



TO STUDY THE SPECTRUM OF VARIOUS RADIOLOGICAL CHANGES DETECTED ON HIGH RESOLUTION ULTRASOUND (HRUS) AND MRI IN PATIENTS WITH PAINFUL SHOULDER

Radiodiagnosis

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ABSTRACT

INTRODUCTION:- This study is aimed to evaluate the role of high resolution USG and MRI in patients with shoulder pathology. **MATERIAL AND METHOD:-** USG and MRI evaluation was done in clinically suspected patients of shoulder pathologies on NEW ESOTATE COLOUR DOPPLER USG machine and on 1.5 tesla philips Achieva MRI machine respectively. **RESULT:-** In present study, the majority of patients were in the age group 30 to 60 years, 66.6 % were male and 33.4 % were female. Out of 60 patients, 42 patients were found to have rotator cuff tear, 8 patients were found to have full thickness tears and 34 had partial thickness tear. From total 8 patient detected with full thickness tear- 6 patients positive on USG and 8 patient positive on MRI and from total 34 patients detected with partial thickness tear – 30 patients were positive on both USG and MRI. **CONCLUSION:-** Our result show that MRI has better accuracy for detecting partial thickness tears and full thickness tear. As USG is easily available and cost effective, it can be used as a primary screening modality in patients suspected of having rotator cuff tear.

KEYWORDS

Rotator cuff tear , ultrasound, MRI , labral tear.

INTRODUCTION

Shoulder pain is the third most common musculoskeletal disorder after low back pain and neck pain. Among the causes of shoulder pain, the rotator cuff disease contributes the most, especially in elderly patients.

The clinical information available to assess rotator cuff pathology is limited thus, the radiological evaluation plays a pivotal role in treatment planning. MR Imaging (2) (3) can provide information about rotator cuff tears such as tear dimensions, tear depth or thickness, tendon retraction, and tear shape that can influence treatment selection and help determine the prognosis.

Increasing easy availability of MRI and development of better High Resolution Ultrasonography (HRUS) hardware provide two different investigation algorithms for evaluation of rotator cuff pathologies with their own advantages and disadvantages.

Aim and Objectives

AIM- To study the spectrum of various radiological changes detected on High Resolution Ultrasound (HRUS) and MRI in patients with painful shoulder.

OBJECTIVES-

1. To study various radiological changes on High Resolution Ultrasound (HRUS) in patients with painful shoulder.
2. To study various radiological changes on MRI in patients with painful shoulder
3. To compare and correlate the sensitivity of positive radiological changes on High Resolution Ultrasound (HRUS) and MRI.

MATERIAL AND METHODS

SOURCE OF DATA:

The study was carried out in the Department of Radiodiagnosis in patients with shoulder pain, referred from Orthopedics department and Rheumatology clinic of medicine department of S.N. Medical College, Agra from September 2017 to August 2019.

Appropriate Ultrasonogram and MRI sequences with multi planar imaging studies were done for every patient.

TECHNIQUE:

A. Ultrasonography technique and patient position.

Technique and equipment- ultra sound examinations were performed with the NEW ESAOTE COLOUR DOPPLER (MEDI DEVICE) with linear transducer with a frequency of 7-18 MHZ.

Patient position- The position of the patient for ultrasonography of the shoulder differs among institutions, countries and examiners. In this study, the patient was asked to sit on a revolving stool with the examiner seated opposite on a similar stool. The height of the patient's stool was adjusted to be ergonomically comfortable for scan performance.

B. MRI TECHNIQUE:

Imaging were done with 1.5 Tesla Philips Achieva machine using shoulder coil, following sequences were taken.

1. Coronal oblique T1W/ proton density weighted (PDW) fast spin echo (FSE) sequence.
2. Coronal oblique fat suppressed (FS) PDW FSE / T2 – W FSE sequence.
3. Sagittal oblique T2 W FSE sequence (fat suppression).
4. Axial T2 – W gradient echo (GE) sequence.
5. Axial PDW FSE (with / without fat suppression)

Field of view 14-16 cm, slice thickness 2-3 mm and matrix 512 x 512.

