

Evaluation of Painful Shoulder with High Frequency Sonography and their Comparison with the Clinical Diagnosis made by Physical Examination

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Abstract

Purpose: The purpose of this study is to compare clinical diagnosis made by physical examination with high frequency ultrasonographic findings and also to correlate ultrasonographic findings of painful shoulders of cases with asymptomatic shoulders of control subjects. The most common clinical diagnosis was supraspinatus lesion (38) followed by bicep tendon lesion (14). Rotator cuff was the most common structure to show abnormality (critical zone of avascularity) with supraspinatus being the most commonly involved tendon in our study. Non-invasiveness, easy availability along with its cost effectiveness justify role of high frequency ultrasound in the assessment of painful shoulder.

Keywords: Painful Shoulder, Physical Examination, Rotator Cuff Tear, Tendinitis

Introduction

Shoulder pain is the most common musculoskeletal complaint after neck and low back pain and can be associated with impairments and marked disabilities. There are many causes of a painful shoulder, but periarticular soft tissue lesions involving tendons and bursae are the most common often associated with chronic impingement of the rotator cuff on the anterolateral margin of the acromion. Most common cause of shoulder pain is Shoulder impingement syndrome (SIS). The patient presents with complain of pain in the shoulder region or arm that may be exacerbated by overhead activities.

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Most common cause of shoulder pain and dysfunction in the patient older than 40 years

Table 1: Age & Sex Distribution of Symptomatic Shoulders

Age in years	Male		Female		Total	
	No.	%	No.	%	No.	%
21-30	2	4	0	0	2	4
31-40	7	14	6	12	13	26
41-50	6	12	4	8	10	20
51-60	8	16	5	10	13	26
61-70	9	18	2	4	11	22
71-80	1	2	0	0	1	2
Total	33	66	17	34	50	100

is cuff fiber failure, which start as tendinopathy and progresses through a partial-thickness tear to a full-thickness tear.

Table 2: Distribution of Symptomatic Shoulder According To Side Involved

Side Involved	No. of Shoulder	Percentage
Right	31	62%
Left	19	38%
Bilateral	0	0%
Total	50	100%

Supraspinatus tendon is involved first and then, gradually, the other tendons.

For shoulder impingement there are many test including Neer and Hawkins tests. For supraspinatus Jobe's test, patte's test for infraspinatus, Gerber's lift off test for subscapularis and Yergason's test, speed test for long head of biceps brachii tendon lesion.

Table 3: No of Suspected Cases on Physical Examination

Shoulder lesion (Physical Examination Test)	No of Cases (n = 50)
Biceps tendon lesion (speed test)	14
Supraspinatus lesion (job's test)	38
Infraspinatus lesion (resisted external rotation)	4
Subscapularis lesion (Gerber's lift off test)	7
Acromioclavicular joint abnormality (cross over test)	6
Impingment syndrome (neer's & hawkin's test)	10

Physical examination alone is not sufficient to diagnose the impingement and rotator cuff abnormalities. So 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 plays crucial role. Each of these has its own limitations and advantages over others.

Table 4: Sonographic Findings In Symptomatic Shoulders & Controls (Asymptomatic Shoulders)

Shoulder pathologies	No. of positive symptomatic shoulder on USG (n=50)	No of positive control on USG (n=20)
Supraspinatus tendinitis	20	1
Supraspinatus Tear		
Partial thickness	9	0
Full thickness	3	0
Infraspinatus Tendinitis	4	0
Infraspinatus Tear	0	0
Subscapularis tendinitis	6	0
Subscapularis Tear	2	0
Biceps Tendinitis	16	2
Biceps Tear	0	0
Biceps tendon sheath effusion	12	1
Biceps subluxation	0	0
Subacromial subdeltoid bursitis	9	0
Acromioclavicular joint arthropathy	9	0
Impingement syndrome	5	0
Glenohumeral Joint Effusion	0	0
Bony pathologies	13	2

