ORIGINAL RESEARCH PAPER

Orthopaedics

COMPARATIVE STUDY OF EVALUATION OF VARIOUS SHOULDER PATHOLOGIES BY ULTRASOUND V/S MRI

KEY WORDS:

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ABSTRACT

Background: Shoulder is a complex and extremely mobile joint with compromised stability. Shoulder pain is a significant cause of morbidity, more so in elderly.60 % of pain can be attributed to rotator cuff pathologies and rest 40% to others. The prevalence of self-reported pain is estimated to be between 16 and 26% and it is the third most common cause of musculoskeletal consultation in primary care centres. **Objective:** The study was done to assess the efficacy of ultrasound in evaluation of shoulder pathologies for Evaluation of rotator cuff, subacromial and long head of biceps tendon(LHBT) pathologies **Methods & Materials:** The study was conducted in a tertiary hospital with help of a radiologist and in total 60 patients were included in the study. Shoulder ultrasound scan was performed in all the patients by the same radiologist. All patients underwent a prospective MRI scan to confirm the findings and all MRI images were interpreted by the same radiologist who performed the ultrasound scans **Result:** The most significant finding in our study was that USG and MRI detected equal 8 number of patients with full thickness supraspinatus tear tears. Four patients of partial thickness tears were missed on US who were detected by MRI. Out of 60 subjects proportion of different pathologies detected by US was 46 (77 %) while proportion of rotator cuff pathologies detected by MRI was 50 (83 %) patients. These results clearly show that US and MRI are almost equally effective in detecting rotator cuff, subacromial and LHBT pathologies **Conclusion:** We came to the conclusion of Ultrasound imaging modality is Almost Equally effective for rotator cuff evaluation and is As good as MRI for evaluation of subacromial pathologies and better than MRI for diagnosis of impingement. It was found to be Equally effective for evaluation of LHBT. Considering the above reasons and the low cost and availability of ultrasound, it should be used as the primary diagnostic modality for shoulder pain assessment

INTRODUCTION

The ball and socket diarthrodial gleno-humeral multiaxial joint, synovial in nature with wide range of movements. Its deluxe design gives a wide range of movements and gives humans the ability for diverse amount of daily activities. The relatively larger head of humerus than the scapula's glenoid fossa although it gives significant range of movements but has a drawback of increased vulnerability to instability. The primary stabilising components of the shoulder joint are glenoid labrum & rotator cuff muscles. Cartilaginous glenoid labrum deepens the glenoid cavity thereby providing more contact area and more stability to glenohumeral joint(1). The rotator cuff connects the humerus to the scapula and is made up of the tendons of four muscles, the supraspinatus, infraspinatus, teres minor and the subscapularis. Tendons attach muscle to bone. Muscles in turn move bones by pulling on the tendons. The muscles of the rotator cuff keep the humerus tightly in the socket. The socket, or the glenoid, is shallow and flat. It is rimmed with soft tissue called the labrum that makes a deeper socket that molds to fit the humeral head. The joint capsule surrounds the shoulder joint. It is a fluid filled sac that lubricates the joint. It is made up of ligaments. Ligaments are soft tissue that holds bone to bone. Shoulder injuries can occur to any part of the shoulder. Shoulder discomfort is frequently caused by rotator cuff disease. Repetitive action at or above the shoulder level, such as work or leisure activities, causes shoulder impingement syndrome. Shoulder impingement syndrome is more common in those over the age of 40, thus age is another aspect to consider. Inflammation or degeneration of the tendons or bursae, dysfunctional glenohumeral and scapulothoracic mechanics, debilitated rotator cuff or scapular musculature, joint capsule abnormalities, positional disorders of the neck or shoulder, and structural deformities of the pertinent skeletal components.

