



Original Research Article

# Estimation of role of ultrasound and MRI in the examination of shoulder joint

Anupsingh Dhakre<sup>1\*</sup>, Harshin Nagori<sup>1</sup>, Harsh Shah<sup>2</sup>, Anil Rathwa<sup>3</sup>,  
Chinmay Parikh<sup>2</sup>, Dhara Patel<sup>4</sup>

<sup>1</sup>2<sup>nd</sup> year Resident, <sup>2</sup>1<sup>st</sup> year Resident, <sup>3</sup>Assistant Professor, <sup>4</sup>Tutor

Radiology Department, SBKS Medical Institute & Research Centre, Sumandeep Vidyapeeth, Vadodara, Gujarat, India

\*Corresponding author email: [anup26sep.singh@gmail.com](mailto:anup26sep.singh@gmail.com)

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## Abstract

**Background:** To recognize different pathologies affecting the shoulder joint with the help of ultrasound and MRI scans and to evaluate the features, pattern and extension of the different pathologies affecting the shoulder joint with help of ultrasound and MRI scans so as to help the clinician for further management.

**Aim:** To estimate role of ultrasound and MRI in examination of shoulder joint.

**Material and methods:** Study comprised of an observational hospital based study. Out of 65 patients, 20 underwent only ultrasound investigation, 25 underwent only MRI scans whereas 20 patients were evaluated by ultrasound and MRI. These were performed by 3-5 MHZ curvilinear probe and 8-10 MHZ linear probe on HD 7 and HD 9 Philips ultrasound machines and 1.5 T Philips MRI machine. MR arthrography was performed as a follow up in some of the patients in outside centre.

**Results:** USG study also showed that the most commonly occurring rotator cuff tears were supraspinatus tears whereas alone infraspinatus and subscapularis tears were very rare. MRI study showed supraspinatus tears were the most frequently occurring in the rotator cuff whereas subscapularis and infraspinatus tears were rare. MRI is 100% confirmative in almost all cases of Rotator cuff tears but may sometimes need extra imaging by MR arthrography in partial bursal tears.

**Conclusion:** Rotator cuff tears are the most common pathologies affecting the shoulder joint according to this study. It was proved that, there is no evident difference in the accuracy of ultrasound and MRI in detecting this pathology, even though MRI has proved to be more accurate in evaluating almost all other pathologies as compared to ultrasound.

## Key words

Rotator cuff, Labrum, Shoulder joint, Subscapularis and Infraspinatus tears, Shoulder girdle.

## Introduction

The shoulder girdle is a complex anatomic structure designed to maximize three-dimensional motion of the upper limb. Shoulder pain and instability are common orthopaedic problems. Although there are many causes of shoulder pain and instability (including fractures and rotator cuff tears), injuries to the glenohumeral ligaments, labrum, and biceps labral complex is often the cause. The shoulder is often thought of as synonymous with the glenohumeral joint, but it is actually composed of four separate joints (glenohumeral, acromioclavicular, sternoclavicular, and scapulothoracic), as well as numerous muscles and ligaments that act synergistically to optimize motion of the upper extremity [1].

X-rays, USG, CT, MRI, MRI Arthrogram, Arthroscopy are the modalities available to diagnose shoulder injuries. Radiographs are often the first imaging examination performed on an individual with a suspected shoulder abnormality, and the complex anatomy of the shoulder has led to the development of numerous radiographic views and techniques, each designed to optimize the evaluation of specific parts of the shoulder girdle. High-resolution real-time ultrasonography (7-15 MHz) is a successful imaging modality for both rotator cuff and non-rotator cuff disorders [2]. Advances in technology and a better knowledge of the anatomy as well as a higher experience of the sonographers have improved the accuracy of this examination. Compared with MRI and CT Scans, alone or combined with arthrography, USG is a readily available, low cost, it allows comparison with the contralateral side and has dynamic capabilities for examining the patient in

multiple scanning planes and specific arm positions or movements [3].

