

# ROLE OF HIGH-RESOLUTION ULTRASOUND IN ASSESSMENT OF CHARACTERISTICS AND EXTENT OF ROTATOR AND NON-ROTATOR CUFF DISORDERS -A ONE YEAR HOSPITAL BASED CROSS-SECTIONAL STUDY

**Dr. Vikash Kumar Gupta<sup>1</sup>, Dr. Parveen Kumar Kaushik<sup>2</sup>, Dr. Tarun Kumar Chaudhari<sup>3</sup>**

<sup>1</sup>MBBS, MD, Associate Professor, Department of Radiodiagnosis, Venkateshwara Institute of Medical Sciences, Gajraula

<sup>2</sup>MBBS, MD, Assistant Professor, Department of Radiodiagnosis, Venkateshwara Institute of Medical Sciences, Gajraula

<sup>3</sup>MBBS, MD, Assistant Professor, Department of Radiodiagnosis, Venkateshwara Institute of Medical Sciences, Gajraula

## **Corresponding Author: Dr. Vikash Kumar Gupta**

MBBS, MD, Associate Professor, Department of Radiodiagnosis, Venkateshwara Institute of Medical Sciences, Gajraula.

E-mail: [vikash\\_k\\_gupta@yahoo.com](mailto:vikash_k_gupta@yahoo.com)

**Abstract:** One of the most prevalent rheumatologic conditions is painful shoulder. There are a number of possible diagnoses that have a similar clinical presentation. Distinguishing between the various conditions is crucial since different therapies are available for each. While arthrography has been the gold standard for diagnosing rotator cuff tears, it is far from painless. One of MR's drawbacks is that, unlike ultrasound, it can't provide us dynamic studies in real time. Research into the function of high-resolution ultrasound in the diagnosis and evaluation of rotator cuff injuries was the driving force for this investigation. The current cross-sectional investigation was carried out in the radio-diagnosis department of the hospital. 125 patients who may have had rotator cuff problems are now having procedures. Ultrasound equipment with a high resolution was used for each scan. Using a linear probe that operates from 7.5 to 12 MHz, my lab's 50 X vision systems is capable of greyscale, color Doppler, and pulse Doppler. Most often, drivers and sportsmen would complain of right-sided shoulder ache after a traumatic event, while moving heavy things, when sleeping, or from their jobs. Isolated findings of tendinopathy or tears occurred in 40 of the 90 positive cases. Both the bicipital and supraspinatus tendons were implicated in rotator cuff diseases more often than the infraspinatus tendons, either alone or in conjunction with other tendon disorders. Infraspinatus tendinitis was only seen in two instances, and even then, only in conjunction with other rotator cuff muscles. In addition to bicipital peritendinitis, supraspinatus tendonitis, and persistent arthritic changes, one patient presented with a parabrachial cyst.

**Keywords:** High Resolution Ultrasound, Rotator Cuff, Hospitals, Bicipital Tendon, Parabrachial Cyst, Bicipital Peritendinitis

**INTRODUCTION**

A sudden and difficult-to-understand soreness in the shoulder may be the result of structures in the subacromial region moving in an uncoordinated way. One of the most prevalent underlying causes of shoulder stiffness and pain is rheumatoid diseases of the shoulder, which may be either periarticular or articular. [1] External manifestations of this condition may also include signs of vascular sickness, malfunction of internal organs, neoplasms, reflected neurological pain, or cervical spine disease. In orthopaedic medicine, the therapy that is advised for all patients is a step-by-step approach. [2,3] This is true regardless of the underlying cause of your condition. Naturally, as individuals become older, their muscle-tendon units get smaller, which leads to the development of the rotator cuff. [4,5] Because disorders with the rotator cuff are connected with 30–70% of all cases of shoulder pain, orthopedic surgeons help a significant percentage of patients who are experiencing discomfort in their shoulders.[6] When it comes to determining the precise form and degree of rotator cuff syndrome, the majority of the time, the physical exams that are used to diagnose the illness, such as the positive painful arc test and the external rotation lag test, are not sufficient. [7]

This meticulous approach to treatment bears the danger of overtreating the patient and delaying their recovery on account of the absence of symptoms that are often associated with rotator cuff illnesses. [8,9] Because of this, rotator cuff diseases are notoriously difficult to diagnose in real life when they occur. [10] The diagnostic imaging techniques that are considered to be the most reliable and accurate include ultrasound, magnetic resonance angiography (MRA), and magnetic resonance imaging (MRI). [11]

