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RESEARCH ARTICLE
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USG AND MRI EVALUATION OF ROTATOR CUFF PATHOLOGY- SINGLE CENTER ANALYSIS.

Dr. Ranweer Singh Mandloi[1], Dr. Gurambir Singh Randhawa[2], Dr. Manoj Singh Patel[3*]

[1]Resident, department of radiodiagnosis, Peoples College of Medical Sciences and Research Centre, Bhopal. ranweer.mandloi06121987@gmail.com
[2]Resident, department of radiodiagnosis, Peoples College of Medical Sciences and Research Centre, Bhopal. guram2r@gmail.com

***Corresponding author:** Dr. Manoj Singh Patel
Resident, department of radiodiagnosis, Peoples College of Medical Sciences and Research Centre, Bhopal. drmanojsinghpatel@gmail.com

Abstract-
Background- Shoulder joint is an elegant anatomic structure. Its range of motion exceeds all other joints, yet under most circumstances it is stable. MRI and Ultrasonography have replaced the arthrography for evaluating the integrity of rotator cuff.
Aims- USG and MRI evaluation of rotator cuff pathology- single center analysis.
Materials and methods- this is a prospective study done in Department of Radio- diagnosis, Peoples college of medical sciences and research centre, Bhopal from January 2023 to January 2024 in 50 patients, in those patients who had been referred for USG, clinically suspicious of rotator cuff pathology selected according to the inclusion and exclusion criteria, and additional MRI of the shoulder joint was done following that. Findings of both MRI and USG were compared and evaluated.
Results- The commonest pathology in rotator cuff tendons was tendinosis (68%), followed by partial tear (64%); and full thickness tears (12%). The most common rotator cuff tendon involved was the supraspinatus tendon (86%), followed by subscapularis (46%) and infraspinatus (14%). USG had almost 100% specificity & sensitivity in diagnosing complete tendon tears. 43 patients (86%) had joint effusion. Peri-biceps tendon fluid was seen in 17 patients (34%), which was more common than subacromial-subdeltoid bursal effusion seen in 15patients (30%).
20 patients (40%) had Acromio-clavicular joint degenerative changes. USG had excellent specificity (88 to 100%), PPV (84 to 100%), better NPV (87 to 96%) and fair sensitivity (75 to 95%) as compared MRI for diagnosing rotator cuff pathologies.
Conclusion- USG and MRI are complementary imaging modalities for evaluation of abnormalities of the shoulder joint. The primary role of USG is evaluation of rotator cuff pathologies. However, MRI provides comprehensive evaluation of the shoulder joint.

INTRODUCTION- Shoulder joint is an elegant anatomic structure. Its range of motion exceeds all other joints, yet under most circumstances it is stable. The shoulder joint relies upon a variety of structures for stability, including the osseous glenoid, the fibrous labrum, the joint capsule, the glenohumeral ligaments, and various muscles around the shoulder [(1)].
The rotator cuff consists of the supraspinatus, infraspinatus, subscapularis and teres minor muscles and tendons. At the distal aspect of the rotator cuff, tendons splay out and interdigitate, forming a common continuous insertion on the greater and lesser tuberosity of the humerus [(2)]. The rotator cuff

is a functional- anatomic unit rather than four unrelated tendons, and injury to one component may have an influence on other regions of the rotator cuff.
The pre-requisites for normal cuff functioning are strong, healthy, intact cuff muscles and tendons, normal capsular laxity, smooth coracoacromial arch and normal bursae. Disorders of this complex mechanism are the most common source of shoulder problem [(3)].
A thorough understanding of the anatomy and function of the rotator cuff and of the consequences of rotator cuff disorders is essential for optimal treatment planning and prognostic accuracy. Identifying the disorder, understanding the potential clinical consequences, and reporting all relevant findings at rotator cuff imaging are also essential [(3)].

There are multiple studies in literature evaluating imaging techniques that can be used to detect rotator cuff abnormality. These techniques include radiography, ultrasonography, magnetic resonance (MR) imaging, MR arthrography, and computed tomographic (CT) arthrography. However, the choice of imaging test in day-to-day clinical practice is based on individual physician preference.
Arthrography is quite accurate in detecting complete tears but it is an invasive procedure with some associated risk and discomfort. In addition, it is insensitive to partial tears involving superficial surface or substance of the cuff. The diagnosis of partial tears, however, is important because many orthopedic surgeons will operate before it progresses to full thickness tear. The relative ease with which they are seen on MRI suggests that MRI may have a role in their diagnosis [(5)].

