

Comparison of sensitivity and specificity of ultrasound scan and magnetic resonance imaging in diagnosing full thickness and partial thickness rotator cuff tear in patients with shoulder trauma

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Abstract

Introduction: The shoulder joint stability is given predominantly by soft tissue structures. Correspondingly, correct diagnosis and treatment of diseases of the soft tissue structures around the glenohumeral joint are of major importance. The rotator cuff is composed of the musculo-tendinous parts of the subscapularis, supraspinatus, infraspinatus and teres minor muscles, which are affected with different frequencies by degeneration and trauma. **Aim and Objectives:** Find sensitivity and specificity of ultrasound scan and MRI in complete and partial thickness rotator cuff tears diagnosed clinically in patients with history of trauma. **Materials and Methods:** 41 Shoulder injury patients were analysed from September-2012 TO July 2014 in OPD and in patient of Father Muller Medical College with history of trauma examined clinically with various tests mentioned above to arrive at a clinical diagnosis and subjected to ultrasound and MRI examination to confirm diagnosis. **Results:** Complete tears were noted in 6 patients out of 6 patients in both ultrasound and MRI scanning. Incomplete or partial tears were picked up in 26 out of 35 patients by ultrasound scanning. MRI scan picked up partial or incomplete tear in 32 out of 35 patients. **Conclusion:** BEST non invasive investigation of choice to confirm the diagnosis is MRI in full thickness and especially in partial thickness rotator cuff tear with sensitivity of 100% and specificity of 96.3%, KAPPA statistics value of 0.936. Where ultrasound scan lacks in sensitivity. Next best alternative non invasive investigation is ultrasound scanning which is usually widely available, less cost, non invasive it has become one of the better methods of diagnosing rotator cuff injuries.

Keywords: US, MRI, Shoulder.

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INTRODUCTION

The shoulder joint stability is given predominantly by soft tissue structures. Correspondingly, correct diagnosis and treatment of diseases of the soft tissue structures around

the glenohumeral joint are of major importance. The rotator cuff is composed of the musculo-tendinous parts of the subscapularis, supraspinatus, infraspinatus and teres minor muscles, which are affected with different frequencies by degeneration and trauma. There are findings on diagnostic images, which indicate a certain etiology of rotator cuff disease, in individual cases, however, an etiologic differentiation might be difficult and most important for the assessment of different imaging modalities is their ability to detect combined pathologies of the shoulder joint^{1,11,20,24}.

AIM AND OBJECTIVES

Find sensitivity and specificity of ultrasound scan and MRI in complete and partial thickness rotator cuff tears diagnosed clinically in patients with history of trauma.

ANALYSIS OF DATA

Then clinical diagnosis is correlated with ultrasound and MRI diagnosis, compared and analyzed for sensitivity, specificity, positive predictive value, negative predictive value, P-Value KAPPA value using KAPPA statistics. And final conclusions are made.

MATERIALS AND METHODS

41 Shoulder injury patients were analysed from September-2012 TO July 2014 in OPD and in patient of Father Muller Medical College with history of trauma examined clinically with various tests mentioned above to arrive at a clinical diagnosis and subjected to ultrasound. Radiologist using a high-resolution Philips IU-22 Machine with linear-array transducer with variable high frequency (5-12 MHz) probe scanned all the patients; the sonographic evaluation of the rotator cuff was performed according to a standard protocol and MRI examination to confirm diagnosis X-ray examinations of shoulder joint were done in all patients to rule out bone fractures, osteoarthritis, any bone pathology and inflammatory arthritis.

RESULTS

1-Complete tears were noted in 6 patients out of 6 patients in both ultrasound and MRI scanning Age range: 43-83 years

Figure 1: Age Distribution

Age (yrs)	Nos.	Percentage (%)
<40trs	0	0
41-50	3	50
51-60	0	0
>60yrs	3	50
Total	6	100

6 patients (2 male 4 female) with age ranging from 43 to 83 years with history of trauma.

Figure 2: Side distribution

Side	Right	Left
	3	3

3 dominant hand and 3 non dominant hand

Figure 3: Sex distribution

Gender	Nos.	Percentage
Male	2	33.34
Female	4	66.66
Total	6	100

2- Male, 4-Female patients.