Method of collection of data : All patients referred to the department of Radio diagnosis with clinically suspected shoulder pathology in a period of 2 years from September 2017 to August 2019.

DURATION OF STUDY: 2 years.

DATA ANALYSIS: It is a Cross sectional descriptive study.

INCLUSION CRITERIA

All patient with shoulder pain attending Orthopaedics department and Rheumatology clinic of medicine department and emergency with complaint of painful shoulder with or without motion restriction.

Age criteria- between 15 to 80 years.

EXCLUSION CRITERIA

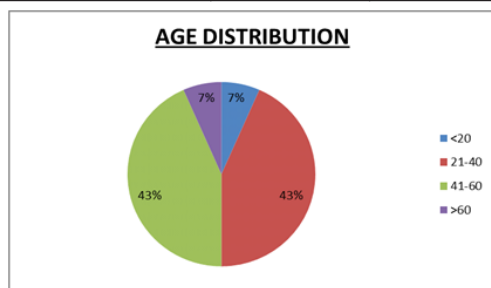
- Refusal of consent
- Patients with congenital abnormality
- Patients with neural or vascular pathology.

OBSERVATIONS AND RESULTS

Table- 1: AGE DISTRIBUTION between 15 to 80 yrs (TOTAL = 60 Pts) (graph 1)

Age group	NO.	%
<20	4	6.6 %
21-40	26	43.3 %
41-60	26	43.3 %
>60	4	6.6 %

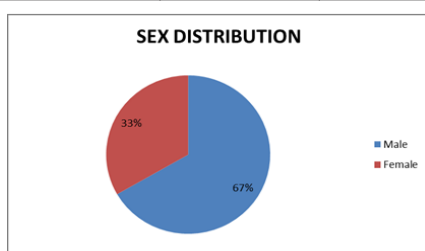
Total	60	
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In our study patients ranging from age group 15 to 80 years were included in which most of the cases (26 cases) were seen in both 21-40 and 41-60 years of age group.

TABLE-2: SEX DISTRIBUTION (TOTAL= 60 PTs.) (graph 2)

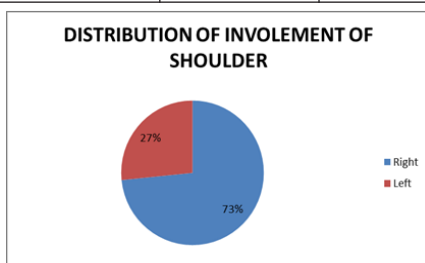
Gender	No.	%
Male	40	66.6%
Female	20	33.4%
Total	60	



In our study male to female ratio was 2:1 with 40 male and 20 female patients.

TABLE-3: DISTRIBUTION OF INVOLVEMENT OF SHOULDER (TOTAL= 60 PTs.) (graph 3)

	No.	%
Right	44	73.4%
Left	16	26.6%
Total	60	



Out of total 60 cases right shoulder was relatively more involved (44) as compared to left shoulder (16).

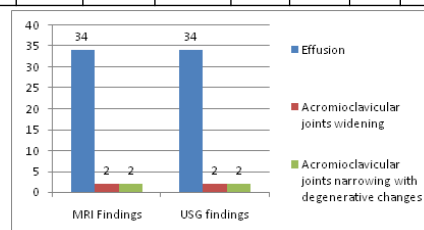
TABLE-4: ACROMIO CLAVICULAR JOINTS EFFUSION (Total – 60 Pts.) (graph 4)

	MRI Findings		USG findings	
	No.	%	No.	%
Effusion	34	56.1%	34	56.1%
Acromioclavicular joints widening	2	3.3%	2	3.3%
Acromioclavicular joints narrowing with degenerative changes	2	3.3%	2	3.3%

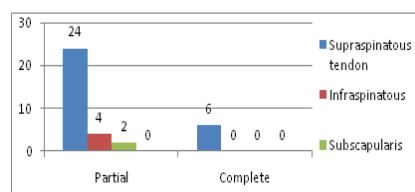
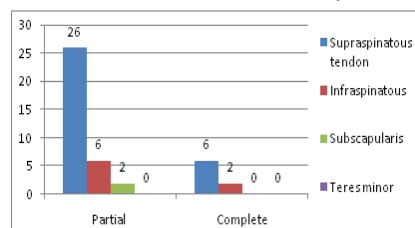
TABLE-5: ROTATOR CUFF INJURY IN MRI AND USG FINDINGS (Total – 60 Pts.) (graph 5 and graph 6)

