ULTRASONOGRAPHY OF DISABLED SHOULDER DUE TO ROTATOR CUFF DISORDERS IN ADULT EGYPTIANS

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ABSTRACT

This study aims at assessment of role of ultrasonography as an available, cheap, easy and valuable diagnostic aid in detecting soft tissue disorders, especially of the small parts of the body including the shoulder. The four tendons of the rotator cuff (Supraspinatus, Infraspinatus, Teres minor & Subscapularis) are vulnerable for injury with frequent use of the shoulder especially in thrower athletes and with advancing age.

In this work, 36 patients (20 males & 16 females) were chosen being suffering from pain in the shoulder (either interrupted or continuous) with or without limitation of movement of the affected shoulder. Plain X-ray and ultrasonography were made to affected shoulders of all cases.

X-ray revealed calcification of some shoulder tendons in some cases, while ultrasonography displayed some labral and tendon disorders (e.g. focal tendon non-visualization, labral and tendon tear, abnormal echogenicity and other disorders).

Ultrasonography is proved as a preliminary diagnostic tool for assessment of rotator cuff disorders. This methodology is considered the easiest, fastest, cheapest, most available, most tolerable and least invasive method than MRI. Its biggest limitations are low experience, long duration of learning, less acceptance by orthopedic surgeons and lack of detailed information about different lesions that may be associated with or mimics RC lesions (such as muscle changes following nerve injuries).

INTRODUCTION

The rotator cuff (R. C.) is formed of the tendons of four muscles, which surround and steady the head of the humerus within the scapular glenoid fossa in the gleno-humeral (shoulder) joint[1, 2&3].

The rotator cuff tendons are continuously subjected to friction with the overlying coraco-acromial arch. This friction results in repeated micro traumas (impingement) and degenerative changes to the tendons of the rotator cuff. The supraspinatus tendon may finally tear, partially or completely. Non-invasive imaging techniques (ultra-sonography "U.S." & magnetic resonance imaging "M.R.I."), are continuously improving. Diagnostic accuracy requires optimization of the technique, recognition of anatomic characteristics, orientation of imaging pitfalls and comprehension of pathogenesis of the condition[4,5 &6].

Successful treatment of the R.C. lesions requires early diagnosis with differentiation between partial and complete tendon tears. Full-thickness (complete) tears need surgical repair, while partial tears are conservatively treated. Delayed or missed diagnosis of RC tears leads to muscular weakness, glenohumeral joint instability, prolonged shoulder pain and disability of the arm. Delayed diagnosis in a massive complete RC tear mostly results in formation of a big defect with retracted fixed tendon edges, which is hardly able to reconstruct surgically [7,8,9&10].

AIM OF THE STUDY

This study aims at confirming the important role of ultrasonography as an available, cheep, easy and valuable diagnostic aid in detecting soft tissue problems, especially of the small parts including the shoulder.

PATIENTS & METHODS

* The study included 36 patients (20 males & 16 females).

* All patients were complaining of the following symptoms:

- Pain: More at the antero-lateral and superior aspects of the shoulder (either interrupted or continuous), which significantly increases by movement of affected arm and sometimes at night.
- Limitation of movement of the affected shoulder.

* All patients were subjected to:

I] CLINICAL ASSESSMENT: Comprising of:

1- Full history:

A) Onset, course, and duration of pain.

B) History of the present illness (mechanism of injury, site of pain and its timing & severity, and effect of movement and crepitus.

C) Presence of any past history of trauma, arthroscopy, operations or local injections.

D) Type of work of patient and whether he or she is right- or left-handed.

2- Examination of the shoulder & neck:

a- Inspection:

b- Palpation:

c- The range of motion:

d- Special tests: (e.g. Job's Test, Lift off Test & Belly press test).

e- Plain X-ray to cervical spine and shoulders: were done for each patient to exclude rheumatic disease, fractures, tumours, cervical spondylosis and other bony abnormalities, which may interfere with the diagnosis.

