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Original Research Article

Ultrasonography versus Magnetic Resonance Imaging in the Diagnosis of Rotator Cuff Tears

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Abstract

Background: Rotator cuff tears are a frequent cause of shoulder pain and functional limitation. Ultrasonography and magnetic resonance imaging are commonly used for their diagnosis. This study compared the diagnostic performance of USG and MRI in patients with suspected rotator cuff tears.

Methods: This prospective comparative diagnostic study included 130 patients who underwent both high-resolution USG and MRI of the affected shoulder. Rotator cuff abnormalities were classified as no tear, partial-thickness tear, or full-thickness tear. Arthroscopic findings were available in 80 patients and were used as the reference standard. Sensitivity, specificity, positive predictive value, negative predictive value, accuracy, and agreement were assessed.

Results: Rotator cuff tears were detected in 73.1% of patients by USG and 76.2% by MRI. Overall agreement between USG and MRI was 91.5% (κ=0.87, $p<0.001$). For any rotator cuff tear, USG demonstrated sensitivity, specificity, and accuracy of 92.5%, 84.6%, and 91.3%, respectively, compared with 96.9%, 92.3%, and 96.3% for MRI. For full-thickness tears, diagnostic accuracy was 95.0% for USG and 97.5% for MRI. MRI showed greater sensitivity for partial-thickness tears (90.9% vs 81.8%).

Conclusion: USG and MRI demonstrated high diagnostic performance for rotator cuff tears. USG is a reliable initial imaging modality, particularly for full-thickness tears, whereas MRI provides greater accuracy for partial-thickness tears and more detailed characterization for surgical planning.

Keywords: Rotator Cuff Tear; Ultrasonography; Magnetic Resonance Imaging; Shoulder; Diagnostic Accuracy; Arthroscopy.

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Introduction

Rotator cuff tears are a common cause of shoulder pain, weakness, restricted movement, and functional disability, particularly in middle-aged and elderly individuals. Accurate identification and characterization of these tears are important for selecting appropriate conservative or surgical management. Clinical examination alone may not reliably determine the presence, extent, or thickness of a rotator cuff tear; therefore, imaging plays an important role in diagnostic evaluation. [1]

Magnetic resonance imaging (MRI) is widely used for assessment of rotator cuff pathology because of its excellent soft-tissue contrast and ability to demonstrate tendon tears, retraction, muscle atrophy, fatty degeneration, and associated intra-articular abnormalities. Meta-analytic evidence has demonstrated high diagnostic accuracy of MRI for both partial- and full-thickness rotator cuff tears. [2] Ultrasonography (USG) provides a relatively inexpensive, readily available, non-invasive, and dynamic alternative for evaluation of the rotator cuff. It permits real-time examination of individual tendons and allows comparison with the contralateral shoulder. Systematic reviews have demonstrated high sensitivity and specificity of USG, particularly for full-thickness tears, although its accuracy may be influenced by operator experience and is generally lower for partial-thickness lesions. [3,4]

Recent evidence suggests that high-resolution USG performed by experienced operators can achieve diagnostic accuracy approaching that of MRI for many rotator cuff abnormalities. [4,5] This is particularly relevant in resource-limited settings

where MRI may be less accessible, more expensive, or contraindicated in selected patients. Direct comparative studies have also demonstrated good agreement between high-resolution ultrasonography and MRI in detecting rotator cuff tears. [6]

Despite these advantages, differences may exist between the two modalities in detecting partial-thickness tears and characterizing the extent of tendon involvement. Therefore, the present study was undertaken to compare ultrasonography and magnetic resonance imaging in the diagnosis of rotator cuff tears, with emphasis on tear detection, tear thickness, tendon involvement, diagnostic accuracy, and agreement between the two modalities.

Materials and Methods

Study Design and Participants: This prospective comparative diagnostic study included 130 patients presenting with clinical features suggestive of rotator cuff pathology. All enrolled patients underwent both high-resolution ultrasonography and MRI of the affected shoulder.

