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## A clinical radiological and arthroscopic correlation in various shoulder pathologies: A prospective study

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### Abstract

Shoulder pain is one of the most common complaint in medical practice and often leads to significant disabilities. Spectrum of etiologies that can give rise to shoulder pain are acute trauma to a gamut of degenerative disorders.

**Objective:** To evaluate clinical, radiological and arthroscopic correlation in various shoulder pathologies. To compare clinical findings with MRI findings of symptomatic shoulder. To compare clinical and MRI findings with arthroscopy.

**Material and Methods:** This is a prospective study, which includes patients with various intra articular shoulder disorders symptoms. 12 patients who were received between October 2013 and September 2015, who were clinically diagnosed to have general shoulder pathology based on a positive Dugas test and or rotator cuff pathology, were evaluated with MRI and subsequently with diagnostic arthroscopy on the symptomatic shoulder.

**Results:** Clinical examination found sensitivity of 78%, specificity of 67% for rotator cuff tears and MRI showed sensitivity of 100% and specificity of 67% for the same. The sensitivity of MRI is higher when compared to clinical examination. But specificity was found to be same due to small sample size. Glenohumeral instability lesions were found in 6 patients. SLAP lesion were found in 2 patients, Bankart in 3 patients, Hill Sachs in one patient. Clinical examination found sensitivity of 80%, specificity of 71% for glenohumeral instability and MRI showed sensitivity of 100% and specificity of 86%. The sensitivity and specificity of MRI is higher when compared to clinical examination.

**Conclusion:** The sensitivity and specificity for all pathologies is higher for arthroscopy in our study as compared to clinical and MRI examinations, as is the observation of most workers in this field.

**Keywords:** Arthroscopy, hill Sach's lesion, Bankart's lesion, rotator cuff tear

### 1. Introduction

The shoulder joint is an incongruous ball and socket joint without any fixed axis of rotation, which has a wide range of motion in multiple planes; there by compromising stability for mobility. The range of motion is used to place the hand in all directions, for powerful throwing activities and less commonly for climbing and crawling. This much range is unique to humans and primates. To compensate for the unstable bony anatomy the shoulder is protected anteriorly, posteriorly and superiorly by a capsule and the tendons that form the rotator cuff. The tendon is subject to "wear and tear" during the day to day activities.

Spectrum of etiologies that can give rise to shoulder pain are acute trauma to a gamut of degenerative disorders and impingement syndrome [4]. Shoulder pain is one of the most common complaint in medical practice and often leads to significant disabilities. The prevalence of shoulder pain has been reported to range from 7% to 14% in the overall population. The initial evaluation of shoulder disorders usually consists of taking clinical history and performing a physical examination, which includes various manipulative tests. But majority of the patients come with pain & restrictive movements of the joint therefore in these patients a through physical examination is difficult. In this situations MRI is the most comprehensive and commonly used modality to evaluate the shoulder disorders. In recent years MRI replaced other techniques for evaluating Shoulder disorders by its non-invasiveness and highly accurate early evaluation of soft tissue [2] pathology by its additional benefit of its ability to image shoulder in any Orthogonal or Off-axis oblique plane. Most commonly patients are referred for Shoulder MRI because of Suspected Rotator cuff tears, Sub acromial

impingement syndrome, Glenohumeral joint instability (Recurrent dislocation of Shoulder), Biceps tendon abnormalities (example Superior labrum anteroposterior lesions), Infections or inflammatory disorders, Degenerative Arthritis, Loose bodies [1]. Shoulder injuries are common, accounting for a significant percentage of all shoulder disorders. Serious shoulder injuries result in decreased performance and result in diminished lifestyle. Failure to recognize and properly manage shoulder injuries can result in significant problem in these patients [2]. Arthroscopy is an invasive procedure with certain risks and discomfort for the patient and is preferably performed only for treatment purposes. The role of magnetic resonance imaging in the diagnosis of shoulder disorders has been established. MRI is non-invasive has proved reliable and safe and offers advantages over diagnostic arthroscopy, which is currently regarded as the reference standard for the diagnosis of intra articular shoulder disorders [3]. Even though a large number of clinical tests are used for the diagnosis of painful shoulder they are considered accurate in determining the location of the periarticular lesions, these entities may be difficult to differentiate by physical examination.

