



## “ROLE OF HIGH RESOLUTION ULTRASOUND IN EVALUATION OF ROTATOR CUFF DISORDERS IN RURAL POPULATION”

**Kaipa Janardhan Reddy**

Associate Professor , Department of Radio- diagnosis, Santhiram Medical College & General Hospital

**Pradeep Kumar Reddy**

Assistant Professor, Department of Radio- diagnosis, Santhiram Medical College & General Hospital.

### ABSTRACT

Painful shoulder is a very common rheumatologic condition. The differential diagnosis includes several entities of similar clinical picture. As each of this condition have different treatments their differentiation is essential.

Arthrography has been the diagnostic procedure of choice in patients with rotator cuff tear, however it is not painless procedure. Shoulder MRI which provides an anatomic picture demonstrates the quality of rotator cuff muscles and shows other intra articular and extra articular pathology, but it is not very specific for partial - thickness tears and also it is not very specific for partial thickness tears and also it is not affordable to all patients. MR also has certain limitations as it does not provide us with real-time dynamic studies which we very well get in ultrasound.

High: Resolution Ultrasound have shown to be an efficient imaging modality for assessment of a wide spectrum of rotator cuff and non – rotator cuff disorders, and both static and dynamic positions helps us to cone down the exact site of pathology, the tendon involved and also to rule out many artifacts.

This study was carried out to determine the role of high resolution Ultrasound in assessment of characteristics and extent of various Rotator cuff disorders.

The present hospital based cross sectional study was conducted in the Department of Radio-diagnosis, SANTHIRAM MEDICAL COLLEGE AND GENERAL HOSPITAL, NANDYAL. 131 CASES SUSPECTED WITH ROTATOR CUFF INJURIES UNDERGOING Ultrasound during the period of two year from September 2018 to November 2020. All the scans were performed with High Resolution Ultrasound machine Esaote My lab 50 X vision with facilities for grey scale, colour Doppler, pulse Doppler, using 7.5 to 12 MHZ linear probe.

Post traumatic shoulder pain, lifting of heavy objects, abnormal sleep position, and occupational pain in drivers and athletes were the presenting complaints with predominant involvement of the right shoulder.

Out of 89 positive cases, 44 cases involved isolated finding of Tendinopathy or tear. The most commonly involved tendons were Bicipital tendon and supraspinatus as isolated or in combination with other rotator cuff tendon pathologies, Infraspinatus tendons rarely get involved in rotator cuff pathology. Only 2 cases showed infraspinatus tendonitis, that too in combination with other rotator cuff muscles.

Solitary case of Parabrachial cyst was seen in combination with bicipital peritendinitis. Supraspinatus tendonitis and chronic arthritic changes.

Compared to other modalities HRUSG provides substantial amount of information regarding rotator and non- rotator cuff lesions and surrounding structures as well as its fat inexpensive, allows dynamic assessment of joint and has no radiation exposure hence it has carved a niche for being a superb diagnostic and follow up modality.

**KEYWORDS :** High Resolution Ultrasound of Shoulder, Painful Shoulder cuff, Non – Rotator cuff lesions.

### INTRODUCTION

The lesions of the rotator cuff are common cause of shoulder pain and dysfunction, Cuff strain, impingement syndrome, Rotator cuff tear make up a group of lesions that produce shoulder pain. It is clinically difficult to differentiate between these diagnoses and distinguish cuff problems from other conditions like Glenohumeral instability<sup>[1]</sup>. Hence, it is the commonest musculoskeletal ultrasound examination request. Improvement in the resolution of ultrasound machines, refined technique and better understanding of the pathology have contributed to high accuracy of USG in the diagnosis of rotator cuff pathology.

High resolution ultrasound is non invasive, less expensive and non ionizing modality with good sensitivity in detecting both rotator cuff and non rotator cuff disorder. It serves as a complementary role to magnetic resonance imaging of the shoulder.