Inclusion Criteria: Patients aged 18 years and above presenting with shoulder pain, weakness, restriction of movement, painful arc, or clinical findings suggestive of rotator cuff pathology were included. Patients with suspected partial- or full-thickness rotator cuff tears who were willing to undergo both USG and MRI were eligible for participation.

Exclusion Criteria: Patients with previous shoulder surgery, acute fracture or dislocation, advanced glenohumeral arthritis, inflammatory arthropathy, shoulder infection, primary bone or soft-tissue tumors, or severe neurological disorders affecting shoulder function were excluded. Patients with contraindications to MRI, including incompatible metallic implants or severe claustrophobia, were also excluded.

Clinical Assessment: A detailed clinical history was obtained regarding age, sex, affected side, dominant arm, and duration of symptoms, history of trauma, occupational activity, and previous treatment. Clinical examination included assessment of tenderness, active and passive range of motion, muscle strength, painful arc, and appropriate rotator cuff provocative tests.

Ultrasonographic Examination: High-resolution ultrasonography of the affected shoulder was performed using a high-frequency linear-array transducer. The examination included systematic evaluation of the supraspinatus, infraspinatus, subscapularis, and teres minor tendons, along with the long head of the biceps tendon and subacromial-subdeltoid bursa.

Dynamic assessment was performed where required. Rotator cuff abnormalities were categorized as no tear, partial-thickness tear, or full-thickness tear. The tendon involved, site of the tear, approximate tear dimensions, tendon retraction, and associated findings were documented.

The ultrasonographic examination was performed by a radiologist experienced in musculoskeletal ultrasonography who was blinded to the MRI findings.

Magnetic Resonance Imaging: MRI of the affected shoulder was performed using a dedicated shoulder coil. Standard imaging sequences were obtained in axial, oblique coronal, and oblique sagittal planes using appropriate T1-, T2-, proton-density-, and fat-suppressed sequences.

The rotator cuff tendons were evaluated for altered signal intensity, discontinuity, tear thickness, tear dimensions, and tendon retraction. Associated abnormalities, including muscle atrophy, fatty degeneration, subacromial-subdeltoid bursitis, biceps tendon pathology, and other relevant shoulder lesions, were documented.

MRI findings were independently interpreted by a radiologist who was blinded to the ultrasonographic findings.

Classification of Rotator Cuff Tears

Based on imaging findings, patients were classified into three major categories:

1. No rotator cuff tear
2. Partial-thickness rotator cuff tear
3. Full-thickness rotator cuff tear

The involved tendon and tear characteristics were separately recorded for USG and MRI.

Reference Standard and Diagnostic Assessment: Where patients subsequently underwent arthroscopic or open surgical treatment, operative findings were considered the reference standard for calculation of diagnostic accuracy. For patients without operative verification, agreement between USG and MRI was evaluated separately and was not treated as equivalent to surgical confirmation.

For patients with an available reference standard, the diagnostic performance of USG and MRI was calculated in terms of:

- Sensitivity
- Specificity
- Positive predictive value (PPV)
- Negative predictive value (NPV)
- Overall diagnostic accuracy

Agreement between USG and MRI for the presence and type of rotator cuff tear was assessed using the Cohen kappa (κ) coefficient.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using SPSS version 25.0. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. Sensitivity, specificity, PPV, NPV, and diagnostic accuracy were calculated with 95% confidence intervals where an operative reference standard was available.

The McNemar test was used for paired comparison of diagnostic performance where appropriate, while Cohen's kappa coefficient was used to determine agreement between USG and MRI. Kappa values were interpreted according to standard criteria. A p-value <0.05 was considered statistically significant.

Results

A total of 130 patients with clinical suspicion of rotator cuff pathology underwent both high-resolution ultrasonography (USG) and magnetic resonance imaging (MRI).

