

*Research Article***Role of Ultrasound imaging in diagnosis of shoulder pain in spondyloarthropathies and rheumatoid arthritis patients****Ahmed H. Ahmed***, **Soha H. Senara***, **Engy Sh. Elkayal**** and **Manar R. Senosi***

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Abstract

Aim of the work: to assess musculoskeletal ultrasound features of painful shoulder in spondyloarthropathies and rheumatoid arthritis patients compared with age and sex-matched healthy controls, and to compare the findings between these two conditions. Patients and methods: forty (40) patients were categorized in two subgroups. Twenty (20) rheumatoid arthritis patients and twenty (20) patients of seronegative spondyloarthropathies, in addition to forty (40) control subjects. Musculoskeletal ultrasound was done to all patients and control subjects. Results: the patient mean age was 40.22 ± 10.9 years. Twenty-three (23) of them were females (57.5%) and seventeen (17) were males (42.5%). While the controls mean age were 31.65 ± 7.25 years. Twenty-two (22) of them were females (55%) and eighteen (18) were males (45%). ultrasound findings in study groups: The most frequent finding in RA and SpA patients was biceps tenosynovitis followed by rotator cuff tendonitis and rotator cuff tears. Biceps tenosynovitis and rotator cuff tendonitis were also reported in control persons. there was a significant difference between rheumatoid arthritis and seronegative spondyloarthropathies patients detected in glenohumeral joint effusion. There was no significant difference as regard physical examination between RA and SpA patients. There was no significant relation between duration of disease & duration of shoulder pain and ultrasonographic findings in rheumatoid arthritis patients. Conclusion: Shoulder US has become the modality of choice for the diagnosis of rotator cuff and non-rotator cuff pathologies, offering a high level of diagnostic specificity and sensitivity along with significant benefits to the examiner and the patient.

Keywords: Rheumatoid Arthritis, Spondyloarthropathies, Musculoskeletal Ultrasound.**Introduction**

Rheumatoid arthritis (RA) is an autoimmune disease that results in a chronic, systemic inflammatory disorder that may affect many tissues and organs, but principally attacks synovial joints. It can be a disabling and painful condition, which can lead to substantial loss of functioning and mobility if not adequately treated^[1]. Spondyloarthropathies are group of diseases affecting the axial skeleton (sacroilitis and spondylitis). They include ankylosing spondylitis, reactive arthritis, psoriatic arthritis and enteropathic arthritis. The group often being termed specifically seronegative spondylarthropathies, they have an increased incidence of HLA-B27, as well as negative rheumatoid factor and ANA^[2]. Recent dynamic development of ultrasound technology has been detected. Consequently, ultrasound is being utilized

on a wide base in Rheumatology. With introducing of high frequency (up to 18 MHz) linear probes, sensitive Doppler techniques, and harmonic imaging options and cross beams, ultrasound is used in the initial diagnosis of rheumatic diseases, monitoring of the effectiveness of treatment and confirmation of remission^[3]. Ultrasound is safe and painless, do not use ionizing radiation (as used in x-rays), thus there is no radiation exposure to the patient. Because ultrasound images are captured in real-time, they can show the structure and movement of the body's internal organs, as well as blood flowing through blood vessels^[4]. Various studies on patients with shoulder disease in RA have demonstrated that US is comparable to MRI in being more sensitive than radiography in detecting bone erosion^[5].

The aim of this study is to assess musculoskeletal ultrasound features of painful shoulder in spondyloarthropathies and rheumatoid arthritis patients compared with age and sex-matched healthy controls, and to compare the findings between these two conditions and to assess the diagnostic value of ultrasonography in the diagnosis of shoulder pain in comparison to physical examination.

