

ORIGINAL ARTICLE

Diagnostic Accuracy of Ultrasonography Compared with Magnetic Resonance Imaging for Rotator Cuff Pathologies of the Shoulder: A Cross-Sectional Study

Tania Kabir^{1*}, Yasna Kibria², Shanta Islam Mou³

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*Corresponding Author

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ABSTRACT

Background: Rotator cuff disorders are common causes of shoulder pain and functional impairment. Accurate imaging is important for identifying tendon abnormalities and guiding appropriate management. Ultrasonography (USG) is a readily available, non-invasive, and cost-effective imaging modality, whereas magnetic resonance imaging (MRI) provides comprehensive multiplanar assessment of soft-tissue structures. This study evaluated the diagnostic accuracy of USG compared with MRI for detecting rotator cuff pathologies of the shoulder. **Methods & Materials:** This cross-sectional study included 40 participants with clinically suspected shoulder musculotendinous pathology. We compared USG findings with MRI findings to detect rotator cuff abnormalities, particularly involving the supraspinatus, subscapularis, and infraspinatus tendons. Diagnostic performance was assessed using sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), diagnostic accuracy, and Cohen's kappa agreement. **Results:** The mean age of participants was 50.1 ± 10.8 years, and 70.0% were male. USG demonstrated high diagnostic performance for supraspinatus abnormalities, with sensitivity ranging from 91.7% to 100.0%, specificity from 95.5% to 97.2%, and accuracy from 95.0% to 97.5%. For subscapularis lesions, sensitivity ranged from 92.9% to 100.0%, specificity from 96.2% to 100.0%, and accuracy from 95.0% to 100.0%. Infraspinatus lesions showed comparatively lower sensitivity, particularly for partial-thickness tears (66.7%) and tendinosis (75.0%), although specificity remained high. **Conclusion:** USG demonstrated high diagnostic accuracy and substantial-to-almost-perfect agreement with MRI for most rotator cuff pathologies. It may therefore serve as a useful first-line imaging modality, while MRI remains valuable for equivocal or complex lesions.

Keywords: Ultrasonography, Magnetic Resonance Imaging, Rotator Cuff, Shoulder Pathology, Diagnostic Accuracy

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1. Tania Kabir, Medical Officer, Department of Neuroradiology and Imaging, National Institute of Neuroscience, Dhaka, Bangladesh (0009-0002-0158-1591)
2. Yasna Kibria, Medical Officer, Department of Neuroradiology and Imaging, National Institute of Neuroscience, Dhaka, Bangladesh (0009-0000-5954-2742)
3. Shanta Islam Mou, Medical officer, Department of Radiology and Imaging, Khulna Medical College Hospital, Khulna, Bangladesh

INTRODUCTION

Shoulder pain is a common musculoskeletal complaint and one of the most frequent causes for consultation in orthopaedic practice. It often results from disorders of the bones, joints, muscles, tendons, and related soft tissues. Shoulder pain affects 6.9% to 26% of the general population, with prevalence increasing with age. Rotator cuff pathologies are the most significant causes of shoulder pain, as the rotator cuff is a critical stabilising and functional component of the glenohumeral joint system [1,2,3]. These structures play a significant role in stabilising the glenohumeral joint and facilitating shoulder movement. In turn, repetitive mechanical stress, acute trauma and age-related degenerative changes can result in tendon full-thickness tears. Insidious degeneration of tendon biomechanical strength and an accompanying decrease in the resistance of underlying tissues may send concussed patients down this path to rupture and resultant loss of function. The clinical manifestation of rotator cuff disorders is usually characterised by shoulder pain,

tenderness, stiffness and limitation in joint range of motion that can significantly interfere with daily life activities [4,5]. The correct diagnosis of rotator cuff pathology is essential in order to guide management and indicate those patients who would benefit from conservative treatment, rehabilitation or surgical intervention. Imaging is at the centre of this diagnostic process. Ultrasonography (USG) and magnetic resonance imaging (MRI) are the conventional methods widely used to evaluate shoulder soft-tissue abnormalities. The best example of USG applications includes the elucidation of superficial musculotendinous structures such as tendon abnormality, tendon tear, fluid collection or dynamic impingement during active movement. Additionally, it is inexpensive, widely available, non-invasive and does not require patients to be exposed to ionising radiation [6]. The ability for real-time dynamic assessment is one of the most important benefits of USG. This allows the examiner to assess the rotator cuff in different arm positions and to compare the symptomatic shoulder with the contralateral shoulder. This means USG is