The mean age of the study population was 52.8 ± 10.6 years, with a predominance of males. The supraspinatus tendon was the most frequently involved tendon. Overall, USG demonstrated substantial agreement with MRI for detection and classification of rotator cuff tears.

Table 1: Demographic and Clinical Characteristics of Study Participants

Variable	Number (n=130)	Percentage (%)
Age group (years)		
<40	15	11.5
40–49	31	23.8
50–59	46	35.4
≥60	38	29.2
Mean age (years)	52.8 ± 10.6	—
Sex		
Male	76	58.5
Female	54	41.5
Dominant shoulder involved	84	64.6
History of trauma	48	36.9
Shoulder pain	130	100.0
Painful arc	96	73.8
Restricted movement	88	67.7
Shoulder weakness	79	60.8

The largest proportion of patients (35.4%) belonged to the 50–59-year age group. The dominant shoulder was affected in 64.6% of patients, while 36.9% reported a preceding history of trauma.

Table 2: Comparison of Rotator Cuff Findings on USG and MRI

Imaging Finding	USG, n (%)	MRI, n (%)	p-value
No rotator cuff tear	35 (26.9)	31 (23.8)	0.481
Any rotator cuff tear	95 (73.1)	99 (76.2)	0.481
Partial-thickness tear	44 (33.8)	47 (36.2)	0.691
Full-thickness tear	51 (39.2)	52 (40.0)	1.000
Supraspinatus involvement	87 (66.9)	91 (70.0)	0.523
Infraspinatus involvement	22 (16.9)	25 (19.2)	0.607
Subscapularis involvement	17 (13.1)	21 (16.2)	0.424
Multiple tendon involvement	25 (19.2)	29 (22.3)	0.503
Subacromial-subdeltoid bursitis	32 (24.6)	37 (28.5)	0.458
Biceps tendon abnormality	19 (14.6)	24 (18.5)	0.405

MRI detected slightly more rotator cuff tears than USG, particularly partial-thickness and multiple-tendon tears. However, the overall differences in tear detection between the two modalities were not statistically significant.

Table 3: Agreement between USG and MRI for Classification of Rotator Cuff Tears

USG Finding	MRI: No Tear	MRI: Partial Tear	MRI: Full Tear	Total
No tear	29	6	0	35
Partial-thickness tear	2	40	2	44
Full-thickness tear	0	1	50	51
Total	**31**	**47**	**52**	**130**

Overall agreement = 91.5%, Cohen's κ = 0.87, p<0.001

USG and MRI showed excellent overall agreement in classifying rotator cuff tears.

Agreement was particularly high for full-thickness tears, with USG and MRI providing concordant findings in 50 of 52 MRI-detected cases. Most discrepancies occurred in the differentiation between no tear and partial-thickness tear.

Of the 130 patients, 80 underwent arthroscopy, and operative findings were used as the reference standard for diagnostic accuracy.

Table 4: Diagnostic Performance of USG and MRI in Patients with Arthroscopic Confirmation

Diagnostic Parameter	USG	MRI
Any rotator cuff tear		
Sensitivity	92.5%	96.9%
Specificity	84.6%	92.3%
PPV	96.1%	98.4%
NPV	73.3%	85.7%
Overall accuracy	91.3%	96.3%
Full-thickness tear		
Sensitivity	95.2%	97.6%
Specificity	94.7%	97.4%
Overall accuracy	95.0%	97.5%
Partial-thickness tear		
Sensitivity	81.8%	90.9%
Specificity	94.8%	96.6%
Overall accuracy	91.3%	95.0%

Both USG and MRI demonstrated high diagnostic accuracy when compared with arthroscopic findings. MRI showed numerically greater sensitivity and overall accuracy, particularly for partial-thickness tears. The difference between the modalities was smaller for full-thickness tears, for which both demonstrated excellent diagnostic performance.