### Material and methods

A clinical diagnosis was made in patients presenting to OPD with shoulder complaints which were based on a standard shoulder examination protocol. Clinical diagnosis and MRI findings were confirmed by arthroscopy. This is a prospective study, which includes patients with various intra articular shoulder disorders symptoms. Twelve (12) patients who were received either in the emergency department or outpatient department between October 2013 and September 2015, who were clinically diagnosed to have general shoulder pathology based on a positive Dugas test and or rotator cuff pathology based on a positive external or internal lag test of shoulder, were evaluated with MRI and subsequently with diagnostic arthroscopy on the symptomatic shoulder. The study was performed with the approval of our institutional ethics committee. Inclusion Criteria: Age group: 20 to 70 years, Post-traumatic pain, instability and stiffness of the shoulder joint, Suspected/clinically diagnosed cases, degenerative bicipital tendinitis and rotator cuff injuries. Exclusion Criteria: Infective pathologies and malignancies the shoulder, Previous surgery or prosthesis of shoulder, Age group below 20 and above 70 years. Clinical Assessment: History of Presenting Illness of the Patient was noted which was pain in all the cases. Examination of the Shoulder Joint was done and all the tests were done (Neer's Impingement Test, Jobs Test, Full Can Test, Empty Can Test, Patte's Test, Lag Sign,

Gerber Lift Off Test, Yergason Test). MRI: 1.5-Tesla superconducting magnet was used [Symphony maestro class, Siemens, Erlanger, Germany]. Transmit-receive extremity coil was applied as close as possible to the symptomatic shoulder joint. The patient was placed in the supine position with the shoulder and arm placed along the side and parallel to the body, positioned in neutral to mild external rotation. Arthroscopy: Arthroscopy was performed, under general anesthesia induced in the patient, by using a 30° whole-angle arthroscope [Karl Storz, Germany] that was 4mm in outer diameter and a three-chip high-resolution camera. Arthroscopy of the shoulder was performed using a posterior portal for the arthroscopy; in addition, an anterior portal was used for introduction of cannula and surgical instruments. Accessory portals, including lateral portal was used for subacromial decompression and a superior portal was also used when necessary. During arthroscopy, the entire joint, including the inferior recess, the glenohumeral joint, the glenoid labrum, the rotator cuff, the glenohumeral ligaments, the long head of biceps insertion was carefully and systematically examined. The arthroscopic images were recorded on a digitized computer.

### Results

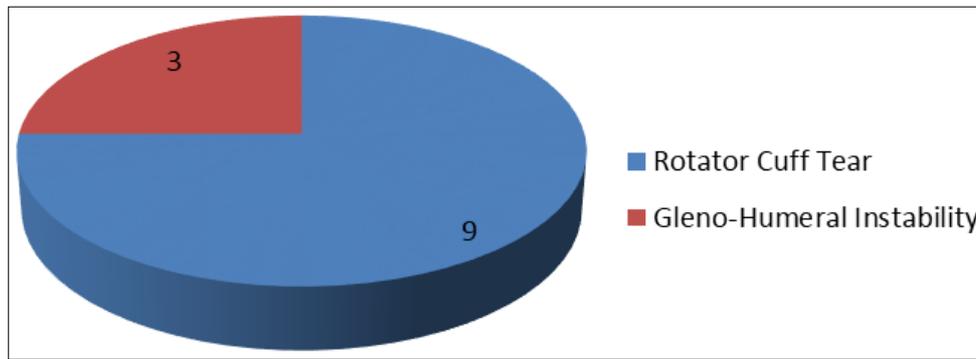
A clinic-radiological and arthroscopic correlation of 12 patients with shoulder joint pain was undertaken to study the correlation of clinical findings with MRI and arthroscopic finding. In this study majority of the cases (5) 41.67% were in the age group between 31 and 40 years. In this study (9) 75% of the cases were males. The side prediction was equal in this study. In this study majority of the lesions (8) 57.14% were Rotator cuff tears clinically. MRI findings in the subjects under study showed that 55.55% (10) of lesions were due to rotator cuff tear. On arthroscopy 60% (9) of lesions were rotator cuff tears. Validity of Clinical Diagnosis with Arthroscopy Findings in Rotator Cuff Tear: Sensitivity – 78%, Specificity – 67%, Positive Predictive Value – 87%, Negative Predictive Value – 75%, Accuracy – 75%. Validity of MRI Findings with Arthroscopic Findings in Rotator Cuff Tears: Sensitivity – 100%, Specificity – 67%, Positive Predictive Value – 90%, Negative Predictive Value – 100%, Accuracy – 92%. Validity of clinical diagnosis with arthroscopic findings in glenohumeral instability: Sensitivity – 80%, Specificity – 71%, Positive Predictive Value – 67%, Negative Predictive Value – 83%, Accuracy – 75%. Validity of MRI findings with arthroscopic findings in glenohumeral instability: Sensitivity – 100%, Specificity – 86%, Positive Predictive Value – 83%, Negative Predictive Value – 100%, Accuracy – 92%.

**Table 1:** Validity of clinical diagnosis with arthroscopic findings and MRI with arthroscopic findings in Rotator cuff tear.