II] IMAGING ASSESSMENT (ULTRASOUND EXAMINATION):

The ultra-sonographic examination was performed with the patient seated on a stool and the examiner standing in front of the patient. First, the biceps tendon was examined with the patient's forearm in a supinated position situated on his or her thigh, in order to examine tendon in a transverse plane from the level of acromion downward to the point, where it merges with the biceps muscle. The transducer was then rotated 90 degree in order to examine the tendon longitudinally.

Next, the sub-scapularis tendon was examined. Patient's arm was externally rotated; the transducer was placed in a transverse anatomical orientation at the level of lesser tuberosity and was moved medially.

The supraspinatus tendon was examined with the shoulder extended, elbow flexed and the hand situated on the iliac crest. This position was necessary in order to expose as much of the supraspinatus tendon as possible from under the acromion. The transducer was oriented parallel to the tendon; i.e. nearly 45 degree between coronal and sagittal planes, in order to visualize tendon fibers in a longitudinal plane. The transducer was rotated 90 degree in order to examine the tendon transversely. Finally, posterior shoulder was examined in the transverse plane to visualize the posterior aspect of gleno-humeral joint as well as infra-spinatus & teres minor tendons.

RESULTS

The present study includes 36 patients (20 males and 16 females with age ranging from 17 up to 67 years (average age of 44 years) with shoulder pain and limited movement and primarily clinically diagnosed as RC disease after excluding cervical spine disorders & other neck problems. The largest suffering group was between ages of 40 and 50 years as shown in table (1) and figure (1).

Table (1): Age & Sex Distribution of Patients

	Age Group	No. of Patients	Sex	
			male	Female
1-	< 20 Years	2	1	1
-2	20-30 Years	5	3	2
3-	30-40 Years	6	3	3
4-	40-50 Years	13	7	6
5-	50-60 Years	7	4	3
6-	60 Years>	3	2	1
7-	Total	36	20	16

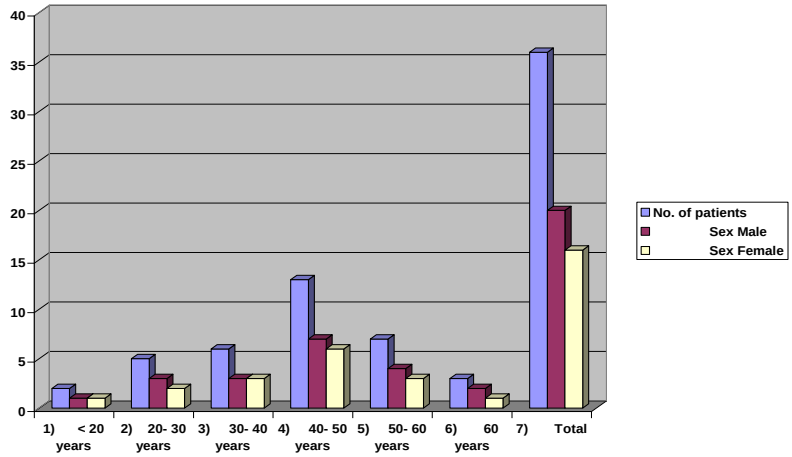


Fig. (1): Age & Sex Distribution Of Patients

All the patients (36 patients i.e. 100%) suffered from shoulder pain during active movement (mainly in abduction), while most of them (31 patients i.e.86 %) had limitation of movement (mainly in abduction). Continuous pain is found in 19 cases (39 %), interrupted pain in 11 cases (30.5 %), while pain increasing at night in 6 cases
(6.5 %), as shown in table (2) and figure (2).

Table (2): Clinical Picture

Presenting Symptoms		Timing	No. of Patients
1-	Pain	During Active Movement	36
		Continuous Pain	19
		Interrupted Pain	11
		Pain During Night	6
2-	Limitation of Movement		31
3-	Pain & Limitation of Movement		31