Plain films are the basic initial investigation required for assessing bony trauma, osteoarthritis and most other arthropathies. They are often supplemented by other techniques for primarily soft tissue abnormalities, such as rotator cuff disease or masses and for patients with instability.

MRI and USG have replaced orthography for evaluating the integrity of the rotator cuff, MR arthrography or CT arthrography is used for instability.

MRI is a reliable technique for the evaluation of the rotator cuff tendons<sup>[2]</sup>, previous low power magnet MRI's provided only a static evaluation of the shoulder joint and indirectly suggested the diagnosis of subacromial impingement. Where as, recent super conductive high speed magnets make it possible to do a dynamic evaluation of the shoulder joint to some extent. Bone scintigraphy<sup>[3]</sup>

has no specific role to play in the imaging of the shoulder in respect to rotator cuff pathologies.

### Methodology

#### Machine:

Esaote My Lab 50 X vision ultrasound with facilities for grey scale, colour Doppler, pulse Doppler, using 7.5 to 12MHz linear probe.

#### Source Of Data:

Study done in SANTHIRAM MEDICAL COLLEGE & GENERAL HOSPITAL, NANDYAL in department of radio-diagnosis on patients referred from various departments OPD / IPD.

#### Inclusion Criterion:

1. All patients with restricted shoulder movements.
2. Painful shoulder with or without restricted movements.

#### Exclusion Criterion:

1. Cases involving fractures around the shoulder.
2. Patients with Neoplastic lesions of the shoulder,
3. Patients with Polyarthritis including shoulder joints.

#### Classification & Diagnostic Criteria Of Lesions:

Ultrasonography<sup>[4]</sup> is a rapid, portable, sensitive technique for confirming the presence of joint effusions. The study can be easily repeated for follow-up of lesions. Ultrasound may be useful in obtaining specimens for microbiologic examination to confirm the diagnosis of infection.

Ultrasonography, with over 90% sensitivity and specificity, can help confirm the diagnosis in clinically or radiographically equivocal cases<sup>[5]</sup>.

**Impingement Syndrome<sup>[6]</sup> :** Sonographic examination of both

shoulders was performed prospectively in a convenient sample of 13 patients (six men, seven women; mean age, 46 years; age range, 37-58 years) presenting with a clinical diagnosis of subacromial impingement. Patients were selected from the surgeon's clinical practice over a period of 6 months on the basis of strict inclusion criteria (age range, 30-60 years; shoulder pain of more than 6 months' duration; positive impingement test) and exclusion criteria (shoulder surgery, history of acromioclavicular joint dislocation, fracture to the shoulder girdle, glenohumeral instability, osteoarthritis of the glenohumeral joint, inflammatory arthritis, diabetes, congenital anomaly, tumor of the shoulder girdle, radiation therapy to the shoulder) and after standardized clinical evaluation of both shoulders.

**An Indian Study**<sup>[100]</sup> retrospectively studied 40 cases and described features of acute tendonitis, chronic tendonitis, tenosynovitis, ganglia.

**Major And Minor Criteria**<sup>[101]</sup> for diagnosing rotator cuff tear, as major and minor criteria's. major being, a) Nonvisualization of the cuff, b) Focal Nonvisualization ,c) Discontinuity of fibers d) Focal abnormal echogenicity. Minor criteria's being a) Presence of fluid along the biceps tendon and in the joint suggests a 95% probability of a cuff tear. B) Concave subdeltoid bursal contour. C) Irregularity of the greater tuberosity. d) Compressibility.

#### Diabetes As A Risk Factor:<sup>[102]</sup>

A large study including 300 patients to ascertain some of the etiological variables in the development of rotator cuff disease concluded that Diabetes Mellitus had a strong correlation with development of rotator cuff pathologies.

#### Observations And Results :

The male predominance among the subjects studied is very clear with male comprising 63% and females 37%.[Table -1]

In the study subjects maximum patients were in the age of 40 – 60yrs (59%) and had rotator cuff injury, where as, patients in the range of 31 - 40 yrs comprise 27 patients (21%), who had maximum of non rotator cuff disorders[Table -2].

