

Study of Rotator Cuff Disorders By Ultrasound With Magneticresonance Imaging Correlation

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Abstract

Background

Rotator cuff disorders are a significant contributor to shoulder pain, weakness and decreased motion. Correct diagnosis of tendon lesions is critical for correct clinical management. Magnetic resonance imaging (MRI) is used to provide a comprehensive assessment of the rotator cuff and associated soft-tissue structures but because of cost, availability, examination time and contraindications, this can limit its use as a primary investigation. High-resolution ultrasonography (USG) is a real time, dynamic, non-ionizing and relatively cost-effective way to evaluate the shoulder, and has specific value in examining superficial tendon abnormalities. In the present study, high-resolution USG is compared to MRI to assess its diagnostic accuracy in the diagnosis of rotator cuff disorders.

Objectives

The aims were to assess patients with shoulder pain or limited ROM using ultrasonography as a primary imaging tool for the diagnosis of rotator cuff disorders and to assess the validity and diagnostic capacity of ultrasonography based on its correlation with MRI results.

Materials and Methods

A prospective comparative study was done at Department of Radiodiagnosis, Adichunchanagiri Institute of Medical Sciences, B.G. Nagara, Mandya, Karnataka. Thirty patients with pain, restriction of movements or clinical suspicion of impingement or rotator cuff pathologies were included who were aged 18–70 years. Avoid patients who are known to have had a prior surgery or prosthesis on the shoulder, or those with contraindications to MRI. The high-resolution grey-scale USG was performed by using 7.5–12 MHz linear-array transducers and the 1.5-Tesla MRI using a dedicated shoulder coil. The rotator cuff tendons, biceps tendon, bursae, acromioclavicular joint and dynamic impingement were evaluated. Data were analyzed descriptively (frequencies and percentages) and the values of sensitivity, specificity, positive predictive value, negative predictive value and accuracy were calculated for USG findings compared to MRI.

Results

All of the patients were between 20 and 68 years of age (mean = 40.7). This sample consisted of 73% males and 27% females. 76.7% of patients had a right shoulder affection and 80% of patients had a dominant hand side affection. The most common affected tendon was supraspinatus. USG identified supraspinatus abnormality in 66.7% while MRI identified 80%. In cases of supraspinatus pathology, the sensitivity of USG was 75%, specificity was 66.7%, PPV was 90% and accuracy was 73.7%. For subscapularis pathology, sensitivity was 66.7%, specificity 95.8% and accuracy 90%. Sensitivity was 50%, specificity 100% and accuracy 96.7% for infraspinatus pathology. USG was 58.3% sensitive, 100% specific, 100% PPV, 78.2% NPV and 83.3% accurate with partial-thickness rotator cuff tears. For full thickness tears, sensitivity was 100%, specificity 96.4%, positive predictive value 75%, negative predictive value 100% and accuracy 100%.

Conclusion

High resolution USG showed good diagnostic accuracy for the rotator cuff tears, especially when the tear was full thickness, and less in partial thickness tears and associated periarticular abnormalities. MRI was used to identify tendon, bursal, biceps sheath and acromioclavicular abnormalities, and more of these were identified. High resolution USG can thus be used as an effective initial examination in suspected cases of rotator cuff disease and may be used for complementary evaluation in cases of uncertain diagnosis or in patients with complex soft-tissue, osseous or preoperative disease.

Keywords: Rotator cuff disorders; shoulder pain; ultrasonography; magnetic resonance imaging; supraspinatus; partial-thickness tear; full-thickness tear; diagnostic accuracy; bursitis; shoulder imaging.

1. Introduction

1.1 Clinical importance of rotator cuff disorders

Shoulder pain is a common musculoskeletal complaint that can be caused by abnormalities of the rotator cuff, the subacromial bursa, the acromioclavicular joint, the glenohumeral joint, the labrum, the long head of the biceps tendon, the muscles, and the osseous structures around the shoulder. Rotator cuff disease is one of the most common sources of shoulder pain and disability. Rotator cuff pathology varies from tendinopathy and degenerative changes to partial-thickness and full-thickness tendon tears.

The rotator cuff is made up of the tendon of the supraspinatus, infraspinatus, subscapularis and teres minor muscles (Venkatesh et al., 2025). These structures play a role in the stability of the glenohumeral joint and the harmonious movement of the shoulder. The supraspinatus tendon is especially vulnerable to tendinopathy and tearing due to its relationship and anatomical position with the acromion and subacromial space amongst the cuff tendons. The present dissertation also found that the tendon most commonly involved was supraspinatus with subscapularis and infraspinatus being the next two most common.

Rotator cuff pathology can develop after trauma or can be a result of the progressive degeneration of the tendon. With ageing, there is an increase in structural changes of the tendon composition, and an increase in abnormal changes of the tendon cuffs. The older age group (> 40 years) had a higher prevalence of tears in the examined cohort and the largest age group was 40–50 years.