MRI can provide information about rotator cuff tears such as tear dimensions, tear depth or thickness and tear shape, involvement of adjacent structures (e.g. rotator interval, long head of biceps brachii tendon etc.) and muscle atrophy, all of which have implications for rotator cuff treatment and prognosis. Information about coraco-acromial arch and impingement as it relates to rotator cuff tears can also be obtained with MRI [(3)].
Although non-invasive, MRI is considerably more expensive than ultrasonography and will probably not replace it as a screening procedure for those trained in its use. For those cases in which the ultrasonography yields indeterminate results or in those institutions in which no one is trained in sonography of the shoulder, MRI may be a useful screening test. The major disadvantages of MRI are the long examination time, high cost and possibility of study being unsuccessful in very large or claustrophobic patients [(9)].
Ultrasonography is effective for detecting tears of the rotator cuff. The size of the tears can be classified and the findings used as a basis for management decisions. Ultrasonography can also reveal the presence of other abnormalities that may mimic rotator cuff tear including tendinosis, calcific tendinitis, sub-acromial sub-deltoid bursitis, greater tuberosity fracture [(10)].

Ultrasonography of rotator cuff is quick and painless. There is no risk of infection and in contrast to arthrography there is no discomfort following the procedure. The simplicity, rapidity, low cost and accuracy of the examination make it especially attractive as a screening and pre-surgical staging study [(1)]. MRI and Ultrasonography have replaced the arthrography for evaluating the integrity of rotator cuff. MRI has become the ―gold standard‖ for detecting both subtle and obvious internal derangement and assessing overall joint structure. Arthrography can be performed in those cases in which ultrasound and MRI are not definitive [(6)].

Both diagnostic ultrasound and magnetic resonance imaging (MRI) are used for investigation of the presence and severity of rotator cuff lesions. There is no consensus as to which is the more accurate and cost-effective study.
Thus, in our study, 50 patients with clinically suspected rotator cuff injury will be subjected to Ultrasonography and MRI, USG findings will be correlated with MRI findings in rotator cuff injuries.

AIM- To identify sonographic appearance of variable rotator cuff abnormalities.

MATERIALS AND METHODS

Source of Data:

this is a prospective study done in Department of Radio- diagnosis, Peoples college of medical sciences and research centre, Bhopal from January 2023 to January 2024 in 50 patients, in those patients who had been referred for USG, clinically suspicious of rotator cuff pathology selected according to the inclusion and exclusion criteria, and additional MRI of the shoulder joint was done following that. Findings of both MRI and USG were compared and evaluated.

Study Description:

a. Design Of Study: Prospective, observational and descriptive Study
b. Duration of the Study: January 2023 to January 2024
c. Sample size: 50
d. Sampling Method: Non probability convenience sampling
e. Inclusion Criteria:

- Clinically suspected to have rotator cuff pathology

f. Exclusion Criteria:

- Patient contraindicated to MRI
- Shoulder joint fracture in X-ray.
- Patient not willing or uncooperative for study.
- Previous history of surgery.
- Previous history of recurrent shoulder dislocation.
- Patient who did not undergo any one of the imaging modalities.

g. Intervention: Nil
h. Method of Collection of Data: observation type Parameters studied:
Principal parameters- Rotator cuff tendons

1. Supraspinatus
2. Infraspinatus
3. Teres minor
4. Subscapularis

OBSERVATION AND RESULTS

The present study was carried out to describe role of USG and magnetic resonance imaging of rotator cuff pathologies. Fifty patients who were found to have rotator cuff disease during the study period fulfilling the inclusion and the exclusion criteria were included in study.

Supraspinatus

Out of 50 patients in MRI, 43 patients (86%) had abnormal supraspinatus tendon, in which 19 (38%) had tendinosis, 3 (6%) were complete tear and 21 (42%) were partial tear.
While in USG, 40 (80%) patients had abnormal supraspinatus tendon, in which 18 (36%) had tendinosis, 3(6%) were complete tear and 19 (38%) were partial tear.

Subscapularis:

Out of 50 patients in MRI 20 patients (40%) had abnormal subscapularis tendon, in which 14 (28%) were tendinosis and partial tear constituted 6 (12%) cases.
While in USG 19 (38%) patients had abnormal subscapularis tendon, in which 14 (28%) were tendinosis and partial tear constituted 5(10%) of the cases.

Infraspinatus

Out of 50 patients MR detected 6 cases (12%) of abnormal infraspinatus tendon, in which 5 (10%) of

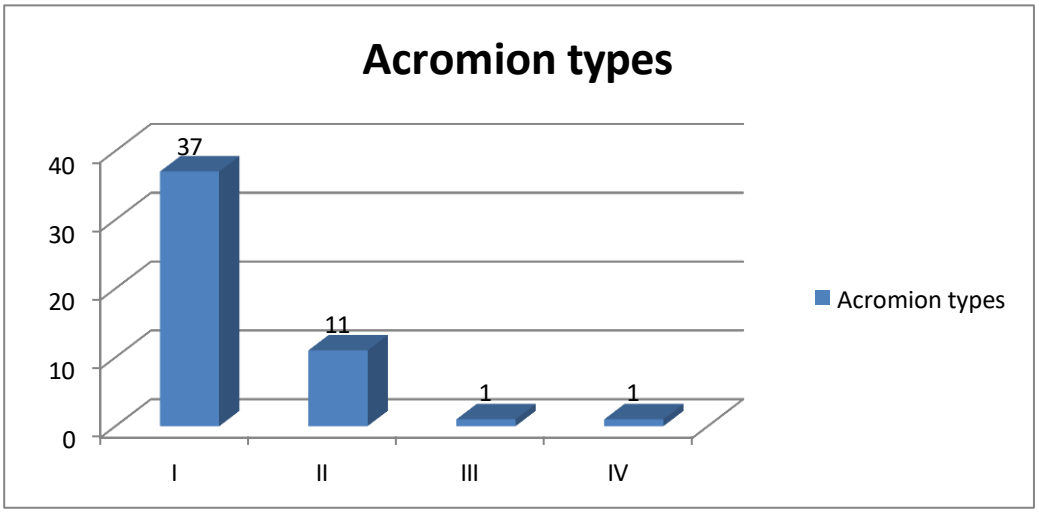
them were partial tear (10%) and 1 (2%) was tendinosis.
USG detected 4 (8%) cases of abnormal infraspinatus tendon in which 3 (6%) were partial tear and 1(2%) was tendinosis.

