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Role of High-Resolution Grey Scale and Power Doppler Ultrasonography in Assessment of Ankle Joints of Symptomatic and Asymptomatic Rheumatoid Arthritis Patients

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ABSTRACT

Background: Rheumatoid arthritis (RA) is a systemic autoimmune chronic inflammatory condition that may impact a variety of organs and tissues, but mostly targets flexible (synovial) joints. **Objective:** The aim of the current study was to assess influence of power Doppler ultrasound (PDUS) and high-resolution ultrasonography (US) in estimation of ankle joints abnormalities in patients suffering RA with or without ankle joint pain. **Patients and methods:** A cross sectional study was conducted on 100 participants presented with clinical diagnosis of RA, from the Rheumatology and Rehabilitation outpatient clinic of Al-Azhar University Hospitals. Participants were subjected to a comprehensive history, clinical examination by the referral to rheumatologist, laboratory tests, and high-resolution US and PDUS examination. **Results**: Patients with symptoms had a considerably higher Disease Activity Score in 28 joints (DAS 28) than those without symptoms (P<0.001). Patients without symptoms had a considerably greater prevalence of low DAS 28 scores (P<0.001), but high score was considerably greater in symptomatic individuals (P=0.007). **Conclusion:** US enables rapid identification and precise detection of joint and/or tendon inflammatory involvement at ankle level in individuals with RA. Clinicians should be recommended to utilize US more often to identify pathological ankle problems.

Keywords: Rheumatoid arthritis, Grey Scale, High Resolution, Power Doppler Ultrasonography, Ankle Joints.

INTRODUCTION

Rheumatoid arthritis (RA) is a systemic autoimmune chronic inflammatory disease that may impact a variety of tissues and organs, but mostly damages flexible (synovial) joints. The process results in an inflammatory reaction of the joint capsule (synovium) due to enlargement (hyperplasia) of synovial cells, extra synovial fluid, and the formation of fibrous tissue (pannus) in the synovium [1]. In RA, imaging modalities have played a significant function in monitoring development of the disease and therapy reaction for many years [2].Disease activity ratings, such as the Disease Activity Score in 28 joints (DAS 28), involve big joints like knees and elbows but exclude ankle joints. Physicians have a tendency to neglect these joints, particularly during short clinic appointment hours. Untreated silent inclusion of these weight-bearing joints might develop to permanent problems and have a significant influence on gait and mobility if left uncured [3]. Regardless of the underlying musculoskeletal disorder, the ankles are weight-bearing joints that play a crucial role in the balance and mobility of individuals [4]. Ultrasonography (US) is well adapted for investigations of the musculoskeletal system as structures are frequently superficial, the individual may be positioned comfortably, and contrasts with the contra-lateral side are available [5]. US technology provides a number of intrinsic benefits. It is popular among patients since it is noninvasive, has a quick scan time, and does not emit radiation. There are various benefits from the standpoint of the physician. It is not hampered by metal artefacts, which may be troublesome for magnetic resonance imaging (MRI) [6].US has proven itself to be a useful imaging method for assessing articular and periarticular inflammation in small and large joints throughout the last years. High resolution musculoskeletal ultrasound (MSUS), incorporating power Doppler ultrasound (PDUS), has demonstrated to be significantly more accurate than clinical evaluation in visualizing the inflammatory process. Furthermore, relatively few studies have examined ankle joint involvement in individuals with RA who lack symptoms [3]. In RA, hyperemia generated by vasodilatation is one of the first visible pathologic changes at the onset of joint inflammation, and angiogenesis, as one of the fundamental requirements for pannus development, plays a significant role in the start and maintenance of synovitis [7].

Doppler is crucial because greyscale US cannot differentiate between thickened synovium owing to inflammation and thickened synovium due to prior assaults [8]. Power Doppler imaging serves a crucial function in assessing therapy response [9]. To avoid joint injury from subclinical inflammation, power Doppler has been promoted for use in defining RA recovery [10].

The aim of the current study was to assess influence of power PDUS and US in estimation of ankle joints abnormalities in patients suffering RA with or without ankle joint pain.

PATIENTS AND METHODS

A cross sectional study was conducted on 100 participants presented with clinical diagnosis of RA, from the Rheumatology and Rehabilitation outpatient clinic of Al-Azhar University Hospitals.

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Inclusion criteria: Age below 60 years and known RA patients for at least 3 years with or without ankle pain.

Exclusion criteria: History of primary osteoarthritis, trauma to the ankle joint, operation to the ankle joint and intra-articular ankle joint injection.

All patients were subjected to comprehensive history taking: Age, sex, weight, height, BMI, and presence of comorbidities (Hypertension, Diabetes mellitus, hyperlipidemia).

The participants were subjected to US by the rheumatologist after clinical examination and laboratory tests that included rheumatoid factor (RF), erythrocyte sedimentation rate (ESR) and anti-cyclic citrullinated protein antibody (ACPA).