Clinical diagnosis is based on the history and physical examination, but these often fail to provide a proper diagnosis of the extent, location or severity of the tendon injury in the rotator cuff. Imaging thus plays a significant role in the diagnosis of tendinous abnormalities, for the thickness of the tears, to evaluate any fluid collections and to identify other causes of shoulder symptoms.

1.2 Imaging evaluation of the rotator cuff

The main information radiography can give regarding the osseous morphology, acromial configuration and degenerative changes is not directly information on the rotator cuff tendons. While computed tomography can be used for osseous assessment, it is also limited in routine assessment of tendon pathologies (Toh et al., 2024). Ultrasonography and MRI provide a significantly more amount of information about the soft tissues of the shoulder.

The multiplanar capability, high soft-tissue contrast of MRI and the ability to characterize tendon tears, muscle atrophy, tendon retraction, labral abnormalities, ligamentous pathology and associated osseous changes have traditionally made MRI an integral part of a comprehensive shoulder imaging approach. The dissertation illustrates the MRI as the most complete method to evaluate rotator cuff and related shoulder structures.

There are multiple features that favor the use of ultrasonography in the initial assessment of a shoulder. It is non-invasive, non-ionizing, allows dynamic study, offers high superficial spatial resolution, and can be performed quickly without much patient preparation. The dissertation singles these properties out as significant benefits to the use of USG as a first-line examination.

1.3 Ultrasonographic assessment

In the case of high-resolution ultrasound, the rotator cuff tendons can be seen directly in several planes (Ueda et al., 2022). A thickening and a change in the echogenicity of the tendon can occur with tendinosis. Partial thickness tears may show focal hypoechogenicity, or fibre discontinuity of the articular surface, the bursal surface or the tendon substance. Fully-thickened tears can show complete loss of tendon fibres from the articular to the bursal surface, tendon retraction and secondary changes in the subacromial-subdeltoid bursa.

The dissertation describes focal tendon discontinuity, altered tendon contour, fluid and associated bursal abnormalities as important sonographic features in the evaluation of rotator cuff tears.

Another added benefit of dynamic ultrasonography is that tendon motion and impingement can be assessed during shoulder movement. Dynamic examination was attempted in 23 patients, and seven patients were not able to complete the examination due to the severity of their pain and also limited range of motion.

1.4 MRI assessment

MRI allows for a detailed assessment of the cuff morphology, tendon signal, fibre continuity, tear depth and tear retraction. The partial thickness tears can be described based on the involvement of the articular surface, the bursal surface or the tendon substance. The full-thickness tears are defined by the presence of a defect in the tendon which allows the communication between the articular and bursal surface.

The MRI literature suggests that MRI has good diagnostic ability for both partial- and full-thickness rotator cuff tears (Gafoor et al., 2023). The pooled sensitivity and specificity for partial and full thickness tears were 80% and

95% respectively, in a systematic review of 44 studies and 2710 patients.

There are also abnormalities that are seen outside of the rotator cuff with MRI. MRIs can better evaluate muscle atrophy, tendon retraction, labral lesions, ligamentous abnormalities and subtle osseous changes than traditional ultrasound.

1.5 Rationale for the present comparative evaluation

The clinical utility of the USG relies on the ability to detect clinically relevant tendon abnormalities with a reasonable level of diagnostic accuracy and on the benefits of ease of use and low cost (Nasr et al., 2023). Previous studies have shown that USG is especially good at identifying full-thickness rotator cuff tears. In a systematic review and meta-analysis of 62 studies with over 6,000 patients, the sensitivity and specificity for full thickness tears were 0.96 and 0.93 and for partial thickness tears were 0.84 and 0.89.

Another systematic review later found that the diagnostic accuracy of ultrasound was comparable to MRI in the diagnosis of supraspinatus tears by experienced operators (but not all, depending on the thickness of the tears and the operator's experience).

The present dissertation presents patient-level comparative data from 30 patients and specifically compares the ability of USG to MRI in each tendon and shoulder abnormality.

2. Literature Review

2.1 Development of rotator cuff imaging

Imaging of rotator cuff disease has evolved from radiography and arthrography to high resolution ultrasound and MRI. In complete tears, arthrography can show communication between the joint and subacromial bursa, but is invasive with limited utility in partial tears. MRI then gained big importance due to its capacity to give multiplanar soft tissue characterization.

Ultrasound has evolved as a complimentary method to the development of a higher frequency transducer, better spatial resolution, and operator proficiency (Mohamed Abd-Aaal Ahmed et al., 2026). Deep-fascial assessment of superficial tendons of the shoulder is possible with high-frequency linear-array transducers. As ultrasound imaging requirements for musculoskeletal imaging are high resolution, the ultrasound protocol for the dissertation was 7.5–12 MHz linear-array transducers.

2.2 Evidence for ultrasound accuracy

Smith et al conducted a metanalysis of 62 studies comparing ultrasound with surgical findings. Pooled analysis demonstrated good diagnostic performance for both partial and complete tears, with better performance for complete tears.