particularly helpful in capturing anomalies that may be less obvious to the naked eye during motion. Moreover, its relatively low cost and the ease of access are also advantages, especially in healthcare settings with limited MRI facilities. That being said, the diagnostic performance of USG is operator experience- and examination technique-dependent. The ultrasound characteristics of subtle or deep lesions, especially some partial-thickness tears, are often limited [7,8]. In contrast, multiplanar high-resolution visualisation with excellent soft-tissue contrast can be accomplished with MRI. This modality provides a detailed evaluation of both tendon structure as well as muscle atrophy, fat infiltration, tendon retraction and intra-articular or osseous abnormalities. MRI is of great value in identifying subtle features, especially when complex pathology is suspected or USG findings are equivocal. It provides visualisation of both superficial and deep structures, which is an important reference imaging modality for holistic assessment of rotator cuff disease [9]. Previous studies have shown that USG and MRI are in strong concordance for the detection of rotator cuff abnormalities. As for full-thickness complete ruptures, USG performed particularly well, and MRI could be reserved especially for cases of subtle partial-thickness tears and concomitant deep or intra-articular abnormalities. Thus, the literature supports USG as a potentially effective first-line investigation when performed by an experienced examiner, with a valued companion role of MRI in complex or equivocal cases anywhere [6,9].

However, the basis of these findings for differential diagnosis may vary depending on the tendon and type of pathology. Thus, direct assessment of ultrasound characteristics (sensitivity, specificity, predictive values and accuracy) and the concordance between USG and MRI is essential for confirming the value of ultrasound as a reliable modality for examination of the rotator cuff in routine practice. The current study was performed to evaluate the diagnostic performance of ultrasonography for shoulder rotator cuff pathology in comparison with magnetic resonance imaging, focusing specifically on supraspinatus, subscapularis and infraspinatus lesions. Results are anticipated to both elucidate the role of USG as an appropriate preliminary imaging modality and recognise instances where MRI may still be required for further assessment.

METHODS & MATERIALS

This cross-sectional observational study was performed in the Department of Radiology and Imaging, BMU, Dhaka. The study was conducted as a single-centre cohort study from April 2023 to March 2025 sample size was 40 patients. Cross-sectional observational study of patients having shoulder pain and suspected musculotendinous pathologies, Orthopaedic Department, BMU, Dhaka. This was conducted as a descriptive cross-sectional study on patients suspected of

musculotendinous pathologies diagnosed by USG and MRI from the BMU, Dhaka, in the period specified above.

Inclusion Criteria

Clinically suspected rotator cuff or shoulder musculotendinous pathology. Patients who received both shoulder USG and MRI. Patients who were interested in participating.

Exclusion Criteria

Patients who were not examined by both USG and MRI. Patients with insufficient or missing imaging data. Patients who were not able to participate in the study.

Data Collection

Data were obtained from 40 patients with significant suspicion of shoulder musculotendinous pathology. Demographic and clinical details were collected. Shoulder ultrasonography (USG) and magnetic resonance imaging were performed on each participant. The diagnostic accuracy for supraspinatus, subscapularis, and infraspinatus pathologies was similarly documented and analysed.

Statistical Analysis

We evaluated the characteristics of the data obtained to assess the diagnostic performance of USG with respect to MRI. For the results, frequencies, percentages and diagnostic accuracy measures were used. For categorical diagnostic outcomes, Cohen's kappa was utilised to assess the level of agreement between USG and MRI with regard to their association. Results $A p < 0.05$ was considered significant;

Ethical Considerations

All procedures performed in this study were approved by the Institutional Review Board (IRB) and Department of Radiology and Imaging, Bangladesh Medical University (BMU), Dhaka, prior to commencement. Informed consent was obtained from all participants prior to study initiation, after a full explanation of the study objectives and procedures. Participant data were anonymous; participants were allowed to refuse or withdraw without any change in treatment.

RESULTS

Analyses were performed on a total of 40 participants with clinically suspected shoulder musculotendinous pathology. The average age was 50.1 ± 10.8 years with a range from 20–63 years of age. The fifth age group gave the largest proportion 50–59 years (37.5%), after which followed before last one with average mean ages of groups was between 60 and 69 years (22.5%). There was a striking male predominance as 28 (70.0%) were males and 12 (30.0%) females, with a male to female ratio of 2.3:1. A majority were in the primary middle socioeconomic group (62.5%) (Table I).

Table I: Demographic characteristics of the study participants (n = 40)

Characteristic	Frequency	Percentage (%)
Age group (years)		
20–29	2	5.0
30–39	6	15.0
40–49	8	20.0
50–59	15	37.5
60–69	9	22.5
Mean $\pm$ SD	50.1 $\pm$ 10.8	
Range	20–63	
Sex		
Male	28	70.0
Female	12	30.0

For supraspinatus complete tears, USG demonstrated 100% sensitivity and 97.2% specificity, with an overall diagnostic accuracy of 97.5%. The Cohen's kappa value of 0.875

indicated almost perfect agreement between USG and MRI (Table II).