When it comes to diagnosing rotator cuff syndrome, magnetic resonance imaging (MRI) and magnetic resonance angiography (MRA) have poor interobserver agreements and are not particularly effective for partial tears. [12] The MRI cannot be done on the patient if they are going to be implanted because of this problem as well. [13] One of the most accurate methods for diagnosing rotator cuff syndrome is the use of ultrasound of the shoulder, which has led to the development of more precise treatment programs that are based on particular diagnostic criteria.[14]

The notion that it would be beneficial to prospectively assess sickness frequencies from the spectrum of rotator-cuff problems in orthopaedic medicine patients who are suffering shoulder pain was established as a result of this circumstance.[15] According to the findings of a prospective observational study, patients who have presented with shoulder pain that has lasted for a period of at least three months may be eligible for treatment after an ultrasound diagnosis. [16] The availability of imaging tests that are of the highest quality and reliability is essential. On the other hand, these tests are affected by a variety of other factors, such as the level of skill possessed by operators, accuracy, sensitivity, and computer processing of images.[17]

Pain in the shoulder is a frequent clinical complaint that is also a significant contributor to both occupational impairment and the expenditures of medical treatment. It is estimated that between 18% and 31% of people in general populations had experienced shoulder discomfort in the thirty days prior to the current evaluation. It is possible for shoulder structures to sustain traumas as a result of unintentional accidents such as falls.[18] Moreover, as people become older, the rotator cuff tendons

go through a process of degeneration, which makes them more susceptible to tendinosis and other problems linked with it. There are a number of shoulder joint illnesses that may cause discomfort in the shoulder. Some of these disorders include adhesive capsulitis, synovitis, and glenohumeral instability. Additionally, acromioclavicular and glenohumeral osteoarthritis are rather common in persons who are becoming older.[19]

When it comes to shoulder discomfort and rotator cuff issues, there are a variety of environmental and individual variables that may either create them or make them worse. An link has been found between shoulder discomfort and disorders and the physical load variables that are present in the workplace. [20] A number of studies have shown that there is a connection between shoulder issues and metabolic variables, such as being overweight or having diabetes mellitus. Previous research, on the other hand, focused only on a subset of people and provided only a limited amount of information about metabolic parameters. On top of that, there have been reports of studies that are contradictory about the relationship between smoking and physical activity.[21,22]

Central obesity, dyslipidemia, and insulin resistance are all components of the metabolic syndrome, which is a growing health concern in industrialized nations. This syndrome also raises the risk of cardiovascular disease. The C-reactive protein (CRP) and the increased intima-media thickness (IMT) of the carotid artery are both risk markers of atherosclerotic stroke and other cardiovascular disorders. Numerous investigations conducted in the past have shown a correlation between CRP and osteoarthritis of the upper extremities. On the other hand, we are not aware of any research that have been conducted exploring the connections between CRP, metabolic syndrome, and carotid IMT with shoulder discomfort and rotator cuff tendonitis.[23]

## **REVIEW OF LITERATURE**

**Shah AB, (2019) [24]** When it comes to ultrasound, the musculoskeletal ultrasound is the one that is performed the most commonly. In addition to having a higher resolution, ultrasound imaging also offers a better comprehension of the condition and produces a high level of accuracy when it comes to the diagnosis of rotator cuff illnesses. Tendon degeneration is caused by repeated active and passive strains, which ultimately results in tendon swelling and subluxation on the tendon side. Impingement syndrome is a condition that arises when there is insufficient space between the acromion and the humeral head. Patients who go to the imaging facility generally experience discomfort and restrictions in their range of motion while abducting their arms, both of which are signs of instability in the shoulder joint.

**Naganna HP (2018) [25]**When it comes to identifying rotator and non-rotator cuff illnesses, high-resolution ultrasound is a therapy that is non-invasive, requires no radiation, and has a high level of sensitivity. A magnetic resonance imaging (MRI) examination of the shoulder joint is performed in combination with this technique. When it comes to identifying either partial or complete tears of the rotator cuff muscle, high-resolution ultrasonography has a considerable degree of accuracy. Magnetic resonance imaging (MRI) is now the most effective method of research for locating any abnormalities in the anatomy of the shoulder joint.