A subsequent systematic review and meta-analysis compared ultrasound to arthroscopic reference standards and to MRI. The results showed that ultrasound had excellent diagnostic accuracy for supraspinatus tears and that, when performed by an experienced sonographer, the difference between ultrasound and MRI was not statistically significant for several categories of tears.

One other meta-analysis found pooled ultrasound sensitivity of 95% and specificity of 72% for rotator cuff tears in general, with some studies having high specificity and others lower (Adriani et al., 2024).

A systematic review of ultrasound, MRI and MR arthrography revealed high diagnostic value for full-thickness tears with sensitivities and specificities >90% and lower for partial tears and tendinopathy.

These results are consistent with the pattern seen in the dissertation: USG is very sensitive for full thickness tears and less sensitive for partial thickness tears.

2.3 Operator dependency and technical limitations

Technical proficiency, proper positioning of patients, setting up the probe and understanding the anatomy of the shoulder are important factors in successful ultrasound. Anisotropy is a very significant technical factor as the angle between the ultrasound beam and tendon fibres can change, creating apparent hypoechogenicity. These can mimic a tendinopathy or partial tear.

The dissertation particular points to operator dependency, a long learning curve, inter-observer variations and anisotropy as the limitations of shoulder USG (Nasr et al., 2026).

This effect of operator experience has also been reported in systematic reviews. The accuracy of ultrasound is not always reliable and may depend on the practitioner's background and experience, especially when it comes to

identifying small partial-thickness tears.

2.4 MRI as a comprehensive imaging modality

MRI provides multiplanar evaluation, and its high soft-tissue contrast allows detailed evaluation of the morphology and associated pathology of tendons (Bhagyasri et al., 2023). Using surgical reference standards, a meta-analysis of the literature found 80% and 95% sensitivity and specificity for partial-thickness tears, and 91% and 97% sensitivity and specificity for full-thickness tears.

MRI is therefore a valuable tool, especially when the clinical problem goes beyond a simple superficial cuff problem. MRI detected a significantly higher number of abnormalities at the AC than did USG in the dissertation.

2.5 Contemporary imaging recommendations

Recent guidelines for when to use USG and MRI in patients with possible rotator cuff disease after non-diagnostic or normal plain radiographs are both acceptable. According to the American College of Radiology, the use of shoulder USG and MRI without contrast is considered "usually appropriate" for chronic shoulder pain with suspected rotator cuff disease and/or subacromial-subdeltoid bursitis.

Therefore, it is concluded from the literature that the relationship between one modality and another is complementary and not complete replacement of one modality by another.

3. Materials and Methods

3.1 Study design

The Department of Radiodiagnosis, Adichunchanagiri Institute of Medical Sciences, B.G. Nagara, Mandya, Karnataka has conducted a prospective comparative diagnostic study. Thirty patients who met the inclusion/exclusion criteria were assessed (Ibounig et al., 2026). The dissertation is a description of an 18-month prospective study.

3.2 Study population

They involved patients ranging in age from 18 to 70 years and with a complaint of shoulder pain, a limitation of the shoulder movement, and/or a clinical suspicion of impingement syndrome and/or rotator cuff pathology.

Prosthesis and patients with prior shoulder surgery were excluded. MRI contraindications (claustrophobia, metallic implants and cardiac pacers) were also excluded.

3.3 Ultrasound protocol

High resolution grey-scale ultrasound images were obtained through GE Voluson S8 and Samsung HS70 with a linear array transducer (7.5–12 MHz). Supraspinatus and infraspinatus tendon, subscapularis tendon, teres minor tendon, biceps tendon, muscles, acromioclavicular joint and dynamic impingement were assessed (Kandil et al., 2025).

Assessment comprised tendon thickness, tendon echogenicity, fibre continuity, and tears along with associated fluid collections. Dynamic examination was carried out when the patient was able to cooperate in assessment of the subacromial and subcoracoid impingement.

3.4 MRI protocol

A 1.5-Tesla (T), 8-channel GE BRIVO scanner with a dedicated shoulder coil was then performed. Imaging consisted of oblique coronal and sagittal T1-weighted sequences, T2-weighted fast spin echo sequences (with and without fat saturation), proton-density fast spin echo sequences, T2* gradient echo imaging and STIR sequences. The reported field of view was 14–16 cm with 3-mm slice thickness.

3.5 Data collection

A structured case proforma was used to record demographic characteristics, clinical history and imaging findings. All subjects had USG and MRI and the USG findings were compared with the MRI findings.

3.6 Statistical analysis

Frequencies and percentages were used for descriptive analysis. Diagnostic performance was assessed by the sensitivity, specificity, positive predictive value, negative predictive value and accuracy (Schamberger et al., 2024). The statistical methodology also included the Crosstabulation with Cramér's V. SPSS for Windows version 20.0 was used for statistical calculations.