In this study, which is a hospital based study, out of 131 patients who underwent ultrasonography for painful shoulder or restriction of shoulder movements, 29% had rotator cuff tear, 39 % had non rotator cuff disorders and 32% had a sonographically normal study[Table -3].

Among the subjects studied for painful shoulder, 44 (34%) subjects had an isolated tendon involvement. In these patients, majority had bicipital tendon pathologies comprising about 52%, followed by supraspinatus for about 36%, and least tendon involved was the infraspinatus (4%)[Table -4].

Excluding the isolated cases, 43 (33% of total subjects) patients had multiple tendon involvement. Among them, 19 patients (44%) had combination of Bicipital and Supraspinatus tendon involvement, where as the involvement of Bicipital, Supraspinatus and Subscapularis tendons were seen in 12 (27%). The least being the Infraspinatus tendon involvement which was seen only in 2 patients (4%)[Table -5].

#### DISCUSSION:

Rotator cuff tears represent a significant cause of shoulder pain and dysfunction. The cause is generally acute trauma superimposed on chronic degeneration of the cuff. Patients have pain, decreased range of movements and weakness. Physical findings include tenderness, weakness of abduction, atrophy or edematous supraspinatus and altered scapulo-humeral motion.

Patients with rotator cuff problems present with a variety of symptoms including a painful arc, night pains, weakness and decreased range of motions. Apart from rotator cuff disorders there are various other causes for shoulder pain, including adhesive capsulitis, cervical nerve root compression, and acute joint inflammation.

In our study, Patients were referred from various departments of Santhiram Medical college and General Hospital (Out patients and In patients) with history of painful shoulder. Hence it is a hospital based study. A total of 131 patients were taken as study subjects for the sonographic evaluation of painful shoulder.

Among 131 patients, clinically diagnosed to have painful shoulder that

underwent sonography were 82 (63%) males and 49 (37%) females. Majority of the subjects, 77 (59%) patients (47 males and 30 females) were in the age group of 40 – 60 yrs.

The male preponderance among the subjects is very clear in the study. The male and female do not differ with regard to the higher incidence of right shoulder involvement than the left shoulder.

The prevalence of diabetes is more in the age group of 40-60 years. All these factors resulted in greater incidence of rotator cuff and non rotator cuff disorder in the age group of 40 to 60yrs<sup>[10]</sup>.

In our study group, Out of 77 patients who were 40 years and above in age, 43 patients (56 %) had isolated or combined pathologies of the rotator cuff which is well correlated with Nithin G Chaubal study<sup>[101]</sup>.

In our study data, [Image 1] supraspinatus lesions<sup>[4]</sup> were seen in 66 (50.50%) of painful shoulders and least commonly involved tendon was Infraspinatus with 2 cases (4%) well correlated with the study of Pradeep Goyal et al.<sup>[103]</sup>

The incidence of bicipital tendon pathologies<sup>[15]</sup> was approximately 40% among their patients of painful shoulder which correlated with our study group which had 54 patients showing bicipital tendon pathologies (41 %)[Image 2].

Nathalia J. Bureau et al<sup>[19]</sup> stated that, these cases reflect a disparity between the diagnosis of rotator cuff pathology<sup>[6]</sup> made at clinical examination and the finding on sonographic evaluation. And thus emphasize the fact that minute or subclinical pathologies are difficult to diagnose by Sonography alone[Image 3].