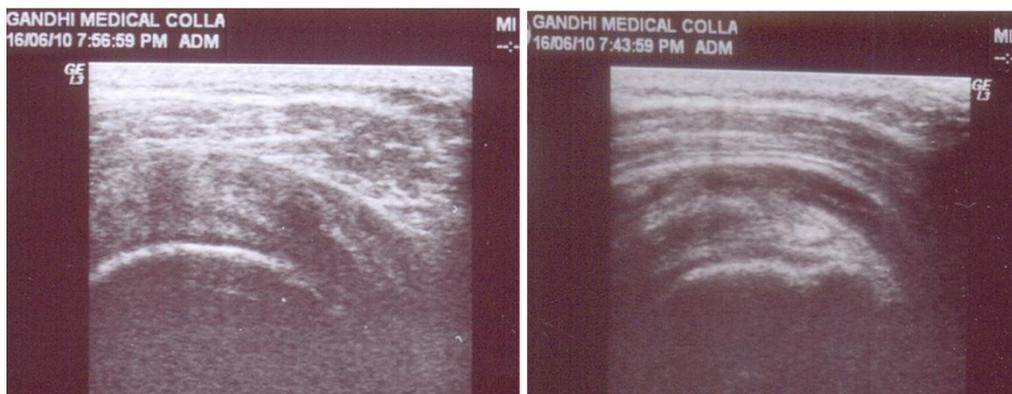


Fig 1: Supraspinatus Tendinitis: Bulky And Heterogenous Hypochoic Tendon with Internal Hypo/Hyperechoic Foci And Poorly Defined Margins.

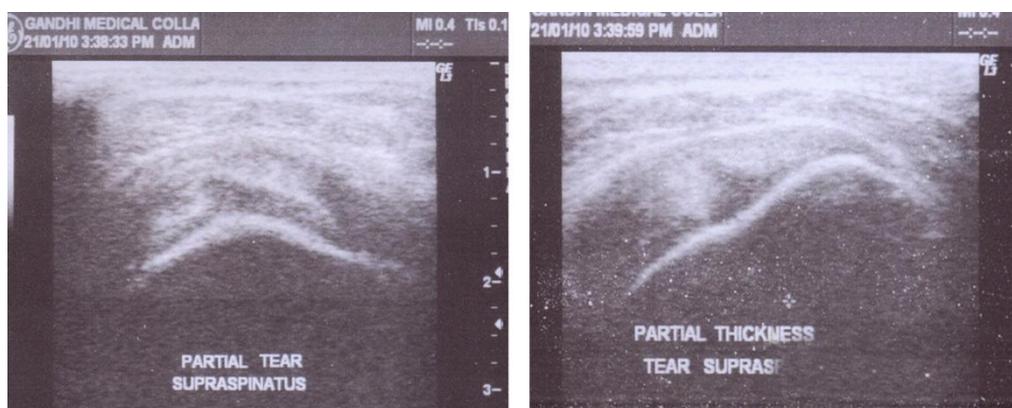


Fig 2: Supraspinatus Partial Thickness Tear: Hypochoic Fiber Discontinuity Involving the Articular Surface Fiber with Intrasubstance Hypochoic Fluid Collection.

Ultrasound is a powerful diagnostic tool for the evaluation of musculoskeletal disorders. It is relatively inexpensive, easily available and allows comparison with the opposite normal side, uses no ionizing radiation, non-invasive and can be performed at bedside or in the operating room if necessary.

Material & Methods

This is a prospective hospital-based study conducted in the department of radiodiagnosis from Jan 2010 to Dec 2011. This study included 50 patients (33 male, 17 female) who were referred to the department of radiodiagnosis after clinical diagnosis made by physical examination & 20 control having asymptomatic shoulders. A thorough

physical examination of cases as well as control was performed by using various tests.



Fig 3: Subscapular Tendinitis: Bulky And Heterogenous Appearance Of Tendon With Multiple Illdefined Hypochoic Intrasubstance Foci.

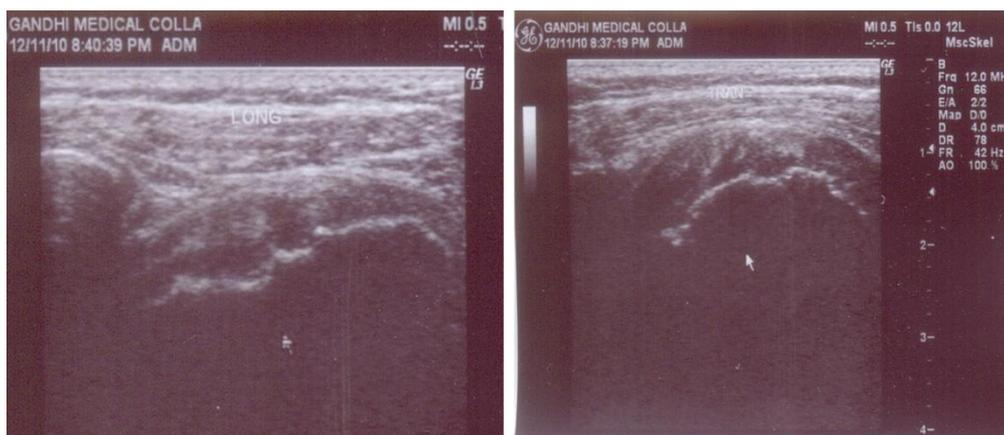


Fig 4: Subscapular Tear: Hypochoeic Intrasubstance And Articular Surface Fiber Defect With Cortical Irregularity of Underlying Bone.