A multitude of factors can lead to shoulder impingement syndrome. They are split into two categories: structural variables and functional factors. The distance between the coracohumeral curve above and the humeral head and tuberosities below is the cause of shoulder impingement syndrome. The rotator cuff tendons travel via this area. Subacromial impingement, sub coracoid impingement, and internal impingement are the three different types of impingement in the shoulder. In the general population, the most prevalent reason of shoulder discomfort is subacromial impingement, which accounts for 44–65 percent among all shoulder disorders. Shoulder impingement syndrome is frequently accompanied by a partial or total tear of the rotator cuff tendon, necessitating examination of rotator cuff integrity in these individuals(2). Non-contrast MRI is the best imaging modality for individuals with suspected shoulder impingement. Although MRI was thought to be a reliable tool for evaluating tendons of rotator cuff muscles, it just evaluates the shoulder joint in a static state. Because most signs are nonspecific, it can only imply a diagnosis of subacromial impingement indirectly. The limited availability of open MR and the fact that MR imaging can only image single-plane shoulder movements sequentially that do not fully mimic physiologic movements of the shoulder are the two primary limitations of dynamic MRI. Being a widely available, non-invasive, and fast tool for musculoskeletal issues, particularly those involving the shoulder joint. The use of high- resolution ultrasonography as a diagnostic tool for musculoskeletal assessment is becoming more common. USG is used to diagnose rotator cuff tendinopathy and shoulder impingements in a fast, dynamic, real-time manner. In the diagnosis of full thickness rotator cuff injuries, USG is as accurate as MRI. According to studies, USG is less accurate in diagnosing partial thickness rotator cuff injuries. USG is a simple, low-cost method that provides immediate similitude with the opposite side. USG accuracy, on the other hand, is highly user-dependent and has a limited role in evaluating the bony and cartilaginous components of the shoulder joint. MR imaging's greater ability to show both internal structures and soft tissue around the joint, as well as its non-invasive nature, has made it the imaging method of choice in many cases.

MRI gives good spatial resolution of bone, cartilaginous, and soft tissue at the shoulder joint, providing anatomical information about the tendon implicated, the size, extent, and position of tendon tears, which is crucial for determining the surgical feasibility and kind of treatment required. Shoulder

MR imaging is commonly utilized to assess impingement, instability, and other clinical problems. MRI can show the progression of rotator cuff tendinopathy and partial or full thickness tear(3)

In this study, we will compare the effectiveness of USG against MR imaging in evaluating shoulder pathologies in patients with shoulder pain in this study.

MATERIALS AND METHODS

This cross sectional, prospective study purely observational was conducted in a tertiary hospital on 60 patients for a period of 6 months from April 2012 to Sept 2012 and in total 60 patients were included in the study. Shoulder ultrasound scan was performed in all the patients by the same radiologist. All patients underwent a prospective MRI scan to confirm the findings and all MRI images were interpreted by the same radiologist who performed the ultrasound scans

Inclusion Criteria

- Age >40 years with History of pain in either shoulder joint.
- History of trauma (trivial).
- Clinically suspected to have a rotator cuff injury (full thickness or partial thickness tears), biceps tendon injury, or calcific tendinitis.

Exclusion Criteria

- Clinically suspected cases of instability.
- Known cases of Rheumatoid arthritis
- Previous surgery or prosthesis of shoulder.
- Patients with pace makers, metal implants in their bodies, foreign bodies in their eyes and those having claustro phobia.

These patients were initially clinically examined by the orthopaedist and then radiologically evaluated. The radiological examinations that were undertaken are an antero-posterior x-ray of the involved shoulder joint, followed by an USG examination with comparison of the opposite shoulder and then a MRI of the affected shoulder.

Antero-posterior and axillary view X-ray:

Initially a plain Antero- posterior and axillary view X-ray radiogram of the affected shoulder joint was done, Findings such as cystic formation or erosions in the tuberosities, degenerative changes in the ACJ, humeral head and glenoid, calcifications in the region of the rotator cuff were documented.

Ultrasound examination of the shoulder:

The examination on the affected shoulder was carried. The rotator cuff tendons and muscles were examined in various positions, the ACJ and the posterior aspect of the joint was also examined. Dynamic examinations of the shoulder were also carried out. Comparison of the opposite shoulder was also done.

MRI of the affected shoulder:

The MRI examination was performed on a 1.5 Tesla, with a Flex C1 coil cantered over the affected shoulder with the patient in supine position. Multiplanar images were obtained in the axial, oblique coronal and sagittal planes.