Patients and methods

This cross sectional descriptive case control study was conducted in Rheumatology and Radiology departments in Fayoum university hospital and include 2 groups. Group 1 includes 40 patients divided into 2 subgroups: Subgroup A includes 20 patients of rheumatoid arthritis & Subgroup B includes 20 patients of seronegative Spondyloarthropathies. Group 2 includes 40 healthy persons not complaining of shoulder pain. All patients were subjected to full history taking and clinical examination including Shoulder examination (Assessing active and passive range of motion of the shoulder & Performing 10 shoulder maneuvers which are: Yergason's test, palm up test, Popeye's sign and Speed test^[5], Neer's test^{[6],[7]}, Hawkins's test^[8], Yocum's test^[9], Jobe's test^[10], Patte's test^[11], Gerber's lift off test^[12]. Assessment of disease activity by DAS28 for rheumatoid arthritis patients and BASDAI for ankylosing spondylitis patients. Laboratory investigations as ESR, RF, CRP were conducted and Imaging of shoulder joint by Plain x-ray (both A-P and axial views of both shoulders) & Ultrasound (US evaluation was bilaterally performed in SPA and RA patients and in control subjects).

Statistical Analysis

Statistical analyses were performed using the Statistical Package for Social Sciences Version 16.0 for Windows. Means and standard deviations were calculated for quantitative data, number and percent for qualitative variables. Comparison of variables between study groups was done using Chi-square test of significance for qualitative variables. Independent test and man-Whitney test for quantitative variables.

The sensitivity and specificity were determined on considering the "Receiver Operating Characteristic" (ROC) curve. A probability value of less than 0.05 was considered statistically significant.

Results

The patient mean age was 40.22 ± 10.9 years. Twenty-three (23) of them were females (57.5%) and seventeen (17) were males (42.5%). While the controls mean age were 31.65 ± 7.25 years. Twenty-two (22) of them were females (55%) and eighteen (18) were males (45%). The mean disease duration in RA patients was 10.11 ± 6.17 (ranging from 3 to 25 years) while in SpA patients was 11.5 ± 7.4 (ranging from 3 to 30 years). The mean duration of shoulder pain in RA patients was 12.65 ± 9.4 (ranging from 2 to 36 months) while in SpA patients was 11.9 ± 10.5 (ranging from 2 to 36 months). Clinical examinations of the patient groups' shows that, 11 patients (7 RA patients & 4 SpA patients) have limited passive ROM & 28 patients (17 RA patients & 11 SpA patients) have limited active ROM.

Neer test was positive in 9 R.A patients and 11 SpA patients, Hawkins test positive in 4 RA & 9 SpA patients. Yocum test was positive in 4 RA patients & 7 SpA patients, Jobe test was positive in 8 RA patients & 11 SpA patients. Gerber test was positive in 3 RA patients & 4 SpA patients, Patte test was positive in 4 RA patients & 5 SpA patients, Yergason test was positive in 10 RA patients & 11 SpA patients. Palm up test was positive in 9 RA patients & 10 SpA patients, Popeye sign was negative in all patients, Speed test was positive in 3 RA patients & 5 SpA patients. Laboratory findings of patients reveals; the ESR was positive in 16 rheumatoid arthritis patients and 17 SpA patients while CRP was positive in 7 rheumatoid arthritis patients and 5 SpA patients. The RF was positive in 18 rheumatoid arthritis patients and negative in all SpA patients. In rheumatoid arthritis patients the 28 joint disease activity score (DAS 28) ranged between 3.16:4.6 with a mean of 3.87 ± 0.44 . In SpA patients, the BASDAI ranged between 1.4: 3.4 with a mean of 3.44 ± 0.86 . Percentage of

psoriatic arthritis patients was 19.04% (4 patients). Ultrasound findings in study groups: The most frequent finding in RA and SpA patients was biceps tenosynovitis followed by rotator cuff tendonitis and rotator cuff tears. Biceps tenosynovitis and rotator cuff tendonitis were also reported in control persons. As regard ultrasonographic findings, there was a significant difference between rheumatoid arthritis (40%) and seronegative spondyloarthropathies patients (20%) detected in glenohumeral joint

effusion (with P value 0.025). There was no significant relation between duration of disease & duration of shoulder pain and ultrasonographic findings in rheumatoid arthritis patients. Median duration of disease was significantly higher in SpA patients with positive SSP tendinitis (12.5) in comparison to those with negative SSP tendinitis (4.5) (P value was 0.008). Median duration of pain was significantly higher in SpA patients with SA-SD bursitis (24) (P value was 0.04).

