

**The Role Of High Resolution Ultrasonography
In Evaluation Of
Non Osseous Causes Of Shoulder Pain.**

Essay

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Abstract

High-resolution real-time ultrasonography (US) has been shown to be a successful imaging modality for both rotator cuff and non-rotator cuff disorders. Advances in technology have substantially improved US image quality, producing spatial resolution exceeding that obtained with magnetic resonance (MR) imaging without the use of special coils and imaging parameters. The ultrasonic demonstration of this condition relies on demonstrating related changes in the bony and soft tissue structures around the shoulder or abnormalities on dynamic assessment.

key words : ultrasonography- shoulder pain – rotator cuff - imaging

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INTRODUCTION

Shoulder pain is an extremely common complaint, and there are many common causes of this of problem, some common causes include : bursitis, rotator cuff tendonitis ,rotator cuff tear, frozen shoulder , calcific tendonitis, shoulder dislocation, shoulder seperation ,labral tear , ,arthritis, biceps tendon rupture,. (Jonathan Cluett, 2009).

High-resolution real-time ultrasonography (US) has been shown to be a successful imaging modality for both rotator cuff and non–rotator cuff disorders (Merritt C., 2001).

Advances in technology have – improved US image quality, producing spatial resolution exceeding that obtained with magnetic resonance (MR) imaging without the use of special coils and imaging parameters (Martinoli C, et al., 2003).

Also, sonography is inexpensive, fast, and offers dynamic capabilities for examining the patient in multiple scanning planes and specific arm positions or movements, in addition to having the ability to focus the examination on the precise region of maximum discomfort (Erickson SJ.: 1997).

Direct correlation of the imaging findings the symptoms of the patient can be easily obtained and interventional procedures can be guided.

US technique for shoulder examination depends on patient positioning, scanning protocol for every tendon and anatomic part, and dynamic imaging. (Athanasios et al: 2006)

The impingement syndrome is one of the most common causes of shoulder pain. It results from narrowing of the subacromial space leading to entrapment of the rotator cuff tendons and other structures in this region. (Mark Stieler ,1998)

The ultrasonic demonstration of this condition relies on demonstrating related changes in the bony and soft tissue structures around the shoulder r abnormalities on dynamic assessment.(Mark Stieler ,1998)

MR imaging is currently considered the reference standard for imaging of shoulder disorders. The strength of MR imaging lies in its potential for assessing sonographically inaccessible areas such as bone, labral cartilage, deep parts of various ligaments, capsule, and areas obscured by bone. (Athanasios et al: 2006)

Studies have investigated the value of dynamic MR evaluation of the shoulder with open MRI .the major limiting factors of dynamic MRI are the restricted availability of open magnets and the fact that the MR technology only allows sequential imaging of single – plane shoulder motions that don't entirely reproduce physiologic shoulder motion (Nathalie J., 2006).

Musculoskeletal sonography is an important complementary tool to MRI because every patient can undergo sonography, ultrasound probe can be placed exactly where it hurts(Adler RS, Finzel KC,2005)

Doppler sonography gives important physiologic information, better for differentiating fluid from solid material .One of the strengths of sonography is to facilitate bilateral comparison and has a more flexible field of view(Adler RS, Finzel KC,2005)

Additionally, US is more patient friendly as claustrophobia, which may occur with MRI scanners, is not encountered with US imaging. When compared to MRI, patients with shoulder pain prefer diagnostic US(Middleton WD et al , 2004)

AIM OF WORK:

The purpose of this study is to highlight the role of high resolution ultrasonography in the evaluation of the non osseous causes of shoulder pain.

In the developing countries ,the cost /effectiveness is very important issue in the evaluation of any diagnostic examination ,so we have a goal to offer an accurate and highly sensitive diagnostic method for the cases of shoulder pain , being widely spread and of low cost .

