

Nonsurgical Management of Shoulder Pain in Rotator Cuff Tears: Ultrasound-Guided Biceps Tenotomy Combined With Corticosteroid Injection



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Abstract: Traditionally, the management of rotator cuff tears in elderly individuals has involved surgical intervention, specifically biceps tenotomy. However, surgical procedures come with inherent medical risks and significant financial costs. As an alternative, ultrasound-guided biceps tenotomy combined with corticosteroid has emerged as a highly effective, well-tolerated, and cost-efficient option. This article aims to describe the procedural technique of nonsurgical management using ultrasound-guided biceps tenotomy combined with corticosteroid injection.

Rotator cuff tears (RCT) are a prevalent upper extremity musculoskeletal condition, even in asymptomatic subjects.¹ Significant pain and functional impotence in daily activities are the most distinctive symptoms.² Biomechanical and biological detriments to tendons are present in patients over 60 years, impacting glenohumeral joint stabilization.³ Therapeutic options include conservative management, which consists of scapular and glenohumeral stabilization exercises to increase the subacromial space and improve control of the upper quadrant.⁴

In cases with several tendon ruptures, surgical intervention is an optimal option with satisfactory outcomes. However, patients' age, tissue structure, natural history, comorbidities, multiple medications, and anesthesia tolerance influence its success.⁵ In turn, for people over age 65, the probability of success decreases considerably,

presenting re-rupture rates close to 70%, mainly associated with degenerative findings in magnetic resonance imaging scans.⁶

The long head of the proximal biceps tendon (LHBT) plays a fundamental role in upper extremity stabilization. The irritability of this tendon is responsible for considerable pain in those patients. Richly innervated with sensitive fibers, it creates a dysfunctional environment that is very challenging to control in this area without direct intervention from the medical team.⁷

One of the procedures is an LHBT tenodesis, which consists of surgically changing the biceps insertion point, or a tenotomy, which is to intervene in the tendon, causing a rupture, to avoid its permanent irritation.⁸ Both strategies are highly recommended, especially in patients with a long history of unsatisfactory rehabilitation, pharmacological treatment, and severe functional impotence. However, surgical procedures carry some degree of medical risk (surgical complications, anesthesia risks, etc.), particularly if patients have advanced age and comorbidities.⁹

Minimally noninvasive radiological procedures under ultrasound have recently been proposed for musculoskeletal conditions. Advantages include high cost-effectiveness without hospitalization.¹⁰ Ultrasound-guided infiltration procedures with corticosteroids make it possible to specify the area of intervention, improving the uptake of the substance by the tissue. To date, and to the best of our knowledge, few publications have performed an LHBT tenotomy procedure using corticosteroids under ultrasound guidance.

This technique has been used for quite some time since the first published experience was in 2015, when

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the tenotomy procedure was performed under ultrasound guidance but with cadavers.¹¹ In turn, the European Society of Musculoskeletal Radiology has supported this procedure since 2020, and there is currently an article published in 2020 that shows an experience similar to ours under the pavilion,¹² so outpatient tenotomy procedures performed on patients with RCT in a radiological procedure room have not yet been well described. This article aims to describe the procedural technique of nonsurgical management using ultrasound-guided biceps tenotomy combined with corticosteroid injection.

Patient Evaluation

Evaluation includes a full medical history focused on shoulder function, pain, and anterior shoulder tenderness. Physical evaluation involves active and passive range of motion, specific shoulder tests assessment for rotator cuff, acromioclavicular joint, and biceps. Biceps evaluation includes bicipital groove tenderness, long head of the biceps stability, and Speed, Yergason, and Ó'Brien tests.

Clinical and Imagenological Evaluation

Symptomatic rotator cuff tear in the elderly (>70 years of age), failure to perform physical rehabilitation, painful biceps, ultrasound- or magnetic resonance imaging–confirmed presence of the long head of the biceps, decreased range of motion, degenerative glenohumeral changes, and rotator cuff arthropathy (Hamada I to IVB) were not contraindications to the procedure.