MR findings served as the comparative reference in the dissertation for interpretation. The study thus compares USG with MRI instead of with an independent surgical or histopathological reference standard, rather than

assessing diagnostic accuracy.

4. Results

4.1 Demographic characteristics

The study population comprised 30 patients. The age range was 20–68 years, with a mean age of 40.7 years. The 40–50-year age group contained the largest proportion of patients.

Table 1. Age distribution of study participants

Age group	Number of patients	Percentage
20-30 years	8	26.7
30-40 years	5	16.7
40-50 years	10	33.3
>50 years	7	23.3
Total	30	100.0

The 40–50-year group represented the largest category, accounting for one-third of the study population (Tharwat et al., 2022). The dissertation reports that rotator cuff pathology was more frequent in patients above 40 years.

Table 2. Gender distribution

Gender	Number	Percentage
Male	22	73.0
Female	8	27.0
Total	30	100.0

The mean age was 38.1 years among males and 47.8 years among females.

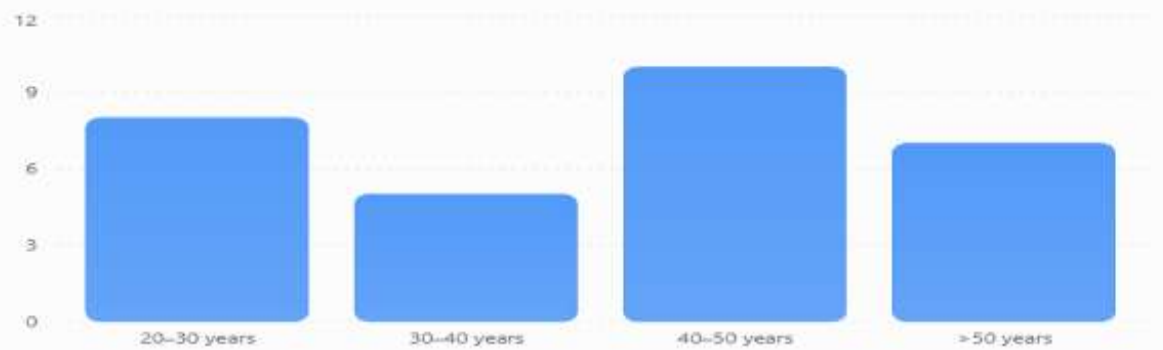


Figure: Gender distribution

Table 3. Affected shoulder and hand dominance

Variable	Category	Number	Percentage
Affected side	Right	23	76.7
Affected side	Left	7	23.3
Hand dominance	Right	29	96.7
Hand dominance	Left	1	3.3
Dominant side affected	Yes	24	80.0

The right shoulder was affected in 76.7% of patients, and the dominant side was affected in 80%.

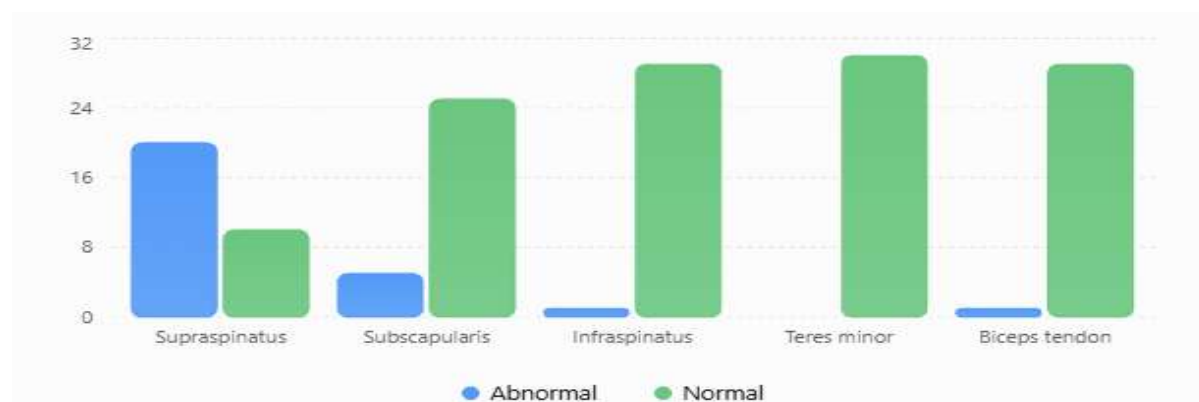
4.2 Ultrasonographic findings

Supraspinatus was the most frequently affected tendon on USG, with abnormality in 20 of 30 patients (Nunna Jr et al., 2023). Subscapularis was abnormal in five patients, infraspinatus in one patient and biceps tendon in one patient. Teres minor was normal in all patients.

