Section: Radiology

Original Research Article

EVALUATION OF ULTRASOUND AS A DIAGNOSTIC TOOL FOR ROTATOR CUFF TEARS IN PATIENTS WITH SHOULDER PAIN

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Received : 10/02/2025
Received in revised form : 27/03/2025
Accepted : 13/04/2025

Keywords:
Rotator cuff tear, shoulder pain, ultrasound, supraspinatus tendon, musculoskeletal imaging, tendon injury, subacromial bursitis.

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DOI: 10.47009/jamp.2025.7.2.170

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2025; 7 (2); 839-842

Abstract

Background: Rotator cuff tears are a frequent cause of shoulder pain, especially among middle-aged and older adults. Timely and accurate diagnosis is essential for appropriate clinical management. While MRI is considered the gold standard, ultrasound offers a more accessible, cost-effective, and non-invasive imaging alternative. This study aimed to evaluate the utility of ultrasound in detecting rotator cuff tears and associated pathologies in patients presenting with shoulder pain. **Materials and Methods:** A prospective observational study was conducted on 100 patients with unilateral shoulder pain at Government Medical College and General Hospital, Vikarabad, from July 2024 to December 2024. All patients underwent clinical examination followed by musculoskeletal ultrasound using a high-frequency linear transducer. Demographic data, duration of symptoms, rotator cuff status, tendon involvement, and associated findings were recorded and analyzed. **Result:** The mean age of participants was 54.6 ± 11.8 years, with 58% being male. Pain was more commonly observed in the dominant arm (62%). Ultrasound revealed full-thickness tears in 36% and partial-thickness tears in 28% of patients, while 36% had normal rotator cuff findings. The supraspinatus tendon was most frequently involved (30 cases), followed by subscapularis (10 cases) and infraspinatus (6 cases). Subacromial-subdeltoid bursitis and biceps tendon pathology were observed in 26% and 18% of patients, respectively. **Conclusion:** Ultrasound serves as an effective, reliable, and accessible diagnostic tool for the evaluation of rotator cuff tears and related shoulder pathologies, particularly in primary and secondary care settings.

INTRODUCTION

Shoulder pain is one of the most prevalent musculoskeletal complaints, contributing significantly to outpatient visits and often resulting in impaired function and reduced quality of life. Among the various etiologies, rotator cuff tears are particularly common, especially in individuals over the age of 40. These tears can range from partial to full thickness and typically involve the supraspinatus, infraspinatus, and subscapularis tendons.[1,2]

Accurate and timely diagnosis of rotator cuff pathology is crucial to prevent the progression to chronic pain, decreased shoulder mobility, and long-term disability. Although Magnetic Resonance Imaging (MRI) is widely regarded as the gold standard for soft tissue evaluation due to its high-resolution imaging capabilities, its application is often limited in routine practice because of high cost, limited accessibility, and contraindications in certain patient populations[1-5]

In recent years, musculoskeletal ultrasound (USG) has emerged as an effective, non-invasive, and cost-efficient imaging modality for the assessment of shoulder pathologies. Ultrasound offers several advantages, including real-time dynamic imaging, the ability to assess multiple structures in different positions, and the capacity to correlate imaging findings with clinical symptoms during the examination,[3,4] In the hands of experienced operators, ultrasound has shown high sensitivity and specificity in diagnosing rotator cuff tears, making it a valuable tool in both primary and specialized care settings.[2,6,7]

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Moreover, ultrasound is not limited to identifying tendon tears; it is also useful in detecting associated abnormalities such as subacromial-subdeltoid bursitis and biceps tendon pathologies, enhancing its diagnostic scope in patients with shoulder pain.[4,6]
Given these advantages, this study was undertaken to assess the role of ultrasound in diagnosing rotator cuff tears and associated abnormalities in patients presenting with shoulder pain, thereby establishing its utility as a frontline diagnostic tool in clinical practice.