Procedural Technique

The objective is to precisely locate the long head of the bicipital tendon. For this purpose, we use the Aplio 500 ultrasound system (Toshiba America Medical Systems, Tustin, CA), equipped with a multifrequency linear transducer. The preferred frequency of 18 MHz is used by a specialized radiologist experienced in ultrasound-guided musculoskeletal injections. The procedure takes place in a dedicated room specifically designed for ultrasound-guided procedures. The ultrasound machine is positioned on the symptomatic side of the patient and directly in front of the provider (Fig 1).

To begin the procedure, the patient is positioned in a supine position on a flat table with their arm in a neutral position and palm facing upward. Pre-procedure scanning is then performed to precisely locate the bicipital groove and LHBT on its most proximal point. During this scan, Doppler imaging is used to identify any vessels that need to be avoided (Fig 2). It is important to note that the anatomical location of smaller vessels may vary from patient to patient,



Fig 1. The ultrasound machine is positioned next to the patient. The patient is placed in a supine position with the right shoulder exposed. The transducer is positioned in the upper anterior region of the shoulder. Then the long head of biceps brachii is identified in the bicipital groove.

making Doppler assessment a valuable step, especially for those taking blood thinning medication. Once the target area is identified, the injection site is marked on the skin, and the necessary supplies and sterile tray are prepared and organized (Fig 3).

Before the injection, the patient is draped with aseptic towels or a medical pad to maintain a sterile environment. The anterior superior arm and shoulder area of the patient is then sterilized using a chlorhexidine swab following strict aseptic techniques. To ensure optimal hygiene, the transducer is inserted into a sterile probe cover after ultrasound gel is applied, all while maintaining severe aseptic conditions.

The transducer is positioned on the short axis of the biceps, allowing for easy identification of the isochoic rounded biceps within its sheath. The needle is oriented in-plane with the transducer, using a lateral-to-medial approach (Fig 4). An 18-gauge sterile needle, bevel up, is inserted approximately 0.5 to 1 cm from the ultrasound transducer. Throughout the procedure, the needle is carefully visualized to ensure accurate placement within the biceps tendon sheath. Once the needle is positioned correctly, a local anesthetic (2 mL of 2% lidocaine; Euro-Med Laboratories, Manila, Philippines) is infiltrated.

Afterward, 3 to 5 fenestrations are made over the biceps tendon, and at the same time, an intratendinous infiltration of 1 to 2 mL of a corticosteroid solution (3 mg/mL of betamethasone acetate and 3mg/mL of