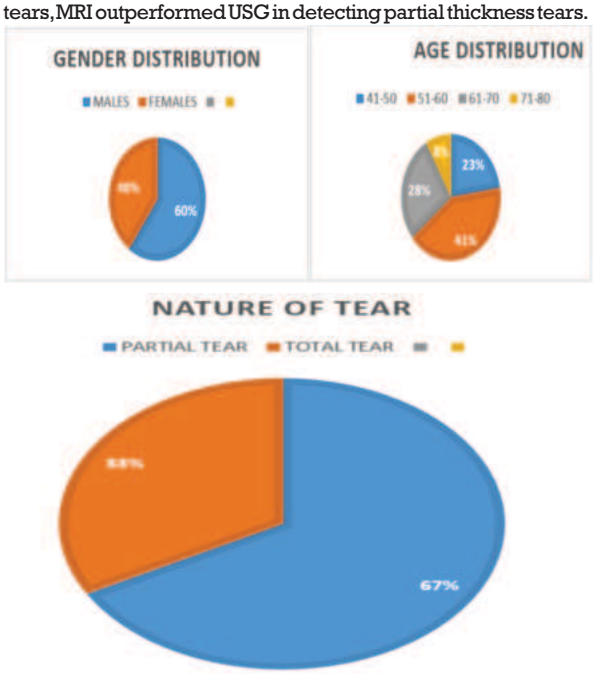
RESULTS:

Total number of 60 patients were included in the study. Of these 36 were Males and 24 were females. The majority of patient's age were between the ages of 41 and 60. The most common age range was 41-50 years (53.3 percent), followed by 51-60 years(25 percent), and 61-80 years (21.66 percent) . The patients' average age was 41.6 years. With Observations from other studies as well, it relates well with findings of our study that there is maximum incidence of rotator tears between the age of 41-60 years.

Majority of patients (70%) had involvement of the right shoulder. This is consistent with the findings of Bouaziz et al, [4] who found that right shoulder involvement is more common (68%) than left shoulder involvement (32 percent). Maximum number of patients had supraspinatus tears (86.7%), followed by subscapularis (7.3%) and infraspinatus (2.7%) tears. Rakesh Vijayvargiya [5] found out that Supraspinatus tendon was the commonest tendon to be involved in his study (90%). This is in correspondence to the study by Zlatkin et al wherein they found that supraspinatus tendon involvement was present in around 80% of their cases.([7])Various other studies had similar results showing that Supraspinatus tendon involvement was present in maximum numbers of their cases including in our study as well.

The USG criteria for detection of partial thickness tears were focal discontinuity of the tendon either at the bursal or articular margin(Fig 1). USG criteria for full thickness tears were recognized by complete absence of the tendon. The space over the humeral head is filled by the deltoid muscle and a thickened subacromial-subdeltoid bursa. Tendinosis was diagnosed by USG, in the form of thinning of the tendon and heterogeneous echotexture. MRI criteria for detection of partial thickness tears are characterized by a focal region of fiber discontinuity that is filled with fluid signal. Beside a focal tendon defect, additional findings included surface fraying or changes in tendon caliber, such as attenuation or thickening. MRI criteria for full thickness tears were characterized by tendon discontinuity. Tendon retraction was another sign to detect full thickness tears. The presence of fluid in the subacromial- subdeltoid bursa, although not specific for a full-thickness tear, to be another indirect sign. MRI, in particularly the SPAIR and STIR sequences are informative in detecting cuff tears. MRI is better in picking up labral and ligamentous pathologies, bony abnormalities and glenohumeral joint arthritis.

Among patients with a tear 67% had a tear which was partial in nature while 33% had a tear which was complete in nature. Ultrasound has a high sensitivity of 92.86 percent & specificity of 100 percent for partial tears, & sensitivity of 100 percent & specificity of 96.3 percent for complete tears(Fig2). In the rotator cuff injuries assessment, USG imaging can be deemed nearly as useful as MRI. In a similar study Aggarwal J et al(6). observed that USG and MRI had a accuracy of 98 percent and 98.6 percent, respectively, for full thickness tears and 90 percent and 94 percent, respectively, for partial thickness tears. Therefore MRI and USG were equivalent in their ability to identify full thickness tears, MRI outperformed USG in detecting partial thickness tears.