Teres minor
In our study, no teres minor pathology was found.

Joint Effusion
In our study 43 patients (86%) had joint effusion in MRI, while 35 patients (70%) with joint effusion were detected by USG. In both, mild joint effusion and peri-biceps tendon fluid was more common than moderate and subacromial- subdeltoid effusion respectively.

Subacromial-Subdeltoid bursal Effusion- MRI detected 15 cases while USG detected 13 cases of SASD bursal effusion.
Peri biceps tendon fluid- MRI detected 17 while USG detected 15 peri biceps tendon fluid collection.

Acromion Types:
Most common type of acromion in our study was type1 seen in 37 patients (74%), followed by Type II seen in 11 patients (22%).



Graph 1. Acromion Types

Acromion clavicular joint degenerative changes:
In our study among 50 cases, 20 patients (40%) had ACJ degenerative changes in MRI

Supraspinatus

Of 43 abnormal cases Supraspinatus tendon in MRI, USG had detected 40 cases. Among 7 normal cases in MRI, all cases were diagnosed as normal by USG.

Table No 1: Association among the cases between USG and MRI findings - Supraspinatus

USG findings Supraspinatus		MRI findings-Supraspinatus		Total
		Abnormal	Normal	
Abnormal	No	40	0	40
	%	80%	0.0%	80%

Normal	No	3	7	10
	%	6%	14%	20%
Total	No	43	7	50
	%	86%	14%	100.0%
Fisher‘s Exact Test			<0.00001	Significant

Diagnostic & Agreement tests	Estimate	Lower 95%Cl	Upper 95% Cl
Sensitivity	93.48%	82.10%	98.63%
Specificity	100.00%	59.04%	100.00%

Subscapularis:

Of 20 abnormal cases of subscapularis tendon in MRI, USG had detected 19 cases. Fisher Exact Test was significant.

Table No 2 Association among the cases between USG and MRI findings – Subscapularis

USG findings Subscapularis		MRI findings-Subscapularis		Total
		Abnormal	Normal	
Abnormal	No	19	0	19
	%	100%	0%	100.0%
Normal	No	1	30	31
	%	3.22%	96.77%	100.0%
Total	No	20	30	50
	%	40%	60%	100.0%

Fisher Exact Test	Value	Df	p-value	Association is-
	42.2125	1	<0.00001	Significant

Diagnostic & Agreement tests	Estimate	Lower 95%Cl	Upper 95% Cl
Sensitivity	95.65%	78.05%	99.89%
Specificity	100%	87.66%	100%

Infraspinatus

Of 6 abnormal cases of infraspinatus tendon in MRI, USG had detected 4 cases. Among 44 normal cases in MRI, all cases were diagnosed as normal in USG

Table No 3: Association among the cases between USG and MRI findings - Infraspinatus

USG findings Infraspinatus		MRI findings-Infraspinatus		Total
		Abnormal	Normal	

Abnormal	No	4	0	4
	%	100%	0.0%	100%
Normal	No	2	44	46
	%	4.3%	95.6%	100%
Total	No	6	44	50
	%	12%	88%	100%

Fisher‘s Exact Test		<0.00001	Significant

Diagnostic & Agreement tests	Estimate	Lower 95%Cl	Upper 95% Cl
Sensitivity	77.7%	39.99%	97.19%
Specificity	100.0%	87.23%	100.00%

Correlation of USG finding with MRI findings- Detail Evaluation Table No 4 Supraspinatus tendinosis –

USG findings- **Supraspinatus tendinosis**		MRI findings- **Supraspinatus tendinosis**		Total
		Abnormal	Normal	
Abnormal	No	18	0	18
	%	100.0%	0%	100%
Normal	No	1	31	32
	%	3.1%	96.87%	100%
Total	No	19	31	50
	%	38%	62%	100.0%

Diagnostic & Agreement tests	Estimate	Lower 95%Cl	Upper 95% Cl
Sensitivity	95.00%	75.13%	99.87%
Specificity	100.00%	88.78%	100.00%
Fisher‘s Exact test ^,#		0.000021	Significant

Table No 5: Subscapularis tendinosis

USG findings- **Subscapularis Tendinosis**		MRI findings **Subscapularis tendinosis**		Total
		Abnormal	Normal	
Abnormal	No	14	0	14
	%	100.0%	0%	100%
Normal	No	0	36	36

	%	0%	100%	100%
Total	No	14	36	50
	%	28%	72%	100.0%

Sensitivity	100.00%	76.84%	
Specificity	97.30%	85.84%	99.93%
Fisher's Exact test ^		0.00013	Significant

Infraspinatus tendinosis–

Among 1 case of intra-substance Infraspinatus tendinosis in MRI, it was detected on USG. Sensitivity, Specificity measures 100 %, 100%, respectively.