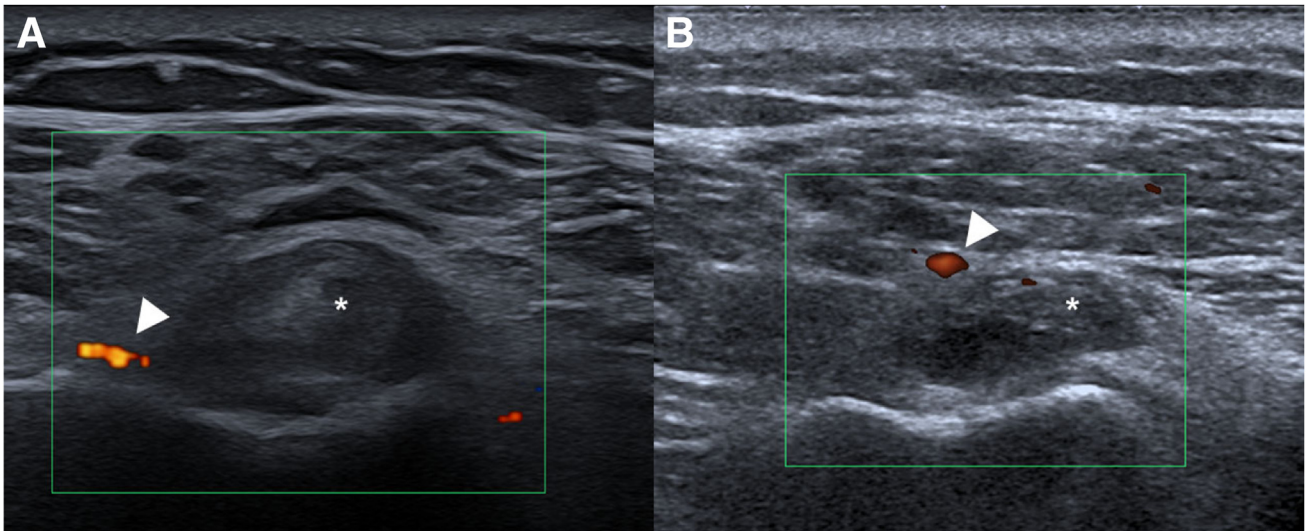


Fig 2. Doppler imaging is used to identify any vessels, with transverse ultrasound scanning over the biceps tendon (*) with Power Doppler in 2 different patients, demonstrating that tendon sheath vessels (arrowheads) may not always be located in the same anatomical position. The patient assumes a supine position with the right shoulder exposed, followed by the implementation of aseptic measures. The view is an axial transverse view, lateral to medial.

betamethasone disodium phosphate; Dacam Rapi-Lento; Laboratorios Chile, Santiago, Chile) is performed. Also, transverse movements of the needle, bevel up, are made to make small cross sections through the tendon (Fig 5).

The procedure is carried out using a freehand technique, where the transducer is held in one hand while the other hand guides the needle toward the biceps

tendon. The aim is to maintain a perpendicular angle to the ultrasound beam for clear visualization of the needle's path. Once the injection is completed, the needle can be safely removed while ensuring continuous visualization. Finally, a small bandage can be applied, and the patient can resume mobilization. After the procedure, we expect the biceps tendon presents a tenotomy under the minimally invasive technique.