DISCUSSION :

over the last decade it's a surge in road traffic accidents. Increased incidence in the age group of 30-50 years is directly related to road traffic accidents .To find out the exact pathology the preferred imaging modalities for evaluation of shoulder pathology includes the use of Ultrasound and Magnetic Resonance Imaging with their own merits and demerits. Accuracy, availability, cost effectiveness and expertise are some of the important parameters. The most significant finding in our study was that USG and MRI detected equal 8 number of patients with full thickness supraspinatus tear tears. Four patients of partial thickness tears were missed on US who were detected by MRI. Out of 60 subjects proportion of different pathologies detected by US was 46 (77 %) while proportion of rotator cuff pathologies detected by MRI was 50 (83 %) patients. These results clearly show that US and MRI are almost equally effective in detecting rotator cuff, subacromial(Fig3) and LHBT pathologies(Fig4)

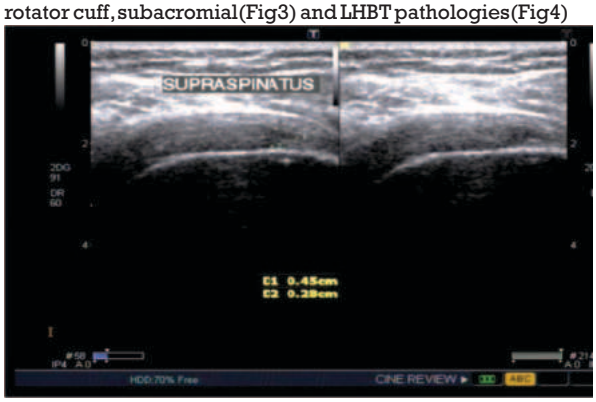


Figure1 Partial thickness articular surface tear of Suprapsinatus tendon

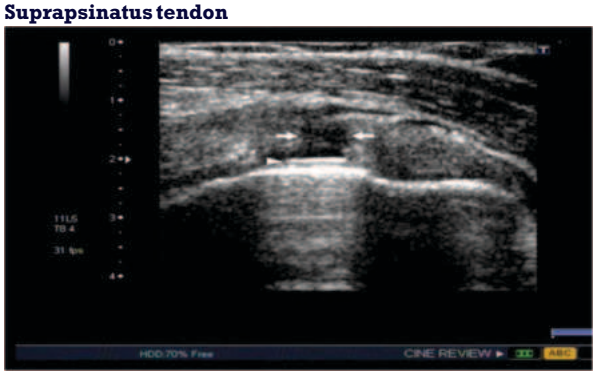


Figure 2: Full thickness Tear of Supraspinatus tendon

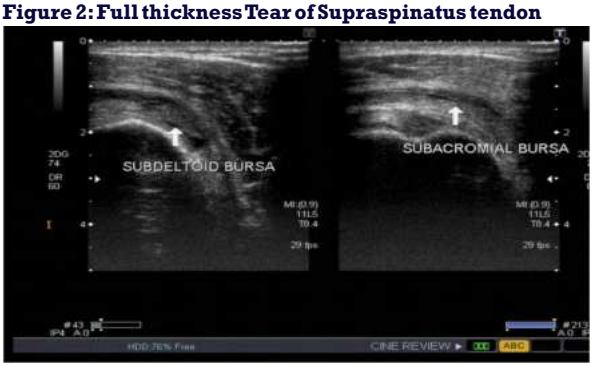


Figure 3 : Subacromial, Subdeltoid Bursitis

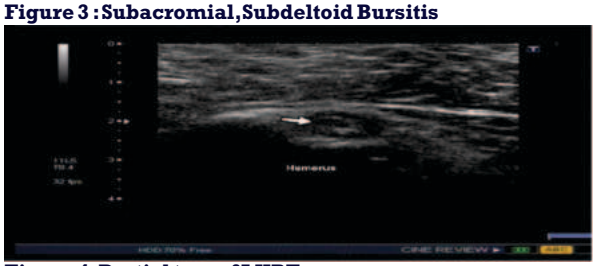


Figure 4: Partial tear of LHBT

CONCLUSION

Clinical examination of the shoulder joint does not provide adequate insight on the cause of shoulder pain. The commonest pathology causing shoulder pain is rotator cuff pathology, like partial or full thickness tears and the next common pathology is ACJ arthritis. We came to the conclusion of Ultrasound imaging modality is Almost Equally effective for rotator cuff evaluation and is As good as MRI for evaluation of subacromial pathologies and better than MRI for diagnosis of impingement. It was found to be Equally effective for evaluation of LHBT. Though operator dependent, a well performed USG can effectively serve as a primary diagnostic method and screening of all painful shoulder joints because it is economic and fast and MRI should be used secondary because it provides more information about the extent of tendons and has lower risk of artefacts.

Transducer can be placed exactly at the site of pain
More flexible field of view
Bilateral comparison available
Patient with cardiac pacemaker
Patient with metal implant not MRI compatible
Patient with claustrophobia

More reasons for the use of USG instead of MRI:

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