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Correlation of Accuracy Between USG and MRI in Full Thickness Tears of Rotator Cuff Injury of Shoulder Joint

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ABSTRACT
Sonographic evaluation of the rotator cuff was initially attempted over two decades ago, not in a popular manner though among radiologists. Early reports did not show favorable results of ultrasonography. Magnetic resonance imaging became rapidly the favored technique of preoperative shoulder joint evaluation and succeeded in the detection of partial and full-thickness rotator cuff tears with high sensitivity and accuracy. The study protocol was approved by our Institutional ethics committee and informed consent was obtained from all patients before USG and 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. In present study of 100 patients, out of 100 patients 94 patients were having rotator cuff tears. Forty two patients were having full thickness tear and 52 patients were having partial thickness tear. From total 42 patients of full thickness tear-40 patients were positive on USG and 41 patients were positive on MRI. From total 52 patients of partial thickness tear-46 patients were positive on USG and 48 patients were positive on MRI.

INTRODUCTION

Tears of the rotator cuff are a common cause of shoulder pain and disability. Early diagnosis allows proper surgical treatment planning that can prevent functional impairment.

Sonographic evaluation of the rotator cuff was initially attempted over two decades ago, not in a popular manner though among radiologists. Early reports did not show favorable results of ultrasonography. Magnetic resonance imaging became rapidly the favored technique of preoperative shoulder joint evaluation and succeeded in the detection of partial and full-thickness rotator cuff tears with high sensitivity and accuracy[1,2].

Thus, MR imaging has been considered the imaging modality of choice for evaluating the rotator cuff tears despite its relatively high cost and occasional limited availability. The technological evolution of high-resolution ultrasound scanners during the last decade allowed substantial improvement in the quality of images and renewed the interest related to US evaluation of the rotator cuff[3].

US has been reported to be reliable in detecting full-thickness rotator cuff tears, compared with surgical findings and/or MR imaging but detection of partial-thickness tears has been controversial. One study has reviewed the existing literature and provided sensitivities and specificities of MRI and ultrasound for the diagnosis of rotator cuff tears. That study included literature with both surgical and nonsurgical reference standards and was published in 2003, after which important advances in both MRI and ultrasound imaging were made[4].

The diagnosis of a rotator cuff tear and its extent, full or partial thickness, can determine whether the patient will be managed conservatively or will need surgery. Furthermore, the surgical approach, open versus arthroscopic, can be chosen once the correct diagnosis is made. Of the various imaging tests that have been used to evaluate the painful Shoulder, unenhanced MRI, indirect and direct MR arthrography and ultrasound have become the standards by which a rotator cuff tear is diagnosed. In the medical literature, various sensitivities and specificities have been reported for these techniques. Although each technique has its inherent strengths and weaknesses, there seems to be no general consensus about which is the most accurate test, despite the large number of studies in the literature[5,6].

MATERIALS AND METHODS

This was a prospective study conducted in the department of Radiodiagnosis. The study protocol was approved by our Institutional ethics committee and informed consent was obtained from all patients before USG and 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 to 20 cm. Sequences performed were:

- **Oblique coronal:** T2 FSE : T2 FSE FS
- **Oblique sagittal:** 2 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:

- Nonvisualization of the cuff
- Localized absence or focal nonvisualization
- Discontinuity
- Focal abnormal echogenicity

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

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

RESULTS

65 patients were below the age of 60 years and 35 patients were above 60 years (Table 1-3).

DISCUSSIONS

Shoulder disorders are common, with as many as 20% of people experiencing shoulder problems at

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

some stage in life. Shoulder disorders account for 5% of all consultations with family physicians. Of patients presenting with shoulder symptoms, 80% remain symptomatic 6 months later and 50% have symptoms at 18 months. Shoulder pain is usually poorly localized, with the exception of pain occurring in the acromioclavicular joint. In patients older than 40 years, the main causes of shoulder pain and/or functional deficit are adhesive capsulitis (frozen shoulder) and impingement and/or rotator cuff disease. Ultrasonography is well tolerated and cost-effective. Its disadvantages include a long learning curve and reduced sensitivity in patients who are obese or who have severely restricted shoulder movement.

MRI also requires a long learning curve and is costly compared to USG. With advent of advance technique and easy performing MRI are better opted these days[7]. In present study of 100 patients, out of 100 patients 94 patients were having rotator cuff tears. 42 patients were having full thickness tear and 52 patients were having partial thickness tear. From total 42 patients of full thickness tear-40 patients were positive on USG and 41 patients were positive on MRI. From total 52 patients of partial thickness tear-46 patients were positive on USG and 48 patients were positive on MRI.

Whereas in Anastasia Fotiadou *et al*.[8] study in 2008, out of 100 patients 88 patients were having rotator cuff tears. 57 patients were having full thickness tear and 31 patients were having partial thickness tear. From total 57 patients of full thickness tear-56 patients were positive on USG and 57 patients were positive on MRI. From total 31 patients of partial thickness tear-27 patients were positive on USG and 28 patients were positive on MRI.

Present study reveals accuracy of USG-97 and MRI-97.6%, similarly Anastasia Fotiadou *et al*.[8] study in 2008 reveals accuracy of USG-98% and MRI-100% in full thickness tear. Present study reveals accuracy of USG-88% and MRI 92%, similarly Anastasia Fotiadou *et al*.[8] study in 2008 reveals accuracy of USG-90% and MRI-96%.

CONCLUSION

USG and MRI are well correlated for evaluation of rotator cuff tears. Both modalities are well correlated in terms of sensitivity and specificity.

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