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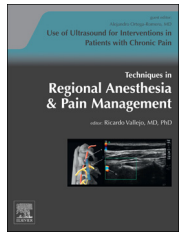

Ultrasound-guided pain interventions in shoulder region

Concepcion del-Olmo, MD[a,*], *Pilar de-Diego, MD*[a], *Paloma Morillas, MD*[b], *Miguel Garcia-Navlet, MD*[c]

[a]*Department of Anesthesia and Pain Medicine, Hospital ASEPEYO, Calle Joaquin de Cardenas 2, 28820 Coslada, Madrid, Spain*
[b]*Department of Anesthesia and Intensive Care, Hospital General Universitario Gregorio Marañón, Madrid, Spain*
[c]*Department of Traumatology, Hospital ASEPEYO, Coslada, Madrid, Spain*

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ABSTRACT

Shoulder pain is one of the common complaints to physicians in general practice. Among therapeutic measures used to treat this pain, invasive techniques, such as joints and periarticular injection, as well as suprascapular and axillary nerve block, play a crucial role. Ultrasound guidance is a safe alternative to blind techniques, increasing the safety and accuracy of the procedure and reducing complications. A good understanding of the anatomy and sonoanatomy is of paramount importance in performing the ultrasound-guided injections.

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Introduction

Pain in shoulder region can originate from various structures, including the subacromial-subdeltoid bursa, the glenohumeral and acromioclavicular joint, the long head of biceps, and the rotator cuff. Interventional pain procedures are an important modality in multidisciplinary care of patients with musculoskeletal shoulder pain, especially when these patients do not respond to conservative measures. The shoulder is one of the most common regions where ultrasound-guided musculoskeletal injection is applied. Shoulder blocks can be used as a diagnostic tool or as a therapeutic modality for short-term shoulder pain and long-term pain syndromes. This revision article's objective is to describe the anatomy and sonoanatomy of both the shoulder and the surrounding structures and also summarize different infiltration techniques and peripheral nerve blocks.

Shoulder anatomy

Anatomically, the shoulder girdle consists of 3 bones (the scapula, clavicle, and humerus), 3 synovial joints (the glenohumeral, acromioclavicular, and sternoclavicular), and 2 gliding mechanisms (the scapulothoracic and subacromial) all acting as a single biomechanical unit.

The glenohumeral joint (GHJ) is the joint with the greatest range of mobility. Its articular surfaces are the humeral head and the glenoid fossa. The shallowness and laxity of the fossa surrounding the GHJ and the fact that only a portion of the humeral head is covered by the glenoid fossa makes this a highly mobile but very unstable joint.[1]

The muscles comprising the shoulder girdle have 2 planes: a superficial plane that consists of the deltoid muscle and a profound plane comprising the supraspinatus, infraspinatus, subscapularis, and teres minor muscles. The tendons of the muscles in the deep plane are called the rotator cuff, and the function of these tendons is to reinforce the joint fossa and improve its stability. These tendons are the subscapularis in the anterior aspect, supraspinatus in the superior aspect, and infraspinatus and teres minor in the posterior aspect.[2]

The subscapularis muscle is filling the subscapularis fossa and it is attached to the lesser tubercle of the humerus by means of a strong tendon. The supraspinatus muscle attaches to the medial two-thirds of the supraspinatus fossa

* *Corresponding author.*
E-mail address: delolmo.c@gmail.com (C. del-Olmo).

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located in the superior aspect of the scapula, the tendon inserts into the anterior most part of the greater tubercle of the humerus.

The infraspinatus attaches to the medial two-thirds of the infraspinatus fossa and its tendon inserts into the middle portion of the greater tubercle, together with the teres minor it is situated in the posterior aspect of the shoulder joint.

The cuff muscles' combined main action is to stabilize the humeral head into the glenoid fossa's concavity and assist shoulder rotation.

Other periarticular structures include the tendon of the long head of the biceps brachii muscle and the subacromial-subdeltoid bursa. The brachial biceps muscle tendon passes through the bicipital groove of the humerus between the greater and lesser tuberosities, and a synovial sheath surrounds it. It enters the GHJ and inserts on the highest part of the glenoid labrum and the bony edge of the glenoid fossa of the scapula.[3] The subacromial-subdeltoid bursa, located under the acromion, the coracoacromial ligament, and the deltoid muscle allows the gliding of the rotator cuff under the deltoid muscle and the acromion during arm movements, and it is in close contact with the supraspinatus tendon (SST) underneath.[4]

Infiltration of shoulder joint and periarticular structures

Infiltration may apply for diseases that do not respond to conservative treatments as in the case of osteoarthritis, synovitis, etc or soft tissue (extra-articular) injections as in the case of tenosynovitis, entrapment neuropathies, synovial cysts, bursitis, fasciitis, and tender and trigger points.

