



Role of High Resolution B-Mode Ultrasound in Shoulder Diseases

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Abstract

Introduction: *Ultrasonography (US) has been shown to be an effective imaging modality in the evaluation of both rotator cuff and non-rotator cuff disorders.*

Aim: *To assess the pathology of soft tissue of shoulder joint mainly in rotator cuff injury in both partial and complete tear.*

Materials and Methods: *The study was conducted in all in patients and outpatient requiring x-ray and sonography of shoulder joint referred by orthopedics department GSVM Medical college, Kanpur. The examination begins with the patient sitting on a rotating stool at a slightly lower level than that of the examiner. US images include but are not limited to longitudinal and transverse or coronal planes relative to the shoulder tendons. Both shoulders are examined, starting with the less or non symptomatic side.*

Discussion: *Based on our results, it can be concluded that ultrasonography is an effective imaging modality that has a positive effect on the management of many patients presenting with shoulder pain and/or disability. Shoulder ultrasound has high accuracy in diagnosing tears of the rotator cuff and in differentiating partial- from full-thickness tears.*

Introduction

The shoulder is one of the anatomic areas that is most commonly evaluated with musculoskeletal ultrasonography, mainly rotator cuff pathology. Developments in technology, as well as better knowledge of the pathology and the anatomy make this examination one of the most useful in the exploration of the shoulder, especially in the hands of the experienced radiologist. Ultrasound is low-cost, readily available and should be considered with plain films as the first step examination of the shoulder. Ultrasound is not only useful for the evaluation of the rotator cuff pathology and impingement syndrome, but is also performing in the evaluation of non rotator cuff

pathology such as biceps tendon pathology, shoulder instability, mass evaluation, infection, degenerative and inflammatory arthropathies and nerve entrapment syndromes. Making a complete evaluation of the shoulder helps to differentiate between rotator cuff pathology and others that can mimic rotator cuff disorders. This article will review shoulder anatomy and examination technique and the different pathologies that can be assessed by ultrasound.

Ultrasound performed with appropriate equipment by skilled operators, is widely recognized as a means of accurately assessing rotator cuff disease, with a sensitivity and specificity as high as 90%-95% in the assessment of both partial and full-

thickness tears. Nevertheless radiologists as a whole are poorly informed regarding the contributions that ultrasound can make in the assessment of non-rotator cuff abnormalities such as instability problems, synovial joint diseases, and nerve entrapment syndromes. Other imaging modalities such as magnetic resonance imaging (MRI) & Computed tomographic (CT) and MR arthrography will probably remain the modalities of choice for diagnosing most non-rotator cuff disorders. With these modalities, image acquisition is less operator dependent and evaluation of anatomic relationships and soft-tissue structures (e.g capsule, labrum, bone) is intuitively easier and can be more readily performed. However, high resolution US is quick, noninvasive, and inexpensive and has specific advantages over MR imaging. These advantages, which include the capacity for higher resolution and for examining tissues in both static and dynamic states with the patient in different positions, warrant the wider use of ultrasound in the evaluation of non-rotator cuff disorders. Various shoulder diseases for which ultrasonography is mainly used are:

Rotator cuff

Rotator cuff abnormalities represent a spectrum ranging from tendinosis to massive tear.

Non-Rotator Cuff

The non-rotator cuff structures include several tendons, ligaments, and bursae in the shoulder area. Non-rotator cuff abnormalities such as instability problems, synovial joint diseases, and nerve entrapment syndromes, Hill-Sachs lesion, primary synovial hemarthrosis, septic arthritis and bursitis, biceps tendinosis (tendon degeneration without inflammatory cells), benign & malignant tumors- superficial lipomas and deep lipomas, elastofibroma dorsi pseudotumor, Milwaukee shoulder (completeosteoarthritic changes, joint effusion, synovial proliferation, cartilage thinning, and loose bodies Degenerative disorders).

Materials and Methods

The study was conducted in all in patients and outpatient requiring x-ray and sonography of shoulder joint referred by orthopedics department GSVM Medical College, Kanpur.

Selection of cases

The study included a 105 case referred from Orthopedics department of GSVM medical college, Kanpur. The study includes all ages and sex.

Methods

The study was carried out in Department of Radiodiagnosis, GSVM Medical Kanpur on the following lines:

- a. A detailed history was recorded.
- b. A detailed local examination of the shoulder joint was carried out along with a complete general examination of the patient.
- c. Relevant lab investigations were done in cases.
- d. Radiological examination.

