

## Ultrasonography as diagnostic tool in rotator cuff injuries of shoulder

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### Abstract

**Introduction:** Rotator Cuff injuries are quite common in adults with or without trauma. These are suspected on clinical history and examination and commonly confirmed by Ultrasonography and MRI of shoulder. This study aims to use Ultrasonography of shoulder as the main diagnostic tool for such injuries.

**Material and Methods:** A total of 30 patients suspected to have complete or incomplete tear of Rotator Cuff were subjected to Clinical Examination of Shoulder including specific tests for Rotator Cuff Muscles, X-ray and Ultrasonography of shoulder. Diagnosis by clinical examination and Ultrasonography was compared.

**Observation and Results:** Out of 30 cases studied, on clinical examination, 10 cases had complete tear of supraspinatus, 19 cases had incomplete tear of supraspinatus with or without subscapularis, and 1 case had isolated subscapularis tear. Ultrasonography noted full thickness tear of supraspinatus in 8 cases, incomplete tear of supraspinatus with or without subscapularis, in 20 cases, bicipital tendinitis in 01 case and subacromial subdeltoid bursitis in 01 case.

**Conclusion:** Ultrasonography confirms the clinical diagnosis of rotator cuff tear with satisfactory sensitivity and specificity. It can be used as a first line diagnostic tool for diagnosis of Rotator cuff tear as it confirms the clinical suspicion and its results are comparable to MRI.

**Keywords:** Rotator Cuff tear, Ultrasonography, Shoulder.

### Introduction

More than 20% of individuals experience shoulder problems at some point of time in life. 80% of these may have symptoms for more than 6 months. Shoulder Pain is the 3<sup>rd</sup> most common musculoskeletal symptom, trailing behind low back pain and knee pain.<sup>1,2</sup> Rotator Cuff Tear is the most prevalent cause of shoulder pain occurring in about 65-75% of patients.<sup>3</sup>

The prevalence of this problem increases with age and it is estimated that by the age of 70 years more than 50% population will have a full or partial thickness of Rotator Cuff Tear though not always symptomatic.<sup>4</sup> Early diagnosis of this entity is important as untreated tears may enlarge, cause increased pain and lead to irreversible fatty degeneration and atrophy of shoulder muscles.<sup>5,6</sup>

Various imaging techniques such as Ultrasonography, MRI, MR arthrography and CT arthrography can be used to detect Rotator Cuff Abnormality. These modalities identify the causal factors, involved tendons and its extension into muscles which cannot be identified clinically.<sup>7</sup> In view of high prevalence of Rotator Cuff injuries and its diagnostic difficulties on clinical examination and high cost and less availability of MRI, this study was done to find out the utility of Ultrasonography as a diagnostic tool in Rotator Cuff Injuries

### Material and Methods

This prospective study was done in Department of Orthopaedics of a tertiary care hospital in Central India, during the period of two years from August 2016 to

July 2018. It included patients between 15-65 years of age presenting with shoulder symptoms of pain and restriction of movements and excluded cases having fractures around shoulder. Sample size was 30 patients.

The patients were interviewed as per a set proforma which included their personal details and detailed history of symptoms. The cases were examined by a post graduate trainee and senior Orthopaedic Surgeon for final clinical diagnosis, based on specific tests of rotator cuff tear, such as Empty Can test and Neer's sign for Impingement and supraspinatus tear, Drop arm test for complete supraspinatus tear and Gerber's Lift off test for subscapularis tear.

Patients were then subjected to X-ray and Ultrasonography of the involved shoulder. Findings of clinical examination and investigations were compared. The data was compared with the help of unpaired T test.

### Observation and Results

Analysis of the data related to 30 patients showed that the maximum patients (10, 33.4%) were in the age group 50-65 followed by 9 patients between 41 to 50 years, 5 between 31-40 years and 4 between 21-30 years. There were only 2 patients (6.6%) between 15-20 years. The mean age of patients was 41.8±11.6 years. There was male preponderance, male female ratio being 2:1 (20 male and 10 female).

53.4% (16) patients were farmer or labourer followed by 30% (9) who were housewives. History of fall was noted only in 20% cases. Nearly 3/4<sup>th</sup> (76.7%, 23 cases) were right handed and right shoulder was

involved in 80% (24 cases). Neer Impingement test was positive in 93.3% (28 cases), showing supraspinatus tendon involvement. Empty can test was positive in 36.7% (11cases) showing complete or incomplete tear of supraspinatus tendon. Drop arm test was positive in 33.3% (10 cases) showing complete tear of supraspinatus tendon. Gerber's Lift Off test was found positive in 26.7% (8 cases) showing subscapularis tendon complete or incomplete tear.

Based on these tests supraspinatus tendon was noted to have partial thickness tear in 19 cases and full thickness tear in 10 cases. Subscapularis tendon was partially torn in 8 cases along with partial tear of

supraspinatus. One case had only subscapularis tendon involvement.