**Krogsgaard MR (2022) [26]** The rotator cuff is protected by the capsule and the tendons, which simultaneously contribute to the rotator cuff's increased stability. Pain in the shoulder may be brought on by several factors, including acute trauma, degenerative illnesses, and impingement syndrome. The majority of people who seek treatment at orthopedics do so because they are experiencing discomfort in their shoulders. In the majority of cases, shoulder discomfort is brought on by soft tissue illnesses, namely impingement syndrome, which affect the tendons and bursae. Shoulder discomfort might be difficult to diagnose due to the fact that a physical examination may be required. If compared to the accuracy of arthroscopy, clinical diagnosis is much less accurate.

### **Significance of the study**

In the field of orthopedics, the relevance of the research on the use of high-resolution ultrasound in evaluating the features and degree of rotator and non-rotator cuff diseases resides in the fact that it has the potential to change diagnostic techniques and enhance patient treatment. Through the demonstration of the effectiveness of ultrasound in providing thorough imaging of both rotator and non-rotator cuff components, the research highlights the significance of ultrasound as a method of diagnosis that is not only cost-effective but also accessible and does not involve any invasive procedures. The significance of this cannot be overstated in contexts where access to sophisticated imaging modalities such as magnetic resonance imaging (MRI) may be restricted or expensive. Additionally, the research emphasizes the significance of operator skill in optimizing the usefulness of ultrasonography, emphasizing the need of consistent training methods in ultrasound interpretation. This is a significant finding. Overall, the results of this research have major implications for clinical practice. They provide orthopedic doctors with a method that is both accurate and efficient for identifying and monitoring rotator cuff problems, which ultimately leads to better patient outcomes and a higher standard of treatment.

### **Statement of the Problem**

This is one possible formulation for the description of the issue for the research project that will investigate the function of excellent quality ultrasound in determining the features and scope of rotator and non-rotator cuff disorders: For the purpose of proper therapy planning and patient care in clinical orthopedics, it is vital to make a precise diagnosis and characterisation of rotator and non-rotator cuff problems. The currently available diagnostic methods, on the other hand, may have limits in terms of accessibility, cost, or invasiveness. Due to the fact that high-resolution ultrasound is accessible, cost-efficient, and non-invasive, it is necessary to conduct an evaluation to determine whether or not it is helpful as a means of diagnosis for these illnesses. By evaluating the diagnostic accuracy and usefulness of high-resolution ultrasound in determining the extent and features of rotator or non-rotator cuff diseases, the purpose of this research is to fill this gap in knowledge and provide significant insights that may be used to improve clinical practice and patient care.

## RESEARCH METHODOLOGY

- **Machine**

The Esaote My Lab 50 X vision ultrasound uses a linear probe that ranges from 7.5 to 12 MHz and has features such as greyscale, color Doppler, and pulse Doppler.

- **Source Of Data**

Research conducted at the radio-diagnosis department of K D General Hospital, Lucknow, on patients referred from different departments On-site / In-patient.

- **Inclusion Criterion**

1. Individuals whose shoulder mobility is limited.
2. Shoulder pain accompanied by limited range of motion

- **Exclusion Criterion**

1. Cases involving fractures around the shoulder.
2. Individuals suffering from shoulder neoplasms,
3. Shoulder joints affected by polyarthritis

## RESULTS

With 63% male and 37% female participants, the study clearly shows a male majority.

**Table1:** Distribution of Patients Based on Their Gender.

GENDER	Number	Percentage
Male	79	63%
Female	46	37%
Total	125	100%

Thirteen patients in the 31–40 age groups had the highest prevalence of non-rotator cuff diseases, whereas forty-five patients in the 40–60 age groups had rotator cuff injuries.

**Table2:** The Patients' Distribution by Age

Rotator cufftear	Non rotatorcuffdisorders	Sonographically Normal study	Total
36 (29 %)	49 (39%)	40 (32 %)	125

From 125 patients who had ultrasonography due to shoulder discomfort or limited motion, 29% had rotator cuff tears, 39% had non-rotator cuff problems, and 32% had a sonographically normal scan. The research was conducted in a hospital setting.

**Table3:** Ultrasound-Detected Rotator Cuff Disorders in Research Participants

Age	Male	Female	Total
20- 30yrs	13 (16%)	5(10%)	18(14%)
31-40	14(18%)	11(24%)	25(20%)
41-50	21(27%)	19(41%)	40(32%)
51- 60	24(30%)	9(21%)	33(27%)
60 & above	7(08%)	2(4%)	09(7.2%)
Total	79(100%)	46(100%)	125(100%)

Forty people with sore shoulders were found to have isolated tendon involvement. Approximately 55% of these individuals experienced problems with their bicipital tendon, 37.5 % with their supraspinatus tendon, and 2.5 % with their infraspinatus tendon, the tendon least affected.