The examination was performed on GE LOGIC 3 EXPERT, using linear array transducer 7.5 - 12 MHz (multifrequency) for evaluation of above patients.

All patients and controls underwent ultrasonographic examination within 1 week of physical examination. In all patients, comparable images of the opposite shoulder were obtained in order to facilitate detection of subtle abnormalities. US findings from the clinically evaluated painful shoulders, asymptomatic opposite shoulders and both shoulders of controls were recorded.



Fig 5: Biceps Tendinitis: Bulky And Heterogenous Appearance Of Biceps Tendon In Bicipital Groove.

Results

The Mean age of the patients was 50.62 years (ranges from 31-70 years). Male female ratio was 1.94: 1 (male 33, female 17). Right shoulder was more commonly involved than left shoulder & none of our cases had bilateral involvement. The most common clinical diagnosis was supraspinatus lesion (38) followed by biceps tendon lesion (14). On ultrasonography, most common pathology detected in painful shoulders was supraspinatus tendinitis followed by biceps tendinitis and biceps tendon sheath effusion, whereas in asymptomatic shoulders of control, biceps tendonitis was the most common pathology. Overall supraspinatus tendon was most commonly involved in our study.

Sensitivity of physical examination with respect to ultrasonography was low in clinical diagnosis of all shoulder lesions.

Discussion

Although Physical examinations are able to detect good amount of individual lesions, still have a lower efficacy to differentiate between various causes of painful shoulder

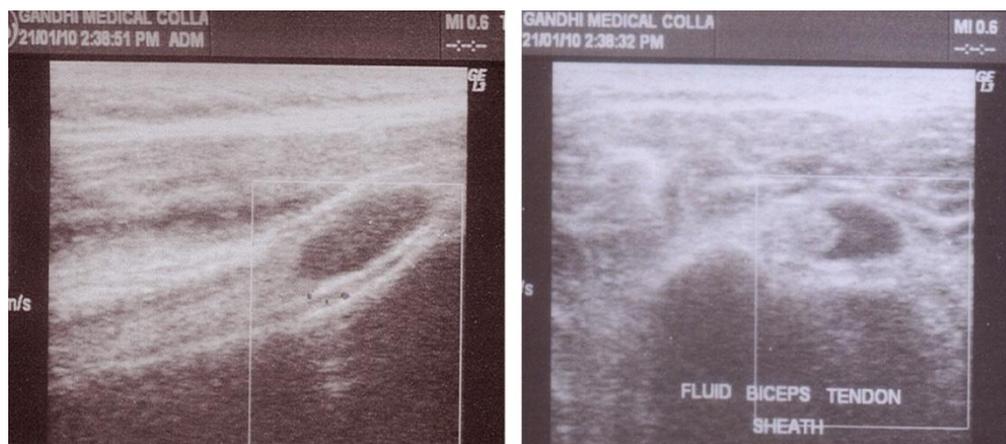


Fig 6: Biceps Tendon Sheath Effusion: Hypoechoic Fluid Collection Surrounding The Biceps Tendon, Thickness Measure >2 Mm.

and to detect the pathology in same. Our studies have found lower sensitivity to detect various pathology of shoulder on physical examination. Reason for this could be the fact that any positional maneuver used to detect rotator Cuff lesion is likely to compress or stretch the biceps tendon and subacromial-subdeltoid bursa. Moreover it is difficult to distinguish between various rotator Cuff diseases like tendonitis, partial tear or full thickness tear by physical examination alone.

Spectrum of the Ultrasonographic findings in current study

Almost whole of the spectrum of pathologies was found in our study except for adhesive capsulitis, glenohumeral instability, infraspinatus tear, biceps tear, biceps subluxation and labral pathology and soft tissue tumours. Adhesive capsulitis has nonspecific findings on ultrasound. Soft tissue tumours are usually large and extensive by the time they reach tertiary set up and it is uncommon for them to present solely as pain as a symptom. Absence of alteration like infraspinatus tear, biceps tear and subluxation in our study is because of

different study population as compared to other study. Glenohumeral instability and labral pathologies are usually seen in patients with past history of trauma, which is one of the exclusion criteria in present study.