CHAPTER I

ANATOMY OF THE SHOULDER GIRDLE

The shoulder joint is a synovial joint of the ball-and-socket joint in which an elegant freedom of movement is allowed at some expense to its strength and stability. The bones entering in its formation are the hemispherical head of the humerus (ball) linking to the shallow glenoid cavity of the scapula (socket). Some protection of the joint against displacement is afforded by its ligaments and by the tendons and muscles that surround it. (Zlatkin , 2002)

Bones of the shoulder joint

The clavicle connects the axial and appendicular skeletons of the upper extremity. Its sternal end is expanded and fits into the notch on the manubrium at the sternoclavicular joint. The lateral one-third is flat, and its sternal end is expanded as it curves back to meet the scapula at the acromioclavicular joint. (Zlatkin , 2002)

The scapula consists of the scapular body, the scapular spine, the scapular neck, the acromion, the glenoid fossa, and the coracoid process. It has costal (anterior) and posterior surfaces with its anterior surface in contact with the thoracic cage (the scapulothoracic interface). From the upper part of the posterior surface, the spine of the scapula projects laterally, terminating into the acromion, which forms the lateral most tip of the shoulder . The lateral angle of the scapula is thick and strong, with an expanded large, shallow glenoid fossa, facing slightly forward and upwards, ready to receive the head of the humerus. Just medial to the glenoid fossa is the coracoid process as it projects upwards from the neck of the scapula. The coracoid process serves as an attachment site for several important ligaments and muscles (shankman et al , 1999).

The acromion classified into three types according to its morphology:

A. Type 1: flat or straight undersurface with high angle of inclination.

- B. Type 2: curved arc and decreased angle of inclination.
 - C. Type 3: hooked anteriorly with decreased angle of inclination.
- (Haygood TM , et al 1993).**

The proximal humerus consists of the head, anatomic neck, and the greater and lesser tuberosities. The intertubercular or bicipital groove is located between the greater and lesser tuberosities along the anterior surface of the humerus. The head of the humerus is approximately one third of a sphere and it is about four times larger than the socket on the scapula. In anatomic position, the faces superiorly, medially, and posteriorly with the lesser tuberosity in front and the greater tuberosity pointing laterally **(Vahlensieck ET AL , 1999)**

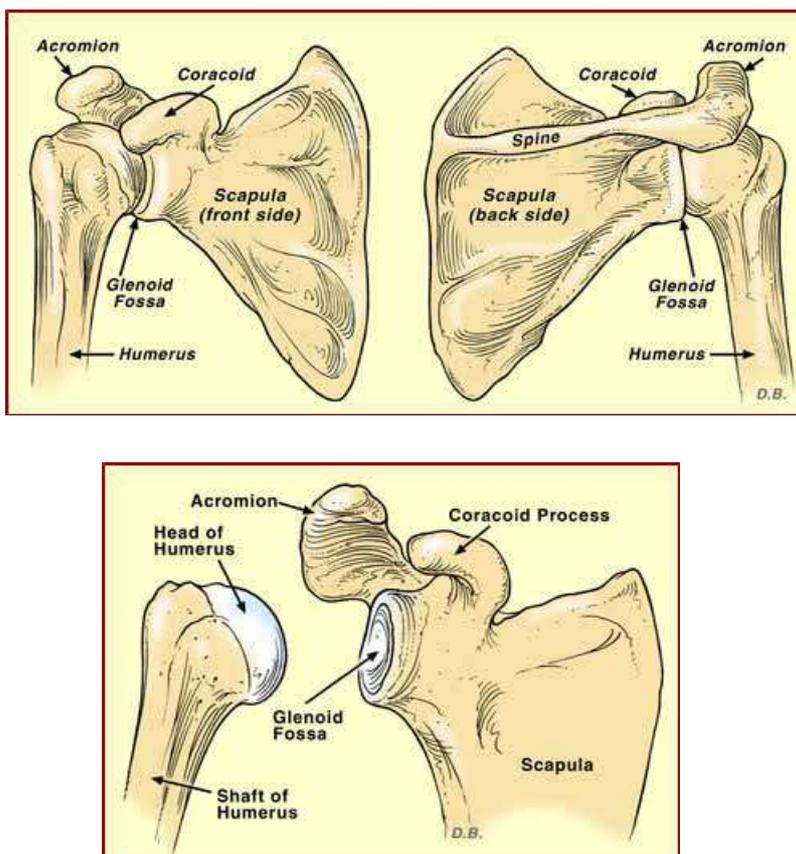


Fig.1 A&B: bones forming shoulder joint **(Wagner et al , 2002)**

MUSCLES OF THE SHOULDER

I – GLENOHUMERAL MUSCLE

1- DELTOID (FIG 3&5)