Table (1): demographic characters of the cases and control groups:

		Cases		Control		P value
Age		N(=40)	%	N(=40)	%	
	< 40 years	19	47.5	26	65.0	0.115
	≥ 40	21	52.5	14	35.0	
	Mean ± SD	40.22±10.9		31.65±7.25		
Sex	Females	23	57.5	22	55.0	0.82
	male	17	42.5	18	45.0	
Residence	Urban	10	25.0	16	40.0	0.152
	Rural	30	75.0	24	60.0	
Occupation	Not Working	23	57.5	15	37.5	0.073
	working	17	42.5	25	62.5	

Table (2): physical examination of shoulder in cases:

Examination	RA		SpA		P value
	N(=20)	%	N(=20)	%	
Passive ROM	7	35 %	4	20 %	
Active ROM	17	85 %	11	55 %	
Neer	9	45.0	10	50.0	0.75
Hawkins	4	20.0	8	40.0	0.168
Yocum	4	20.0	7	35.0	0.288
Jobe	8	40.0	10	50.0	0.525
Gerber	3	15.00	3	15.00	>0.99
Patte	4	20.0	4	20.0	>0.99
Yergason	9	50.0	10	50.0	>0.99
Palm up	9	45.0	10	50.0	0.75
Popeye	0.00	0.00	0.00	0.00	
Speed	3	15.0	4	20.0	>0.99

RA= rheumatoid arthritis, SpA= seronegative spondyloarthropathies, ROM= range of motion

Table (3): Ultrasonographic findings in study groups:

Sonar	RA		SpA		Control	
	N(=20)	%	N(=20)	%	N(=40)	%
Biceps tenosynovitis	16	80.0	14	70.0	4	10.0
SSP tendinitis	9	45.0	12	60.0	4	10.0
SSC tendinitis	6	30.0	7	35.0	2	5.0
ISP tendinitis	4	20.0	5	25.0	0	0.0
SSP tear	4	20.0	3	15.0	0	0.0
SSC tear	3	15.0	1	40.0	0	0.0
ISP tear	2	10.0	1	5.0	0	0.0
Osteophytes	1	5.0	2	10.0	0	0.0
AC joint effusion	10	50.0	9	45.0	0	0.0
AC joint erosion	6	30.0	5	25.0	0	0.0
GHJ effusion	8	40.0	4	20.0	2	5.0
Intratendeneous calcification	2	10.0	6	30.0	0	0.0
Impingement	10	50.0	6	30.0	0	0.0
SA-SD bursitis	5	25.0	7	35.0	2	5.0

RA= rheumatoid arthritis, SpA= seronegative spondyloarthropathies, SSP=supraspinatus, SSC=subscapularis, ISP=infraspinatus, ACJ= acromioclavicular joint, GHJ=glenohumeral joint, SA-SD= subacromial subdeltoid bursitis.

Table (4): shows Comparison of ultrasonographic findings in RA and SpA patients:

US	RA		SpA		P value
	N(=20)	%	N(=20)	%	
Biceps tenosynovitis	16	80.0	14	70.0	0.46
SSP tendinitis	9	45.0	12	60.0	0.34
SSC tendinitis	6	30.0	7	35.0	0.74
ISP Tendinitis	4	20.0	5	25.0	0.75
SSP tear	4	20.0	3	15.0	0.67
SSC tear	3	15.0	1	5.0	0.61
ISP tear	2	10.0	1	5.0	0.99
Osteophytes	1	5.0	2	10.0	0.99
ACJ effusion	10	50.0	9	45.0	0.64
ACJ erosion	6	30.0	5	25.0	0.60
GHJ effusion	8	40.0	4	20.0	0.025
Bursitis	5	25.0	7	35.0	0.49
Intratendeneous calcification	2	10.0	6	30.0	0.23
Impingement	10	50.0	6	30.0	0.197