Association among the cases between USG and MRI findings Supraspinatus tear –

Among 24 cases of Supraspinatus tear in MRI, 3 cases are complete tear and among 7 cases of intra-substance partial tear, 2 cases of intra-substance partial tear are not detected by USG. Complete or full thickness tear is more frequent in supraspinatus in most of the literature.

Table No 6: Association among the cases between USG and MRI findings – Supraspinatus tear

USG findings – Subscapularis tear-location		**MRI findings – Supraspinatus tear-location**					**Total**
		Complete Tear#	**Articular surface partial tear#**	**Bursal surface partial tear#**	**Insertion partial tear#**	**Normal**	
Complete Tear#	**No**	3	0	0	0	0	3
	%	100%	0%	0%	0%	0%	100%
Articular surface partial tear#	**No**	0	9	0	0	0	9
	%	0%	100%	0%	0%	0%	100%
Bursal surface partial tear#	**No**	0	0	5	0	0	5
	%	0%	0%	100%	0%	0%	100%
Insertion partial tear	**No**	0	0	0	5	0	5
	%	0%	0%	0%	100%	0%	100%
Normal	**No**	0	0	0	2	26	28
	%	0%	0%	0%	7.14%	92.8%	100%
Total	**No**	3	9	5	7	26	50
	%	6%	18%	10.0%	14%	52%	100%

Table No 2: Association among the cases between USG and MRI findings – Supraspinatus tear

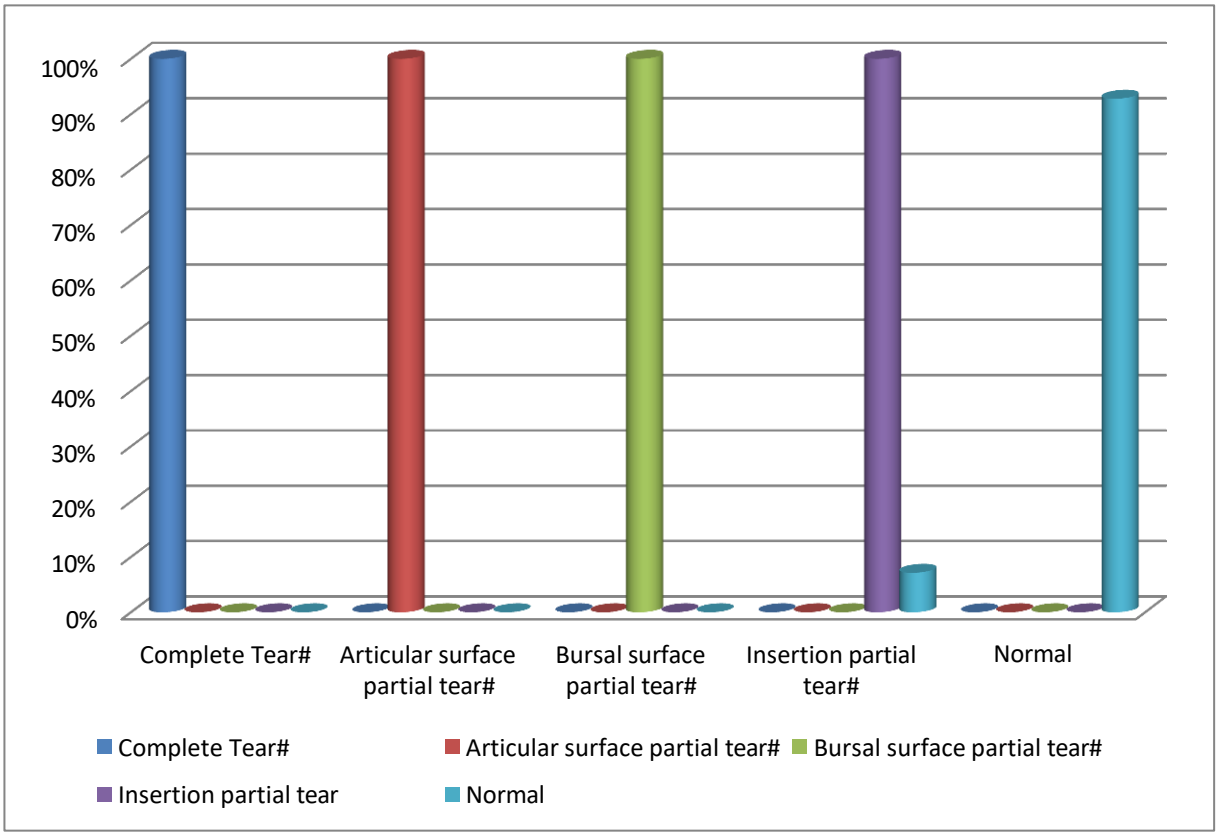


Table No 7: Association among the cases between USG and MRI findings – Supraspinatus Tear-Diagnostic agreement test