The largest and the most important of the glenohumeral muscles is the deltoid ,it consists of three parts ,the anterior deltoid ,the middle portion ,and the posterior deltoid ,Elevation in the subscapularis plane is the role of the anterior and middle portions with some actions by the posterior parts especially above 90 degrees .flexion is the role of the anterior and middle parts of the muscle and the clavicular portions of the pectoralis major ,with some contributions by the biceps .Abduction in the coronal plane is mainly by the action of the posterior portion of the muscle (Williams and Dyson,1992)

2-THE ROTATOR CUFF (FIG 4,5,6&7)

The rotator cuff is generally defined as a complex of four muscles that arise from the scapula and attach to the tuberosities of the humerus .along with the adjacent capsule that blends with these tendons near their insertions. The muscles of the rotator cuff include the subscapularis ,supraspinatus, infraspinatus and teres minor muscles arranged in the saggital image as well as in the corresponding projectional image in figures 7&8(Neer et al ,1992)

a) The supraspinatus muscle (FIG 3,4,5&6)

The supraspinatus muscle arises from the medial two thirds of the supraspinatus fossa of the scapula and from the strong supraspinatus fascia .the muscle forms a tendon ,which passes under the acromion and inserts in the highest facet in the greater tubercle of the humerus it approaches its insertion ,many fibers are fused with the capsule of the shoulder joint .Its

tendinous insertion is in common posteriorly ,with the infraspinatus tendon and anteriorly,with the coracohumeral ligaments.

Nerve Supply

The muscle is supplied by the suprascapular nerve C4-C5 (**Jobe.1992**)

B] The Infraspinatus Muscle (FIG 4,5,6&7)

The infraspinatus arises from the medial two thirds of the infraspinatus fossa .the superficial fibers from the infraspinatus fascia covering the muscle the tendon of the muscle inserts in the middle facet of the of the greater facet of the humerus as it crosses the capsule of the shoulder joint some of the fibers blend with the capsule .the tendon is in common anteroposteriorly with the suprascapular tendon and inferiorly with the teres minor tendon

Nerve supply.

The muscle is supplied by the suprascapular nerve C4-C5 (**Williams and Dyson,1992**)

C] The Subscapularis Muscle (FIG. 4,5&6)

It is the anterior portion of the rotator cuff .it arises from the subscapularis fossa it is a large powerful muscle that inserts in the lesser tubercle of the humerus ,some fibers blend with the capsule of the shoulder joint ,some fibers are sometimes found passing in the intertubercular sulcus (**Holder et al ,1992**)

Nerve Supply.

The muscle is supplied by the sub scapular nerve C5-C6-C7(**Jobe.1990**)

D] Teres Minor Muscle FIG (4,5,6&7)

The teres minor muscle is a narrow muscle which arises from a strip along the upper two thirds of the lateral edge on the dorsal surface of the scapula .it is sometimes inseparable from the infraspinatus .its tendon

inserts in the lowest of the facets of the on the greater tubercle of the humerus

Nerve supply.

