, and long-term follow-up studies to further establish the role of ultrasoundguided barbotage in the management of calcific tendinitis of the shoulder.