MATERIALS AND METHODS

Study Design and Setting: This was a prospective observational study conducted at the Department of Radiodiagnosis, Government Medical College and General Hospital, Vikarabad, over a period of six months, from July 2024 to December 2024.
Study Population: A total of 100 patients presenting with unilateral shoulder pain suspected to be of rotator cuff origin were included. These patients were referred from the orthopedic and general outpatient departments for radiological evaluation using ultrasound.
Inclusion Criteria
Patients aged 18 years and above
Clinical suspicion of rotator cuff pathology (e.g., shoulder weakness, restricted range of motion, pain during overhead activities, or night pain)
Willingness to undergo ultrasound evaluation
Exclusion Criteria
History of recent trauma, fracture, or surgery on the affected shoulder
Known systemic inflammatory or degenerative joint diseases (e.g., rheumatoid arthritis, ankylosing spondylitis)
Incomplete clinical data or inability to undergo ultrasound examination
Ultrasound Examination: All patients underwent high-resolution musculoskeletal ultrasound of the affected shoulder using a 7.5–12 MHz linear array transducer. The examination was performed with the patient in a seated position following a standardized protocol, which included dynamic assessment of the supraspinatus, infraspinatus, subscapularis, and biceps tendons, along with evaluation of the subacromial-subdeltoid bursa. Findings were categorized as normal, partial-thickness tear, or full-thickness tear based on standard sonographic criteria.
Data Collection and Analysis:
Demographic details, symptom duration, sonographic findings, and associated abnormalities were recorded in a structured proforma. Descriptive statistics (frequencies, percentages, and means with standard deviations) were used to summarize the data. The results were interpreted to determine the distribution and pattern of rotator cuff involvement and associated ultrasound findings.
Ethical Considerations: Prior approval for the study was obtained from the Institutional Ethics Committee of Government Medical College and General Hospital, Vikarabad. Written informed consent was obtained from all participants after explaining the purpose and nature of the study. Patient anonymity and data confidentiality were strictly maintained throughout the research.

RESULTS

A total of 100 patients presenting with unilateral shoulder pain were included in the study. The mean age of the participants was 54.6 ± 11.8 years. Of the total patients, 58 were male (58%) and 42 were female (42%). A majority (62%) reported involvement of the dominant arm [Table 1].
With respect to the duration of symptoms, 20 patients (20%) experienced pain for less than one month, 48 patients (48%) had symptoms lasting between 1–6 months, and 32 patients (32%) reported chronic symptoms of more than six months [Table 2].
Ultrasound evaluation showed that 36 patients (36%) had normal rotator cuff tendons. Partial thickness tears were observed in 28 patients (28%), while full thickness tears were noted in 36 patients (36%) [Table 3]. Among patients with rotator cuff tears, the supraspinatus tendon was the most frequently involved (30 cases), followed by the subscapularis tendon (10 cases) and infraspinatus tendon (6 cases) [Table 4].
Laterality analysis revealed that the right shoulder was more commonly affected (61%) than the left (39%) [Table 5].
In addition, associated findings identified by ultrasound included subacromial-subdeltoid bursitis in 26 patients (26%) and biceps tendon pathology in 18 patients (18%) [Table 6].

Table 1: Demographic Characteristics.

Parameter	Value
Mean Age (years)	54.6 ± 11.8
Male	58 (58%)
Female	42 (42%)
Dominant Arm Involvement	62 (62%)

Table 2: Duration of Shoulder Pain

Duration of Shoulder Pain	Number of Patients (%)
< 1 month	20 (20%)
1–6 months	48 (48%)
> 6 months	32 (32%)

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Table 3: Ultrasound Findings

Finding	Number of Patients (%)
Normal Rotator Cuff	36 (36%)
Partial Thickness Tear	28 (28%)
Full Thickness Tear	36 (36%)

Table 4: Tendon Involvement in Tears

Tendon	Number of Cases
Supraspinatus	30
Subscapularis	10
Infraspinatus	6

Table 5: Tear Laterality

Side	Number of Patients (%)
Right Shoulder	61 (61%)
Left Shoulder	39 (39%)

Table 6: Associated Findings on Ultrasound

Associated Finding	Number of Patients (%)
Subacromial-subdeltoid bursitis	26 (26%)
Biceps tendon pathology	18 (18%)