Table 4. USG findings of rotator cuff tendons

Tendon	Abnormal	Normal	Abnormal percentage
Supraspinatus	20	10	66.7
Subscapularis	5	25	16.7
Infraspinatus	1	29	3.3
Teres minor	0	30	0.0
Biceps tendon	1	29	3.3

USG identified supraspinatus tendinosis in 12 patients, partial-thickness tear in four and full-thickness tear in four. Subscapularis showed three cases of tendinosis and two partial tears. Across the rotator cuff, tendinopathy was detected in 16 patients, representing 53.3% of the sample.



4.3 MRI findings

MRI demonstrated a higher frequency of rotator cuff abnormalities than USG, particularly involving supraspinatus and partial-thickness tears (Hekmatnia et al., 2026).

Table 5. MRI findings of rotator cuff tendons

Tendon	Tendinosis	Partial tear	Full-thickness tear	Normal
Supraspinatus	13	8	3	6
Infraspinatus	1	1	0	28
Teres minor	0	0	0	30
Subscapularis	3	3	0	24
Biceps tendon	0	0	0	30

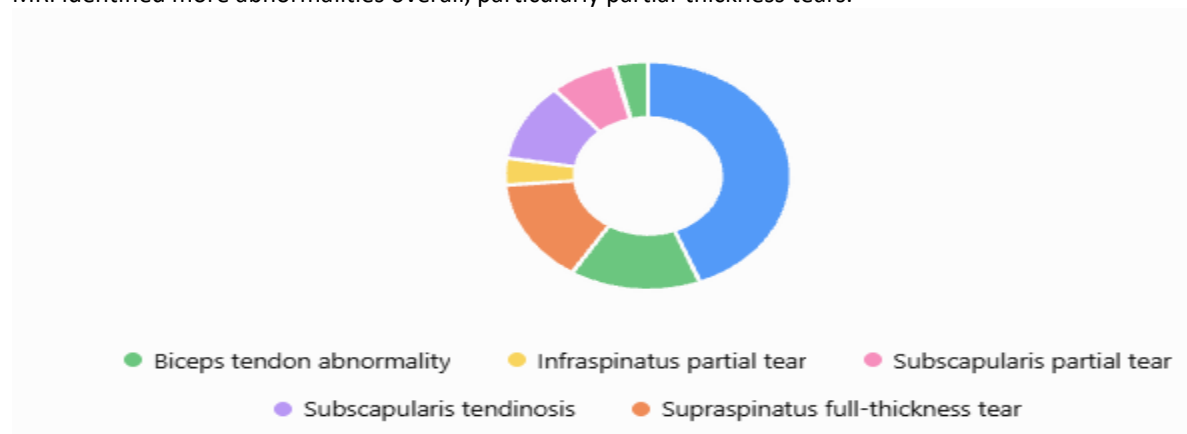
MRI demonstrated supraspinatus abnormality in 24 patients, corresponding to 80% of the cohort. MRI identified 17 patients with rotator cuff tendinopathy and 12 with partial-thickness tears. Partial tears involved supraspinatus, subscapularis and infraspinatus, while full-thickness tears occurred in supraspinatus.

4.4 Comparative tendon findings

Table 6. Comparison of USG and MRI findings

Tendon/pathology	USG	MRI
Supraspinatus tendinosis	12	13
Supraspinatus partial tear	4	8
Supraspinatus full-thickness tear	4	3
Infraspinatus partial tear	1	1
Subscapularis tendinosis	3	3
Subscapularis partial tear	2	3
Teres minor abnormality	0	0
Biceps tendon abnormality	1	0

MRI identified more abnormalities overall, particularly partial-thickness tears.

**Figure: Comparison of USG and MRI findings**

4.5 Associated abnormalities

Table 7. USG and MRI detection of associated findings

Associated finding	USG n (%)	MRI n (%)
Biceps tendon sheath fluid	2 (6.7)	8 (26.7)
Subacromial-subdeltoid bursitis	7 (23.3)	11 (36.7)
Subcoracoid bursitis	2 (6.7)	9 (30.0)
ACJ pathology	3 (10.0)	17 (56.7)

MRI demonstrated substantially greater detection of fluid collections and ACJ abnormalities.

4.6 Acromion morphology

Table 8. MRI-based acromion classification

Acromion type	Number	Percentage
Type I	15	50.0
Type II	11	36.7
Type III	4	13.3
Total	30	100.0

Type I acromion was the most frequent morphology.

4.7 Diagnostic performance of USG

Table 9. Diagnostic performance of USG for individual tendons

Tendon/pathology	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Accuracy (%)
Supraspinatus	75.0	66.7	90.0	40.0	73.7
Subscapularis	66.7	95.8	80.0	92.0	90.0
Infraspinatus	50.0	100.0	100.0	96.6	96.7

The supraspinatus showed the largest number of abnormalities but comparatively lower specificity and negative predictive value than subscapularis and infraspinatus (Venkatesh et al., 2025).

Table 10. Diagnostic performance of USG for rotator cuff tears

Tear type	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Accuracy (%)
Partial-thickness	58.3	100.0	100.0	78.2	83.3

Tear type	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Accuracy (%)
Full-thickness	100.0	96.4	75.0	100.0	100.0

The diagnostic performance demonstrates a marked difference between partial- and full-thickness tears.