N.B.: A patient may have more than one complaint

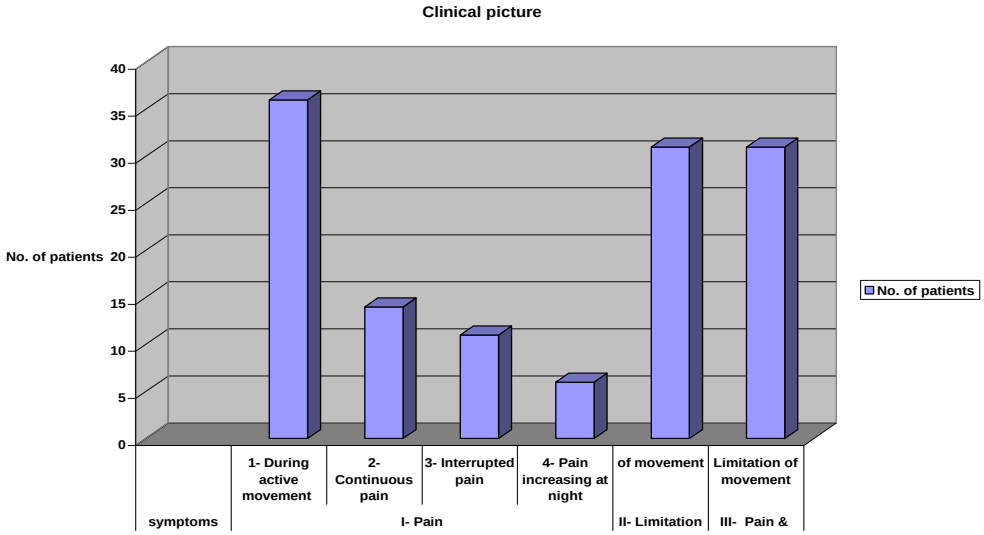


Fig. (2): Clinical Picture

According to clinical evaluation and ***history*** of the present patients with conservative management including physiotherapy and medical treatment; 24 patients were diagnosed as supraspinatus tendon tear (16 with partial and 8 with full-thickness tears); 19 of them were associated with impingement syndrome & 2 patients were associated with labral tears. 6 patients were diagnosed as supraspinatus tendinosis (tendinopathy); 2 of them were diagnosed as calcifying tendonitis.

All cases of tendinosis (6) were diagnosed to have associated impingement, while 2 of them were diagnosed to have associated labral tears with history of recent trauma. Six patients were diagnosed to have normal supraspinatus tendon (2 of them were diagnosed to have associated labral tears with history of recent trauma, while another 2 of them were diagnosed to have associated impingement syndrome). Impingement syndrome was clinically diagnosed in 27 patients (19 associated with tears, 6 associated with tendinosis and 2 associated with normal cuff).

Table (3): Final Pathological Diagnosis

RC Tendon Lesion		No. of Patients	Associated with	
			2	19
	a- Partial	16	2	12
	b- Complete	8	0	7
II- Tendenosis		6	2	6
III- Normal		6	2	2
Total		36	6	27

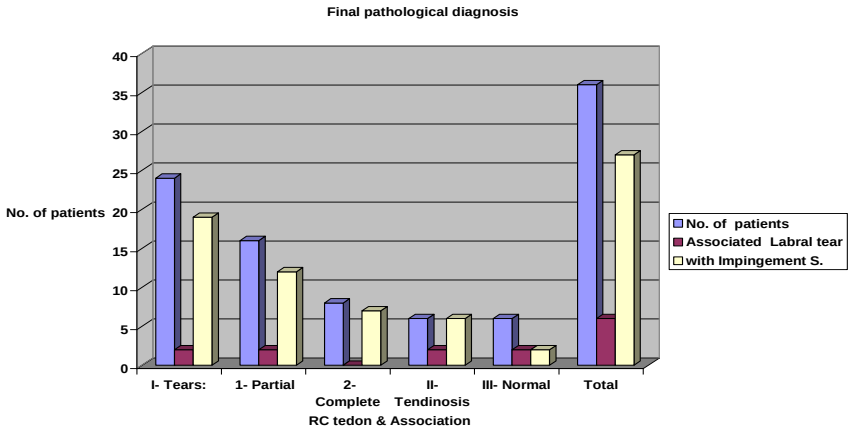


Fig. (3) Final Clinical diagnosis

In the present work, 24 patients were diagnosed as supraspinatus tendon tear; 15 were males and 9 were females); 19 of them were associated with impingement syndrome and 2 patients were associated with labral tears. Their main complaints were pain & limitation of movement.