Diabetes mellitus also plays a role in rotator cuff pathologies . Out of study sample, 33 (~25%) patients were diabetic, 24 (77%) patients who were diabetic showed rotator cuff pathologies against 07 patients who had diabetes but showed no evidence of rotator cuff pathology [Image 4] which is well correlated with the study of Northover JR et al.<sup>[102]</sup>

In the study, the type of injury whether rotator or non rotators cuff disorders had a definite relation with age. Those 60yrs and above had a higher rate of rotator cuff tear (82% v.s. 18%). Those below 60yrs had higher rate of non rotator disorders (63% v.s. 37%). The reason for greater incidence of rotator cuff tears in patients aged 60 yrs and above is the fragile nature of tendons which lack in their tensile strength, deposition of calcium crystals within the tendon and superimposed chronic degenerative changes[Image 5]. This correlates well with the study of Josh Moosikasawan<sup>[8]</sup>.

#### CONCLUSION:

High- resolution ultrasound have been shown to be an efficient imaging modality for the assessment of a wide spectrum of rotator cuff and non- rotator cuff disorders and can be used as a primary imaging modality for evaluating the rotator cuff.

It is fast and inexpensive and allows dynamic assessment of the joint.

Non rotator cuff disorders like tenosynovitis, tendinopathies, joint effusion, bursal collections, calcific tendonitis, chronic arthritic changes, paralabral cysts can be easily demonstrated.

Comparison of symptomatic shoulder to the other asymptomatic shoulder is of great importance to pick up subtle abnormalities.

Diagnostic accuracy of HRUSG is good and comparable with that of MR imaging in regard to identifying and measuring the size of partial – and- full –thickness rotator cuff tears.

There were total 7 cases, of which 2(28%) cases showed isolated subacromial subdeltoid bursal fluid collection without any obvious underlying rotator cuff tear, where as 5(71%) cases of bursal fluid collection with rotator cuff pathologies were noted.

In this study, majority of cases had supraspinatus tendonitis, with isolated 9 (45%) cases, and another 11 (55%) cases associated with other rotator cuff pathologies, all these comprising to grade 2 type of impingement syndrome .

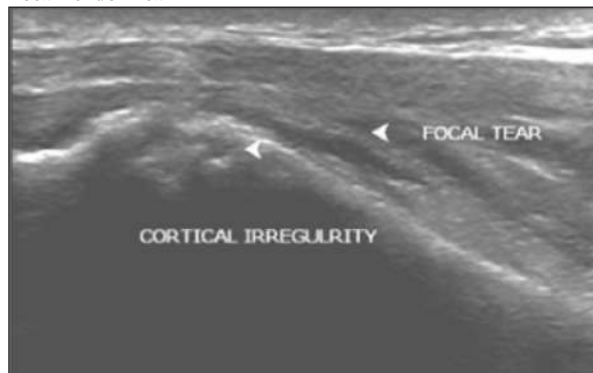
In this study, patients having acromioclavicular joint degenerative

pathology were all above 50yrs. 6 cases had positive finding for acromio-clavicular joint arthritis.

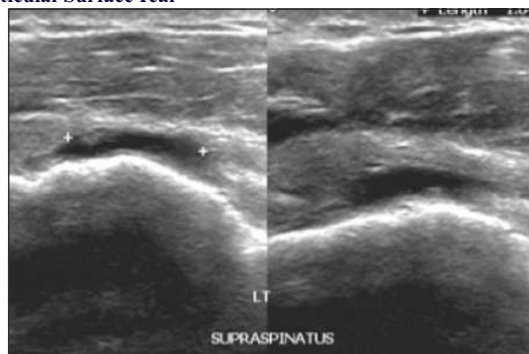
In this study, among 44 patients aged above 50yrs, there were 24 cases that had chronic degenerative changes, 2 had erosive arthropathy, and 1 patient had greater tuberosity fracture

These cysts develop as degenerative cystic abnormalities. Sonography shows anechoic cystic lesion ranging from 3 to 30mm in and located at different shoulder sites, one case had a similar cyst lesion seen medially between the deltoid and subscapularis tendon measuring 15 x 12 mm that had chronic degenerative changes.

