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Original article:

Study of evaluation of the role of MRI in rotator cuff injuries

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Abstract:

Introduction: The shoulder joint is an incongruous ball and socket joint without any fixed axis of rotation, which has a wide range of motion in multiple planes; hence stability is compromised for mobility.

Material and methods: 30 patients referred to the department of Radio diagnosis, Adesh Medical College and Hospital, Kurukshetra, Haryana with clinically suspected rotator cuff injuries were subjected to undergo MRI after thorough history taking and clinical examination. After clinical evaluation, once a patient satisfied the inclusion and exclusion criteria for this study, he or she would undergo MRI examination after giving consent.

Results: In our study 13 cases had bone changes of which 16.7% were Subchondral cysts, 10% were erosions/osteophytes and 16.7% were edema/contusion. In our study only 20% of patients had associated Labral tear. In MRI it was observed that 16 patients had tendon lesions of supraspinatus muscle, 2 patients had Infraspinatus tear, 6 patients had Subscapular tear and there was no tear in Teres minor and Biceps tendon. 6 patients had tendinosis of supraspinatus muscle.

Conclusion: In our study MRI had a sensitivity of 92%, specificity of 80%, PPV of 95.83%, NPV of 66.67%, diagnostic accuracy of 90% and kappa degree of agreement of 0.66. These results suggest that MRI is sensitive and has good diagnostic accuracy in detecting rotator cuff tears.

Keywords: rotator cuff injuries, shoulder joint, MRI

Introduction:

The shoulder joint is an incongruous ball and socket joint without any fixed axis of rotation, which has a wide range of motion in multiple planes; hence stability is compromised for mobility.[1] To compensate for the unstable bony anatomy the shoulder is protected anteriorly, posteriorly and superiorly by a capsule and the tendons that form the rotator cuff. The radiological diagnosis of rotator cuff tears has traditionally been performed with arthrography and more recently with ultrasonography and MRI[2]. Rotator cuff disease is one of the most common causes of shoulder pain. In addition to history and physical examination, evaluation of a patient with shoulder pain often involves assessment of the rotator cuff with a diagnostic test such as high resolution ultrasonography or MRI[3].

Material and methods:

The main source of data for the study were patients from the following teaching Hospital attached to Adesh group of institutions, Adesh Medical College and Hospital, Kurukshetra, Haryana

30 patients referred to the Adesh Medical College and Hospital, Kurukshetra, Haryana with clinically suspected rotator cuff injuries were subjected to undergo USG and MRI after thorough history taking and clinical examination.

Study Period: Two years

Study Design: Proportion study

Inclusion criteria:

The study includes

- All patients with clinical suspicious of rotator cuff injuries.
- Cases of all age groups irrespective of sex

Exclusion criteria:

The study will exclude

- Patient having history of claustrophobia.
- Patient having history of metallic implants insertion, cardiac pacemakers and metallic foreign body insitu.

After clinical evaluation, once a patient satisfied the inclusion and exclusion criteria for this study, he or she would undergo MRI examination after giving consent.

MRI examination of the shoulder: was performed on 1.5 Tesla MRI scanner (Achieva, Philips), using a dedicated surface coil for shoulder. Patient was placed in supine position with external rotation of affected shoulder wherever possible.

Data was entered into Microsoft excel sheet and was analyzed using EPI Info 7 version software.

Results:

The age of the patients with rotator cuff pathologies studied ranged from 23 to 76 years, with a mean of 46.6 +/- 2.08.

The patients involved in the study were divided into 3 age groups viz. <40 years, 41-50 years, >50 years. Majority of Rotator cuff injures were observed after 50 yrs of age in 40% of subjects. 30% at < 40 yrs and 41 to 50 yrs.

Of the 30 patients studied, 5(16.7%) were females and 25 (83.3%) were males. The mean age among females was 54 + /-1.98 and the mean age among males was 45.12+/- 2.2.

Majority of the patients with rotator cuff injuries presented with pain (43.3%), followed by Inability to do overhead abduction in 23.3%, Stiffness in 13.3%, pain and stiffness in 10%, pain and weakness in 6.7% and weakness in 3.3%.

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Table 1: MRI findings in Tendon injuries

		SS	IP	SUB	TM	BT
Tendons	No tear	8	28	24	30	30
	Articular surface partial tear	10	1	4	0	0
	Bursal surface partial tear	2	0	0	0	0
	Full thickness tear	3	1	2	0	0
	Intrasubstance tear	1	0	0	0	0
	Tendinosis	6	0	0	0	0
	Total	30	30	30	30	30

In MRI it was observed that 16 patients had tendon lesions of supraspinatus muscle, 2 patients had Infraspinatus tear, 6 patients had Subscapular tear and there was no tear in Teres minor and Biceps tendon. 6 patients had tendinosis of supraspinatus muscle.