US Picture:

US examination was performed to all patients of this group (24 patients). US detected the lesion as non- visualization of supraspinatus tendon in 3 patients, focal non-visualization of tendon in 4 cases, discontinuity of tendon in one patient, focal abnormal echogenicity (hypo-echoic defect or focal mixed echogenic area) in 8 cases, flattening of bursal side in 4 patients, heterogeneous echogenic pattern of supraspinatus tendon in 1 patient and normal echogenic pattern of the cuff in 3 cases. The final result of this group was 8 cases with complete (full-thickness) supraspinatus tendon tears and 16 patients with partial tears, 1 with supraspinatus tendonitis and 3 cases with normal cuff. These results are summarized in table (4).

Table (4): Sonographic Appearance of RC Tears in 24 Patients

Sonographic Appearance	No. of Patients	**US Diagnosis**			
		Normal	**Tendenosis**	**Partial Tears**	**Complete Tears**
Non-visualization of the Tendon	**3**	**0**	**0**	**0**	**3**
Focal Non-visualization of the Tendon	**4**	**0**	**0**	**0**	**4**
Discontinuity of the Tendon	**1**	**0**	**0**	**0**	**1**
Focal abnormal echogenicity	**8**	**0**	**0**	**8**	**0**
Flattening of bursal side	**4**	**0**	**0**	**4**	**0**
Heterogeneous echogenic pattern of supraspinatus tendon	**1**	**0**	**1**	**0**	**0**
Normal	**3**	**3**	**0**	**0**	**0**
Total	**24**	**3**	**1**	**12**	**8**

Regarding associated sonographic findings with RC tears, sub-acromial/subdeltoid fluid collection was found in 14 cases, joint effusion was found in 19 cases, concave sub-deltoid fat contour was found in 4 cases, bone surface irregularity was found in 5 cases, tendon calcification was found in 2 cases and no associated sonographic findings was found in 3 cases. These data were illustrated in table 5 & fig. 4.

Table (5) Sonographic Appearance of Associated Findings in R. C. Tears in 24 Patients

Associated Sonographic Findings with R. C. Tears	No. of Patients
Sub-acromial/Sub-deltoid Fluid Collection	**14**
Joint Effusion	**19**
Concave Subdeltoid Fat Contour	**4**
Bone Surface Irregularity	**5**
Tendon Calcification	**2**
No Associated Sonographic Findings	**3**

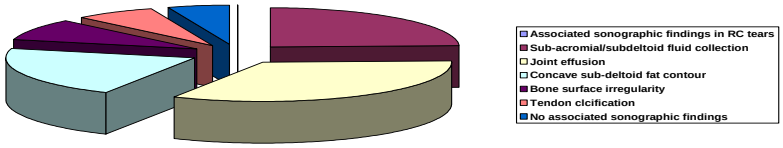


Fig. (4) Sonographic appearance of associated findings in RC tears in 24 patients

RC Tendinosis:

Herein this study, 6 patients (4 males and 2 females with age ranging from 22 to 44 years) were clinically diagnosed as tendinosis of supraspinatus tendon. 2 of them were diagnosed as calcifying tendonitis and were confirmed by both US and plain X-ray. Their main complaints were pain (which is severe in 2 cases) and limitation of movements in all cases. All of 6 cases were associated with impingement, while 2 of them were clinically associated with labral tears.