USG Technique

Ultrasound has been widely used for the evaluation of the shoulder. A high-frequency (5-12 MHz) linear array scan head should always be used. Harmonics, extended field of view, and new image optimization techniques are desirable. Modern transducers give a spatial resolution of less than 1 mm and produce excellent diagnostic images. Normal tendons appear hyper echoic relative to adjacent muscles and demonstrate an internal fibrillar structure.

The examination begins with the patient sitting on a rotating stool at a slightly lower level than that of the examiner. US images include but are not limited to longitudinal and transverse or coronal planes relative to the shoulder tendons. Both shoulders are examined, starting with the less or nonsymptomatic side. The application of graded pressure with the scan head and the focusing of the examination at the site of maximum discomfort are essential for obtaining the correct diagnosis.

Discussion

Ultrasonography, in spite of being introduced as a diagnostic tool in the field of orthopedic has principally been the domain of orthopedician. Our aim was to study the clinicoradiological spectrum of shoulder pathology and assess the role of sonography as the imaging modality in the diagnosis of shoulder diseases. The study correlated with sonographic finding with clinical course and MRI finding.

In present study various diseases group into 2 categories as follow:

1. Rotator cuff pathology
2. Non-rotator cuff pathology

Rotator cuff pathology

Rotator cuff tear

Rotator cuff tear is the most common cause of restricted movement and shoulder pain in acute case and degenerative cause in chronic case.

Dinnes j et al in 2003 assess the shoulder pain due to soft tissue disorder and observe the prevalence of rotator cuff disorder was generally high. On Ultrasound found to be most accurate. When used for full thickness tear; sensitivity was lower for detection of partial thickness tear.

E. Naredo in 2002 first established the clinical diagnosis by physical examination and compared with high frequency ultrasonographic finding in patient with painful shoulder.

According to Carlo Martinoli, M D in 2003 by USG can differentiate from rotator cuff diseases to non rotator cuff diseases including instability of the biceps tendon, glenohumeral joint, and acromioclavicular joint; arthropathies and bursitis (inflammatory diseases, degenerative and infiltrative disorders, infections); nerve entrapment syndromes and space-occupying lesions. Many of these conditions may be overlooked clinically or can even mimic rotator cuff tears, and US can help redirect the diagnosis if a complete shoulder examination rather than a simple rotator cuff assessment is performed. This finding correlates with this study.

Daenen B et al in 2007 evaluate the shoulder joint mainly for rotator cuff pathology and development in technology as well as better knowledge of the pathology and anatomy. In present history most common rotator cuff pathology is rotator cuff partial/total tear.

The prevalence of shoulder complaint in higher in patient with Parkinson disease than in healthy individuals. Out of 5 cases found rotator cuff tear in 4 cases (80%). These appearances were similar to those described by Mov Disord in 2008.

Rotator cuff tendinosis

Out of 10 cases, 7 cases foci of calcification and rest with heterogeneity. Kayer R in 2005 described preoperative USG examination of the shoulder permit a reliable diagnosis of complete rotator cuff tear and calcium deposit. Finding were in concordance with this study

Non-rotator cuff pathology

LHBT Pathology

LHBT show fluid around tendon in 22 cases (21%), subluxation in 5 cases (4.7%). Mainly LHBT pathology secondary to rotator cuff pathology. Tendon dislocation occurs up to 20% with rotator cuff tear. This study is similar to that study, described by Marnix T. vanholsbeeck MD 1999.

Glenohumeral joint

6 cases of osteoarthritis, 4 cases of adhesive capsulitis are seen during this study and less common and only 1 case of Hill Sachs lesion, Milwaukee shoulder and osteochondromatosis are seen. According to this study 4 patients suffered with adhesive capsulitis. Out of 4 cases, 3 cases had history of DM. Incidence of adhesive capsulitis being two to four times higher in DM than in general population. This study is similar to those described by Tigh CB in 2008.

Acromioclavicular Joint

According to Athanasios Papatheodorou Ultrasound is helpful in evaluating the superior aspect of acromioclavicular joint. It is possible to image the joint space. Joint fluid is a rare finding

in normal shoulders. Bone erosion, fluid, cysts, and hypertrophic changes represent degenerative changes. In this study 6 cases of Osteoarthritis and 2 case of dislocation are found.

Glenoid labrum

Two cases of Barkart's lesion are seen.

Conclusion

High-resolution ultrasound has been shown to be an efficient imaging modality for the assessment of a wide spectrum of rotator cuff and non-rotator cuff disorders. It is fast and inexpensive and allows dynamic assessment of the joint. Findings at physical examination and radiography can suggest the diagnosis of rotator cuff tear. Ultrasound can help confirm the presence of rotator cuff tear and help diagnose other potential clinical mimics of this injury. A direct correlation of the imaging findings with the symptoms of the patient can be easily obtained and interventional procedures can be guided.