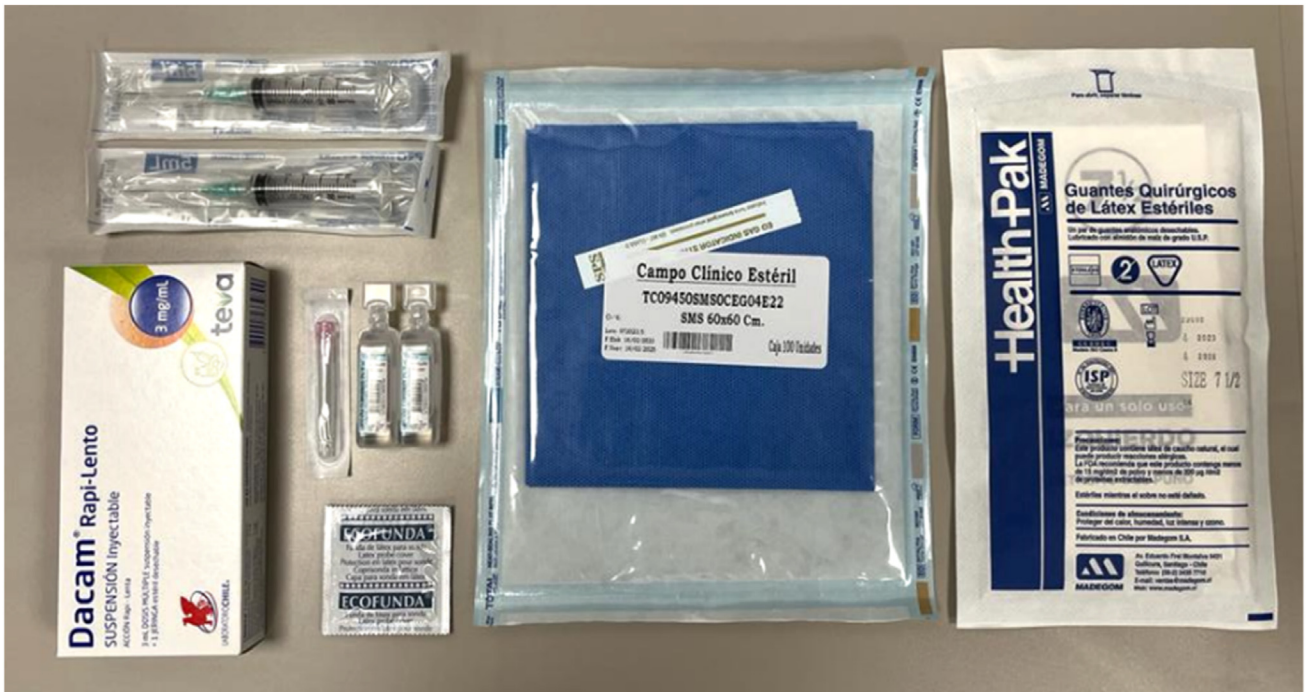


Fig 3. Supplies and sterile tray, in the procedures table with all the elements that will be used: corticosteroid solution (3 mg of betamethasone acetate and 3.9 mg of betamethasone sodium phosphate); Dacam Rapi-lento; Laboratorio Chile, Santiago, Chile), syringes, local anesthetics, sterile cover to ultrasound probe, sterile field, and sterile gloves.



Fig 4. Probe positioning and needle approach on a patient placed in a supine position with the right shoulder exposed. The ultrasound probe is on the transverse plane of bicipital tendon, and the needle is inserted from lateral to medial.

These results can manifest from 2 to 3 days within up to 3 weeks after the intervention, demonstrating an empty biceps sheath (Fig 6, Video 1).

Postprocedural Care

Include a partial restriction of activities involving shoulder elevation, based on each patient's tolerance.

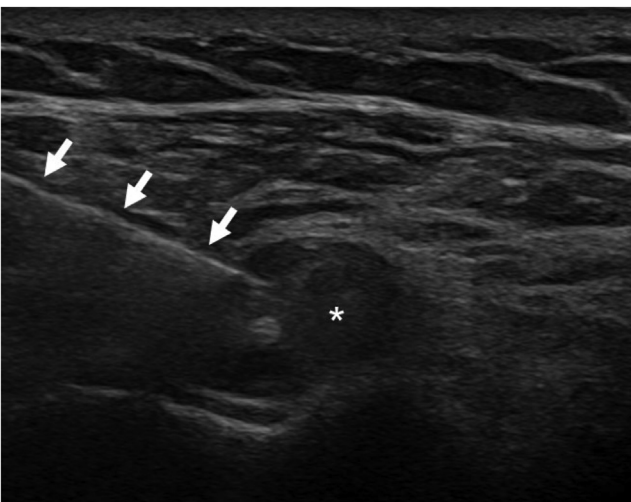


Fig 5. Needle (white arrows) in a lateral-to-medial approach reaching the bicipital tendon (*) to make multiple fenestrations.

Additionally, patients are prescribed paracetamol at a dose of 500 mg every 6 to 8 hours to manage pain. Patients are also informed about the possibility of hematoma formation on the skin, which is somewhat anticipated.

Rehabilitation

Rehabilitation protocols are well-documented for conventional tenotomy procedures using arthroscopy¹³ and open subpectoral biceps tenodesis.¹⁴ However, the novelty of our procedure means a dedicated protocol is pending. We strongly advise early exercise or an accelerated rehabilitation plan. Prioritizing standard rehabilitation phases ensures pain relief, favorable clinical outcomes, and a progressive reintegration into work or sports.¹⁵

Discussion

Ultrasound-guided biceps tenotomy combined with corticosteroid injection can be an optimal option for patients who need nontraditional management for rotator cuff tears (Tables 1 and 2). In elderly patients, specific requirements exist that should not be treated with conventional orthopaedic treatments. Infiltration with corticosteroids under ultrasound guidance is a safe, cost-effective radiological technique that minimizes the risks associated with undergoing conventional surgery under anesthesia.

