

Role of Ultrasonography in the Evaluation of Painful Shoulder

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ABSTRACT

Introduction: Shoulder pain is a common problem encountered in clinical practice. It is often disabling to the patient and results in considerable morbidity and unsatisfactory outcomes if therapy is not instituted effectively or delayed. Ultrasonography is a rapid, real time and cost effective alternative to MRI and diagnostic arthroscopy. Here, we compare sonographic diagnosis with clinical diagnosis in the diagnosis of the various causes of shoulder pain.

Methods: This descriptive study was done in the radiology department of Nepalgunj Medical College Teaching Hospital, Kohalpur during a time period of 18 months. About 30 cases of shoulder pain that had been evaluated clinically by a single examiner in the orthopedics OPD were diagnosed with the help of sonography. Correlation between clinical diagnosis and USG diagnosis was done.

Results: Clinically, most of these cases were provisionally diagnosed as Frozen shoulder 9 (30%) followed by Cuff tendinopathy 8 (26.66%) and Impingement syndrome 6 (20%). However, USG of the shoulder revealed rotator cuff tendinopathy and cuff tear (n=6 each) to be the main etiology behind shoulder pain. Supraspinatus calcific tendinopathy was found in 4 individuals. Hence, it was seen that the diagnosis of the causes of shoulder pain with clinical tests alone is unsatisfactory. Out of 30 cases, clinical examination could correctly diagnose only 20% of the time (n=6). 73% of the time (n=20), USG showed a different diagnosis compared to clinical examination whereas in 4 (7%) cases a more specific diagnosis was reached.

Conclusions: We conclude that USG is more specific and frequently leads to increased diagnostic accuracy when compared to clinical examination.

Keywords: shoulder pain; ultrasonography; shoulder; clinical tests.

INTRODUCTION

Shoulder pain is the most common musculoskeletal complaint after neck and low back pain and can be associated with marked impairments and can be disabling.¹ Therefore the rewards for a correct diagnosis and appropriate treatment are high in order to halt progression into chronicity.² Most common cause of shoulder pain and dysfunction in the patient older than 40 years is cuff fiber failure, which starts as tendinopathy and

progresses through a partial-thickness tear to a full-thickness tear.^{3,4}

Fiber failure demonstrates a sequential progression from the partial thickness tear almost always starting in the Supraspinatus to massive tears involving multiple cuff tendons.⁵ For diagnosing articular as well as periarticular pathologies of shoulder joint various imaging modalities like plain radiography, ultrasonography, computed tomography, CT arthrography, MRI and MR arthrography play a crucial role. Each of these has its own limitations and advantages over others.⁶

The objective of the study is to establish the role of sonography in the evaluation of causes of shoulder pain.

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METHODS

A cross-sectional descriptive study was undertaken in the Department of Radiology, Nepalgunj Medical College Teaching Hospital. The study period was from February 2015 to August 2016, for a total duration of 18 months. Total of 30 patients with shoulder pain (unilateral) that had already been evaluated by one senior orthopaedic resident were taken into the study. The ethical approval was taken from institutional review committee (IRC) of NGMC and School of Medical Science, Kathmandu University were taken prior to the study. After receiving informed consent from the patient, sonography of both the affected and normal shoulders were carried out. The lead researcher was blinded to the orthopaedic provisional diagnosis prior to sonography. Sonography was done in accordance to the systemic sonographic examination technique. A detailed patient proforma was filled up at the end of each study.

Thirty cases were included in the study and the following formula was used in calculating sample size. Minimum Sample size determination:

$$n = Z^2 \times \frac{P(1-P)}{e^2}$$

n=Sample size, z=Z score based on CI,
P= Proportion, e=precision.

Statistical analysis was carried out using the help of a statistician and a software package. Data entry was done in Microsoft Excel 2007. Statistical Package for Social Sciences (SPSS) version 20 was used in data analysis and chart construction. Agreement between clinical diagnosis and radiological diagnosis was statistically compared by chi-square test. A $P < 0.05$ is considered to be significant.

RESULTS

The mean age of the study population was 42.93 with a standard deviation of 10.866. The patients in our study had ages between 22 and 60. The median age was 42 years. There were 16 males and 14 females included in our study. Patients presenting with shoulder pain presented with complaints on both the right and left shoulders. The right shoulder was the one involved slightly more (total=16, 53.33%) than the left shoulder (total=14, 46.67%).

Patients varied in the presentation time after the pain. The mean time to presentation was 8.88 months with a median of 6 months and mode of 12 months. All patients presented within 24 months of onset of shoulder pain. Prior to sonographic evaluation, a provisional diagnosis was made by a senior orthopedic resident that was recorded as follows. The most common provisional diagnosis was Frozen shoulder (n=9) followed by Rotator cuff tendinopathy (n=8) and Impingement syndrome (n=6). A sonographic evaluation of the affected shoulder was done by the lead investigator and comparisons were done with the clinical provisional diagnosis. The following table tabulates the results in all cases (Table 1).

Table 1. List of Clinical and Sonographic Diagnosis compared.