RA= rheumatoid arthritis, SpA= seronegative spondyloarthropathies, SSP=supraspinatus, SSC=subscapularis, ISP=infraspinatus, ACJ= acromioclavicular joint, GHJ=glenohumeral joint.

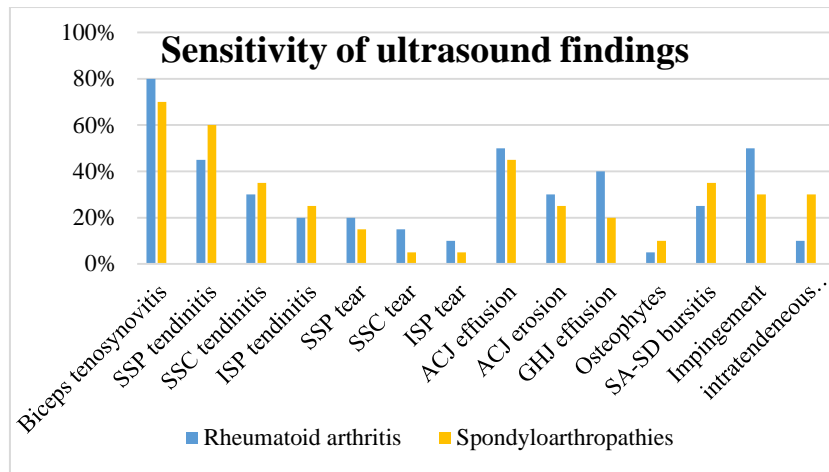


Figure (1): shows sensitivity of ultrasound findings

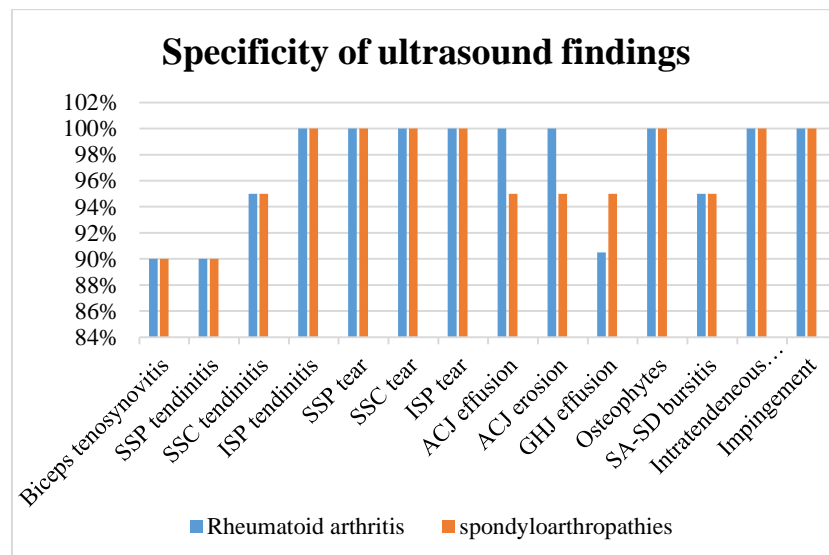


Figure (2): shows specificity of ultrasound findings

Discussion

Shoulder pain is one of the most common complaints encountered in patients with rheumatoid arthritis (RA). During the first 2 year of RA, nearly 50% of patients have shoulder symptoms, and 90% complain of shoulder pain at some time during the course of the disease. In addition to the synovitis of the glenohumeral (GH) joint, shoulder pain in RA arises from pathologies involving diverse periarticular soft tissues, and the involvement of more than one anatomical structure is common. Because it is difficult to detect and identify the site of