USG findings- **Supraspinatus tear - location**		MRI findings- **Supraspinatus tear-location**		Total
		Abnormal	Normal	
Abnormal	No	22	0	22
	%	100.0%	0%	100%
Normal	No	2	26	28
	%	7.1%	92.85%	100%
Total	No	24	26	50
	%	48%	52%	100.0%

Fisher‘s Exact Test		<0.00001	Significant

Diagnostic & Agreement tests	Estimate	Lower 95%Cl	Upper 95% Cl
Sensitivity	92.31%	74.87%	99.05%
Specificity	100.00%	86.77%	100.00%

Subscapularis Tear – Among 6 tendon tears on MRI, all were partial tears which were detected on USG. Out of 6 partial tears on MRI 5 were detected on USG, 1 articular surface partial tear was missed on USG.

Table No 8: Association among the cases between USG and MRI findings – Subscapularis Tear

USG findings – Subscapularis tear-location		MRI findings – Subscapularis tear-location					Total
		Complete Tear#	Articular surface partial tear#	Bursal surface partial tear#	Intra-substance partial tear#	Normal	
Complete Tear#	**No**	0	0	0	0	0	2
	%	0%	0%	0%	0%	0%	0%
Articular surface partial tear#	**No**	0	2	0	0	0	2
	%	0%	100%	0%	0%	0%	100%
Bursal surface partial tear#	**No**	0	0	1	0	0	1
	%	0%	0%	100%	0%	0%	100%
Intra- substance partial tear	**No**	0	0	0	2	0	2
	%	0%	0%	0%	100%	0%	100%
Normal	**No**	0	1	0	0	44	45
	%	0%	2.32%	0%	0%	97.77%	100%
Total	**No**	0	3	1	2	44	50
	%	0%	6%	2%	4%	88%	100%
Fisher‘s Exact test ^,#				<0.00001		Significant	