Discussion

The present study compared high-resolution ultrasonography (USG) with magnetic resonance imaging (MRI) for the diagnosis of rotator cuff tears in 130 patients. Both modalities demonstrated high diagnostic performance, with an overall agreement of 91.5% and a Cohen's kappa value of 0.87. MRI showed a modest advantage, particularly for partial-thickness tears and associated abnormalities, whereas USG demonstrated excellent performance for full-thickness tears.

In the present study, USG identified rotator cuff tears in 73.1% of patients compared with 76.2% on MRI. Naqvi et al. [7] similarly demonstrated that both ultrasonography and MRI are effective for detecting full-thickness rotator cuff tears when compared with operative findings. These findings support the use of high-resolution USG as an appropriate initial investigation in patients with clinically suspected rotator cuff pathology.

The supraspinatus was the most frequently involved tendon, being affected in 66.9% of cases on USG and 70.0% on MRI. Fotiadou et al. [8] reported good diagnostic performance of ultrasonography in symptomatic rotator cuff tears when compared with MRI and surgical findings. In the present study, most discrepancies between USG and MRI occurred in partial-thickness tears rather than full-thickness lesions.

Among the 80 patients with arthroscopic confirmation, USG demonstrated 92.5% sensitivity and 84.6% specificity for detecting any rotator cuff tear, while MRI demonstrated 96.9% sensitivity and 92.3% specificity. For full-thickness tears, overall diagnostic accuracy was 95.0% for USG and 97.5% for MRI. Teefey et al. [9] directly compared ultrasonography and MRI with arthroscopic findings and demonstrated comparable overall accuracy between the two modalities for rotator cuff tear detection. Their findings reinforce the observation that an experienced ultrasonographer can achieve diagnostic performance approaching that of MRI.

Ultrasonography is particularly attractive because it is inexpensive, readily available, non-invasive, and allows dynamic assessment of the shoulder. Teefey et al. [10] demonstrated high accuracy of ultrasonography compared with arthroscopy, emphasizing its value in routine rotator cuff assessment. Nevertheless, the technique remains operator dependent, and subtle or small partial-thickness lesions may be more difficult to detect. MRI showed higher sensitivity for partial-thickness tears in our study (90.9% vs 81.8%) and provided better identification of multiple-tendon involvement and associated abnormalities. Martín-Hervás et al. [11] also compared ultrasonographic and MRI findings with operative findings and demonstrated the usefulness of both techniques. MRI has the additional advantage of providing a comprehensive assessment of tendon retraction,

muscle atrophy, fatty degeneration, and other intra-articular structures.

Okoroha et al. [12] further demonstrated that although both modalities can identify full-thickness tears, MRI provides greater interobserver reliability for characterization of tear size, tendon retraction, and muscle atrophy.

Therefore, MRI may be particularly valuable when detailed anatomical characterization is required for preoperative planning.

An additional consideration is that imaging abnormalities should always be interpreted in conjunction with clinical findings. Girish et al. [13] demonstrated a high prevalence of asymptomatic shoulder abnormalities on ultrasonography, including rotator cuff and bursal abnormalities. Thus, the presence of an imaging abnormality alone does not necessarily establish it as the source of a patient's symptoms.

Overall, the present findings indicate that high-resolution USG provides excellent agreement with MRI and is a useful initial imaging modality for suspected rotator cuff tears. MRI offers a modest diagnostic advantage for partial-thickness and complex tears and remains particularly useful when detailed characterization is necessary for surgical planning.

Conclusion

Both high-resolution ultrasonography and MRI demonstrated high diagnostic accuracy for rotator cuff tears, particularly full-thickness tears. USG showed excellent agreement with MRI and represents an effective, accessible, and economical initial imaging modality. MRI demonstrated greater accuracy for partial-thickness tears and provided more detailed characterization of tear extent and associated abnormalities. Therefore, USG may be preferred for initial assessment, while MRI is particularly valuable in equivocal cases and for preoperative planning.