anatomical alterations with clinical examinations even in non-RA shoulders, correct diagnosis and management of painful RA shoulder by clinical examination alone is often problematic^[13]. In seronegative spondyloarthropathies shoulder involvement is common during the course of the disease. Prevalence of shoulder pain in AS varied from 3.5 to 33%. Despite its common occurrence in patients with AS, shoulder involvement is not frequently disabling. However, etiologies of shoulder pain in patients with AS remain to be defined, physicians

presumed that shoulder pain might be due to synovitis, bursitis, or structural joint damage. There have been very few studies which examined the etiology of shoulder pain in patients with AS, and usually not in a controlled format. Some cross-sectional plain radiographic studies have described joint space narrowing, erosion, and bony proliferation in the acromioclavicular joint, the glenohumeral joint, and around the rotator cuff insertion^[14]. In this study the most frequent finding in R.A patients was biceps tenosynovitis (80%) followed by rotator cuff tendinitis, supraspinatus was the most frequently involved (45%) followed by subscapularis (30%) and infraspinatus (20%). Tendon tear was detected most frequently in supraspinatus (20%) followed by subscapularis and infraspinatus (15 & 10% respectively). Similar findings were obtained by Kim et al., study^[13] and EL Liethy et al., study^[15] where the most frequent finding was effusion in the long head of the biceps tendon, which was observed in 37.1% & 57.1% respectively. In Kim et al., study among the rotator cuff tendon, subscapularis was the most frequently involved, with tendon tear observed in 37% of shoulders^[13]. For supraspinatus and infraspinatus tendon, tendon tear was observed in 34 and 11% of the shoulders respectively. There were also 2 patients (10%) who had rotator cuff calcifying tendonitis. We found that 50% of RA patients have sub-acromial impingement this was in agreement with the study by Bruyn et al.,^[16] and El-Liethy et al.,^[15] which showed that impingement was found in about 65% of RA patients.

For SpA patients the most frequent finding was biceps and rotator cuff tendinitis. In a study by Ali et al.,^[14] (38 patients with AS were studied) the most frequent finding was enthesitis. Among rotator cuff tendon tears supraspinatus was the most commonly affected followed by subscapularis and infraspinatus this part was in agreement with Ali et al.,^[14]. In contrast to RA rotator cuff calcifying tendonitis was more common in SpA patients (6 patients=30% were affected) while subacromial impingement was less frequent in SpA patients (30%). Biceps tenosynovitis and rotator cuff tendinitis were also detected in about

25 % of control persons. SA-SD bursitis was more common among SpA than R.A (35% vs 25%) patients this was in contrary to a study by Ottaviani et al.,^[17]. It was also detected in 2 control persons (10%). AC joint abnormalities (synovitis and erosion) were more common in RA than SpA patients this was also in contrast to what have been described by Ottaviani et al.,^[17].

However, this was in agreement with a study by Ali et al., (2013) which stated that AC joint abnormalities was less common in AS patients. For the GH joint it was more frequently involved in RA than SpA patients (40% vs 20%) this was similar to what have been reported by Kim et al., and Ottaviani et al., 2 control persons (10%) had GH joint effusion^{[13]. [17]}. According to previous reports Kim et al.,^[13], Naredo et al.,^[17] and Nelson et al.,^[18] our results show that the clinical examination of periarticular conditions in the painful shoulder is not accurate. The low sensitivity and specificity of physical examination for RA and SpA shoulders may be due to the fact that most patients with shoulder pain have multiple periarticular lesions, involving tendons, the subacromial-subdeltoid bursa, and GH joint or AC joint simultaneously. The failure to distinguish between positive findings due to weakness or pain might also have resulted in the low specificity of physical examination in our patients. In addition, involvement of elbow or wrist joint often hinders proper examination of the shoulder, decreasing diagnostic accuracy.

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