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"A COMPARATIVE ANALYSIS OF USG WITH MRI FOR DIAGNOSIS OF ROTATOR CUFF INJURIES"

Radio-Diagnosis

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ABSTRACT

Shoulder pain is one of the most common musculoskeletal complaint a patient presents to a clinician with. Tendinosis, tendon tears, arthritis, impingement and fractures are some of the common causes of shoulder pain.[1] The rotator cuff is the most commonly involved structure in such cases and subacromial impingement syndrome (SAIS) is the most common presentation of rotator cuff injury.[2] Because of improvements over the past 10 years in transducer strength, soft tissue penetration, and user experience, ultrasound has become a more reliable diagnostic tool for suspected rotator cuff tear. Further, unlike MRI, ultrasound is inexpensive, readily available, and well tolerated, and it offers real-time results and dynamic visualization.[3] Thus, the present study was conducted to compare the USG findings with MRI findings in cases of rotator cuff injuries.

KEYWORDS

rotator cuff injuries, USG, MRI, partial tear, complete tear

INTRODUCTION

Shoulder pain is one of the most common musculoskeletal complaint a patient presents to a clinician with. Tendinosis, tendon tears, arthritis, impingement and fractures are some of the common causes of shoulder pain.[1] The rotator cuff is the most commonly involved structure in such cases . It consists of four muscles originating on the scapula and inserting on the superior humeral head to improve stability. The subscapularis inserts on the lesser tubercle of the humerus. The supraspinatus muscles insert onto the greater tubercle of the humerus. The infraspinatus also inserts onto the greater tubercle, but a little inferior to the supraspinatus.

The teres minor inserts inferior to the infraspinatus on the greater tuberosity . Injuries ranged from 9.7% in those 20 years and younger increasing to 62% in patients 80 years and older (whether or not symptoms were present).[4] There are 2 primary imaging modalities that are used to visualize the rotator cuff: ultrasonography and magnetic resonance imaging (MRI). Unlike MRI, ultrasound is inexpensive, readily available, and well tolerated, and it offers real-time results and dynamic visualization.[3] Thus, the present study was conducted to compare the USG findings with MRI findings in cases of rotator cuff injuries.

AIMS AND OBJECTIVES

1. To subject the patients with suspected rotator cuff injuries, to shoulder USG and MRI examinations.
2. To classify the injury on the basis of partial or complete muscle/tendon tears.
3. To identify the most commonly injured muscles.
4. To evaluate the efficacy of USG as an imaging modality in diagnosis of rotator cuff injuries, as compared to MRI.

MATERIALS AND METHODS

This prospective, longitudinal study was conducted from November 2019 to November 2021 on 55 cases who were suspected to have rotator cuff injuries attending the OPD during the study period and met the inclusion and exclusion criteria after the approval of Institutional Ethics Committee .

Study Population:

All the cases who are suspected to have rotator cuff injuries and attending the OPD during the study period and meeting the inclusion and exclusion criteria.

Inclusion Criteria:

1. Patients aged more than 18 years of either gender.
2. Patients having shoulder pain and with clinical suspicion of rotator cuff injury.
3. Patients presenting with decreased range of motion at the shoulder joint.

Exclusion Criteria:

1. Patients aged less than 18 years of age.
2. Patients with diagnosed shoulder joint fractures/ dislocations.
3. Patients with a history of previous shoulder surgery.
4. Patients who do not consent to participate in the study.

A structured pre prepared case proforma was used to enter the patient demographics, clinical history, examination and imaging findings. The patients underwent USG examination of the diseased as well as the contralateral healthy shoulder. This was followed by MRI evaluation by the same radiologist, to reduce inter observer variation. The radiologist was blinded to the MRI study to prevent any bias.

Ultrasonography of the shoulder was performed on Philips HD-15 ultrasound scanner using high resolution 12 MHz linear transducer. The long head of biceps was used as the landmark and thereafter sequential scanning of Subscapularis, Supraspinatus followed by scanning of Infraspinatus and Teres Minor were performed in both long and short axis (axial and sagittal planes).

The acromioclavicular joint and the posterior aspect of shoulder was also be examined. These findings were compared with the contralateral healthy shoulder. MRI analysis was done using Toshiba 1.5 Tesla scanner with shoulder coil.

The patient lied supine with the shoulder in neutral position. The following sequences were acquired:

1. T2w: Sagittal, Axial, Coronal
2. PDw: Sagittal, Axial, Coronal
3. STIR: Coronal
4. GRE: Coronal

Assessment

USG

A. Full thickness tear:

1. Lack of visualisation of the tendon
2. Complete discontinuity or breech (seen as focal hypo-echoic defect or a mixed echogenicity defect which extends through the entire thickness of the tendon)

B. Partial thickness tear:

1. Focal discontinuity which involves partial thickness of the tendon (seen as focal hypoechoic defect or a mixed echogenicity defect which extends through part of the thickness of the tendon) on either the articular or bursal side or within the tendon.
2. Focal thinning of the tendon or loss of the normal convex contour on the outer border (bursal surface) of the tendon.