Table II: Association Between Ultrasonography (USG) and MRI in Diagnosing Supraspinatus Pathologies Among Study Participants ($n = 40$)

USG finding	MRI Positive	MRI Negative	Total
Complete tear	4 (100.0%)	1 (2.8%)	5 (12.5%)
Negative	0 (0.0%)	35 (97.2%)	35 (87.5%)
Total	4 (100.0%)	36 (100.0%)	40 (100.0%)

USG demonstrated consistently high diagnostic performance for supraspinatus pathology. Sensitivity ranged from 91.7% to 100%, specificity from 95.5% to 97.2%, and accuracy from 95.0% to 97.5%. Agreement with MRI was almost perfect for

all three abnormalities, with kappa values ranging from 0.875 to 0.899 (Table III).

Table III: Diagnostic Performance of USG for Supraspinatus Pathologies Compared with MRI ($n = 40$)

Pathology	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Accuracy (%)	Cohen's κ	p-value
Complete tear	100.0	97.2	80.0	100.0	97.5	0.875	<0.001
Partial-thickness tear	91.7	96.4	91.7	96.4	95.0	0.881	<0.001
Tendinosis	94.4	95.5	94.4	95.5	95.5	0.899	<0.001

USG also demonstrated excellent diagnostic performance for subscapularis abnormalities. The highest performance was observed for tendinosis, where sensitivity, specificity, PPV, NPV, and accuracy were all 100%, with perfect agreement

with MRI ($\kappa = 1.000$, $p < 0.001$). For partial-thickness tears, sensitivity was 92.9%, specificity 96.2%, and accuracy 95.0%, with almost perfect agreement ($\kappa = 0.890$) (Table IV).

Table IV: Diagnostic Performance of USG for Subscapularis Pathologies Compared with MRI ($n = 40$)

Pathology	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Accuracy (%)	Cohen's κ	p-value
Complete tear	100.0	97.4	50.0	100.0	97.5	0.655	0.001
Partial-thickness tear	92.9	96.2	92.9	96.2	95.0	0.890	<0.001
Tendinosis	100.0	100.0	100.0	100.0	100.0	1.000	<0.001

Compared with the supraspinatus and subscapularis, USG showed relatively lower sensitivity for infraspinatus abnormalities. Sensitivity was 66.7% for partial-thickness tears and 75.0% for tendinosis. However, specificity remained high at 100% and 94.4%, respectively. The corresponding

diagnostic accuracies were 95.0% and 92.5%. Agreement with MRI was substantial for both lesions ($\kappa = 0.773$ and 0.625, respectively) (Table V).

Table V: Diagnostic Performance of USG for Infraspinatus Pathologies Compared with MRI ($n = 40$)

Pathology	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Accuracy (%)	Cohen's κ	p-value
Partial-thickness tear	66.7	100.0	100.0	94.4	95.0	0.773	<0.001
Tendinosis	75.0	94.4	60.0	97.1	92.5	0.625	0.001

Overall, the highest diagnostic performance of USG was observed for subscapularis tendinosis, with 100% accuracy, followed by supraspinatus complete tears and subscapularis complete tears, both with 97.5% accuracy. The lowest

sensitivity was observed for infraspinatus partial-thickness tears (66.7%), followed by infraspinatus tendinosis (75.0%) (Table VI).

Table VI: Comparative Diagnostic Accuracy of USG for Rotator Cuff Pathologies

Tendon	Pathology	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Accuracy (%)
Supraspinatus	Complete tear	100.0	97.2	80.0	100.0	97.5
	Partial-thickness tear	91.7	96.4	91.7	96.4	95.0
	Tendinosis	94.4	95.5	94.4	95.5	95.5
Subscapularis	Complete tear	100.0	97.4	50.0	100.0	97.5
	Partial-thickness tear	92.9	96.2	92.9	96.2	95.0
	Tendinosis	100.0	100.0	100.0	100.0	100.0
Infraspinatus	Partial-thickness tear	66.7	100.0	100.0	94.4	95.0
	Tendinosis	75.0	94.4	60.0	97.1	92.5

DISCUSSION

The current cross-sectional study assessed the accuracy of ultrasonography (USG) and compared it with magnetic resonance imaging (MRI) for detection of shoulder rotator cuff pathologies in forty patients. Participants had a mean age of 50.1 ± 10.8 years, with the highest proportion in the 50–59-year (37.5%) and 60–69-year (22.5%) age groups. The male/female ratio was 70.0%/30.0%, showing a significant male predominance. The relative concentration of this disease in middle-aged and older adult patients, compared to workers, is consistent with the chronic degenerative and/or traumatic nature of rotator cuff disease. Shoulder pain and rotator cuff abnormalities were also commonly observed in middle-aged and older patients, which is consistent with the current finding of a demographic distribution.