Graph No 3: Association among the cases between USG and MRI findings

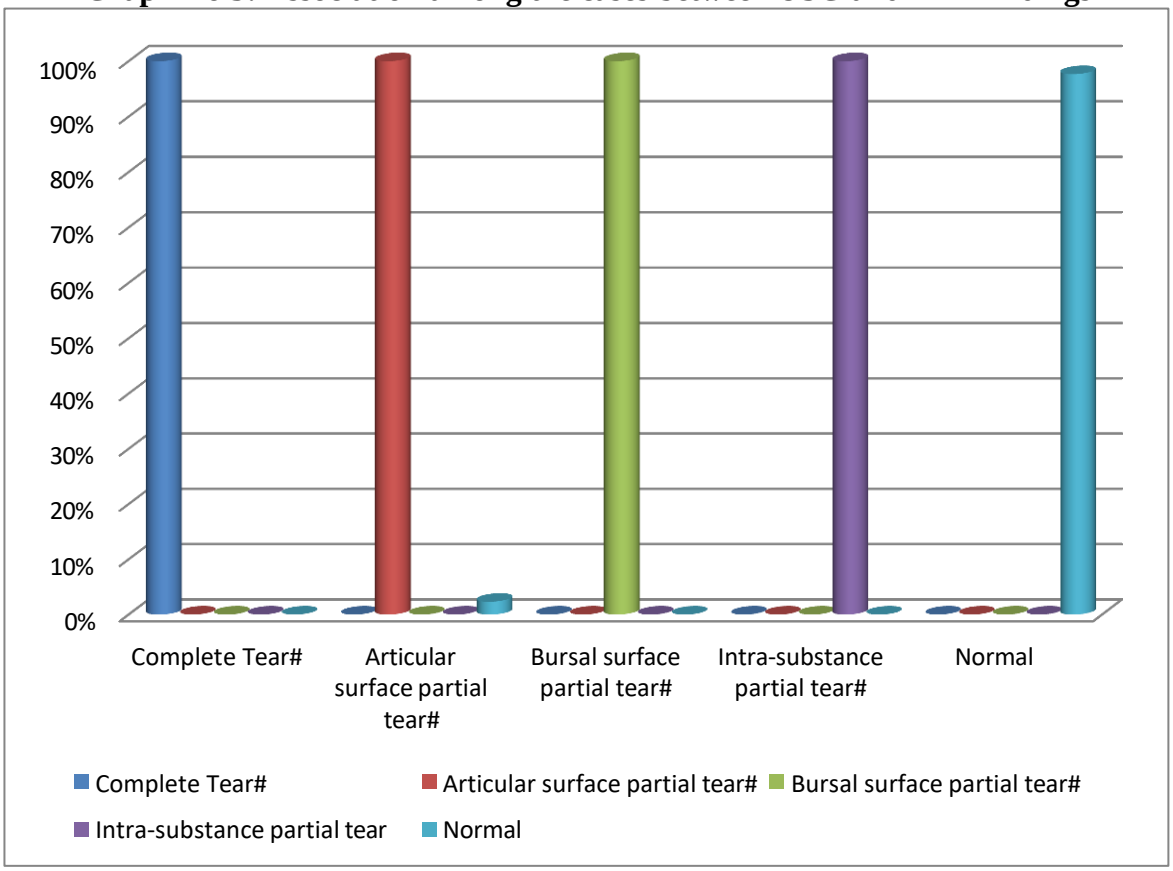


Table No 9: Subscapularis tear

USG findings- **Subscapularis tear – location**		MRI findings- **Subscapularis tear-location**		Total
		Abnormal	Normal	
Abnormal	No	5	0	5
	%	100%	0%	100%
Normal	No	1	44	45
	%	2.2%	97.77%	100%
Total	No	6	44	50
	%	12%	88%	100.0%

Fisher‘s Exact Test	-	<0.00001	Significant

Diagnostic & Agreement tests	Estimate	Lower 95%Cl	Upper 95% Cl
Sensitivity	88.89%	51.75%	99.72%
Specificity	100.00%	91.59%	100.00%

Infraspinatus tear –

Among 5 cases of Infraspinatus tear, 1case of intra-substance partial tear & bursal surface partial tear each is not detected by USG.

Table No 10: Association among the cases between USG and MRI findings – Infraspinatus tear

USG findings – Infraspinatus tear-location			MRI findings – Infraspinatus tear- location			
		Complete Tear#	Bursal surface partial tear#	Insertion partial tear#	Normal	Total
Complete Tear	**No**	0	0	0	0	0
	%	0%	0%	0%	0%	0%
Bursal surface partial tear#	**No**	0	0	0	0	0
	%	0%	0%	0%	0%	0%
Intra-substance partial tear	**No**	0	0	3	0	3
	%	0%	0%	100%	0%	100%
Normal	**No**	0	1	1	45	47
	%	0%	2.1%	2.1%	95.74%	100%
Total		0	1	4	45	50
		0%	2%	8%	90%	100%

Fisher‘s Exact test #		0.0001	Significant

Graph-3 No 14 Association among the cases between USG and MRI findings – Infraspinatus tear

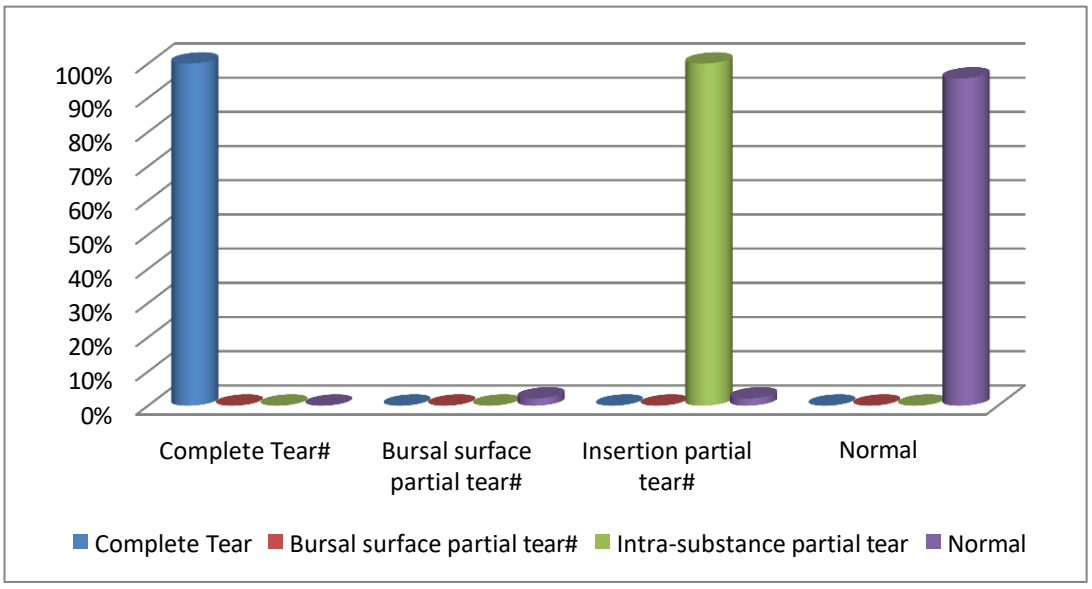


Table No 10: Association among the cases between USG and MRI findings – Infraspinatus tear-Diagnostic agreement test

USG findings- **Infraspinatus tear – location**		MRI findings- **Infraspinatus tear-location**		Total
		Abnormal	Normal	
Abnormal	No	3	0	3
	%	100.0%	0%	100%
Normal	No	2	45	47
	%	4.25%	95.74%	100%
Total	No	5	45	50
	%	10%	90%	100.0%
Fisher's Exact Test		0.0001	Significant	

Diagnostic & Agreement tests	**Estimate**	**Lower 95%Cl**	**Upper 95% Cl**
Sensitivity	75%	34.91%	96.81%
Specificity	100.00%	91.96%	100.00%

Association of joint effusion with rotator cuff pathology:

There was no significant correlation between joint effusion and degree of joint effusion with rotator cuff pathology in our study.

