MAK HILL Publications Research Journal of Medical Sciences

Research Article
doi: 10.59218/makrjms.2024.3.225.227

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Key Words
Rotator cuff injury of shoulder joint, partial thickness tears, USG and MRI

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Received: 20 December 2023
Accepted: 13 January 2024
Published: 25 January 2024

Citation: Dayanandaswamy and Jyoti Aggrawal, 2024. Rotator Cuff Injury of Shoulder Joint: Correlation of Accuracy Between USG and MRI in Partial Thickness Tears. Res. J. Med. Sci., 18: 225-227, doi: 10.59218/makrjms.2024.3.225.227

Rotator Cuff injury of Shoulder Joint: Correlation of Accuracy Between USG and MRI in Partial Thickness Tears

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ABSTRACT
Magnetic resonance imaging also seems to be a promising technique for shoulder pathology, including Rotator Cuff Tears. However, Magnetic resonance imaging is time-consuming, expensive, and not readily available. On the other hand, due to the specialized expertise required for shoulder sonography and the long learning curve, sonography might be less available than Magnetic resonance imaging in some countries. 100 patients with traumatic shoulder injury or chronic shoulder pain that were clinically examined by orthopedician and highly suspective of rotator cuff tear were referred for USG and MR evaluation. Present study showed that Rotator cuff Injury are studied well on both USG & MRI and are well correlating. While USG can be used in emergency situation, MRI can be reserved for patient with stable condition.

INTRODUCTION

The location of shoulder pain is a poor indicator of its origin and the value of clinical assessment of the shoulder is often limited. Plain radiography, often used to supplement the clinical examination, is hardly diagnostic for Rotator Cuff Tears. Traditionally, arthrography has been used through the years to detect Rotator Cuff Tears. Both sonography and magnetic resonance imaging, developed as new imaging techniques in the past 10 years, can be applied to the visualization of shoulder pathology. A recent study has shown that sonography and arthrography are of equal value for the detection of full-thickness Rotator Cuff Tears[1,2]. However, arthrography is an invasive technique, with up to 50% of patients experiencing more pain 24-48 hours after injection of the contrast material. Magnetic resonance imaging also seems to be a promising technique for shoulder pathology, including Rotator Cuff Tears. However, Magnetic resonance imaging is time-consuming, expensive and not readily available. On the other hand, due to the specialized expertise required for shoulder sonography and the long learning curve, sonography might be less available than Magnetic resonance imaging in some countries[3,4].

The purpose of present study was to compare the diagnostic efficacy of US and MR imaging in the detection of full and partial-thickness rotator cuff tears in symptomatic patients using updated equipment, with arthroscopy or open surgery used as the reference standard.

MATERIALS AND METHODS

The study protocol was approved by our Institutional ethics committee and informed consent was obtained from all patients before USG & MRI study. Hundred patients with traumatic shoulder injury or chronic shoulder pain that were clinically examined by orthopedician and highly suspective of rotator cuff tear were referred for USG and MR evaluation.

Examination Conducted on:

- Voluson pro 730 USG machine using linear probe of frequency range 7-12 MHz
- Siemens Magnetom C_MR Scanner using a surface coil placed anteriorly over the shoulder

Imaging Parameters for the Sequences Performed during the MR Examination:
The Slice Thickness: 5mm.

Field of view (FOV): 16-20 cm. Sequences performed were:

- **Oblique Coronal:** T2 FSE
- T2 FSE FS
- **Oblique Sagittal:** T2 FSE
- **Axial**: T1 FSE
- T2 FSE
- GRE

Inclusion Criteria: Patients who were clinically examined and highly suspected to have a rotator cuff pathology, both acute and chronic and in those whom USG and MR imaging reveals a rotator cuff lesion.

Exclusion Criteria:

- Patients with metallic implants, cardiac pacemakers, cochlear implants
- Post treatment patients
- Post-surgery patients
- Patients who were claustrophobic
- Patient who were unwilling for imaging

All 100 shoulders were analyzed for rotator cuff injury and also assessed for rotator cuff signal and morphology, synovitis/effusion, bursitis. USG Criteria used for Rotator Cuff Tears:

- Non-visualization of the cuff
- Localized absence or focal non-visualization
- Discontinuity
- Focal abnormal echogenicity

USG technique explained in review of literature. MRI criteria used for rotator cuff tear in present study:

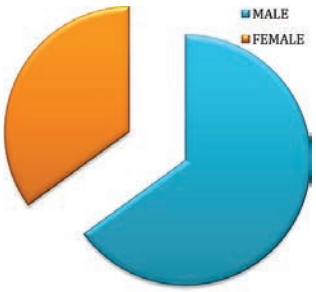

Fig 1: Gender distribution of patients in present study

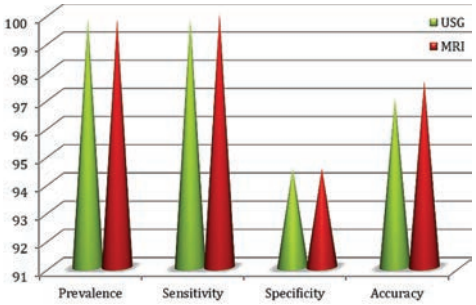

Fig 2: Correlation of accuracy between USG and MRI in partial thickness tears in present study

Table 1: Gender distribution of patients in present study

Gender	No. of patients
Male	65
Female	35

Table 2: Partial thickness tears in present study

	TP	TN	FP	FN	Total
USG	46	0	1	5	52
MRI	48	0	2	2	52
Surgery	50	2	0	0	52

Table 3: Observations for partial thickness tears in present study

	USG	MRI
Prevalence	99.8%	99.8%
Sensitivity	99.8%	100%
Specificity	94.5%	94.5%
Accuracy	97%	97.6%

p>0.05

Table 4: Sensitivity and Specificity of USG and MRI in Siebold *et al*.[6]

Specificity (full thickness tear) %		Specificity (partial thickness tear) %
USG	76-94	94
MRI	93-99	85-99

Table 5: Comparison of results of accuracy of present study with other studies

	Partial Thickness RCT	
	USG	MRI
Present Study	88%	92%
Fotiadou *et al*.[8]	90%	96%
Siebold *et al*.[6]	99%	87.5%

- **A:** At the articular surface
- **B:** At the bursal surface
- **C:** A complete tear, connecting A and B tears

RESULTS AND DISCUSSIONS

In Joseph O. de Jesus study in[5] ROC curve is greatest for MR arthrography (0.935), followed by ultrasound (0.889) and then MRI (0.878), however, pairwise comparisons of these curves show no significant differences between MRI and ultrasound (p>0.05) and concluded that MR arthrography is the most sensitive and specific technique for diagnosing both full-and partial-thickness rotator cuff tears. Ultrasound and MRI are comparable in both sensitivity and specificity, similarly in present study MRI and USG are comparable in both sensitivity and specificity with (p>0.05%). Both studies are well correlating. Sensitivity of both imaging modalities i.e. USG and MRI are coming high in present study as compared to siebold *et al*.[7] study, this could be due selection of patients with strong suspicion of tear and exaggerated positive case inclusion in present study.

Hence, present study showed that Rotator cuff Injury are studied well on both USG and MRI and are well correlating. While USG can be used in emergency situation, MRI can be reserved for patient with stable condition.

CONCLUSION

USG can be used as first imaging modality in patients suspected of Rotator cuff injury. However in equivocal and doubtful cases MRI can be recommended. By categorizing Rotator cuff tears unnecessary surgical and arthroscopic procedures can be minimized.

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