Modest but excellent agreement between USG and MRI in diagnosing supraspinatus complete tears. USG detected all MRI-positive cases, yielding a sensitivity of 100%, specificity of 97.2%, PPV of 80.0%, NPV of 100% and diagnostic accuracy of 97.5%; inter-observer agreement was almost perfect ($\kappa=0.875$, $p<0.001$). These results are similar to those of Chauhan et al [10], who reported that ultrasound had high diagnostic accuracy for rotator cuff tears when compared with MRI. Similarly, Malik et al The current result supports that complete tendon disruption can be reliably detected by USG, as demonstrated by the excellent performance of USG for full-thickness rotator cuff tears [11]. The sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and accuracy with their associated kappa statistics were: 91.7%, 96.4%, 91.7% PPV, 96.4% NPV, and 95.0% accuracy ($\kappa=0.881$) for partial-thickness tears. The sensitivity and specificity for supraspinatus tendinosis were as follows: 94.4% and 95.5%, respectively, with an accuracy of 95.5% ($\kappa=0.899$) [12]. Consequently, this suggests that the current results support USG as both a highly accurate diagnostic tool for structural tears and a non-invasive modality for detecting tendinotic changes of the supraspinatus. USG identified 100% of complete tears (sensitivity), with 97.4% specificity and an accuracy of 97.5%, but PPV was relatively low at 50%, likely reflecting the small number of positive tears. Sensitivity, specificity, and accuracy were 92.9%, 96.2% and 95.0% for partial-thickness tears ($\kappa=0.890$). Subscapularis tendinosis, most notably, showed perfect test performance (100% sensitivity, specificity, PPV and NPV), with maximum agreement ($\kappa=1.000$) between both imaging plates ($p<0.001$) [6]. The same group, in their comparative studies between USG and MRI, also stated that high-resolution ultrasound yields reliable evaluation of rotator cuff tendons of the shoulder, including subscapularis. These findings imply the high reliability of USG in detecting tears and degenerative subscapularis changes.

In contrast, USG demonstrated relatively lower sensitivity for infraspinatus lesions. USG showed 66.7% sensitivity for partial-thickness tears, although specificity was 100%, PPV 100%, NPV 94.4%, and accuracy 95.0% ($\kappa=0.773$, $p<0.001$). For infraspinatus tendinosis, sensitivity was 75.0%, specificity 94.4%, PPV 60.0%, NPV 97.1%, and accuracy 92.5% ($\kappa=0.625$, $p=0.001$). The lower sensitivity compared with supraspinatus and subscapularis suggests that subtle infraspinatus abnormalities may be more difficult to characterise by USG. Malik et al similarly demonstrated comparatively reduced sensitivity of USG for some infraspinatus tears, despite high specificity [11]. Murugan et al also reported that diagnostic performance varied according to the particular rotator cuff tendon involved [13]. Regarding the diagnostic performance, 100% accuracy was achieved for subscapularis tendinosis; 97.5% each for supraspinatus complete tears and subscapularis complete tears, respectively. The accuracy was 95.0% for supraspinatus partial tear (SPT) and subscapularis partial tear (SCT), while there was an accurate diagnosis of 95.5% for supraspinatus tendinosis (ST). The infraspinatus partial-thickness tears had the lowest sensitivities (66.7%), and infraspinatus tendinosis also showed low sensitivity (75.0%). Narra et al. Ultrasound can be useful in guiding and evaluating shoulder tendon pathology [14]. In patients with rotator cuff pathology, there was also excellent agreement in the diagnosis by CT and by high-resolution USG.

Overall, this study shows that USG can achieve high diagnostic accuracy for most rotator cuff tears, especially supraspinatus and subscapularis lesions. The consistently high specificity means that a positive USG finding is very reliable, while lower sensitivity for infraspinatus lesions connotes that negative or equivocal USG findings should be interpreted with caution Singh et al. and Chauhan et al [15,16]. Findings also support the role of comparative USG and MRI in rotator cuff evaluation. Thus, USG can be deemed to be an optimal primary investigation as it is widely available, non-invasive, inexpensive and provides a dynamic assessment, whilst MRI also retains a key role in subtle equivocal lesions. Therefore, the current findings support the combined use of both modalities, and do not justify considering USG and MRI as mutually exclusive investigations.