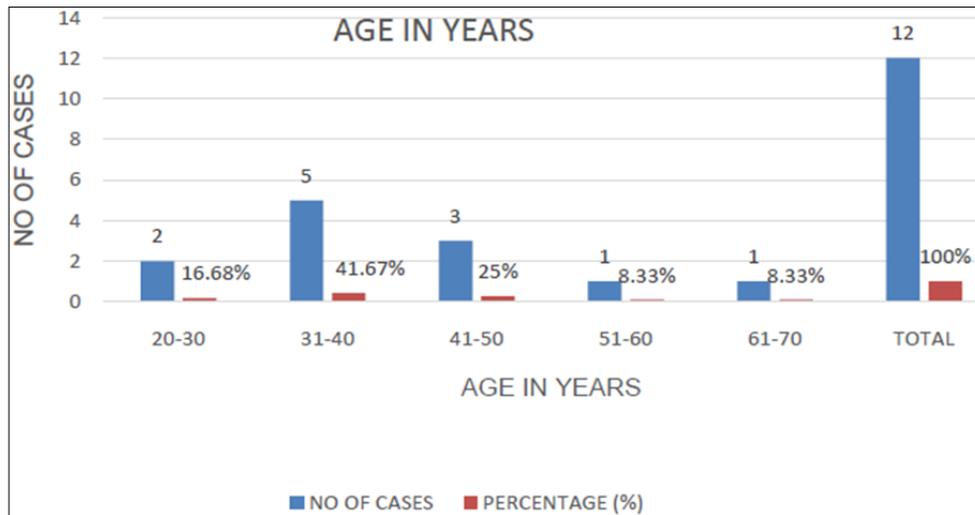
Study	Sensitivity	Specificity	PPV	NPV	Accuracy
Clinical vs Arthroscopy	78%	67%	87%	50%	75%
MRI vs Arthroscopy	100%	67%	90%	100%	92%

**Table 2:** Validity of clinical diagnosis with arthroscopic findings and MRI with arthroscopic findings in glenohumeral instability.

Study	Sensitivity	Specificity	PPV	NPV	Accuracy
Clinical vs Arthroscopy	82%	71%	67%	83%	75%
MRI vs Arthroscopy	100%	86%	83%	100%	92%



**Dia 1:** Pie chart showing Arthroscopic findings in present study



**Dia 2:** Bar chart representing age of patients

**Discussion**

In this study clinical findings have been matched against arthroscopy and similarly MRI findings have been compared with arthroscopy, as currently arthroscopy is acknowledged as gold standard. Hence no comparison have been made for clinical findings and MRI findings. In this discussion, we have taken two clinical entities and compared each entity separately. The entities are: Rotator cuff tears (Supraspinatus, Infrapinatus, Subscapularis, Teres minor), Glenohumeral instabilities. (SLAP, Bankart lesion, Hill sachs lesion).

**Rotator cuff tears:** A Total of nine patients were found to have rotator cuff tears on arthroscopy, out of them six patients had isolated supraspinatus tear, one patient had isolated subscapularis tear. One patient had both supraspinatus and infrapinatus tear and one had combined supraspinatus and subscapularis tear.

**Clinical Findings:** We have performed clinical examination on twelve patients. The tests like Jobs test and full can tests have shown a sensitivity of 78% and specificity of 67%, but these clinical tests are limited by their lack of specificity to rotator cuff tears [4]. Arthroscopy has emerged as gold standard to evaluate the status of the rotator cuff tears. The study done by Anthony *et al.* [5] on 42 patients showed sensitivity of [91%], specificity of [75%] for diagnosis of rotator cuff tears. The sensitivity [78%], specificity [67%] and accuracy of [75%] for rotator cuff tears in present study is comparable to that of AM Malhi *et al.* [6] who studied one thirty symptomatic patients, performed tests and found a sensitivity of [100%], specificity of [99%] for rotator cuff tears. Out of 12 patients studied one patient was given a false

positive diagnosis of supraspinatus tear which was diagnosed as tendinosis in arthroscopy. One patient in whom clinical tests were inconclusive of rotator cuff tears was subsequently found to have supraspinatus tears in arthroscopy. One patient with subscapularis tendon tear was clinically suspected with supraspinatus tear but arthroscopy showed both tendon tears.

**MRI Findings:** MRI is a noninvasive examination that is highly accurate. Varying sensitivity, specificity and accuracy of MRI has been reported in literature regarding diagnosis of all rotator cuff tears. The sensitivity [100%], specificity [68%] and accuracy [92%] of rotator cuff tears in our study is comparable to that of Zlatkin *et al.* [7] The sensitivity [100%], specificity [68%] for rotator cuff tears in our study is also comparable to that of Joseph *et al.* [3] who analysed 65 articles reporting the sensitivities and specificities of MRI for the diagnosis of rotator cuff tears. One patient falsely interpreted as rotator cuff tear on MRI, was found to be normal on arthroscopy. Isolated partial tears are difficult to detect on MRI because small area of increased signal intensity may be due to inflammation and oedema from early stages of impingement, which was described by Andrew *et al.* [8] as being similar to our study.