DISCUSSION

Pathology of the rotator cuff is the most common problem of the shoulder joint and accurate diagnosis is essential for appropriate management. Ultrasonography and MRI are successful imaging modalities for both rotator cuff and non-rotator cuff disorders. This study is conducted to compare the results obtained after the evaluation of the rotator cuff injuries of the shoulder joint by Ultrasonography and Magnetic Resonance Imaging. This is a prospective study of 50 patients who presented with shoulder pain. A history and clinical examination were done initially, following which USG examination of the affected shoulder was done, and finding were compared with shoulder MRI.

Sensitivity and specificity of USG in diagnosing abnormality in rotator cuff pathologies:

Supraspinatus –

Of 43 abnormal cases of Supraspinatus tendon in MRI, USG had detected 40 cases. Among 7 normal cases supraspinatus tendon in MRI, all cases were diagnosed as normal by USG. Sensitivity, Specificity 93.8%, 100%, respectively. Fisher Exact Test was 0.0001 i.e. significant.

In our study, 24 (55.8%) patients in MRI had tear of supraspinatus tendon, in which articular surface partial tear constituted 9 (37%) cases. While in USG, 22 (55%) patients had tear of supraspinatus tendon, in which bursal surface partial tear constituted 9 (40%) cases. In a study conducted by Zhang et al [(14)], the sensitivity of US diagnosis was 93.4 % (31/33), and specificity is 75% (3/4) and concluded that, high frequency ultrasound in the diagnosis of rotator cuff tears injuries has a high sensitivity and specificity. High frequency ultrasound can be used as a routine method to diagnose rotator cuff tears injuries. Our study shows sensitivity near equal to study done by Zhang et al [(14)], while specificity is high when compared to it.

Subscapularis -

In MRI 20 (40%) patients had abnormal Subscapularis tendon, in which articular surface tendinosis

constituted 7 (14%) cases. While in USG, 19 (38%) patients had abnormal Subscapularis tendon, in which 1 case of intra-substance tendinosis was diagnosed as articular surface tendinosis. Sensitivity, Specificity 95.65%, 100% respectively. Fisher Exact Test was 0.0001, significant. In the study conducted of 70 patients conducted by Nabetani Y., et al, [13]
, the diagnostic accuracy, sensitivity and specificity of US is 94.3%, 94.3 % and 95.8% when the intraoperative findings were regarded as a gold standard.

Infraspinatus –
Among 6 abnormal cases of Infraspinatus tendon in MRI, USG had detected 5 cases. While one intra-substance & one bursal surface partial tear was not detected in USG. Among 45 normal cases of Infraspinatus tendon in MRI, all cases were diagnosed normal in USG. Sensitivity, Specificity 77.77%, 100%, respectively. Fisher Exact Test was 0.0001, significant.

Tendinosis - Supraspinatus tendinosis -
Among 19 cases of Supraspinatus tendinosis on MRI, one intra-substance tendinosis was missed by USG. Sensitivity, Specificity 95%, 100% respectively. Fisher Exact Test was 0.000021, significant.
In meta- analysis conducted by Ottenheijm RE., et al [15], for tendinopathy, sensitivity ranged from 0.67 to 0.93, specificity from 0.88 to 1.00, which is same compared to our study.

Subscapularis tendinosis –
Among 14 cases of Subscapularis tendinosis, all were detected on USG but an intra-substance tendinosis was diagnosed as articular surface tendinosis on USG.
Sensitivity, Specificity, 100%, 97.3% respectively. Fisher Exact Test was 0.00013, significant.

Infraspinatus Tendinosis –
MRI detected 1 intra-substance tendinosis which was detected on USG as well. Sensitivity, Specificity, 100%, 100% respectively.

Rotator cuff tears:
Supraspinatus tear –
Among 24 cases of Supraspinatus tear in MRI, 3 cases are complete tear and are detected by USG. Among 7 cases of intra-substance partial tear 2 cases were missed by USG. Complete or full thickness tear is more frequent in supraspinatus in most of the literature. Sensitivity, Specificity, 92.30 %, 100%, respectively. Fisher Exact Test was 0.0001, significant.
In a study conducted by Ok JH, et al [16] in 51 patients, the sensitivity of USG for detecting partial thickness tears is 45.5% and that of full thickness tears was 80.0%. The specificity of USG for detecting partial thickness tears is 45.1% and for full thickness tears was 82.4% and Kappa coefficient is 0.47, which is less in compared to our study, however similar to our study sensitivity and specificity of complete tear is more in compared to partial tear.