It is usually combined with plain radiographs for the detection of calcifications, and bony or articular abnormalities. Even if MRI or CT remain the examination of choice for certain pathologies, ultrasound is considered to be the first step examination combined with plain films in evaluation of shoulder joint. Magnetic resonance imaging (MRI) is an imaging technique used primarily in medical settings to produce high quality images of the inside of the human body [4]. Its high spatial resolution, excellent image contrast, and multiplanar capabilities make MRI an excellent tool in the evaluation of the labrum. MR allows accurate depiction of the size and location of rotator cuff tears and their associated capsular and glenohumeral ligament injuries, also non rotator cuff injuries. Normal variants that can mimic pathology are also well depicted on MR imaging [5].

Conventional MR imaging has greatly increased the sensitivity by which it is possible to detect pathologies, but the gains in sensitivity have not been paralleled by gains in specificity. By the use of MR arthrography the specificity of detecting the lesions can be greatly increased. MR arthrography extends the capabilities of conventional MR imaging because contrast solution distends the joint capsule, outlines intra-articular structures, and leaks into abnormalities. The labrum is best evaluated by the use of MR arthrography. Whereas conventional MR imaging is usually sufficient for the evaluation of acute shoulder injuries due to the presence of a posttraumatic joint effusion, MR arthrography is the imaging modality of choice for chronic shoulder instability [6]. Since



there are currently various surgical shoulder stabilization methods as well as conservative treatment strategies, the role of imaging is to provide diagnostic information to help determine the therapeutic approach. And hence conventional MR imaging and MR arthrography are important and indispensable modalities for accurate diagnosis of shoulder injuries [7].

**Materials and methods**

The study was carried out in the Department of Radiodiagnosis, S.B.K.S Medical Institute and Research Centre, Waghodia, Vadodara.

**Study design**

Type of the study: An observational, descriptive hospital based study.

Sample size: 65 patients.

**Selection of subject**

**Inclusion criteria**

- Only patients willing to participate in this study were included.
- Patients referred to the radiology department for shoulder joint symptoms, and found to have positive findings were included in this study.
- All cases needing a follow up were included in this study.
- All accidentally diagnosed cases of shoulder joint disorders were also included.

**Exclusion criteria**

- All patients unwilling were excluded from this study.
- All patients suffering from shoulder joint disorders but already diagnosed, treated and not needing follow up were also excluded from this study.

**Study tools**

This were performed by 3-5 MHZ curvilinear probe and 8-10 MHZ linear probe on HD 7 and

HD 9 Philips ultrasound machines and 0.3 T HITACHI AIRIS series and 1.5 T Philips MRI machines.

**Study protocol**

Patients who were referred to Radiology Department with having shoulder joint symptoms such as pain, stiffness, restriction of movements are first advised to get the plain X – ray shoulder joint AP and Axial view done. Many shoulder joint pathologies are diagnosed by plain films such as joint dislocation, TB of shoulder joint etc. if further investigation is required for confirmation of pathology diagnosed on plain film or non diagnosed pathology, further investigation such as ultrasound and MRI will be advised according to keeping in account the cost effectiveness to the patient. Gold standard investigation of MR arthrography is very useful in diagnosing labral tears.

**Results**

As observed in this MRI study, supraspinatus tears were the most frequently occurring in the rotator cuff whereas subscapularis and infraspinatus tears were rare. (Table – 1, Figure – 1)

**Table - 1:** MRI in rotator cuff tears.

Rotator cuff tears	No. of cases
Supraspinatus tears	7
Infraspinatus tears	0
Supraspinatus-infraspinatus complex tears	2
Subscapularis tears	1

Here, USG study also showed that the most commonly occurring rotator cuff tears were supraspinatus tears whereas lone infraspinatus and subscapularis tears were very rare. (Table – 2, Figure – 2)

**Table - 2:** Ultrasound in rotator cuff tears.

Rotator cuff tears	No. of cases
Supraspinatus tears	9
Infraspinatus tears	0
Supraspinatus-infraspinatus complex tears	4
Subscapularis tears	1

**Table - 3** proved that MRI is more sensitive as compared to ultrasound for the evaluation of shoulder pathologies.

**Table - 3:** Sensitivity of ultrasound and MRI in shoulder joint pathologies.

Pathologies	Ultrasound	MRI
Rotator cuff tears	73%	88%
Labral tears	25%	73%
Tumors	60%	90%

### Discussion

10 cases with different pathologies were compared with each other on Ultrasound and MRI and it was proven that MRI was better in diagnosis of almost all the pathologies. Ultrasound and MRI were; however, almost equal in diagnosing partial and full thickness rotator cuff tears. (**Table – 4**)