DAS 28 was computed and categorized as recovery (DAS28 ≤2.6), low (DAS28 >2.6 - <3.2), moderate (DAS28 >3.2 - <5.1), and high (DAS28 >5.1) activity[11]. The existence of spontaneous ankle discomfort was used to characterize symptomatic ankles; this symptom was assessed and documented by an experienced rheumatologist/US examiner before US testing.

High resolution greyscale US and PDUS study:

A Toshiba Aplio 400 was used to accomplish US Grayscale and PDUS (Toshiba Medical Systems, Otawara, Japan). A 5–12 MHz linear transducer was utilized, operating mostly at 11.0 MHz for B-mode and 6.1 MHz for color mode. PD was conducted with a pulse repetition rate of 15.6–17.3 kHz utilizing conventional procedures. Typical velocity scale range was 5 cm/s. An experienced rheumatologist/US examiner did routine scans of the ankle in accordance with the standards for MSUS in rheumatology [12].

Ankle US was performed according to EULAR guidelines. The ultrasonographic evaluation started with the patient in a supine position. The ankle was scanned longitudinally to get an overall view of the tibiotalar joint and talonavicular joint in order to identify joint edema or synovial enlargement. Individual examination of the extensor tendons of the ankle was conducted in both longitudinal and transverse directions, beginning medially and progressing laterally (tibialis anterior tendon, then EHL tendon, and most laterally EDL tendon). To check peroneal tendons, a little inversion of the foot was then done while the patient remained in the same posture. Regarding peroneal tendons, they were examined just behind the lateral malleolus in both longitudinal and transverse planes.

To check the flexor tendons, the patient was next requested to laterally twist the lower leg while reclining. Similar to the extensor tendons, the flexor tendons of the ankle were evaluated in longitudinal and transverse orientations from medial to posterolateral (tibialis posterior tendon, then flexor digitorum longus tendon, and most laterally flexor hallucis longus tendon). The patient is then instructed to lay prone and rest on his or her toes. In longitudinal and transverse directions, the Achilles tendon was investigated from its musculotendinous union to its calcaneal attachment.

Doppler mode evaluation was done in the same windows and regions as grey scale ultrasound. All example photographs were digitally archived and accessible to the examiner for re-evaluation.

The examination of MSUS includes investigation of synovitis, tenosynovitis, and erosions. By GSUS and PDUS, synovitis (effusion and/or synovial enlargement) was identified. Tenosynovitis was evaluated using a (yes = 1 and no = 0) scale by both the GSUS and PDUS. GSUS erosions were scored (0) when absent and (1) when existent [13].

In order to conduct an accurate inspection, a lower PRF and a bigger color gain were employed. To prevent artefacts, the color gain was tuned to a level somewhat above that of noise. The PD score indicated the existence of blood flow in the synovial proliferation. 0 = no Doppler signal, and 1 = decreased signal evident in a single vessel, 2 = moderate signal of vessels visible at the confluence, 3 = powerful Doppler signal present on more than fifty percent of intraarticular surface [14].

Intraarticular fluid, synovial enlargement and erosions were seen as pathological manifestations. Intraarticular fluid manifests as an anomalous hypoechoic or anechoic (compared to subdermal fat, although occasionally may be isoechoic or hyperechoic) intra-articular substance that is displaceable and collapsible and lacks a Doppler signal. The synovial hypertrophy (synovitis) is an aberrant intra-articular tissue that is hypoechoic (compared to subdermal fat, but sometimes may be isoechoic or hyperechoic) and non-displaceable and weakly collapsible; may display Doppler signal. As intraarticular discontinuities of the bone surface in two perpendicular planes, bone erosions are observed [15].

Ethical Consideration:

This study was ethically approved by the Institutional Review Board of the Faculty of Medicine, Al-Azhar University. Written informed consent was obtained from all participants. This study was executed according to the code of ethics of the World Medical Association (Declaration of Helsinki) for studies on humans.

Statistical analysis

The collected data were introduced and statistically analyzed by utilizing the Statistical Package for Social Sciences (SPSS, IBM Inc., Armonk, NY, USA).) version 26 for windows. Qualitative data were defined as numbers and percentages. Chi-Square test and Fisher's exact test were used for comparison between categorical variables as appropriate. Quantitative data were tested for normality by Kolmogorov-Smirnov test. Normal distribution of variables was described as mean and standard deviation (SD), and independent sample t-test was used for comparison between groups. P value ≤0.05 was considered to be statistically significant.

RESULTS

Patients' demographics and disease features were shown in **Table 1**.