**Gleno Humeral Instability  
Clinical Findings**

Three patients were clinically suspected for glenohumeral instability. Tests performed were apprehension test for anterior instability and clunk test for SLAP tear. On arthroscopy three patients were diagnosed with Bankart lesion, one patient with Hill Sachs lesion and two patients with SLAP tear. The present study showed sensitivity of 78%

and specificity of 67% which were comparable to Carlos *et al.* (2003). They studied sixty shoulders undergoing arthroscopy for a variety of pathologies. All subjects submitted to the Speed test, an anterior apprehension maneuver, Yergason test, O'Brien test, Jobe relocation test, the crank test, and a test for tenderness of the bicipital groove. Their study showed a sensitivity of 72% and specificity of 73%.<sup>[9]</sup> AM Malhi *et al.* retrospectively reviewed notes of 130 consecutive shoulder arthroscopies performed over a 10 month period. A clinical diagnosis of instability was obtained by a positive apprehension or jobes relocation test. At arthroscopy the presence of Hill Sachs, Bankart or labral lesions was recorded. It showed sensitivity of 81% and specificity of 10%. Utkarsha *et al.*<sup>[10]</sup> carried out prospective study of 30 patients of shoulder instability including both sexes and all age groups. The patients were first examined clinically, followed by MRI scan and finally arthroscopically. The findings of diagnostic arthroscopy were correlated with clinical & MRI findings. Sensitivity, Specificity and diagnostic accuracy of clinical examination for anterior instability was 85%, 100%, 86% respectively. This is comparable to the sensitivity of 80%, sensitivity of 71% and accuracy of 75% in the present study. In present study three patients presenting with recurrent dislocation were clinically suspected of having Bankart lesion. Out of them two patients were found to have Bankart lesion on arthroscopy. One patient was given a false positive diagnosis clinically. One patient with Bankart lesion was missed on clinical examination and found to have anterior labral tear on arthroscopy. One of them showed an associated Hill-Sachs lesion. Three patients were showing positive clunk test and were suspected to be having a Superior Labrum Anterior Posterior tear. Two of them were found to be true positive on arthroscopy. One patient was given a false positive diagnosis of SLAP which was given normal on arthroscopy.

**MRI Findings:** MRI of the shoulder has been found to be highly accurate in the diagnosis of glenohumeral instability. The sensitivity, specificity and accuracy were 100%, 86%, 92% respectively for glenohumeral instability in our study are comparable to that of Hayes *et al.*<sup>[11]</sup> They prospectively reviewed eighty-seven patients with recurrent dislocation of shoulder and compared clinical, MRI and arthroscopic findings. Their sensitivity, specificity and accuracy were 87%, 81%, 95% respectively for glenohumeral instability. Higher sensitivity in present study is due to small sample size. The study done by Utkarsha *et al.* in 2014 on 30 patients of shoulder instability on a 1.5 tesla MRI scanner showed a sensitivity of 91%, specificity of 85% and diagnostic accuracy of 90%. This is comparable to the present study. Three patients had Bankart lesion and one patient had associated Hill-Sachs lesion. The associated Hill Sachs lesions is due to the fact the biomechanical forces that result in Hill-Sachs lesions also results Bankart lesions. A total of three patients were found to have Bankart lesions on arthroscopy. The sensitivity [100%], specificity [89%] of overall Bankart lesions of our study corresponds that of Joseph *et al.*<sup>[3]</sup> They studied One hundred and twenty-seven patients with shoulder pain on a 1.5 T MRI, and found a sensitivity of 88%, specificity of 93% for overall Bankart lesions.

**Limitations and Pitfalls:** In this study we observed these drawbacks: Sample of the study is small (n=12). Interpretation of clinical test is difficult in patients presenting with acute injury. Getting an MRI in patients with

claustrophobia, obese patients, postsurgical metallic implant fixations is difficult. The magic angle artifact is routinely encountered in MRI examinations of the shoulder, which can be mistaken for a supraspiatus tear. Limited number of studies for comparison.

### Conclusion

Clinical examination can be used as a first line of diagnosis in a case of shoulder joint pathology to suspect Rotator Cuff tears and Glenohumeral instabilities. Clinical examination often does not provide adequate diagnosis to the underlying pathology, therefore radiological evaluation is required. (MRI). Diagnostic Arthroscopy is the gold standard and clinical & radiological examinations are compared with arthroscopy. The sensitivity and specificity for all pathologies is higher for arthroscopy in our study as compared to clinical and MRI examinations, as is the observation of most workers in this field.

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