

# Journal of Advanced Medical and Dental Sciences Research

Journal home page: [www.jamdsr.com](http://www.jamdsr.com)

doi: 10.21276/jamdsr

(e) ISSN Online: 2321-9599; (p) ISSN Print: 2348-6805

## Original Article

### MRI imaging of Adjacent Bone Changes in patients suffering from Rotator Cuff Tendon pathologies

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#### ABSTRACT:

**Background:** Rotator cuff tendon pathology and its diagnosis remain to be a common problem encountered by the physicians. Rotator cuff tear is a common problem at the shoulder joint. Magnetic resonance imaging has a crucial role in diagnosis of rotary cuff disease. Use of MRI has shown its usefulness for years thus its use has been found increasing. **Aim:** Purpose of this descriptive study is was to study the diagnostic accuracy of magnetic resonance imaging of adjacent bone changes in patients suffering from rotary cuff tendon pathology. **Material and method:** Patients referred to the Department of Radio diagnosis, Ananta Institute of Medical Sciences & Research, for MRI shoulder with suspected shoulder pathology were examined. 70 patients aged above 18 years with Rotator cuff lesions were detected on magnetic resonance imaging of the shoulder joint and were selected for the study. **Result:** Out of the 70 patients included in this study, type I acromion was seen in 11 (16%) patients while type II acromion was seen in 46(65%), type III in 11(16%) patients and type IV in 2 (3%) patients. Thus most common in our study was type II acromion, Joint effusion was noted in 30% patients. Combination of subacromial and subdeltoid bursitis was seen in 34 %. **Conclusion:** Magnetic resonance imaging is very useful in accurate diagnosis of rotator cuff disease. It gives a detailed view of its predisposing factors like the acromion type & orientation, reduction in coracohumeral distance, reduced acromioclavicular distance and other associated features.

**Key words:** Rotator cuff, tendon, tear, shoulder joint, MRI

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**This article may be cited as:** Chotrani M, V Chakra V. MRI imaging of Adjacent Bone Changes in patients suffering from Rotary Cuff Tendons. J Adv Med Dent Scie Res 2018;6(1):59-64.

#### INTRODUCTION:

A detailed understanding of the anatomy and function of the rotator cuff and its disorders is essential for optimal treatment, planning and prognostic accuracy of the disease. Identifying the disorder, understanding the potential clinical consequences and reporting all relevant findings at rotator cuff imaging is also essential holds an impact on treatment outcome.<sup>1</sup> Several authors recommended that the diagnosis of a rotator cuff tear and its extent, full or partial thickness, helps in determining the treatment modality whether the patient will be managed conservatively or will need surgery.<sup>2,3</sup> Various imaging modalities like conventional radiography, ultrasonography, computed tomography, magnetic resonance imaging and arthrography has been used for diagnosis of rotary cuff tendons for years.

Rotator cuff disorders are characterized by tendinous and ligamentous structures which are pathologically altered with increasing age.<sup>4</sup> Ehab et al mentioned that the most commonly affected rotator cuff

tendon is the supraspinatus.<sup>5</sup> Based on the literature available MRI is been used to diagnose rotator cuff disease for years and Classification of tears is also more conspicuous with the help of it.<sup>6,7</sup> MRI has good multiplanar delineation even without contrast as well as good spatial resolution for assessment of soft tissue, to identify tendon edema & tear in the muscle cuff. In addition to detailed information regarding cuff defects, MRI also provides information about adjacent structures, muscle atrophy, size of muscle, cross-sectional area and fatty degeneration which have 4 implications for the physiologic and mechanical status of the rotator cuff.<sup>1</sup>

So we aimed to study the diagnostic accuracy of magnetic resonance imaging of adjacent bone changes in patients suffering from rotary cuff tendons.

#### MATERIAL AND METHOD:

All the patients aged between above 18 attending Department of Radiodiagnosis, Ananta Institute of Medical

Sciences, for MRI shoulder with suspected shoulder pathology were examined for the study. Ethical clearance was obtained. Patients were explained regarding the procedures to be performed and treatment. Written informed consent was obtained from patients/guardians.

**Inclusion criteria**

- 1) Patients who were above 18 years of age,
- 2) Those with suspected Rotator Cuff Tendon pathology.