Table 2: Calcification diagnosed by MRI

		Frequency	Percent
SS	Absent	29	96.7
	Present	1	3.3
IP	Absent	30	100
SUB	Absent	30	100
TM	Absent	30	100
BT	Absent	30	100

In the study one patient was diagnosed to have calcification in Supraspinatus tendon.

TABLE 3: MRI Findings of Labral tear

		Frequency	Percent
LABRAL TEAR	Absent	24	80
	Present	6	20
	Total	30	100.0

In our study only 20% of patients had associated Labral tear.

TABLE 4: MRI findings of Bone changes

		Frequency	Percent
Bone Changes	**Normal**	17	56.7
	Subchondral cysts	5	16.7
	Erosions/osteophytes	3	10.0
	Edema/contusion	5	16.7
	Total	30	100.0

In our study 13 cases had bone changes of which 16.7% were Subchondral cysts, 10% were erosions/osteophytes and 16.7% were edema/contusion.

Table 5: Other Findings on MRI in Rotator Cuff Injuries

		Frequency	Percent
OTHERS	Axillary Ln	1	14.3
	Communited Fracture Of Humeral Head	1	14.3
	Greater Tuberosity Avulsion Fracture	1	14.3
	Hill Sach Lesion	1	14.3
	Hill Sach Lesion With Lesser Tuberosity Fracture	1	14.3
	Humeral Head Fracture With Muscle Edema	1	14.3
	Multiple Exostosis Arising From Humeral Head, Neck And Shaft	1	14.2
	Total	**7**	**100**

Discussion:

Various techniques are used for evaluating patients with rotator cuff tears including clinical examination, X-ray, Arthrography, USG, CT scan and MRI. The gold standard is arthrography but has the disadvantage of being invasive. MRI is sensitive and specific but is expensive and cannot be used as a first line of investigation. However, USG is a non-invasive, relatively inexpensive modality that can be used as a first line of investigation. [4]

The soft tissue structures supporting the shoulder are arranged in multiple planes, hence the direct multiplanar imaging capability of MRI is superior to the single plane capability of computed tomography. The rotator cuff is well visualized in MRI and the individual central tendons of the four rotator cuff muscles can be separately identified[5]. Thus allowing precise localization and quantification of rotator cuff abnormalities. MRI can demonstrate the rotator cuff excellently including the subacromial portion, which is hidden from view on ultrasonography. In our study most commonly involved tendon was supraspinatus (73.3%), followed by subscapularis (20%), infraspinatus (6.67%) with teres minor and biceps tendon least commonly affected (0%). This is consistent with literature[6] In our study done in 30 patients with rotator cuff pathologies, most common was type II

in 12 (40%) followed by type III in 8 (22%) then type I in 6 (20%) and least common type IV in 4 (13.3%). In this study it was found 66.67% of patients (20 out of 30) had either type II or III acromion. Of these patients 14 (70%) had tears (partial and complete), 3(15%) had tendinosis and 3 (15%) had normal supraspinatus tendon. Thus in this study rotator cuff pathologies were common with type II /III acromion which is consistent with literature[7,8].

An overlap of symptoms exists among patients with a glenoid labral lesion and those with a rotator cuff disorder or glenohumeral instability[93].A labral tear can result as a result of trauma like in patients who engage in over head throwing athletic sport activities, or secondary to degenerative changes in the labrum leading on to tear. Rotator cuff tears and long head of the biceps tendinopathy may accompany a superior labral tear. Both chronic overuse tears of the posterosuperior labrum and articular-side partial tears of the supraspinatus and infraspinatus tendons may result from internal impingement in the overhead position. In a study conducted by Glenn et al on 41 patients with arthroscopy proven labral tear , it was found 68% patients had both labral and rotator cuff tears[9].

In our study out of the 30 patients, 6 (20%) patients showed glenoid labrum tear. This smaller number may be because of the limitation of magnetic resonance imaging without arthrogram in detecting labral tears[9]. In our study associated findings included axillary lymph node (14.3%), greater tuberosity avulsion fracture (14.3%), hill sach lesion (14.3%), hill sach lesion with lesser tuberosity fracture (14.3%), humeral head fracture with muscle edema (14.3%) and multiple exostosis arising from humeral head,neck and shaft (14.3%).

Conclusion:

In our study MRI had a sensitivity of 92%, specificity of 80%, PPV of 95.83%, NPV of 66.67%, diagnostic accuracy of 90% and kappa degree of agreement of 0.66. These results suggest that MRI is most sensitive and has highest diagnostic accuracy in detecting rotator cuff tears as compared to USG and clinical diagnosis.

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