S.N	Clinical Diagnosis	USG Diagnosis	Agreement
1	Rotator cuff tear	Rotator cuff tear	Yes
2	Impingement Syndrome	Sub acromial bursitis	Yes, specific diagnosis reached
3	Adhesive capsulitis	AC joint degeneration + Rotator cuff tendinopathy	No
4	Rotator cuff tendinopathy	Calcific tendonitis	No
5	Rotator cuff tendinopathy	Rotator cuff tear	No
6	Adhesive capsulitis	Rotator cuff tendonitis	No
7	Adhesive capsulitis	Normal	No
8	Adhesive capsulitis	Rotator cuff tear	No
9	Adhesive capsulitis	Rotator cuff tendinopathy +Biceps Tenosynovitis	No
10	Impingement Syndrome	Rotator cuff tendinopathy	No
11	Impingement Syndrome	Calcific tendonitis	No
12	Adhesive capsulitis	Calcific tendonitis	No
13	Cervical Radiculopathy	Rotator cuff tear	No
14	Rotator cuff tendinopathy	Normal	No
15	Septic Arthritis	Abscess (Teres Minor)	No
16	Adhesive capsulitis	Loose body	No
17	Impingement Syndrome	Rotator cuff tear	No
18	Rotator cuff tendinopathy	Rotator cuff tear	No
19	Rotator cuff tendinopathy	Rotator cuff tendinopathy	Yes
20	Biceps tendonitis	Biceps tenosynovitis	Yes
21	Rotator cuff tendinopathy	AC joint arthrosis	No
22	Rotator cuff tendinopathy	Normal	No
23	Shoulder subluxation	Normal	No
24	Septic Arthritis	Septic Arthritis	Yes

25	Rotator cuff tendinopathy	Rotator cuff tendinopathy	Yes
26	Sub acromial bursitis	Subcutaneous lipoma	No
27	Impingement Syndrome	Sub acromial bursitis	Yes, Specific Diagnosis reached
28	Impingement Syndrome	Calcific tendonitis	No
29	Adhesive capsulitis	Adhesive capsulitis	Yes
30	Adhesive capsulitis	Normal	No

Taking sonographic diagnosis alone, we constructed the following figure. Rotator cuff tendinopathy and rotator cuff tear were the major abnormality in sonogram.

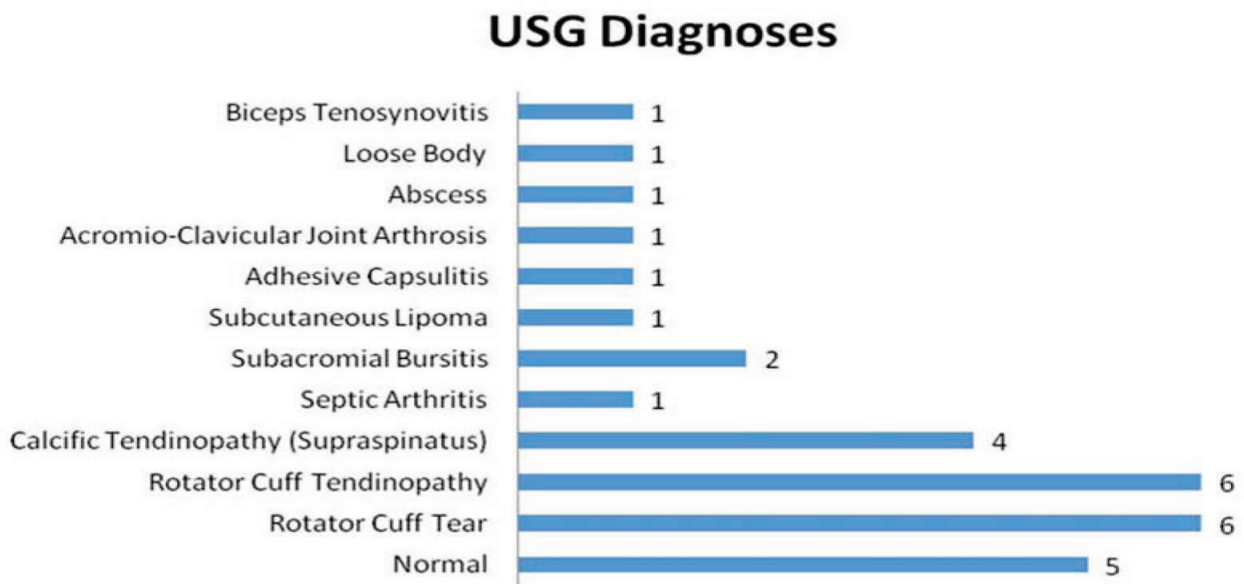


Figure 1. Various USG diagnoses in the study.

The following figure illustrates the agreement and disagreements between clinical and sonogram results. In 73% of cases a different diagnosis was reached. Thus, 41 clinical examination was successful in reaching at the correct diagnosis (USG) in only 27% cases. Even in these “true positives”, USG could delineate the site of injury better and reach at a more specific diagnosis.