US Picture:

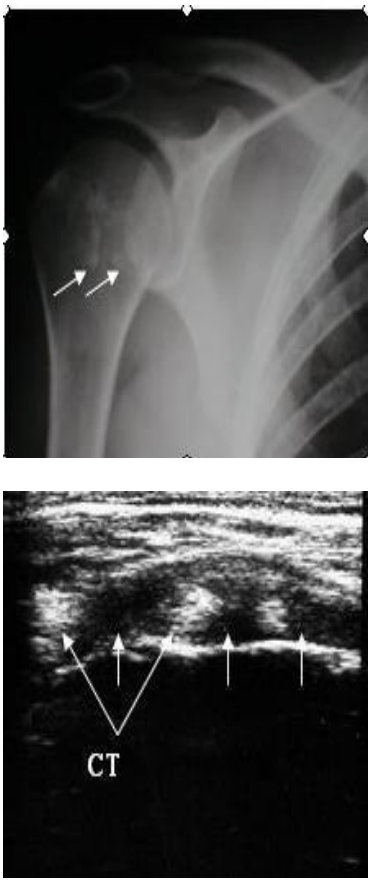
US examination was performed to all members (6) of this group, where it gives true positive results in 3 cases appearing as heterogeneous echogenic pattern of supraspinatus tendon, one patient was diagnosed as intra-substance partial tear and 2 were under-diagnosed as normal cuff. Sonographic findings and associated findings were summarized in table (6).

Table (6) Sonographic Appearance of Associated Findings in R. C. Tendenosis in 6 Patients

Sonographic Findings	No. of Patients
Normal Supraspinatus Tendon	**2**
Heterogeneous echogenic pattern of supraspinatus tendon	**3**
Focal abnormal echogenicity	**1**
Sub-acromial/Sub-deltoid Fluid Collection	**2**
Joint Effusion	**2**
Concave Subdeltoid Fat Contour	**3**
Bone Surface Irregularity	**2**
Tendon Calcification	**2**

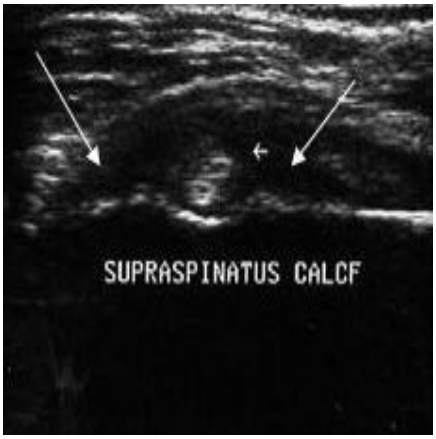
ILLUSTRATIVE CASES:

***Case (3*): Multiple full-size tear with calcific tendonitis (Arrows & CT).**



Case

***(11*) Massive Full-thickness tear of supraspinatus tendon**



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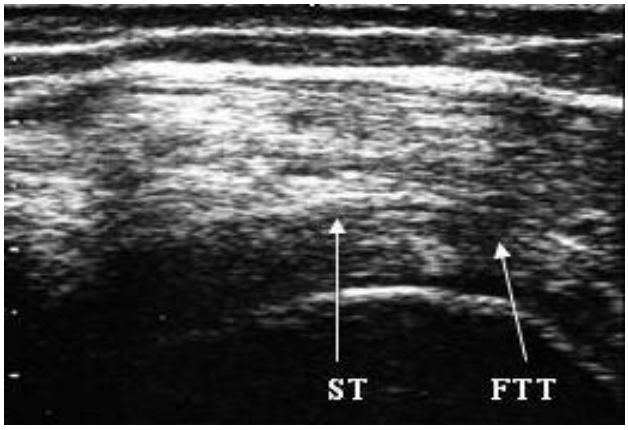
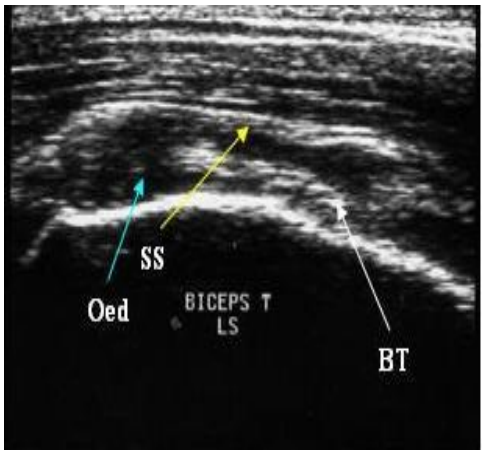
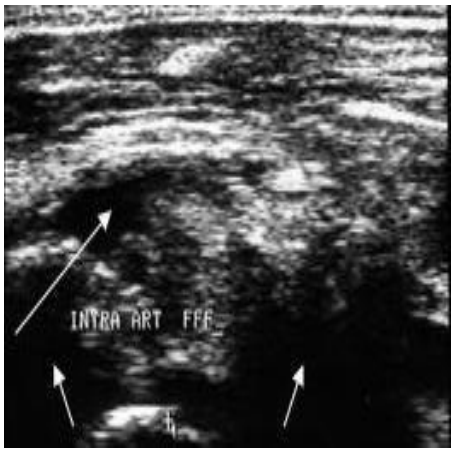
***(13)* Minor full-thickness tear (FTT) of supraspinatus tendon (ST).**