OBSERVATIONS AND RESULTS

Table 1: Distribution of the study population according to the

number of muscle involvement on MRI . No muscle was involved in 14.55% of the cases. Single muscle was involved in 63.82% of the cases.

PARAMETER	NUMBER	PERCENTAGE
NONE	8	14.55%
SINGLE	30	54.54%
MULTIPLE	17	30.91%
TOTAL	55	100%

Table 2: Distribution of the overall true and false positives and negatives in the study population according to the USG findings (N=72)

PARAMETER	NUMBER	PERCENTAGE
TRUE POSITIVES	33	45.84%
FALSE POSITIVES	14	19.44%
TRUE NEGATIVES	8	11.11%
FALSE NEGATIVES	17	23.61%
TOTAL	72	100%

Table 3: Sensitivity, specificity, PPV and NPV of the USG according to the MRI findings.

PARAMETER	FINDING
SENSITIVITY	66%
SPECIFICITY	36.36%
PPV	70.21%
NPV	32%

DISCUSSION

In the present study; majority of the cases (47.47%) belonged to the age group of 51 to 60 years. The mean age of the study population was 46.35 ± 11.88 years. The mean age of males (45.97 ± 12.87 years) was similar to the females (46.80 ± 10.83 years); P value: 0.798. There was a slight male preponderance (54.55%) in the study population. When assessed according to the age groups, male preponderance was observed in all age groups except in 41 to 50 years. In the present study, MRI findings suggested no muscle involvement in 14.55% of the cases. Amongst the cases in which there was muscle involvement, single muscle was involved in 63.82% of the cases and double/multiple muscles were involved in 36.18% of the cases.When assessed according to the type of muscle involvement as per MRI findings, supraspinatus was the most commonly involved muscle (58.33%), followed by subscapularis (26.39%), infraspinatus (4.17%) and teres minor (0%). Partial thickness tear was common in all the three muscles. Amongst the cases having supraspinatus muscle involvement, 21.43% had full thickness tear. Amongst the cases having subscapularis muscle involvement, 5.26% had full thickness tear. Amongst the cases having infraspinatus involvement, none had full thickness tear.On analysis, sensitivity of USG findings was 66% as compared to MRI, specificity was 36.36%, positive predictive value was 70.21% and negative predictive value was 32%. When assessed according to the type of muscle and tear, it was found that for subscapularis muscle, the overall sensitivity and specificity in the present study was 73.68% and 90.57%, respectively. For full thickness tears, it was 100% and 94.37%, respectively and for partial thickness tears, it was 61.11% and 94.44%, respectively. It can be concluded that USG was able to correctly diagnose healthy cases for overall subscapularis muscle and partial thickness tears. For full thickness tears, it was correctly able to diagnose positive cases as well. Also, it was observed that there was a high probability of cases diagnosed negatively on USG do not have the tear (high NPV).Furthermore, for supraspinatus muscle, the overall sensitivity and specificity in the present study was 66.67% and 90%, respectively. For full thickness tears, it was 66.67% and 90.48%, respectively and for partial thickness tears, it was 45.45% and 89.47%, respectively. Thus, for supraspinatus muscle, USG is able to correctly diagnose healthy cases (almost 90% specificity). It also has high PPV indicating high probability of cases with positive test having the disease, for overall muscle and partial thickness tears. For full thickness tears, it was observed that there was a high probability of cases diagnosed negatively on USG (do not have the tear (high NPV)).

For infraspinatus muscle, the overall sensitivity and specificity in the present study was 0% and 100%, respectively. For partial thickness tears, it was 0% and 100%, respectively. Thus, USG was correctly able to diagnose negative/healthy cases. USG wasn't able to diagnose infraspinatus tear (0% sensitivity).Thus, it can be effectively concluded that for the overall diagnosis of rotator cuff injuries, USG has high sensitivity and PPV. USG is correctly able to rule out tear & also has high probability of correctly diagnosing full thickness tears as compared to partial thickness tears.

CONCLUSION

It can be effectively concluded from the present study that rotator cuff injuries are more common in the age groups of late 40s or early 50s with a slight male preponderance. Supraspinatus is the most commonly involved muscle while infraspinatus is the least commonly involved muscle. Partial thickness tears are more common than full thickness tears. For the overall diagnosis of rotator cuff injuries, USG has high sensitivity and PPV. Depending on the type of muscle involved, USG is correctly able to rule out tear in most of the cases. USG also has high probability of correctly diagnosing full thickness tears as compared to partial thickness tears.

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