#### 1. USG IMAGE OF Supraspinatus Partial Tear Focal Tendon Tear



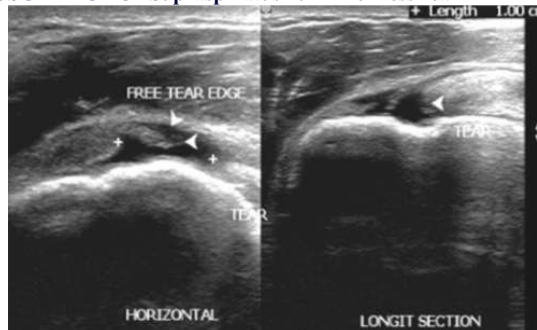
#### Articular Surface Tear



#### 2. UsG Image Of Bursal Surface Tear

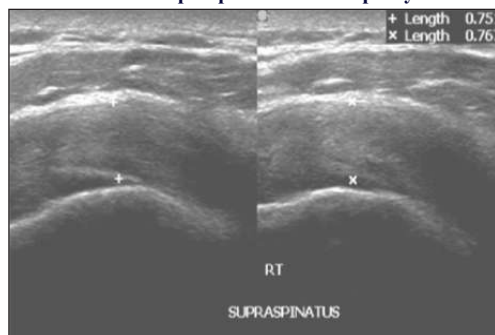


#### 3. USG IMAGE OF Supraspinatus Full Thickness Tear

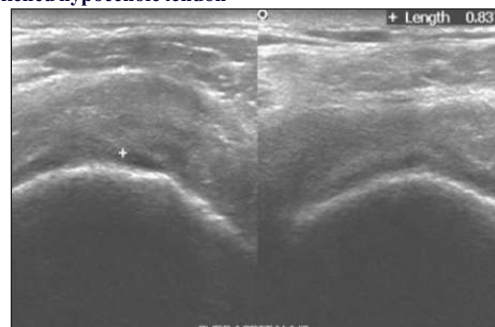


#### Supraspinatus- Full Thickness Tear- Axial Views- Dynamic And Resting Phases

#### 4. USG IMAGE OF Supraspinatus Tendinopathy



#### Thickened hypochoic tendon



#### 5. USG IMAGE OF Tendon calcification



**Table 1: Sex Wise Distribution Of Patients**

| GENDER | Number | Percentage |
|--------|--------|------------|
| Male   | 82     | 63%        |
| Female | 49     | 37%        |
| Total  | 131    | 100.00%    |

**Table 2: Age Wise Distribution Of The Patients**

| Rotator cuff tear | Non rotator cuff disorders | Sonographically normal study | Total |
|-------------------|----------------------------|------------------------------|-------|
| 38 (29 %)         | 51 (39%)                   | 42 (32 %)                    | 131   |

**Table 3: Sonographically Diagnosed As Rotator Cuff Disorders In A Study Subjects**

| Age        | Male     | Female   | Total     |
|------------|----------|----------|-----------|
| 20- 30yrs  | 13 (16%) | 5(10%)   | 18(14%)   |
| 31-40      | 15(18%)  | 12(24%)  | 27(21%)   |
| 41-50      | 22(27%)  | 20(41%)  | 42(32%)   |
| 51- 60     | 25(30%)  | 10(21%)  | 35(27%)   |
| 60 & above | 7(08%)   | 2(4%)    | 09(06%)   |
| Total      | 82(100%) | 49(100%) | 131(100%) |

**Table 4: Distribution Of Patients In Isolated Tendon Involvement**

| Isolated Tendon involvement | Number of cases |
|-----------------------------|-----------------|
| Bicipital tendon            | 23 (52%)        |
| Supraspinatus               | 16 (36%)        |
| Subscapularis               | 3(7%)           |
| Infraspinatus               | 2(4%)           |
| Total                       | 44              |

**Table 5: Distribution Of Patients With Combined Pathologies**

|            | BT +SS  | BT+SS+SC | SS +SC  | SS +SC +IN | Total     |
|------------|---------|----------|---------|------------|-----------|
| Occurrence | 19(44%) | 12(27%)  | 10(23%) | 2(5%)      | 43 (100%) |

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