Subscapularis tear –
Among 6 cases of Subscapularis tear in MRI, one articular surface partial tear was missed on USG. Sensitivity, Specificity, 88.89%, 100% respectively. Fisher Exact Test is 0.00001, significant.
Cochrane Database systemic review [12] done on 20 studies of people with suspected rotator cuff tears (1147 shoulders), of which six evaluated MRI and US (252 shoulders), or MRI and US (127 shoulders) in the same people shows rotator cuff tears, the summery sensitivity and specificity 91% (95% CI 83% to 95%) and 85% (95% CI 74% to 92%) respectively for US (13 studies, 854 shoulders).

Infraspinatus tear –
Among 6 cases of Infraspinatus tear 1 case each of bursal surface partial tear & intra-substance partial tear are missed by USG. Sensitivity, Specificity, 75%, 100% respectively. Fisher Exact Test was 0.0001, significant. In a prospective study conducted Sipola et al [17] in 77 patients, Sensitivity, Specificity, PPV, NPV of USG is 92 %, 45%, 91% and 50% respectively.

In a meta-analysis study conducted by Ottenheijm RP., et al [15], partial- thickness tears, pooled sensitivity of ultrasound was 0.72 (0.58-0.83), and specificity 0.93 (0.89-0.96), which is similar to our study.

Teres Minor –
In a study conducted [19] on 2436 shoulder MRI examinations for a period of 67-months period from September 1996 to April 2002. MRI findings of Teres minor abnormality were seen in 0.8% only among the study population. No teres minor pathology was found in our study.
In a retrospective study conducted Rutten MJ et al [18], in 5216 patients for past 4 years, US correctively depicted 22 (100%) of the 22 full-thickness tears, 6 (67%) of the 9 partial-thickness tears. Detection of complete tear by USG in good in compare to partial thickness tears which is similar to our study.

Joint effusion and rotator cuff diseases:
In our study, 43 (86%) patients had joint effusion in MRI, while 35 (70%) patients with joint effusion were detected by USG. In both USG and MRI mild joint effusion and peri-biceps tendon fluid is more common than moderate subacromial-subdeltoid bursal effusion.
In assessing degree of joint effusion in compare to MRI, USG findings correlate well.
There was no significant correlation between joint effusion or degree of joint effusion with rotator cuff pathology in our study which is contradictory to the study done by Arsalan G et al [20]. It was concluded in this study that fluid in the bursa (subacromial / sub deltoid), joint effusion had strong association with rotator cuff tears. The specificity and PPV for rotator cuff tears increase when both bursal and joint fluid were present, and careful evaluation of rotator tendons is a warranted to rule out tears in presence of joint effusion or bursal effusion.
In a study conducted by Hollister et al [11], the sonographic finding of intra-articular fluid alone (without bursal fluid) has both a low sensitivity and a low specificity for the diagnosis of rotator cuff tears. However, the finding of fluid in the sub acromial and sub deltoid bursa, especially when combined with a joint effusion, is highly specific and has a very high PPV for associated rotator cuff tear; however in our study there is no significant association between sub acromial- sub deltoid bursal effusions with rotator cuff tears.
Similar results were also found in the study by Gringer et al, [21] who reviewed 1831 MRI over 2 years. They suggested sub coracoid bursa effusions is not an incidental finding but may be associated with rotator cuff and rotator interval tears.

Acromion Types:
Acromion is classified as type I to IV, flat, curve inferior surface, hooked and convex near the distal end. Most common type of acromion in our study was type I seen in 37 (74%) patients, followed by type II seen in 11 (22%). In a study conducted by Musil et al [21], says relationship between the type of acromion and rotator cuff tears. In a study conducted Hamid et al, association between the acromial spur and full thickness rotator cuff tear is shown. However in our study there is no relationship between the type of acromion and rotator cuff tear.

Conclusion- USG and MRI are complementary imaging modalities for evaluation of abnormalities of the shoulder joint. The primary role of USG is evaluation of rotator cuff pathologies. However, MRI provides comprehensive evaluation of the shoulder joint.
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, fast, dynamic and widely available. Sound anatomical knowledge of the rotator cuff on USG, awareness of artifacts and practice is a prerequisite for this procedure.
MRI has lesser artifacts, good soft tissue resolution but has limitations of being time consuming, costly, static and not widely available. However MRI is excellent in evaluation of labral, capsular or ligamentous pathologies.
In our study, USG examination had excellent specificity (88 to 100%), PPV (84 to 100%), better NPV

(87 to 96%) and fair sensitivity (66 to 95%) as compared MRI for diagnosing rotator cuff pathologies. It is equal to MRI in diagnosing and quantifying joint effusion and acromio-clavicular degenerative changes. USG scores over MRI in diagnosing calcific tendinosis. MRI was better in evaluation of partial rotator cuff tear as compared to USG. USG can be used as a first line screning investigation for a case of shoulder joint pain to rule out rotator cuff pathologies; however it was found poor in detecting partial tears. USG cannot completely replace MRI in evaluation of rotator cuff pathology as partial tear of rotator cuff, which was the most common rotator cuff pathology in our study, was not as effectively diagnosed on USG compared to MRI.

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