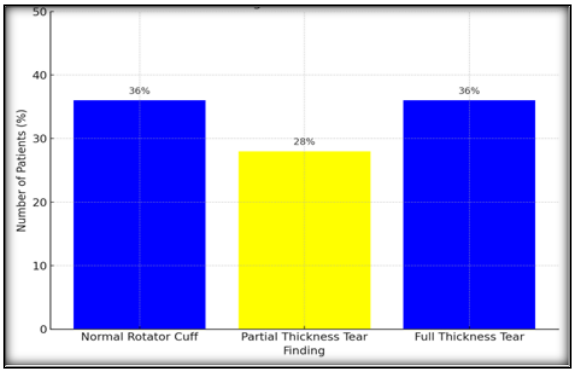

Figure 1: Ultrasound Findings in Patients with Shoulder Pain

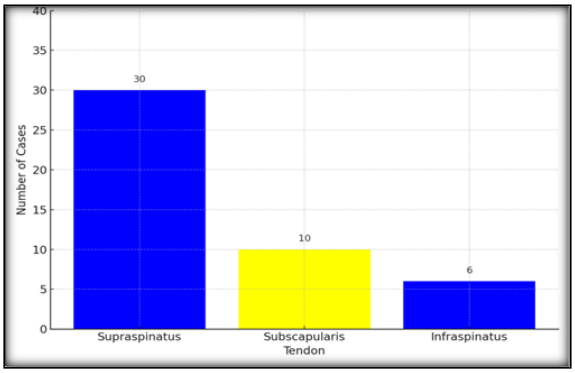

Figure 2: Tendon Involvement in Rotator Cuff Tears

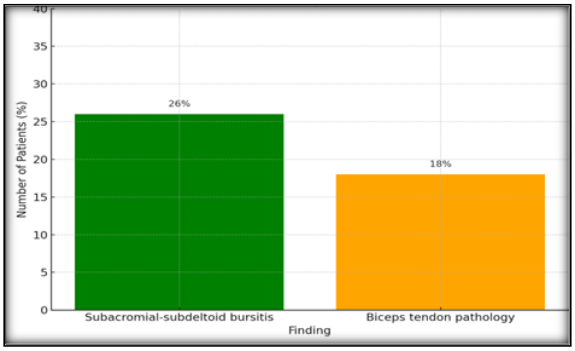

Figure 3: Associated Finding in Ultrasound

DISCUSSION

The present study evaluated the role of musculoskeletal ultrasound in detecting rotator cuff tears in patients presenting with unilateral shoulder pain. Ultrasound proved to be an effective diagnostic tool, identifying full-thickness tears in 36% and partial-thickness tears in 28% of patients, while 36% had normal rotator cuff findings. These results align with existing evidence supporting ultrasound as a reliable modality for assessing soft tissue shoulder abnormalities.[8-11]

Among the tendons involved, the supraspinatus was the most commonly affected, followed by the subscapularis and infraspinatus tendons. This pattern is well-supported by anatomical and clinical observations, as the supraspinatus is anatomically predisposed to degeneration and impingement due to its critical role in abduction and its passage beneath the acromion.[10,12]

In addition to diagnosing rotator cuff tears, ultrasound detected associated conditions such as subacromial-subdeltoid bursitis (26%) and biceps tendon pathology (18%), reinforcing its utility in providing a comprehensive evaluation of shoulder pain. The real-time capability of ultrasound offers dynamic assessment and allows direct symptom correlation, which adds to its diagnostic value.[9,13]

Although MRI remains the gold standard for rotator cuff imaging, it is not always feasible due to cost, availability, and patient-specific contraindications such as metallic implants or claustrophobia. In contrast, ultrasound is affordable, portable, and non-invasive, making it an excellent first-line imaging option, especially in primary care and resource-limited settings.[8,10,12]

A key strength of the present study is its prospective design and use of a standardized ultrasound protocol, ensuring consistent imaging quality and diagnostic interpretation. However, limitations include the operator dependency of ultrasound and the lack of

ISSN (O): 2687-5365; ISSN (P): 2753-6556

confirmatory imaging (e.g., MRI or surgical correlation), which might have enhanced diagnostic precision.[13,14] Additionally, inter-observer variability was not assessed, which could affect the generalizability of the findings, especially among less experienced sonographers.[13]

Future studies should focus on larger, multi-center cohorts with correlation to surgical outcomes or MRI findings to further validate ultrasound's diagnostic accuracy and reliability in shoulder pathology.[8,12,14]

CONCLUSION

This study highlights the utility of musculoskeletal ultrasound as a reliable, non-invasive, and efficient diagnostic tool for evaluating rotator cuff tears in patients with shoulder pain. Ultrasound effectively identified both partial and full-thickness tears, with the supraspinatus tendon being most commonly involved. Additionally, it proved valuable in detecting associated pathologies such as subacromial-subdeltoid bursitis and biceps tendon abnormalities. Given its affordability, real-time dynamic capability, and accessibility, ultrasound serves as an excellent first-line imaging modality, particularly in primary care and resource-constrained settings. Wider adoption of standardized scanning protocols and training of sonographers can further enhance its diagnostic accuracy and clinical impact.

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ISSN (O): 2687-5365; ISSN (P): 2753-6556