MRI Findings	Supraspinatus tendon		Infraspinatus		Subscapularis		Teres minor	
	No.	%	No.	%	No.	%	No.	%

Partial	26	43.3%	6	10%	2	3.3%	0	0
Complete	6	10%	2	3.3%	0	0	0	0
USG Findings								
Partial	24	40%	4	6.6%	2	3.3%	0	0
Complete	6	10%	0	0	0	0	0	0



Acromioclavicular joint effusion was equally detected on both USG and MRI in all 34 cases out of 60 cases under study.



Out of total 60 cases, 42 cases showed rotator cuff injury with full thickness tear in 8 cases and partial thickness tear was seen in 34 cases. On MRI, both the full thickness tear and partial thickness tear was detected in all 8 and 34 cases. However, On USG the full thickness tear was detected only in 6 cases and partial thickness tear was seen in 30 cases.

Overall most common tear including both partial and complete tear was seen involving supraspinatus tendon (32) followed by infraspinatus tendon tear.

Both partial and full thickness tear was more prevalent in supraspinatus muscle seen in (26) and (6) cases, respectively. The second most common involved muscle was infraspinatus - (6) partial thickness tear and (2) full thickness tear.

Partial tear of subscapularis muscle was detected only in 2 case.

DISCUSSION

Shoulder pathologies are very common among the general population. The location of shoulder pain is very poor indicator of its pathology and the value of clinical assessment of the shoulder is very limited. Plain radiography is often used to supplement the clinical examination and is hardly diagnostic for rotator cuff tears.

Rotator cuff tears are a frequent finding in patients with shoulder pain. Non invasive imaging modalities such as USG and MRI are used for evaluating rotator cuff pathologies. The purpose of the present study was to evaluate the ability of USG and MRI to detect shoulder pathologies.

Total 60 patients with clinically suspected rotator cuff shoulder pathologies were reviewed on both USG and MRI. Out of 60 patients 40 (66.6%) were male and 20 (33.4%) were female. Thus, the Male:Female ratio was 2:1. Our study found no statistically significant differences in the prevalence of rotator cuff tear between genders, which correlates with the results of study carried by Mailgram et al.(4) In the present study, 44 (73.4%) patients had pain involving the right

shoulder and 8(26.6%) patients had pain involving the left shoulder. Thus the right shoulder was more frequently involved than the left shoulder. This correlates with the results of the study by Bouaziz et al.(5) who found right shoulder involvement (68%) to be more frequent than left shoulder involvement (26.6%).

In the present study with age ranging from 15 to 80 years, the majority of the patient belonged to age group between 20 -40 yr (43.3 %) and 40-60 yr (43.3 %).

The tears of the rotator cuff as seen in this study, were commonly visualized as hypoechoic full thickness defects in the tendon extending from the bursal surface to its articular margin. Partial thickness tears on USG appear as focal discontinuities at the articular or bursal aspect or were located within the substance of the tendon(Figure 1). On MRI full thickness tear seen as hypo intense defects in tendon on T1W images. The presence of hyper-intense fluid at site of tear on T2W images supported the diagnosis. Additional signs of complete tears include muscle retraction, fluid in subacromial – subdeltoid bursa and displacement of peri-bursal fat plane.