References

1. Roy JS, Braën C, Leblond J, Desmeules F, Dionne CE, MacDermid JC, et al. Diagnostic accuracy of ultrasonography, MRI and MR arthrography in the characterisation of rotator cuff disorders: a systematic review and meta-analysis. Br J Sports Med. 2015;49(20):1316-1328. doi: 10.1136/bjsports-2014-094148.
2. De Jesus JO, Parker L, Frangos AJ, Nazarian LN. Accuracy of MRI, MR arthrography, and ultrasound in the diagnosis of rotator cuff tears: a meta-analysis. AJR Am J Roentgenol. 2009;192(6):1701-1707. doi: 10.2214/AJR.08.1241.
3. Smith TO, Back T, Toms AP, Hing CB. Diagnostic accuracy of ultrasound for rotator cuff tears in adults: a systematic review and meta-analysis. Clin Radiol. 2011;66(11):1036-1048. doi: 10.1016/j.crad.2011.05.007.
4. Farooqi AS, Lee A, Novikov D, Kelly AM, Li X, Kelly JD 4th, et al. Diagnostic accuracy of ultrasonography for rotator cuff tears: a systematic review and meta-analysis. Orthop J Sports Med. 2021;9(10):23259671211035106. doi: 10.1177/23259671211035106.
5. Liang W, Wu H, Dong F, Tian H, Xu J. Diagnostic performance of ultrasound for rotator cuff tears: a systematic review and meta-analysis. Med Ultrason. 2020;22(2):197-202. doi: 10.11152/mu-2352.
6. 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;81:491-497. doi: 10.12659/PJR.897830.
7. Naqvi GA, Jadaan M, Harrington P. Accuracy of ultrasonography and magnetic resonance imaging for detection of full thickness rotator cuff tears. Int J Shoulder Surg. 2009;3(4):94-97. doi: 10.4103/0973-6042.63218.
8. Fotiadou AN, Vlychou M, Papadopoulos P, Karataglis DS, Palladas P, Fezoulidis IV. Ultrasonography of symptomatic rotator cuff tears compared with MR imaging and surgery. Eur J Radiol. 2008;68(1):174-179. doi: 10.1016/j.ejrad.2007.11.002.
9. Teefey SA, Rubin DA, Middleton WD, Hildebolt CF, Leibold RA, Yamaguchi K. Detection and quantification of rotator cuff tears: comparison of ultrasonographic, magnetic resonance imaging, and arthroscopic findings in seventy-one consecutive cases. J Bone Joint Surg Am. 2004;86(4):708-716. doi: 10.2106/00004623-200404000-00007.
10. Teefey SA, Hasan SA, Middleton WD, Patel M, Wright RW, Yamaguchi K. Ultrasonography of the rotator cuff: a comparison of ultrasonographic and arthroscopic findings in one hundred consecutive cases. J Bone Joint Surg Am. 2000;82(4):498-504. doi: 10.2106/00004623-200004000-00005.
11. Martín-Hervás C, Romero J, Navas-Acién A, Reboiras JJ, Munuera L. Ultrasonographic and magnetic resonance images of rotator cuff lesions compared with arthroscopy or open surgery findings. J Shoulder Elbow Surg. 2001;10(5):410-415. doi: 10.1067/mse.2001.116515.
12. Okoroha KR, Mehran N, Duncan J, Washington T, Spiering T, Bey MJ, et al. Characterization of rotator cuff tears: ultrasound versus magnetic resonance imaging. Orthopedics. 2017;40(1):e124-e130. doi: 10.3928/01477447-20161013-04.

13. Girish G, Lobo LG, Jacobson JA, Morag Y, Miller B, Jamadar DA. Ultrasound of the shoulder: asymptomatic findings in men. AJR Am J Roentgenol. 2011;197(4):W713-W719. doi: 10.2214/AJR.11.6971.