On Ultrasonography supraspinatus tendon was the most common tendon involved. Out of 8 patients having full thickness tear, 7 patients had tear of supraspinatus tendon and 1 patient had full thickness tear of subscapularis muscle. Partial thickness tear of supraspinatus tendon was noted in 20 cases. Partial thickness tear of subscapularis muscle was noted in 8 cases, most of which were associated with partial thickness tear of supraspinatus tendon also. 2 cases did not have any tear on Ultrasonography. Of these 2 cases, one had subacromial- subdeltoid bursitis and 1 had bicipital tendinitis.

**Table 1: Correlation of Clinical and USG Finding of Rotator Cuff Injuries**

Type of tear	On Clinical Examination	On Ultrasonography
Full Thickness tear of Supraspinatus tendon	10	7
Partial thickness tear of Supraspinatus with or without Subscapularis	19 (8 of these patients had partial tear of Subscapularis tendon)	20(8 of these cases Subscapularis tear also)
Only Subscapularis Tear (Full thickness)	1	1
Subacromial Bursitis	0	1
Bicipital Tendinitis	0	1

There was full thickness tear in 10 cases clinically, while USG showed only 8 full thickness tears. Using statistical tests, USG was 88.9% sensitive, 93.1% specific, had 80% positive predictive value, 96.4% negative predictive value and was 92.1% accurate in diagnosing full thickness tear. 28 tears were partial thickness on USG while clinical finding noted 27 partial thickness tears. USG was 93.15% sensitive, 88.9% specific, had 96.4 PPV, 80% NPV and was 96.4% accurate in diagnosing partial thickness tear.

## Discussion

Rotator cuff of shoulder is formed by confluence of joint capsule, tendons and coracohumeral ligament. The tendons are that of Supraspinatus, Infraspinatus, Teres Minor and Subscapularis. All these muscles arise from scapula and insert upon lesser and greater tuberosity of humerus.

Rotator Cuff tear may be traumatic or degenerative in etiology. Degenerative tear is more frequent and multifactorial. Tendon is weakened by extrinsic and intrinsic factors leading to gradual failure with or without superimposed trauma, resulting in full thickness tear.

Clinical tests have variable sensitivity and specificity and findings may overlap indicating multiple tendon involvement as well as bursitis or tendinitis. X-rays of shoulder do not show any specific finding except decrease in subacromial space or calcification at the insertion in cases of calcific tendinitis. Cortical irregularity of the greater tuberosity at attachment site

of supraspinatus indirectly indicates the presence of a rotator cuff tear with a sensitivity of 90% and a negative predictive value of 96%.<sup>8</sup> Based on this finding specific treatment cannot be offered.

Ultrasonography of rotator cuff was started in 1977<sup>9</sup> and has become wide spread due to increased portability, less cost and easy learning curve. With ultrasound, image acquisition and image interpretation are dependent on the skill of the interpreting physician. Low inter-observer variability has been demonstrated in rotator cuff evaluation.

Saraya S et al<sup>10</sup> noted ultrasound sensitivity for tendinitis detection 85% with 86% NPV and 90% accuracy. For partial thickness tear he noted sensitivity and specificity of 88% and 89% respectively. For full thickness tear, he noted 100% sensitivity and 100% specificity.

Chauhan NS et al<sup>11</sup> found high resolution ultrasound equivalent to MRI in diagnosis of Rotator cuff tear. He noted a sensitivity of 86.7 % and specificity of 100% for full thickness tears and sensitivity of 89.7% and specificity of 98.8% for partial thickness tears. He also found comparable diagnostic accuracy of USG and MRI and recommended the use of ultrasonography as the first line investigation for diagnosis of rotator cuff tear.

Singh A et al<sup>12</sup> evaluated shoulder pain patients with USG and MRI. His majority of patients were in the age group of 56-65 years, similar to our study. There was male preponderance (56%) as seen in our study. Out of 50 patients subjected to investigations, he

noted complete thickness tear in 25 (50%) patients and partial thickness tear in 15 (30%) patients, tendinosis in 18% and no abnormality in 2% patients. MRI detected 28 complete and 12 partial thickness tears in his study. It was concluded that USG of shoulder shows promising results in the diagnosis of Rotator Cuff tears and in differentiating partial from complete tears.

Singh AP et al<sup>13</sup> noted rotator cuff tears either partial or full thickness in 70% of his 60 cases on USG. MRI showed rotator cuff tear in 81.67% of the cases.

Netam SBS et al<sup>14</sup> noted supraspinatus tears in 61% of his patients and tendinosis in 8% cases on USG.

In our study Ultrasound detected tear in 93% of our cases, 26% having complete tear and 67% with incomplete tear. 7% patients had tendinosis. Thus, most of our patients had confirmation of Rotator cuff injuries on Ultrasonography. This shows a good correlation between clinical diagnosis and ultrasonography findings. Experience of the radiologist doing the ultrasonography and quality of USG machine may be other factors for high percentage of detection of tears in our series. MRI done in 8 of the above cases with positive tear on USG, had similar results, thus showing USG almost equivalent to MRI for diagnosis of rotator cuff tear.

### Message

Ultrasonography of shoulder is a reliable, sensitive and accurate investigation tool for diagnosis of rotator cuff tears.

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