**Table4:** Patients Involved with Isolated Tendon Disorder.

Isolated Tendon involvement	Number of cases
Bicipital tendon	22 (55%)
Supraspinatus	15 (37.5%)
Subscapularis	2(5%)
Infraspinatus	1(2.5%)
Total	40

Among the total individuals, 39 patients (31% of the total) had multiple tendon involvement, excluding the isolated instances. Seventeen patients (44%) showed signs of involvement in both the supraspinatus and bicipital tendons, whereas eleven patients (28%) showed signs of involvement in all three areas. Two individuals had involvement of the infraspinatus tendon, the least common symptom.

**Table5:** Characteristics of Patients with Co-Occurring Disorders

	BT+SS	BT+SS+SC	SS+SC	SS+SC+IN	Total
Occurrence	17(44%)	11(28%)	9(23%)	2(5%)	39 (100%)

**DISCUSSION**

A major source of shoulder discomfort and ineffectiveness is rotator cuff injuries. Acute trauma on top of chronic cuff deterioration is usually the culprit. Weakness, reduced range of motion, and discomfort are symptoms that patients experience. Tenderness, weak abduction, atrophy or edematous supraspinatus, and altered scapulo-humoral motion are all physical findings. A painful arc, sleep aches, weakness, and limited range of motion are some of the symptoms that patients with rotator cuff disorders may experience. Shoulder discomfort may be caused by a variety of conditions, not just rotator cuff issues. These include adhesive capsulitis, compression of the cervical nerve root, and acute joint inflammation, among others.

Participants in our research had a history of shoulder discomfort and were referred from several departments at K D General Hospital, both inpatient and outpatient. This investigation was conducted in a hospital setting. The sonographic examination of sore shoulders was conducted on 125 patients as part of the research.

Sonography was performed on 125 individuals, 79(63%) of whom were male and 46(37%) of whom were female, all with a clinical diagnosis of sore shoulder. Males make up a disproportionately large portion of the sample. Regarding the increased frequency of right shoulder involvement compared to left shoulder involvement, there is no difference between males and females. Diabetic complications are more common in those aged 40 to 60. The prevalence of rotator cuff and non-rotator cuff disorders increased in the 40–60 age range as a consequence of all these causes.

Of the 77 patients in our research group who were 40 years old and higher, 39 patients (or 31% of the total) experienced rotator cuff issues, either alone or in combination, and these issues were significantly associated. [27]

The majority of sore shoulders (66 out of 100) were caused by supraspinatus lesions, whereas infraspinatus tendon involvement was rare (only 2 instances, or 4% of the total) and poorly linked with our research.[28]

Consistent with our research group's 54 individuals exhibiting bicipital tendon pathologies (41%), their incidence of bicipital tendon pathologies among uncomfortable shoulder patients was about 40%.

According to [29], there is a discrepancy between the clinical examination's diagnosis of rotator cuff disease and the sonographic evaluation's finding in these patients. It is difficult to identify minute or subclinical illnesses only with sonography. It's not [30]

Rotator cuff diseases might be influenced by diabetes mellitus as well. There was a strong correlation between the research and the fact that 24 out of 33 (or 25%) diabetic individuals had rotator cuff diseases, whereas 7 out of 33 diabetic patients did not.[31]

An age-related relationship was found between the kind of injury (rotator cuff or non-rotator cuff diseases) and the study's participants. The incidence of rotator cuff tears was 18% in the general population and 82% in those aged 60 and over. [32,33]The incidence of non-rotator diseases was greater among those younger than 60 years old (63% vs. 37%). Tendon fragility due to decreased tensile strength, calcium crystal deposition inside the tendon, and chronic degenerative changes all contribute to a higher risk of rotator cuff tears in individuals 60 and older. There is a good match between this and the research [ 34,35]

## **CONCLUSION**

One of the main ways to evaluate the rotator cuff is using high-resolution ultrasonography, which has shown to be an effective imaging tool for a variety of illnesses, including those not related to the rotator cuff. Performing a dynamic evaluation of the joint is made possible by this quick and cheap method. Paralabral cysts, calcific tendonitis, persistent arthritic alterations, tenosynovitis, tendinopathies, joint effusion, bursal collections, and other non-rotator cuff illnesses are readily demonstrable. Identifying minor abnormalities requires comparing the affected shoulder to the other asymptomatic shoulder. When it comes to detecting and quantifying the extent of partial-and full-thickness rotator cuff injuries, HRUSG has high diagnostic accuracy, on par with MR imaging.

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