**Exclusion criteria:**

- 1) Postoperative patients.
- 2) Known case of rotator cuff lesions.
- 3) Patients with contraindicated MRI
- 4) Medically compromised patients

Complete examination was carried out for all the patients. 70 patients 38 males and 32 females were included in our study. All the patients were subjected to MRI scan using 1.5 T MRI scanners. All patients were positioned in supine position with the head directed toward the scanner bore. The patient's arms rested to the side of the body and should not be placed on the abdomen to avoid transmission of respiratory motion. The patients were instructed to position arms is neutral to slightly externally rotated. Use of supports under the elbows can assist in maintaining this position. In external rotation, the posterior labrum is well visualized. Stabilizing the hand in partial external rotation with the use of small sandbags and tape will reduce shoulder motion artefact secondary to upper extremity muscle spasms.<sup>8</sup>

**STATISTICAL ANALYSIS:** Data was collected each variable was analyzed and A *p*-value <0.05 was considered statistically significant. Data was analyzed by specific statistical software (IBMSPSS V10 STATISTICS, IBM, ARMONK, USA).

**RESULT**

The sample size for the current study was a total of 70 patients aged above 18 years. The age of the patients with rotator cuff pathologies in present study ranged from 21 to 80 years, with a mean of 50.57 ±13.97. The patients involved in the study were divided into 6 age groups viz. 21-30 years, 31-40 years, 41-50 years, 51-60 years, 61-70 years and 71- 80 years. There were nine (12%) in 21-30year age group, ten (14%) in 31-40year age group, 17 (14%) in 41-50year age group, 22 (31%) in 51-60 year age group, 14 (20%) in 61-70 year age group and three (4%) in 71-80 year age group. (Table 1) Out of the 70 patients included in this

study, type I acromion was seen in 11 (16%) patients while type II acromion was seen in 46(65%), type III in 11(16%) patients and type IV in 2 (3%) patients. Thus most common in our study was type II acromion (Table-2). Joint effusion was noted in 21 out of 70 patients i.e. 30%. No effusion was seen in 49 i.e. 70% patients. Of the 21 patients, 13 i.e. 61.9% had tears and 7 i.e. 33.3% had tendinosis and one patient had nothing significant (Graph-1). Bursal fluid / bursitis can be seen in patients with rotator cuff disorders. In current study, bursae around the shoulder joint were normal in 18/70 (25%) patients. Isolated subacromial and subcoracoid bursitis was noted in 3/70 (4%) and 20/70 (29%) patients respectively. Combination of subacromial and subdeltoid bursitis was seen in 24/70 (34 %) patients, being the most frequent in current study (Graph-2).

Acromioclavicular joint degeneration/ hypertrophy was noted in 22 (31%) patients, 18 (28%) patients had degenerative changes and subacromial spurs, while 4 (6%) patients had fibrous outgrowth/hypertrophy of the capsule. Of these 22 patients in our study with acromioclavicular arthropathy, 17 (77.3%) had tear, 3 (14%) had tendinosis and 2 (9%) had normal tendon (Table-3). In current study only 10(15%) patients, showed normal supraspinatus tendon with less than 10mm AHD. In patients with AHD less than 7mm, abnormal supraspinatus was seen in 30 (93%) out of total 32 patients with partial tears in 21(65%) and tendinosis in 4 patients (12%). In patients with AHD between 8-10mm, 26 (76%) patients had abnormal tendon of which 21 (61.2%) had tear (Table- 4). Eighteen patients (25%) had coracohumeral distance more than 10mm. Seven (10%) had coracohumeral distance less than 6mm. Of these, all (100%) had abnormal subscapularis tendon. Twenty-five (35 %) patients had coracohumeral distance between 7 and 8mm. Of these 4(64%) had normal tendons and 9 (36 %) have abnormal tendons. In the coracohumeral distance between 9 and 10 mm group there were 20 (28%) patients and out of them 2 (10%) had abnormal tendon (Table-5). Adjacent bone changes were evaluated for surrounding bone edema, contusions, geodes, subchondral cysts and erosions. In current study 36 out of 70 patients (51.4%) showed changes in the adjacent bones like edema, contusion, geodes or subchondral cysts and erosion depending upon the mechanism causing rotator cuff disease or as changes secondary to the rotator cuff disease itself (Table- 6). Of the 70 patients with rotator cuff pathologies, 17 patients (24%) had associated Labral tear. Rest of the patient showed no labral abnormality (Graph-3).