5. Results Analysis

5.1 Age-related distribution

The age group between 40-50 years had the highest percentage of respondents. Average age of the study population was 40.7 years (Toh et al., 2024). The dissertation further shows higher incidence of rotator cuff tears in people aged over 40.

There is no substantial age variation which would be an issue with the known correlation of older age with degenerative tendon changes. In the literature, degenerative changes and prevalence of tears have been described to be growing in the fourth and fifth decades.

5.2 Sex and laterality

Of the cohort, 73% were male. In 76.7% the right shoulder was involved and in 80% the dominant shoulder was involved.

This imbalance in the involvement of the dominant side can be supported by a heightened mechanical stress of the dominant shoulder. The dissertation connects this result with previous literature on overhead activity that is related to occupation or repetitive overhead activity.

5.3 Supraspinatus predominance

Both USG and MRI were most commonly used on the tendon of supraspinatus. 20 patients had abnormalities in the USG and 24 patients had abnormalities in the MRI.

This pattern is the median pattern at the center of the dataset. Partial and full thickness tears also occurred most frequently in the supraspinatus (Ueda et al., 2022). The distribution is similar to the literature summarized in the dissertation and is consistent with the evidence from a systematic review that identified supraspinatus as the tendon that has been most consistently evaluated and affected in rotator cuff disease.

5.4 Partial-thickness tears

USG identified less partial thickness tears than MRI. There were four partial tears of the supraspinatus detected by USG and eight by MRI; two of the subscapularis were detected by USG and three were detected by MRI.

Though specificity and PPV were 100%, the overall sensitivity of USG for partial thickness tears was 58.3%.

This decreased sensitivity is consistent with the difficulty of detecting small and subtle defects in the partial-thickness area. Partial tears can occur in one part of the tendon thickness and can be hard to differentiate from tendinosis or anisotropy using ultrasound. The dissertation explains that partial tears are less easily identified than full thickness tears.

The study finding aligns with other evidence that found partial thickness tears to be less diagnostic than full thickness tears.

5.5 Full-thickness tears

USG performed best in detecting full thickness tears in the dataset. The sensitivity and accuracy were 100% and the specificity was 96.4%.

A complete tear will result in greater morphological defects than a partial tear. Focusing on the tendon discontinuity, contour alteration, tendon retraction and associated bursal fluid can aid in sonographic recognition (Gafoor et al., 2023). The dissertation defines the imaging features of full-thickness tendon tearing as tendon discontinuity.

This comes in addition to the extensive diagnostic literature. The pooled sensitivity and specificity in ultrasound studies were 96% and 93%, respectively, for full-thickness tears in a meta-analysis of these studies.

5.6 Supraspinatus diagnostic performance

For supraspinatus pathology, USG was 73.7% accurate and PPV 90% with sensitivity of 75% and specificity of 66.7%.

This may be due to the fact that there are more and more abnormal supraspinatus and the spectrum is wider,

which results in a lower specificity compared to subscapularis and infraspinatus. Partial tears and full thickness tears can produce similar sonographic pictures, especially in the presence of anisotropy and/or degenerative changes, as can tendinosis.

5.7 Subscapularis and infraspinatus

For subscapularis pathology, USG showed 66.7% sensitivity, 95.8% specificity and an accuracy of 90% (Nasr et al., 2023). The sensitivity, specificity and accuracy of Infraspinatus pathology were 50%, 100% and 96.7%, respectively. Such apparently high accuracy of infraspinatus assessment should be viewed in the context of the small number of abnormal cases. There were only two abnormalities identified in the infraspinatus on MRI, and this prevented the stability of sensitivity estimates.

5.8 Bursal and biceps sheath fluid.

26.7% of patients had fluid in the biceps tendon sheath on MRI; 6.7% on USG. Likewise, subacromial-subdeltoid bursitis was identified on MRI in 36.7% and on USG in 23.3% and subcoracoid bursitis on MRI in 30% and USG in 6.7%.

There is also a significant difference between the two, as these fluid collections have lower sensitivities in USG when compared to comprehensive shoulder imaging, which is very important to note when considering the use of targeted tendon evaluations. The USG sensitivity of subacromial-subdeltoid bursitis, subcoracoid bursitis and biceps tendon sheath fluid were 45.5%, 22.2% and 12.5%, respectively (Mohamed Abd-Aal Ahmed et al., 2026). Specificity was high for the specificities of 89.5%, 100% and 95.5% respectively.

5.9 Acromioclavicular joint pathology

MRI was able to detect ACJ pathology in 17 patients while USG was able to detect abnormalities in only three. These led to a USG sensitivity of 17.6% and specificity of 100%.

This shows that the greatest value in ultrasound for this population is in assessing tendons and not in assessing all shoulder structures. MRI showed irregularity, osteophytes and effusion with joint space narrowing.