The muscle is supplied by the axillary nerve C5-C6 (**Jobe.1990**)

II-SCAPULO THORACIC MUSCLES

1] Trapizius(FIG 2)

The muscle acts as a scapular rotator, with the upper fibers used mostly for elevation of the lateral angle (**Williams and Dyson,1992**)

2] Rhomboides (FIG2)

Their main action is retraction of the scapula and because of their oblique coarse also participate in elevation of the scapula (**Williams and Dyson,1992**)

3]Serratus Anterior (FIG 7)

It protracts the scapula and participates in upward rotation of the scapula(**Jobe.1990**)

4]Pectoralis Minor

Its function is protraction of the scapula if the scapula is retracted and depression of the lateral angle of the scapula if the scapula is upward rotated (**Jobe.1990**)

5]Subclavius Muscle

The action of this muscle is to stabilize the sterno-clavicular joint (**Williams and Dyson,1992**)

6]Levator Scapulae(FIG 2)

The muscle is inserted into the superior angle of the scapula and acts to elevate it (**Jobe.1990**)

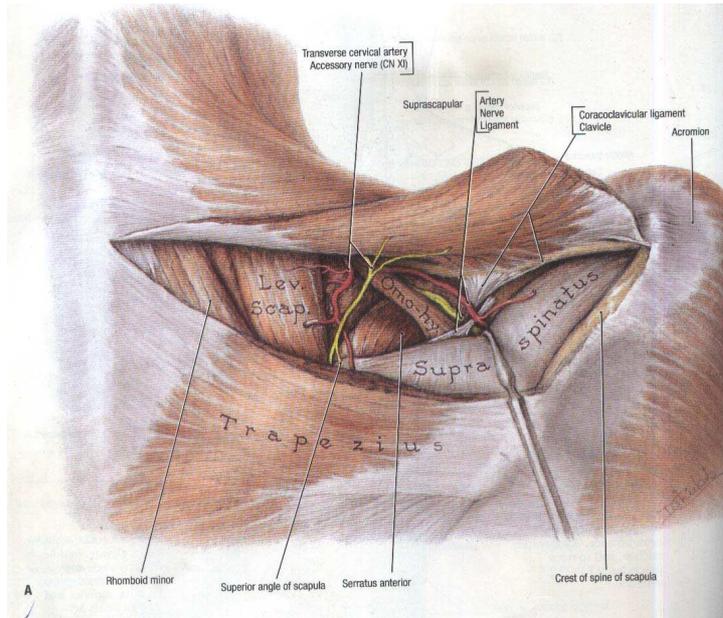
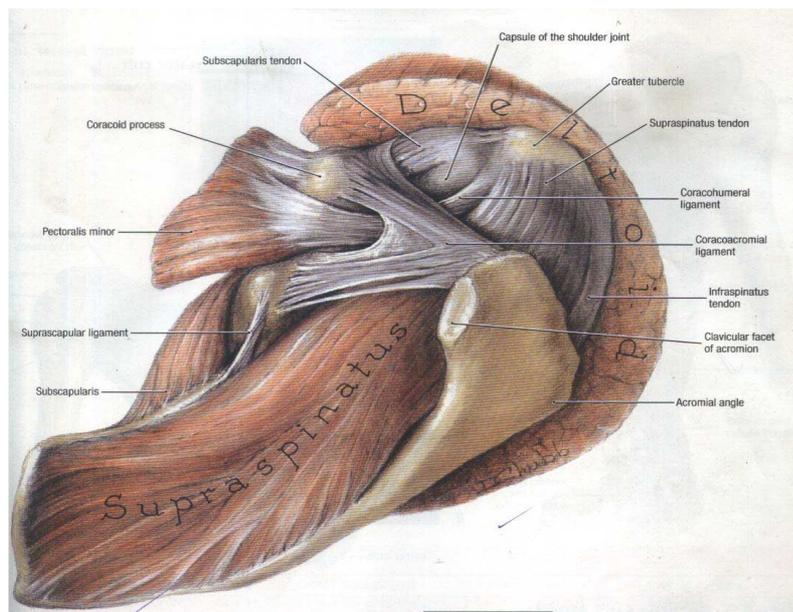


Figure (2) graphic image of a posterior view of the muscles of the back of the shoulder(Williams and Dyson,1992)



Figure(3)graphic image of a superior view of the supraspinatus muscle and shoulder ligaments(Williams and Dyson,1992)