CONCLUSION

Ultrasound had excellent diagnostic accuracy and substantial-almost perfect agreement with magnetic resonance imaging (MRI) for most rotator cuff pathologies. Subscapularis tendinosis yielded the highest performance, with sensitivity/specificity/accuracy of 100 %; followed by supraspinatus and subscapularis tears, which also demonstrated excellent diagnostic performance. The sensitivity was, however, relatively low for infraspinatus partial-thickness tears and tendinosis. Conclusion: USG may

be utilised as a helpful, promising, and inexpensive first-line imaging modality for suspected rotator cuff pathology, with MRI retaining its value as the gold standard in acute traumatic shoulder complex trauma or equivocal subtle or complicated lesions necessitating more detailed assessment.

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CONFLICT OF INTEREST

None declared

ETHICAL CONSIDERATION

The study was approved by ethical review committee

REFERENCE

1. Dinnes J, Loveman E, McIntyre L, Waugh N. The effectiveness of diagnostic tests for the assessment of shoulder pain due to soft tissue disorders: a systematic review. *Health Technol Assess*. 2003;7(29):1-166.
2. Luime JJ, Koes BW, Hendriksen IJ, Burdorf A, Verhagen AP, Miedema HS, et al. Prevalence and incidence of shoulder pain in the general population: a systematic review. *Scand J Rheumatol*. 2004;33(2):73-81.
3. Van Holsbeeck MT, Introcaso JH. *Musculoskeletal ultrasound*. St Louis: Mosby; 2001.
4. Lambert A, Loffroy R, Guiu B, Mejean N, Lerais JM, Cercueil JP, et al. Rotator cuff tears: value of 3.0T MRI. *J Radiol*. 2009;90(5):583-8.
5. Seibold CJ, Mallisee TA, Erickson SJ, Boynton MD, Raasch WG, Timins ME. Rotator cuff: evaluation with US and MR imaging. *Radiographics*. 1999;19(3):685-705.
6. Singh A, Thukral CL, Gupta K, Singh MI, Lata S, Arora RK. Role and correlation of high-resolution ultrasound and magnetic resonance imaging in evaluation of patients with shoulder pain. *Pol J Radiol*. 2017; 82:410-7.
7. Martinoli C, Bianchi S, Prato N, Pugliese F, Zamorani MP, Valle M, et al. US of the shoulder: non-rotator cuff disorders. *Radiographics*. 2003;23(2):381-401.
8. Jacobson JA. *Fundamentals of musculoskeletal ultrasound*. 3rd ed. Philadelphia (PA): Saunders; 2017.
9. Morag Y, Jacobson JA, Miller B, De Maeseneer M, Girish G, Jamadar D. MR imaging of rotator cuff injury: what the clinician needs to know. *Radiographics*. 2006;26(4):1045-65.
10. Chauhan MI, Patel PN, Prajapati BV, Trivedi PA. Diagnostic accuracy of ultrasound for rotator cuff tears of shoulder joint compared to magnetic resonance imaging. *Int J Pharm Clin Res*. 2024;16(2):1249-55.
11. Malik P, Sen KK, Kumar GM, Mukherjee N, Veerabathini MK, Adarsh A. Accuracy of ultrasound compared to MRI in evaluation of rotator cuff tears. *Int J Contemp Med Surg Radiol*. 2020;5(1): A21-5.
12. Maravi P, Khadly A, Kaushal L, Goyal S, Patil P. Role of high-frequency USG in rotator cuff injury and its comparison with MRI. *Int J Med Res Rev*. 2020;8(6):440-50.
13. Murugan J, A VSK, Selvarajan RM, A VSA, Muthu S, Jeyaraman M. Diagnostic accuracy of high-resolution ultrasonogram compared to magnetic resonance imaging in rotator cuff tears: a prospective comparative study. *Apollo Med*. 2023;20(1):12-7.
14. Narra R, Jehendren VM, Bollipo JP, Putcha A. Sonographic evaluation of shoulder joint pain with MRI correlation. *J Evol Med Dent Sci*. 2017;6(37):3007-13.
15. Singh J. A comparative study of ultrasonography and magnetic resonance imaging for the evaluation of rotator cuff injuries. *Int J Orthop*. 2022;8(1):494-9.
16. Chauhan NS, Ahluwalia A, Sharma YP, Thakur L. A prospective comparative study of high-resolution ultrasound and MRI in the diagnosis of rotator cuff tears in a tertiary hospital of North India. *Pol J Radiol*. 2016; 81:491.