Table 5: Rotator Cuff Tendon Involvement in Symptomatic Group Physical Examination versus Ultrasonography

Tendon	Physical Examination		USG	
	No.	%	No.	%
Supraspinatus	38	76	32	64
Infraspinatus	4	8	4	8
Subscapularis	7	14	8	16
Biceps Tendon	14	28	28	56

As in our study, the studies done by Iagnocco et al. 2003 and Naredo et al. 2002 also showed supraspinatus to be the most commonly involved tendon and teres minor least commonly involved. subscapularis involvement was commoner as compared to infraspinatus in our study which was not in accordance with studies done by Iagnocco et al., 2003 and Naredo et al., 2002. This variability could be due to difference in

Table 6: Comparison between study conducted by E. Naredo et al., 2002 and our study (both evaluating sensitivity, specificity, PPV and NPV of physical examination considering USG as optimal test)

Shoulder lesions	Sensitivity (%)		Specificity (%)		PPV (%)		NPV (%)	
	Our Study	E.Naredo	Our Study	E. Naredo	Our Study	E. Naredo	Our Study	E. Naredo
SST	85	72	57	38	57	61	85	50
SSTr	42	18	92	100	63	100	83	53
IST	75	57	98	70	75	36	98	85
SBT	50	50	98	88	75	50	93	88
SBTr	50	50	96	95	33	75	98	87
BT	69	73	91	58	79	73	86	58
SASDB	44	42	97	88	80	75	89	65
ACCLJA	56	58	98	85	83	93	91	37
IS	80	65	87	72	40	81	97	53

sample size and study population which was in accordance with study done by Goyal et al. 2010.

Partial thickness tears were commoner than full thickness tears in the present study.

Articular surface partial thickness tear was the most common type of partial thickness tear in our study in accordance with previous study by Holsbeeck et al. 1992. Most commonly observed pathology of biceps tendon in association with rotation cuff tear was tendon sheath effusion. These findings are in accordance with Iagnocco et al., 2003 and Naredo et al. 2002. Biceps tendon is subject to mechanical forces that contribute to cuff impingement because of its anterior location in impingement area. Also the synovial sheath of biceps is an extension of glenohumeral synovial membrane. Hence the

frequent association of cuff tear with biceps tendon abnormalities is observed.

SASD bursal fluid was found in 9(18%) painful shoulder in our study which is not significant statistically as compared to controls. Out of 9, six were associated with rotator cuff tear and two with supraspinatus tendonitis which is in accordance with the study done by Hollister et al. 1995 (Specificity 96%) and in the study by Van Holsbeck et al. 1993 (Specificity 90%) for the diagnosis of rotator cuff tear. Acromioclavicular joint abnormalities were found in 9 (18%) of painful shoulders in present study, which was not statistically significant as compared to controls. The findings in our study were not similar to the study done by Iagnocco et al. 2003 and Naredo et al. 2002. The most probable region is different study population.

In our study irregularity of GT was identified in 13(26%) painful shoulders which are statistically significant as compared to controls. Rotator cuff tear/tendinitis was associated with irregularity of greater tuberosity in painful shoulders. Cortical irregularity of greater tuberosity was considered to be one of the secondary sonographic signs of full thickness tear by Middleton WD et al. 1989 and Dondelinger RF et al. 1995 in their studies.

Calcific tendonitis seen in present study occurred less commonly than study by Naredo et al., 2003. This may be due to less mean duration of symptoms (44 days) in our study whose as compared to study by Naredo et al. 2003 (mean duration of symptoms group-I -3.3 months and group-II 8.6 months).

Impingement is a rare isolated finding. There are usually secondary changes within supraspinatus tendon or the subacromial bursa has been used as a further criterion for the presence of early stage impingement, i.e. Neer stage-I.

Table 7:

Tendon	Our Study	Iagnocco et al. 2003
Supraspinatus	64%	64.6%
Intraspinus	8%	16.5%
Subscapularis	16%	4.3%
Teres minor	0%	0%

5 (10%) painful shoulder showed buckling of supraspinatus tendon in association with SASD bursal fluid in our study which is not statistically significant finding as compared to controls. Finding is less common than the study done Naredo et al. 2002. This may be

due to different study population and different in age range.

Limitations of ultrasonography include lack of visualization of posterior aspect of supraspinatus and infraspinatus tendons, limited view of glenohumeral joint and glenoid labrum and lack of desirable patient position during sonographic examination due to restricted painful movements of shoulder joint.

Conclusion

Non-invasiveness, easy availability along with its cost effectiveness justify role of high frequency ultrasound in the assessment of painful shoulder. This investigation is more sensitive than clinical examination for the diagnosis and confirmation for painful shoulder

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