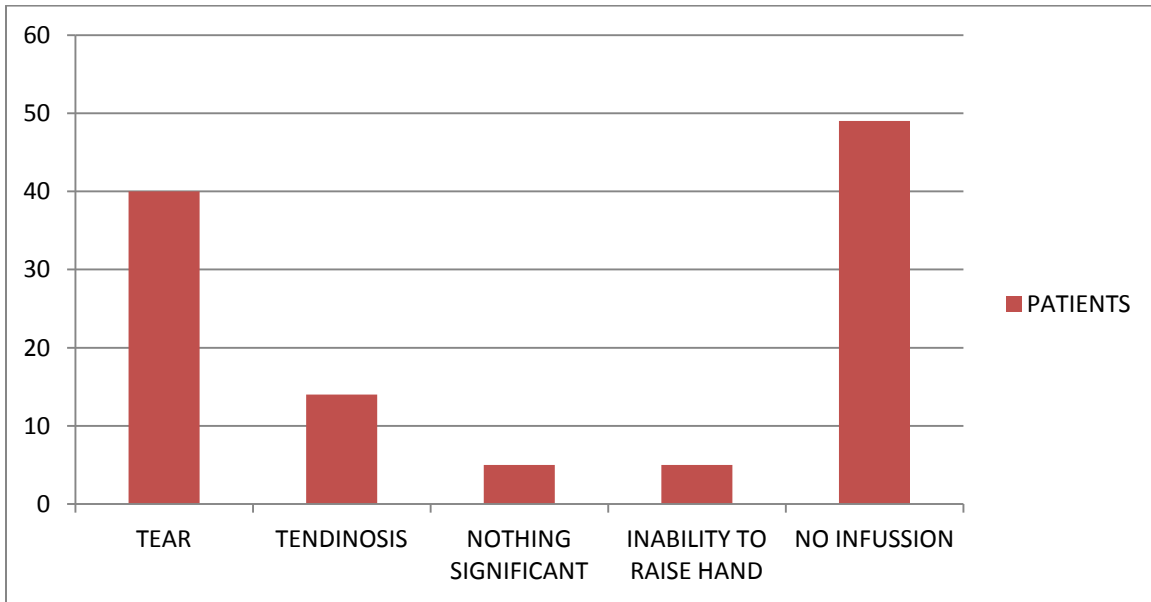
**Table 1:** Age wise distribution of patient

Age group	No. patients	Percentage
21-30 yrs	9	12%
31-40 yrs	10	14 %
41-50 yrs	12	17 %
51-60 yrs	22	31 %
61-70 yrs	14	20 %
71-80 yrs	3	4 %

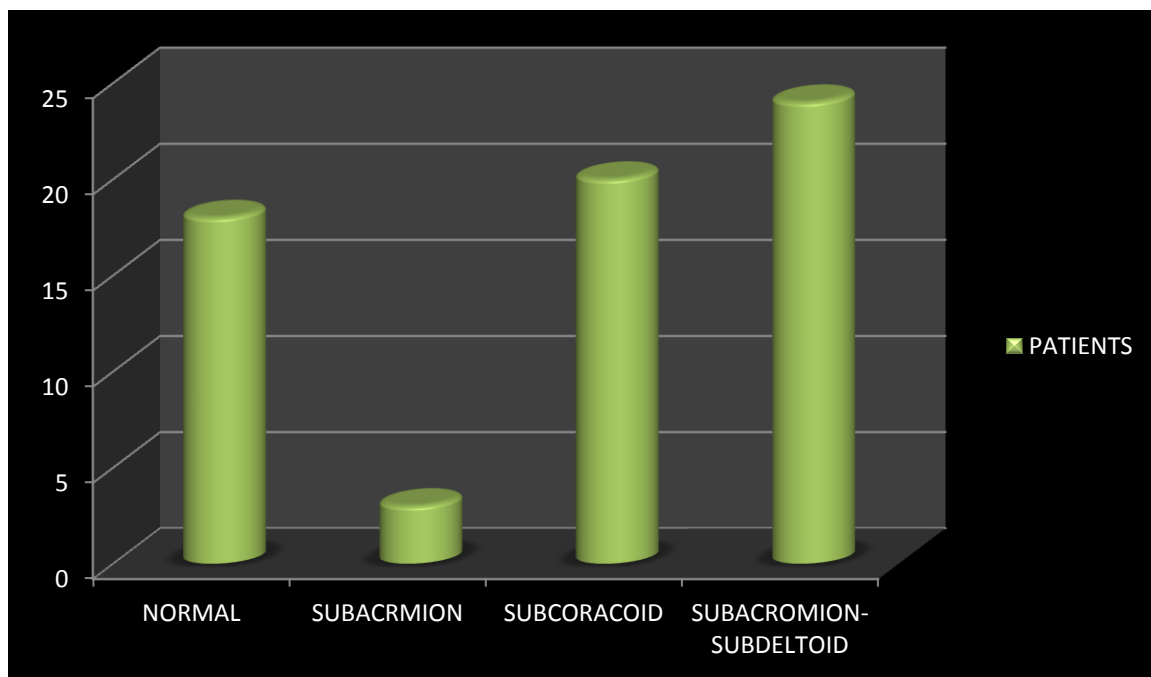
**Table 2:** Types of Acromion in study population