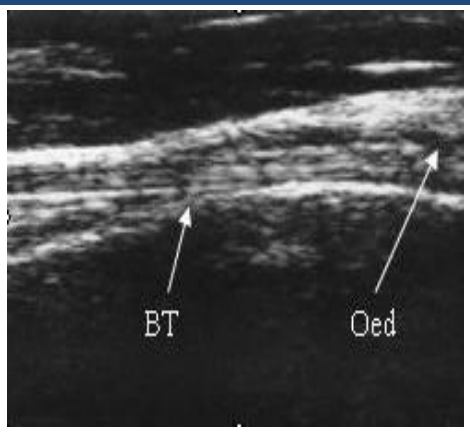


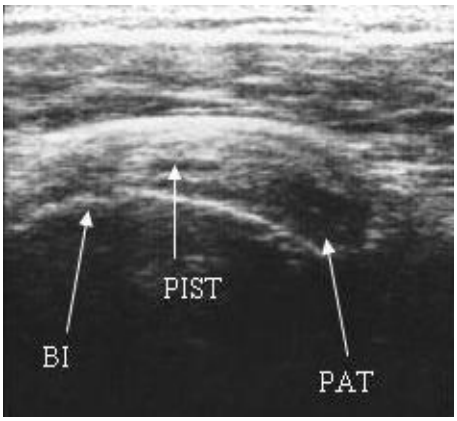
Case
***(20)* Massive complete RC tear with intra-articular effusion and biceps tenosynovitis**





Case
***(22)* Combined partial articular tear (PAT) and intra-substance tear of supraspinatus with slight bone irregularity & oedematous (Oed) biceps tendon (BT)**





DISCUSSION

Shoulder pain may be due a variety of causes. Its major causes in patients above 40 years are rotator cuff (RC) impingement and tears. New arthroscopic techniques for treating RC disorders make US have increasingly important role as a non-invasive diagnostic test to determine the patient going to benefit from surgery[11,12,13&14]. This agrees with the present study, as the most suffering age group lies between 40 and 50 years. US proved to be valuable, but MRI seemed to be more reliable before surgery as mentioned before by[15, 16 & 17].

US presents difficulties in distinguishing between partial and small full-thickness tears, although it clearly shows tendinosis. In patients with shoulder pain & limited movement not responding to conservative therapy MRI may be required to evaluate partial tears or query small full-thickness tears [18]. The same can be concluded in the present study.

RC impingement is a clinical diagnosis, but identifying an associated non-massive RC tear on physical examination could be difficult. The main role of US in these patients is diagnosis of a tear of RC [19 & 20]. This cope with the present study, where there was coincidence between high percentage of cases of impingement with RC tears.

CONCLUSION

Ultrasonography is preferred as a screening diagnostic aid for assessment of RC disorders. It is a more available, reliable, easy, fast, low-cost, more-tolerated and non-invasive method than MRI. Its biggest limitations are low experience, long duration of learning, less acceptance by orthopedic surgeons and lack of detailed information about different lesions that may be associated with or mimics RC lesions (such as muscle changes following nerve injuries).

Lastly, for clinically-diagnosed RC disorders, US is first advised to confirm the diagnosis (especially in acute cases). In chronic, cases failed to be treated conservatively and in preoperative cases, MRI is performed to already clinically and sonographically-diagnosed diseased RC cases before any surgical interference.

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