Relative Diagnostic Comparison

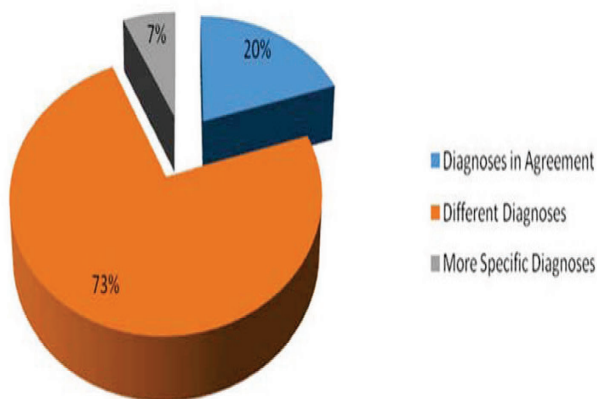


Figure 2. Agreement between clinical diagnosis and USG diagnosis.

The P value of the test when clinical diagnosis was compared to USG diagnosis was >0.05 , i.e. the two methods differed significantly in the diagnosis of shoulder pain. Only 42 % of cases could be clinically identified correctly whereas 58 % of the cases were missed by clinical examination alone as depicted by the following pie diagram.

Rotator Cuff Pathology (Clinical Detection)

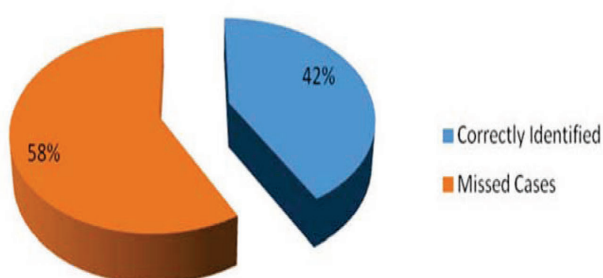


Figure 3. Clinically detected rotator cuff cases as compared to USG.

DISCUSSION

This study was done to evaluate the effectiveness of USG in the diagnosis of shoulder pain. Shoulder pain is a common and often disabling symptom. Despite all this, it is frequently mislabeled and

misdiagnosed as too much reliance on clinical examination is sought for diagnosis in our part of the world. As already stated, shoulder pain is a very common symptom. In fact, it is the third most prevalent musculoskeletal disorder after low back and neck pain. Shoulder pain is usually caused by various pathologies at the shoulder. They are subacromial impingement and bursopathy, tendinopathy, a tendon tear, a frozen shoulder, ligamentous instability, and osteoarthritis. In this study, the same patients that had their shoulders examined clinically were evaluated by a senior radiology resident to further investigate the value of clinical examination alone. De Jesus et al. in their metaanalysis showed that sonography was comparable to MRI in both sensitivity and specificity in diagnosing rotator cuff tears whether partial or full. Furthermore, it is important to accurately diagnose and characterize cuff tears for management decisions. Accurate depictions of anatomical lesions are important since they help in decision making and serial follow ups. Additionally, fatty degeneration of cuff muscles can be evaluated with a similar accuracy with ultrasonogram. Fatty degeneration is very important to visualize since it signifies a poor outcome and places the patient at an increased risk for tear recurrence.⁷ Ultrasonography correlates reliably to MRI in two studies and the authors have pointed out that USG can be efficaciously used in place of MRI for the diagnosis of cuff muscle atrophy and fatty degeneration.³ Thus, keeping in mind the cost and prohibitiveness of MRI, we decided to evaluate patients sonographically in the investigation of shoulder pain. Clinicians, in particular orthopaedicians utilize various diagnostic tests to evaluate shoulder pain. There is a huge controversy in the literature regarding the efficacy of clinical tests in the diagnosis of the causes of shoulder pain. Studies have pointed out that diagnosis by clinical examination is not reliable and has not been reproduced reliably along studies. While some studies show that rotator cuff available, non-invasive and fast imaging technique for diagnosis.⁸ And as already pointed out it has an efficacy at par with MRI of the shoulder joint with additional advantages that have already been stated. Additionally, USG frequently is used in the west for treatment decisions. The treatment

options for shoulder pain can be either surgical or nonsurgical. If surgical option is made, post-operative evaluation can be done easily with a sonogram. With non-surgical treatment as well, progression of tears/pathology can be serially evaluated and improvement documented so that conservative treatments would continue.

This study also had some inherent limitations. Bias may have been introduced due to our inability to randomize all patients that presented to us. To standardize our USG findings comparison could have been done with an MRI. However, MRI of all patients with shoulder pain would have been unjustifiable and external funding might have been required. Inter-observer variations might exist as ultrasonogram is operator dependent, more so than MRI. This study was done in a single center and by a single examiner. Therefore further studies of this nature could be done in other centers and by different examiners so as to further evaluate the case validity and reliability.

CONCLUSIONS

In this study, diagnostic USG of shoulder in symptomatic painful shoulders was compared to just clinical tests in our setting. This study was significant in that our assumption that shoulder pain could not be evaluated in isolation by clinical tests alone was proven. Rather, USG of the shoulder, given its almost universal availability and low cost is an effective instrument for proper diagnosis of the various causes of shoulder pain.

CONFLICT OF INTEREST: None.

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