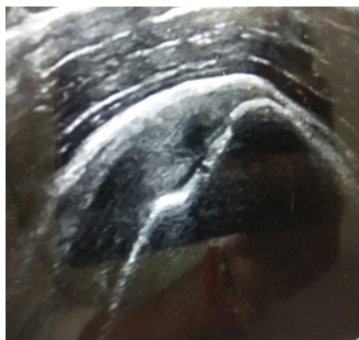


Figure 1 A - USG images showing partial tear of supraspinatus



Figure 1 B - MRI, T2W coronal images showing partial tear of infraspinatus



Figure 1 C - MRI, PDW coronal images showing partial tear of supraspinatus and, fluid in sub-deltoid bursa and sub-acromial bursa

In the present study, out of 60 patients, 40 (66%) patients were found to have rotator cuff tears. 8 (13.2%) had full thickness tear(Figure 2) and 34 patients had partial thickness tear. Full thickness tear was detected in total 8 patients, with 6 patients positive on USG and 8 patients positive on MRI. In 8 patients diagnosed with full thickness tear, 6 patients showed full thickness tear(Figure3) with retraction and 2 patients had tear without retraction. From total 34 patients detected with partial thickness tear, 30 patients were positive on USG and 34 patients were positive on MRI. In 34 patients diagnosed with partial thickness tear, 20 patients showed defect involving the articular

surface and 14 patients had defect in long bursal surface. Out of 40 patients, 32 patients were having supraspinatus tear either isolated or in conjugation with Infraspinatus tear and Subscapularis tear. Rest 8 patients were having only Subscapularis and Infraspinatus tear not involving Supraspinatus. So prevalence of supraspinatus tear was very high.

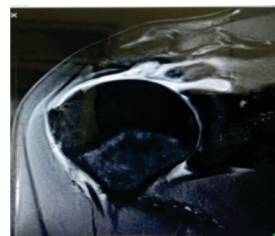


Figure 2 A - MRI, T2W coronal image show complete tear of right supraspinatus and right coracoid bursitis with glenohumeral effusion

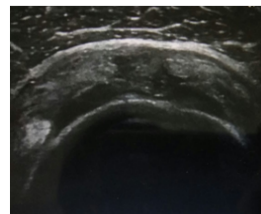


Figure 2 B - USG images showing complete tear of right supraspinatus.

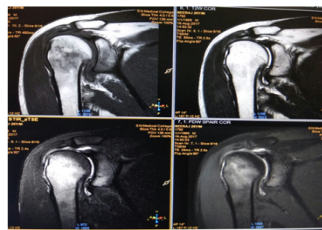


Figure 3- MRI coronal (A) T1 W (B) T2 W (C) STIR and (D) PDW images showing complete chronic supraspinatus tear with proximal tendon retraction and atrophy of muscle bulk.

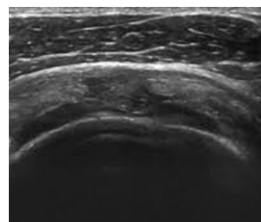


Figure 3 F- on USG, complete tear of supraspinatus tendon seen.

Naqvi GA, Jadaan M, Harrington P.(6) showed, that MRI has better accuracy for detecting full thickness tear and has high sensitivity and positive predictive value in diagnosis of partial thickness and full thickness tear. Present study also showed MRI had better accuracy for detection of full thickness and partial thickness tear.

In the present study, in 8 (12.0%) cases biceps tendon sheath effusion was seen on USG examination, while on MRI also 10 (16.6%) cases of biceps tendon sheath effusion were seen(Figure 4). Thus both USG and MRI showed a high agreement for detection of biceps tendon sheath effusion. Similar result were reported by Alasaarela et al. (7) who reported effusion of biceps tendon sheath in 24 patients on MRI and in 20 patients on USG. They found good agreement between USG and MRI for detection of effusion of the biceps tendon sheath.

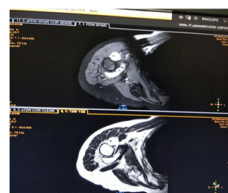


Figure 4 A - MRI, PDW and T2 weighted images showing

circumferential fluid collection around the long head of biceps tendon in bicipital groove

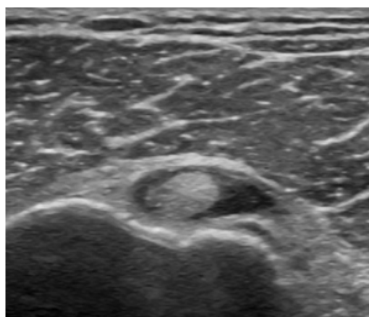


Figure 4 B - USG images of same patient showing circumferential fluid collection around the long head of biceps tendon.