Generally, most cases of shoulder pain are due to injury of the periarticular structures, with rotator cuff conditions (degeneration-tears) being the most common cause, whereas severe joint disease itself is less common.

The shoulder structures are usually infiltrated including the glenohumeral and acromioclavicular joints, tendons of rotator cuff muscles, biceps brachii tendon and subacromial-subdeltoid bursa.

Rotator cuff tendinitis is the most common shoulder pathology treated by local injection. The SST is the most affected, followed by the infraspinatus tendon and less frequently the subscapularis. The subacromial-subdeltoid bursa is involved in most SST injuries, as well as crystalline diseases.

Infiltrations are conducted for diagnostic purposes, in cases where the pain origin is unknown, for pain relief as an analgesic, and as a support measure in rehabilitation of these patients (shoulder stiffness).

Ultrasound-guided techniques for shoulder injection

Ultrasound has proved to be a useful tool guiding the needle and increasing safety and accuracy of the procedure.[5,6] The ultrasound approach to these joints and the periarticular structures surrounding them is usually performed with patient in a sitting position using a high-frequency linear probe (7.5-13 MHz).

The following anatomical structures of the shoulder can be visualized via ultrasound: bone structures, such as the

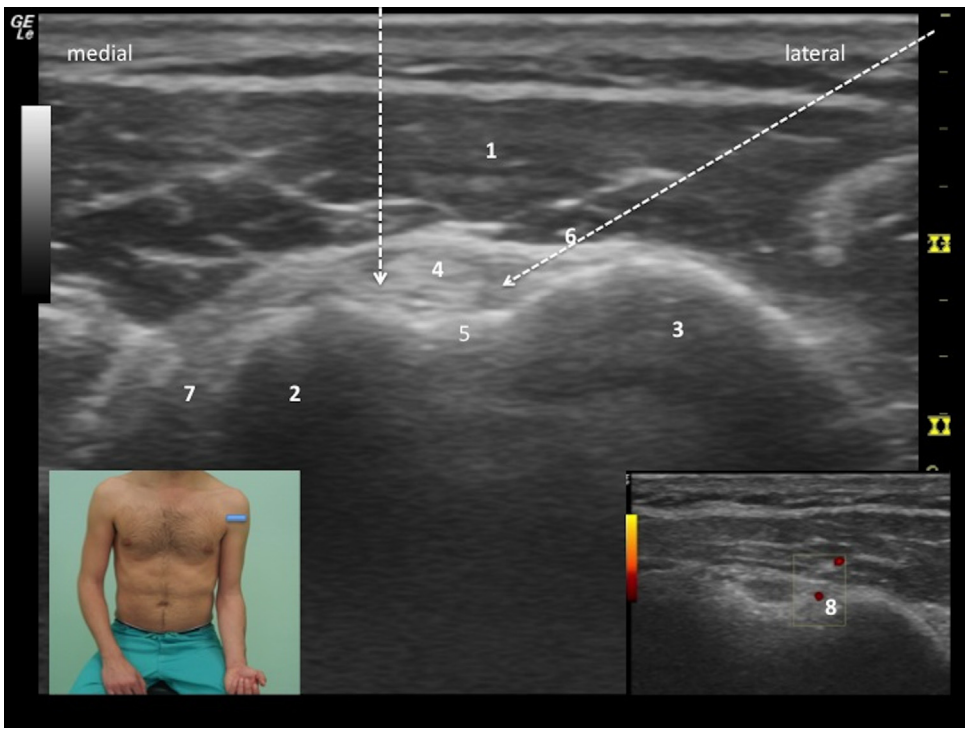

Fig. 1 – *Biceps tendon*. The inset shows the position of the patient and the linear ultrasound probe: probe transverse across superior aspect of bicipital groove. Arm adducted, hand supinated. Note that the biceps tendon appears hyperechoic. *Landmark*: 1—deltoid muscle; 2—lesser tuberosity; 3—greater tuberosity; 4—biceps tendon; 5—floor of groove; 6—transverse ligament; 7—subscapularis tendon; 8—anterior circumflex artery. (Color version of figure is available online.)

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