6. Discussion

6.1 Principal findings

The key findings of the investigation are the excellent diagnostic value of high-resolution USG in evaluating rotator cuff tears, especially full-thickness tears. The study showed 100% sensitivity, 96.4% specificity and 100% accuracy for full-thickness tears. For partial-thickness tears, sensitivity decreased to 58.3%, although specificity and PPV remained 100%.

The difference in detecting partial- versus full-thickness tears is in line with known imaging properties of these tears (Madhavi et al., 2024). These defects are full thickness and cause complete fibre discontinuity and may be accompanied by bursal fluid and tendon retraction. Some tears may be partial and are small, focal or intratendinous and may be more difficult to describe.

The 62 studies included in a systematic review reported ultrasound sensitivity and specificity of 84% and 89% for partial-thickness tears and 96% and 93% for full-thickness tears. The direction of the findings is thus in line with the overall evidence but the numerical values are different owing to the MRI-based reference approach and the small sample size in the present data set.

6.2 Comparison with contemporary evidence

Diagnostic literature suggests that USG can be very diagnostic if the operator is experienced. A systematic review and meta-analysis of 23 studies revealed high diagnostic accuracy for supraspinatus tears and no significant difference in diagnostic accuracy between USG and MRI in several supraspinatus tear categories (Adriani et al., 2024).

The current results also show that USG is able to detect clinically relevant cuff tears, especially full thickness tears. The lower sensitivity for partial tears, however, suggests that MRI can still contribute to the diagnosis of a subtle problem.

A systematic review found that USG, MRI and MR arthrography had high sensitivity and specificity for full thickness rotator cuff tears and lower sensitivity for partial tears and tendinopathy.

6.3 Role of MRI

There were more supraspinatus abnormalities detected by MRI than by USG, and more partial thickness tears.

Additionally, MRI revealed significantly more biceps tendon sheath fluid, subcoracoid fluid and abnormalities of the ACJ.

The results of this study indicate MRI is a suitable tool for diagnosing a question that goes beyond superficial tendon integrity (Nasr et al., 2026). MRI is especially useful for the assessment of labral abnormalities, muscle atrophy, subtle bone changes, complex shoulder pathology and tendon retraction. The dissertation focuses on these benefits.

6.4 Clinical utility of ultrasound

The major clinical benefit of USG is it allows for both structural and dynamic assessment. The use of ultrasound can be done quickly, repeated as needed and combined with clinical examination. Does not use ionizing radiation and less costly than MRI.

The dissertation identifies USG as a cost-effective screening method, and suggests the use of USG as a first line investigation in suspected rotator cuff disease.

For chronic shoulder pain with a suspected rotator cuff disease or subacromial-subdeltoid bursitis, after proper initial evaluation, current American College of Radiology recommendations also consider shoulder ultrasound to be, in most cases, appropriate.

6.5 Operator Skills are key

Operator skills are essential to the performance of USG. operator dependence, learning curve and interobserver variation and anisotropy are major limitations identified in the dissertation (Bhagyasri et al., 2023).

This is especially true for partial thickness tears. A small hypoechoic area could be due to anisotropy, tendinosis or partial fibre disruption. The correct scanning technique and examination of several planes combined with the knowledge of tendon morphology is required to minimise the potential for false-positive and false-negative interpretations.

6.6 Relationship between tendon tears and associated fluid

The data showed that MRI detected fluid collections more frequently than did USG. Ten of the 11 USG-detected subacromial-subdeltoid, subcoracoid or biceps sheath fluid patients had rotator cuff tendon pathology (Ibounig et al., 2026).

It is recognized that effusion in the subacromial-subdeltoid bursa is a common associated condition of rotator cuff disease but it is not specific to a full-thickness rotator cuff tear. It is important to take time to assess the cuff tendons when the fluid is present (dissertation).

6.7 Indices of the proposed imaging pathway

There is evidence that a sequential imaging strategy can be followed, with high-resolution USG for initial tendon assessment and MRI for cases in which further characterization is necessary. This has potential advantages in resource utilisation as many patients who have simple full thickness or clinically significant tendon pathology can be effectively assessed using ultrasound (Kandil et al., 2025).

MRI is required when USG is inconclusive, when a diagnosis of partial thickness disease is suspected despite a negative ultrasound examination, when the ultrasound examination is technically limited, or when other labral, capsular, ligamentous, muscle or osseous pathologies must be evaluated.

7. Limitations

The main drawback is the limited number of patients of 30. Small diagnostic studies yield fairly imprecise estimates of the sensitivity, specificity, and predictive values, especially if there are few positive cases.

The second is that MRI use as the comparative reference exam. Surgical or arthroscopic diagnosis would give a better independent standard of truth for the absolute diagnostic accuracy of USG (Schamberger et al., 2024). Thus the reported diagnostic parameters represent measurements of how well the USG criteria are performed compared to the MRI and not the absolute pathological truth.