Non visualization of biceps tendon in the Bicipital groove indicates either rupture or subluxation of tendon. In the present study 4 (6 %) patients had non visualized biceps tendon in the inter tubercle sulcus on USG and the same results was observed on MRI.

Out of 60 patients , 18 (29.7%) patients were found to have tendinitis (supraspinatus tendon = 12 patients , infraspinatus tendon = 4 patients and Subscapularis tendon= 2 patients) on MRI and 16 (26.4%) patients were found to have tendinitis (supraspinatus tendon = 10 patients, infraspinatus tendon = 4 patients and Subscapularis= 2 patients) on USG.

Present study showed prevalence of Supraspinatus tendinitis is as the most common (Figure 5) and MRI had better accuracy for detection of tendinitis than USG.

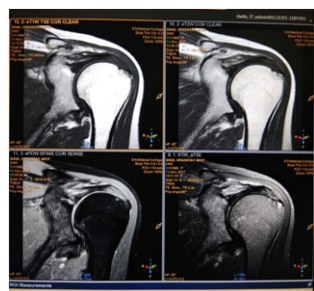


Figure 5- MRI coronal (a) T1 W (b) T2 W (c) PDW and (d) STIR images showing supraspinatus tendinitis evidenced by tendon thickening and intrasubstance altered signal intensity. associated subarticular partial tear is noted as focal region of fluid collection

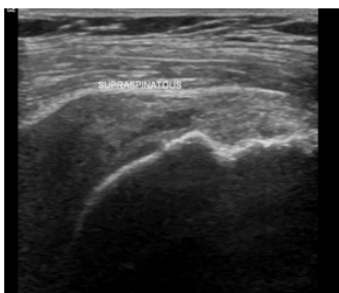


Figure 5 e - on USG, intrasubstance hypoechoic noted consistent with partial tear

In the present study, 34 (56%) patients of AC joint effusion was seen on USG examination, while on MRI also 34 (56.1 %) patient showed AC joint effusion. Thus MRI and USG showed a high agreement for detection of AC joint effusion. Among total 18 patients of bursitis detected on MRI, all patients were also positively detected on USG.

Hill sach's lesion (Figure 6) and Bankart lesions are common sequelae to recurrent dislocation of shoulder joint. Hill sach's lesion is a compression fracture of the postero-lateral humeral head due to its compression against the antero-inferior part of the glenoid when the humerus is anteriorly dislocated.



Figure 6 A – MRI coronal PDW image showing hill sach's lesion.



Figure 6 B - MRI coronal STIR image showing hill sach's lesion.

A Bankart lesion results from detachment of anterior inferior labrum from the underlying glenoid due to the same mechanism. It may occur as a rotation injury to the labrum, or it can extend to the bony glenoid margin, when it is called a bony Bankart. In most cases both findings are associated together. SLAP (Superior labral anterior posterior) tear is an abnormality of superior labrum usually centered on the attachment of the bony head of biceps tendon.

Out of 60 patients, 10 (16.6 %) were found to have Bankart lesion, 14 (23.3 %) had Hill sach's lesion and 6 (10 %) had SLAP lesion on MRI. None of the patients were found to have Bankart lesions, Hill sach's lesion and SLAP tear on USG. So present study showed MRI has better accuracy for detecting of Bankart lesion, Hill Sachs Lesion and SLAP tear.

SUMMARY AND CONCLUSION

Based on our result, it can be concluded that MRI had slightly better accuracy for detecting partial thickness tear and full thickness tear than Ultrasonography. Shoulder Ultrasonography also has high accuracy in diagnosing tears of rotator cuff and in differentiating partial from full thickness tear, and as Ultrasonography is easily available and cost effective it can be used as a primary screening modality in patients suspected of having rotator cuff tear. MRI can be reserved for patients with suspicious Ultrasonography results. However MRI had always been successful in overall assessment of joint structure and superior in estimation of assessment of correct site and extent of tear. MRI provide additional information likely associated labral tear and gleno-humeral ligaments which cannot be superseded by USG.

Acknowledgement

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