	No's		No's		No's
Clinically positive	6	Ultrasound and MRI Positive	06	Ultrasound and MRI negative	0
Clinically negative	35	Ultrasound and MRI Positive	00	Ultrasound and MRI negative	35

Kappa Statistics of Both MRI and Ultrasound

Sensitivity of 100%
 Specificity of 100%
 Positive predictive value [PPV] of 100%
 Negative predictive value of 100%
 Kappa -1
 P-Value-<0.01

2A-Incomplete or partial tears were picked up in 26 out of 35 patients by ultrasound scanning.

2B-MRI scan picked up partial or incomplete tear in 32 out of 35 patients.

Age range-21-70 years

Figure 5: Age distribution

Age (yrs)	No's	Percentage (%)
<40trs	11	31.42
41-50	8	22.85
51-60	8	22.85
>60yrs	8	22.85
Total	35	100

35 patients (26 male 9 female) with age ranging from 21 to 70 years with history of trauma.

side	right	left
	24	11

35 patients (26 male 9 female) with age ranging from 21 to 70 years with history of trauma.

24 dominant hand and 11 non dominant hand

Gender	Nos.	Percentage %
Male	26	78.28
Female	9	25.72
Total	35	100

Figure 6: Sex distribution

	No's		No's		No's
Clinically positive	35	Ultrasound Positive	26	ultrasound negative	9
Clinically negative	6	Ultrasound Positive	00	ultrasound negative	6

Clinically positive	35	MRI Positive	32	MRI negative	3
Clinically negative	6	MRI Positive	00	MRI negative	6

Kappa Statistics of Ultrasound Scan

Sensitivity of 73.3%
 Specificity of 100%
 Positive predictive value [PPV] of 100%
 Negative predictive value of 40%
 Kappa -0.458
 P-Value-<0.001

Kappa Statistics of MRI

Sensitivity of 100%
Specificity of 96.3%
Positive predictive value [PPV] 91.4%
Negative predictive value of 100%
Kappa =0.936
P-Value-<0.001

The 3 negative patients {1 female 2 male} where MRI scan showed negative for partial or incomplete tear. Arthroscopy was done and diagnosis of partial tear was confirmed.

DISCUSSION

A number of studies have been carried out since 1995, in order to compare Ultrasound and MRI in detecting partial tears and complete tear of the rotator cuff, with correlation to surgical findings. The results of these studies are controversial and, although a consistent improvement in detection rates has occurred with advancement in imaging techniques, use of higher end machines with high end probes frequency ranging between(5-13 MHz). Our data says that ultrasound and MRI are very good diagnosing tool in diagnosing full thickness rotator cuff tears. But MRI is more sensitive in diagnosing partial thickness tears compared to ultrasound as shown in our study. Invasive methods are like MR-Arthrography and Diagnostic Arthroscopy are the best investigations to diagnose all kinds of rotator cuff tears. But due its limited availability, high cost of procedure, skilled man power, complications and technical expertise to do it, its usage is limited in clinical practice. Clinical examination is considered essential for classification of subgroups of patients with shoulder pathology. Identification of tears as partial and correct localization (articular or bursal) is of great importance for the treating surgeons. Exact localization aids decision-making regarding the procedure (arthroscopic or mini-open), since only arthroscopy allows intraarticular visualization of the rotator cuff structures. Dimensions of the partial tear have relatively less importance since great retraction of partial lesions is not expected. The most useful information that the surgeon would seek from an imaging modality regarding partial tears is the depth of the lesion, since significant lesions (50% thickness) necessitate repair.^{4,11, 13,16,20,24,25,27,28}

CONCLUSION

Rotator cuff tear is most common noted pathology in shoulder following injury due to trauma where patient has painful and limited range of motion especially abduction and internal rotation movements along with clinical examination. Best non invasive investigation of choice to confirm the diagnosis is MRI in full thickness and especially in partial thickness rotator cuff tear with

sensitivity of 100% and specificity of 96.3%, KAPPA statistics value of 0.936. Where ultrasound scan lacks in sensitivity. Next best alternative non invasive investigation is ultrasound scanning which is usually widely available, less cost, non invasive it has become one of the better methods of diagnosing rotator cuff injuries. Ultrasound has an established role in detecting shoulder pathology, particularly full thickness rotator cuff tears with almost Sensitivity of 100% and Specificity of 100%. In partial thickness tear its Sensitivity of 73.3% and Specificity of 100% with KAPPA statistics value of 0.458 which says it is a good diagnostic tool to detect partial tears also if modern machines with probes frequency ranging between 5-12 MHz are used by an experienced radiologist and proper protocol is followed while examining the patient.

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