Type of acromion	No. of patients	Percentage
Type I	11	16 %
Type II	46	65 %
Type III	11	16 %
Type IV	2	3 %
Total	70	100 %

**GRAPH 1-** Association of joint effusion with rotator cuff tendon pathologies



**GRAPH 2-** Bursal involvement observed



**TABLE 3:** Acromioclavicular joint changes associated with rotator cuff tendon pathologies

AC Joint changes	No. of patients	Percentage
Degenerative	18	28 %
Hypertrophic	04	6%
Normal	42	66 %

**TABLE 4:** Association of acromiohumeral distance and supraspinatus tendon pathology

Acromiohumeral distance	Normal	Tendinosis	Partial tear	Complete tear	Total
≤7mm	2	4	21	5	32
8-10mm	8	5	21	0	34
>10mm	3	1	0	0	4

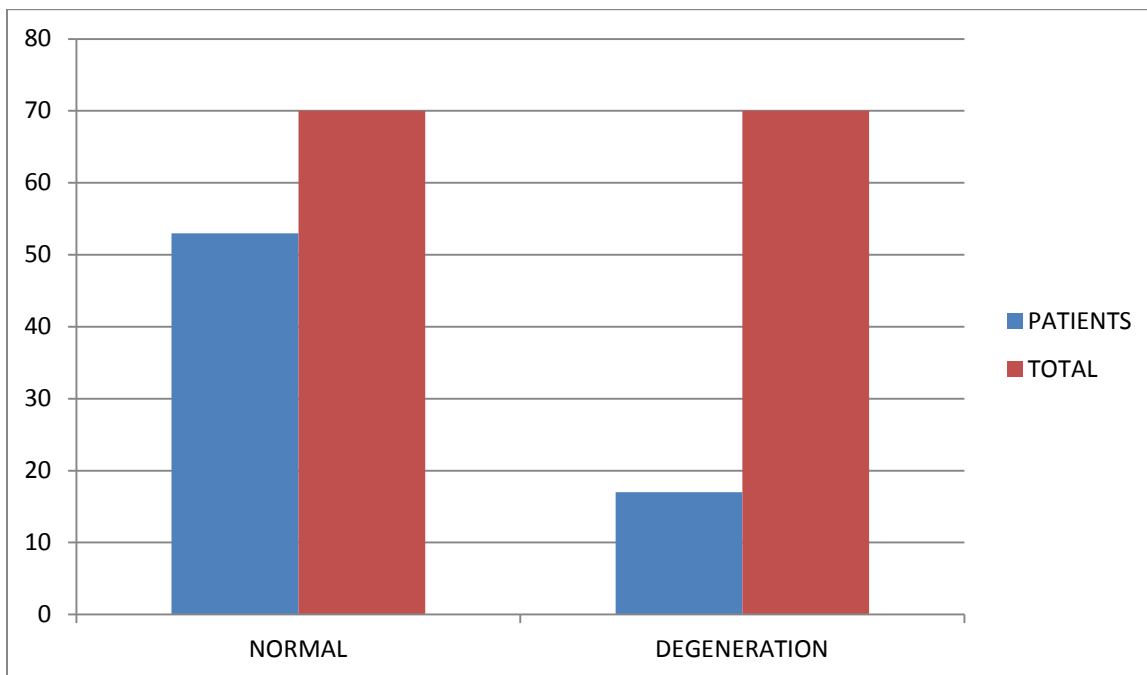
**TABLE 5:** Association of coracohumeral distance and subscapularis muscle pathology