The tendon of the long head of the proximal biceps plays a fundamental role in rotator cuff stabilization. Because of its function and extensive innervation, it is an important source of pain and functional weakness in patients. Although there are currently multiple

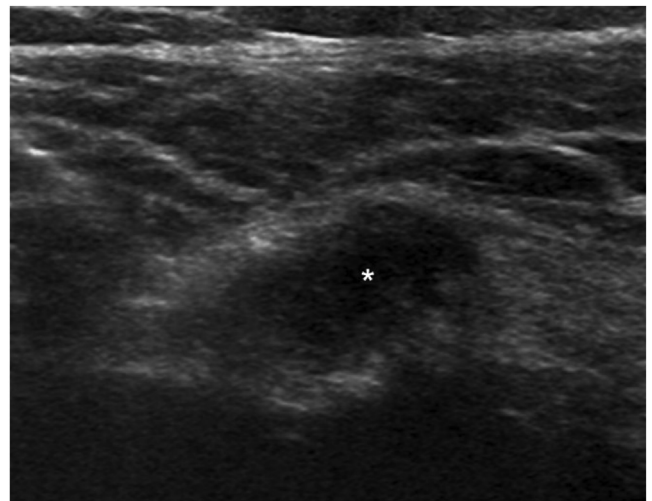


Fig 6. Transverse ultrasound scanning over the biceps tendon sheath after procedure demonstrates an empty sheath (*) caused by total tendon rupture. The patient assumes a supine position with the right shoulder exposed, followed by the implementation of aseptic measures. The view is an axial transverse view, lateral to medial.

Table 1. Advantages and Disadvantages

Advantages
Cost-effective technique
Allows a diagnostic and treatment procedure
Symptom relief in real time
No radiation exposure
Outpatient procedure without hospitalization
No anesthetic intervention
Precise and accurate radiological intervention
Disadvantages
Local hematoma
Heavily user dependent
Requires a room for radiological procedures
Corticosteroid interaction in diabetic patients

alternatives for treatment with acceptable results, other factors must be considered, such as the age of the individuals, previous pathologies, tolerance to anesthesia, comorbidities, and more. Therefore having access to new treatment alternatives seems to be of vital importance.

Our therapeutic proposal presents both a diagnostic and therapeutic aspect, because patients immediately experience a positive response to the use of local anesthetic and anti-inflammatory agents during the procedure. For purely therapeutic purposes, the procedure could solve the patient’s problem—namely, the intense pain generated in the proximal anterior region of the humerus. A single procedure often is enough based on recorded experience to date. In addition, it is vital to prescribe a plan of complementary exercises for the shoulder girdle after the procedure, which can stabilize the affected area and prevent future compensation. These exercises can be prescribed the day after the procedure.

Fortunately, there have been no reports of complications from procedures using corticosteroids under ultrasonography in this type of individual. According to our records, we have not experienced any significant complications, except minor bleeding and swelling in the area associated with this type of procedure. The procedure is successful and convenient because the area under treatment is easily accessible and recognizable when using an ultrasound machine, ensuring that other areas that could be affected are not compromised. Finally, it is extremely important to inform the patient that they may feel a snap and experience a change in the morphology of the affected muscle (Popeye’s sign) resulting from the rupture of the tendon. This outcome is the objective for which the procedure is performed. Furthermore, future studies are

Table 2. Pearls and Pitfalls

Pearls
To identify anatomical landmarks
Ensure location and image quality
Consider aseptic measures during the procedure
Pitfalls
Do not intervene the vascular bundle of the biceps to prevent bleeding and damage to the vessels
A short learning curve is required

necessary to compare the proposed technique with conventional procedures.

Disclosure

The authors report no conflicts of interest in the authorship and publication of this article. Full ICMJE author disclosure forms are available for this article online, as [supplementary material](#).

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