A third restriction is that operators are tightly coupled. The performance of ultrasound is dependent on experience, equipment, positioning and technique of the patient.

A fourth limitation is that seven patients could not participate in dynamic examination due to their high pain and limited movement.

The fifth restriction is that there are no detailed confidence intervals that are provided for the reported diagnostic estimates. Confidence intervals would be important for a journal-level diagnostic accuracy analysis.

Sixth, in some tendon groups, there are relatively few abnormalities. For instance, abnormalities in the infraspinatus were rare, which affects the stability of the estimates of sensitivity.

There are also a few inconsistencies in the dissertation with respect to numerical value and methods which need to be coordinated prior to submission to a journal (Tharwat et al., 2022). Especially, there is a need of having a common term for the reported duration of the study and description of the dynamic impingement findings in both abstract and methodology and results section.

8. Conclusion

The use of high resolution ultrasonography proved useful in the diagnosis and clinical evaluation of rotator cuff disorders. The most common affected tendon was the supraspinatus, the second was the subscapularis and the third was the infraspinatus. Patients older than 40 years were more likely to have rotator cuff tears, and right or dominant shoulder was more likely to be involved.

For supraspinatus pathology, USG was able to show 75% sensitivity, 66.7% specificity and 73.7% accuracy. The sensitivity, specificity and accuracy of subscapularis pathology were 66.7%, 95.8% and 90%, respectively. The sensitivity, specificity and accuracy of infraspinatus pathology was 50%, 100% and 96.7%, respectively.

The best results were obtained in the diagnosis of full-thickness rotator cuff tears, with 100% sensitivity and 100% accuracy in the study population for USG. Even if there was 100% specificity and 83.3% sensitivity, 100% specificity and 58.3% sensitivity were found for partial thickness tears.

More partial-thickness tears and more abnormalities of the biceps tendon sheath, subacromial-subdeltoid bursa, subcoracoid bursa and acromioclavicular joint were detected on MRI.

The results demonstrate that high resolution USG can be used as an effective first line imaging modality to evaluate patients with suspected rotator cuff disease, particularly for clinically significant full thickness tears. MRI continues to play a very important role in ambiguous exams, subtle partial-thickness disease, technically challenging ultrasound exams, and comprehensive assessment of associated shoulder pathologies. The combination of USG and MRI offers a sensible and logical diagnostic approach that allows for accessibility and dynamic assessment as well as soft-tissue characterization.

9. Clinical and Research Implications

The findings argue for the use of high resolution USG of the shoulder as a part of the initial radiological assessment of patients with suspected rotator cuff disease. Many clinically significant abnormalities of the tendon can be detected during a technically satisfactory examination of the tendon by ultrasound, and ultrasound can give immediate dynamic information.

The high performance for full thickness tears suggests that USG may be a clinically useful tool to enable diagnosis without immediate MRI in appropriate patients. However, a negative ultrasound should be taken with a grain of salt when the clinical history is still expressive of a possible partial-thickness tear due to the poor specificity of ultrasound for partial tears (58.3%).

MRI should therefore continue to be used as a complimentary problem-solving imaging modality. MRI's ability to detect partial tears, fluid collections, ACJ pathology, muscle changes and other soft-tissue abnormalities is very relevant to complex clinical presentations and for preoperative evaluation.

Larger multicentre populations with formal confidence intervals and blinded interpretation of the operator and reference surgical and arthroscopic standards should be included in future investigations. Some of the key factors would increase the statistical support of this study, such as interobserver agreement (kappa statistics) and multivariable assessment of age, sex, symptom duration, dominant-side involvement, and tendon-specific pathology.

10. Overall Research Interpretation

The main finding of the study is the ability of high-resolution USG to demonstrate the diagnosis of rotator cuff tears at good level, particularly in the case of full-thickness tears when compared with MRI scans. The outcomes are not favorable to the use of MRI as a substitute in all patients. Rather, they back a distributed imaging approach in which USG is utilized as a practical initial examination, and MRI is utilized for definitive comprehensive imaging evaluation when USG is negative, equivocal or incomplete.

It is important to differentiate tendon tears from complete shoulder assessment. For tendon discontinuity USG was good, but was not so sensitive for associated bursal, biceps sheath and ACJ abnormalities. MRI was used to identify a wider range of pathology. Each modality can then have a diagnostic role dependent on the clinical question.

The results agree with the published diagnostic literature, where the performance of ultrasound is best for full-thickness rotator cuff tears, and less consistent for partial-thickness rotator cuff tears.

Therefore, the evidence of the dissertation could be summarized as follows: High-resolution ultrasonography is an effective, readily available and cost-effective first-line imaging test for suspected rotator cuff disorders, especially for full-thickness tears, whereas MRI is the complementary imaging modality for partial-thickness tears, unresolved ultrasound findings, and multifaceted evaluation of shoulder pathology.

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