Coracohumeral distance	Normal	Tendinosis	Partial tear	Complete tear	Total
≤ 6mm	0	0	6	1	7
7-8mm	16	1	8	0	25
9-10mm	18	2	0	0	20
>10mm	18	0	0	0	18

**TABLE 6:** Adjacent bone changes associated with rotator cuff pathologies

Adjacent bone abnormality	No. of patients	Percentage
Normal	34	48 %
Edema/contusion of humeral head	23	33 %
Subchondral cyst/ geode	11	16 %
Others (eg-fractures)	2	3 %
Total	70	100 %

**Graph 3:** Labrum involvement



**DISCUSSION:**

Rotator cuff tendon disease is a complex disease and most commonly encountered in elderly people. Various diagnostic aids are used for the diagnosis of RCT like ultrasound, computed tomography, magnetic resonance imaging. Magnetic resonance imaging had gained importance over computed tomography due to good differentiation of the soft tissues, which CT does not. Based on the data available sensitivities of up to 99% have been reported for ruptures of the supraspinatus tendon.<sup>9</sup> Zanetti M et al suggested that MR-imaging of the shoulder permits evaluation of degeneration and atrophy of the rotator cuff musculature. A quick estimate of atrophy of the supraspinatus muscle can be based on the so-called tangent sign.<sup>10</sup> The degree of atrophy and degeneration of the musculature plays a important role in prognosis of the rotator cuff (post surgery), making it essential to evident these changes carefully.<sup>11</sup>

In present study the most common age group was 41-50 year i.e. 31%. Previous studies have demonstrated that a large prevalence of rotator cuff tendon pathologies increases in older patients, similar result was derived from our study.<sup>12</sup> In the current study, the common type of acromion was the type II or curved acromion. In this study, it was found that 81% of patients (57 out of 70) had either type II or III acromion. Thus, in this study abnormal tendons were common with type II /III acromion. 10 out of 12 (83.3%) type III acromion were associated with tears. This was consistent with the literature available. Bigliani LU et al in their study showed similar result with type II being the most common acromion.<sup>13</sup>

Acromioclavicular joint degeneration/ hypertrophy has been noted in 22 (31%) patients. 18 (25.7%) patients had degenerative changes and subacromial spurs, while 4 (5.3%) patients had fibrous outgrowth/hypertrophy of the capsule. Of these 22 patients in our study with acromioclavicular arthropathy, 18 (81%) had tear, 2 (9.5%) had tendinosis and 2 (9.5%) had normal tendon. Hijioka et al found 60% degenerative changes in subacromial surface in 96 specimens, which was higher than those reported in our study.<sup>14</sup> In the current study, only 8% patients showed normal supraspinatus tendon with total 58 patients with less than 10mm AHD. In 32 patients with AHD up to 7mm, abnormal supraspinatus was seen in 93% patients, with tears in 86% and tendinosis in 4 patients 7%. Only 2 normal supraspinatus were seen. In 34 patients with AHD between 8-10mm, 76% patients had abnormal tendon of which 65% had tear our findings were in relation to those reported by other authors.<sup>15</sup> Glenn et al in his study on 41 patients with arthroscopy proven labral tear, it was found 68% patients had both labral and rotator cuff tears. However in our study out of the 70 patients, 24% patients showed abnormal glenoid labrum and out of these 94% had both labral and rotator cuff tears. These results showed different results may be because of the limitation of magnetic resonance imaging without arthrogram in detecting labral tears.<sup>16</sup>

**CONCLUSION:**

In present study it is noted that abnormal supraspinatus is common when the acromioclavicular distance is less than 7 mm. No patient with acromioclavicular distance less than 7mm had normal supraspinatus tendon. Various other findings like joint effusion, adjacent bone changes, bursal fluid and labral tears have also been noted along with rotator cuff disease. The frequently found finding is acromioclavicular arthropathy followed by bursal fluid, joint effusion, changes in the adjacent bone and labral tears. Thus magnetic resonance imaging is very useful in depicting prompt diagnosis of rotator cuff tendon pathology along with its predisposing factors like the acromion type & orientation, reduction in coracohumeral distance, reduced acromioclavicular distance and other associated features like effusion, bursitis and bone changes.

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**Source of support:** Nil

**Conflict of interest:** None declared

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