### Conclusion

Ultrasound and MRI scans have proved to be successful modalities in evaluating the shoulder joint, but MRI results increased the physician's confidence in the diagnosis. However there has to be a proper and careful correlation between clinical presentation and imaging results, a task that largely depends on the shoulders of the referring physician. Rotator cuff tears are the most common pathologies affecting the shoulder joint according to this study. It was proved that, there is no evident difference in the accuracy of ultrasound and MRI in detecting this

pathology, even though MRI has proved to be more accurate in evaluating almost all other pathologies as compared to ultrasound. As previous studies show, MR arthrography is considered to be a gold standard investigation for rotator cuff tears as well as labral tears. A comparison between the follow-up findings of MR arthrography and MRI findings proved that 1.5 T MRI scans were almost as good as MR arthrography in these pathologies.

Ultrasound did not prove to be quite this successful in detection of labral tears. Abduction and external rotation of the shoulder joint in MRI scans further proved helpful in the evaluation of the labral pathologies and internal impingement syndrome. Even though, MRI is the investigation of choice in almost all the cases, ultrasound has been helpful as one of the first line of investigation for evaluation of the shoulder joint because it is readily available, low cost, takes less time and has dynamic capabilities which help to evaluate the shoulder joint in different planes owing to specific movements. It is also helpful as it can compare the contralateral side easily in case of any doubt. In the end, to optimize imaging of individual patients, it is also important to remember the contributions that can be made by plain films, CT scans and arthrographies.

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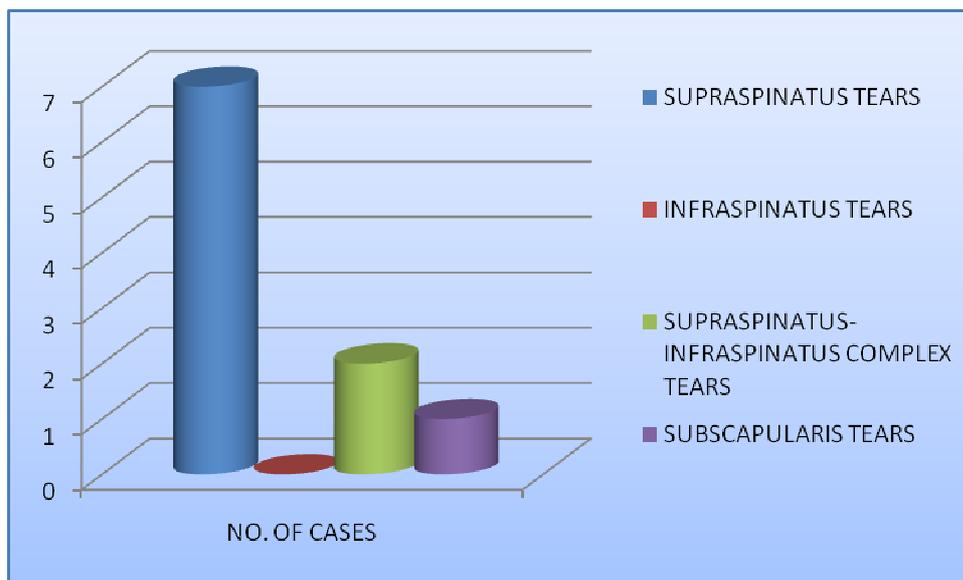
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**Table – 4:** Comparison between MRI and ultrasound.

Sr. No.	Pathology	USG	MRI
1.	Synovial chondromatosis	+	+++
2.	Subdeltoid lipoma	+++	+++
3.	Partial sp tear ext to ip and ss	+++	+++
4.	Subacromial bursitis	+++	+++
5.	Deltoid lipoma	+++	+++
6.	Subcutaneous abscess	++	+++
7.	Septic arthritis with abscess	++	+++
8.	Malignant fibrous histiocytoma	+	+++
9.	Comp SP, IP, SS tears with hill sach's and bony bankart lesion	+	+++
10.	Osteopoikilosis	+	+++

**Figure - 1:** MRI in rotator cuff tears.



**Figure - 2:** Ultrasound in rotator cuff tears.