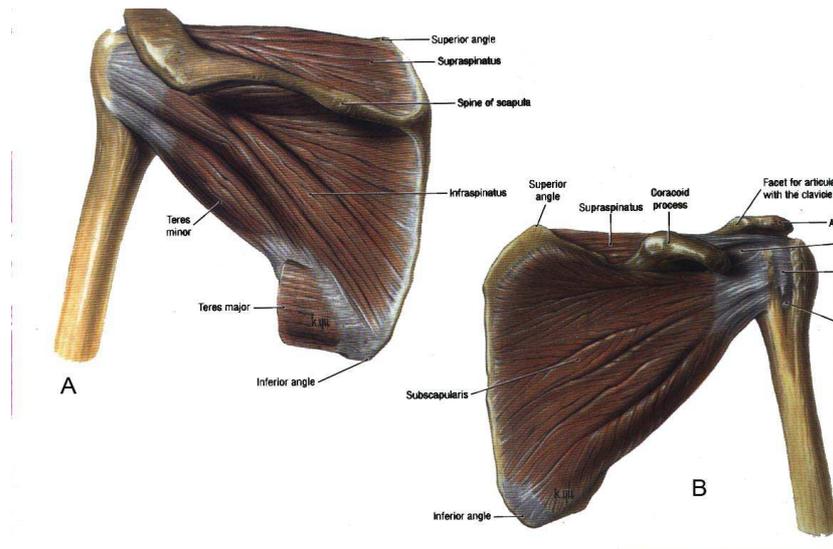
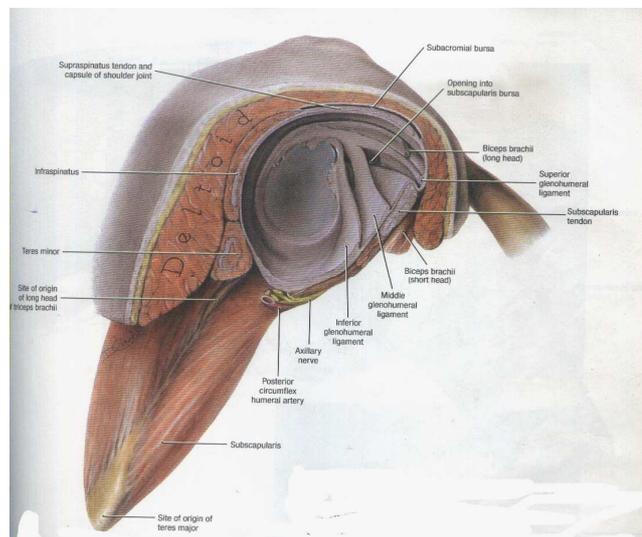


Figure (4) graphic image of a coronal section A-posterior view B-anterior view of the rotator cuff muscles(Williams and Dyson,1992)



Figure(5) graphic image of a lateral section through the shoulder showing the glenohumeral ligaments as well as the rotator cuff superimposed by the deltoid muscle(Williams and Dyson,1992)

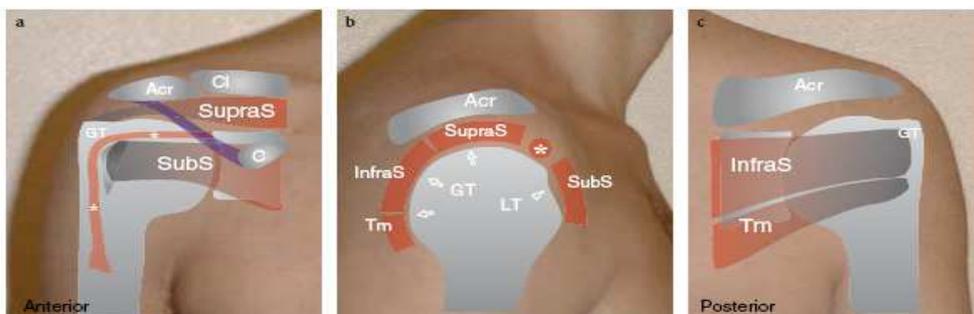


figure (6)a-c. Projectional images of rotator cuff muscles and tendons as seen in an anterior (a), lateral (b) and posterior (c) view of the shoulder. Note the relationship of