Table (1): Demographics and disease characteristics of the studied patients

Variable		All study participants (n =100)
Age (years)	**Mean ± SD**	41.81 ± 10.99
	Range	20 – 60
Gender	**Male**	7 (7%)
	Female	93 (93%)
BMI (kg/m^2)	**Mean ± SD**	28.2 ± 5.17
	Range	15.2 - 47.9
DAS 28 score	**Mean ± SD**	**4.66 ± 1.15**
	Range	**2.55 - 6.96**
DAS 28 grades	**Low**	**15 (15%)**
	Moderate	**35 (35%)**
	High	**49 (49%)**
	Remission	**1 (1%)**
ESR (mm/hr)	**Mean ± SD**	**42.63 ± 9.51**
RF	**Positive**	**82 (82%)**
	Negative	**18 (18%)**
Anti-CCP	**Positive**	**100 (100%)**
	Negative	**0 (0%)**
Disease duration (years)	**Mean ± SD**	**8.52 ± 5.4**
	Range	**3 – 25**
Symptoms	**No Symptoms**	**38 (38%)**
	Right ankle	**9 (9%)**
	Left ankle	**15 (15%)**
	Bilateral	**38 (38%)**

BMI: Body mass index, SD: Standard deviation, DAS: Disease Activity Score, ESR: Erythrocyte sedimentation rate, RF: Rheumatoid factor.

Table 2 summarizes right and left ankle joint anterior compartment, right and left ankle joint medial, lateral, and posterior compartments of the studied patients**.**

Table (2): Right and left ankle joint anterior compartment, Right and left ankle joint medial, lateral, and posterior compartments of the studied patients.

	Right ankle joint anterior compartment		All study participants (n =100)
Grey scale US	Anterior recess (Tibiotalar)	Synovial effusion	9 (9%)
		Synovial hypertrophy	29 (29%)
	Talonavicular	Synovial effusion	2 (2%)
		Synovial hypertrophy	23 (23%)
	Tendons	TA	21 (21%)
		EHL	2 (2%)
		EDL	5 (5%)
Power Doppler US	Anterior recess (Synovial hypertrophy)	Grade 1	2 (2%)
	Talonavicular (Synovial hypertrophy)	Grade 1	1 (1%)
	Tendons (TA)	Grade 1	3 (3%)
	Right ankle joint medial, lateral, and posterior compartments		All study participants (n =100)
Grey scale US	Medial compartment tendons	TP	64 (64%)
		FDL	13 (13%)
		FHL	0 (0%)
	Lateral compartment tendons	PL	37 (37%)
		PB	37 (37%)
	Posterior compartment	Tendon Achilles	6 (6%)
		Bursa retrocalcaneal	0 (0%)
Power Doppler US	Medial compartment TP	Grade 1	7 (7%)
		Grade 2	2 (2%)
	Medial compartment FDL	Grade 1	2 (2%)
	Lateral compartment PL	Grade 1	12 (12%)
		Grade 2	2 (2%)
		Grade 3	1 (1%)
	Lateral compartment PB	Grade 1	11 (11%)
		Grade 2	3 (3%)
		Grade 3	1 (1%)
	Posterior compartment Achilles	Grade 2	1 (1%)
	Left ankle joint anterior compartment		All study participants (n =100)
Grey scale US	Anterior recess (Tibiotalar)	Synovial effusion	2 (2%)
		Synovial hypertrophy	14 (14%)
	Talonavicular	Synovial effusion	5 (5%)
		Synovial hypertrophy	28 (28%)
	Tendons	TA	9 (9%)
		EHL	2 (2%)
		EDL	1 (1%)
Power Doppler US	Talonavicular (Synovial hypertrophy)	Grade 1	4 (4%)
	Tendons (TA)	Grade 1	2 (2%)
	Left ankle joint medial, lateral, and posterior compartments		All study participants (n =100)
Grey scale US	Medial compartment tendons	TP	65 (65%)
		FDL	7 (7%)
		FHL	1 (1%)
	Lateral compartment tendons	PL	32 (32%)
		PB	30 (30%)
	Posterior compartment	Tendon Achilles	8 (8%)
		Bursa retrocalcaneal	0 (0%)
Power Doppler US	Medial compartment TP	Grade 1	9 (9%)
		Grade 2	5 (5%)
	Medial compartment FDL	Grade 1	1 (1%)
	Lateral compartment PL	Grade 1	12 (12%)
		Grade 2	3 (3%)
	Lateral compartment PB	Grade 1	11 (11%)
		Grade 2	3 (3%)
	Posterior compartment Achilles	Grade 2	1 (1%)

US: Ultrasound, TA: Tibialis anterior tendon, EHL: Extensor hallucis longus tendon, EDL: Extensor digitorum longus tendon, SD: Standard deviation, TP: Tibialis posterior tendon, FDL: Flexor digitorum longus tendon, FHL: Flexor hallucis longus tendon, PL: Peroneus longus tendon, PB: Peroneus brevis tendon.

Participants were then categorized in accordance to symptoms presence and absence, no critical change was seen in age, gender, and BMI between patients with or without Symptoms. DAS 28 score was considerably lower in asymptomatic than symptomatic patients (P<0.001). Low DAS 28 score was considerably higher in asymptomatic patients (P<0.001), but high score was considerably higher in symptomatic patients (P=0.007). No significant change was seen in ESR, RF, anti-CCP, and disease duration among symptomatic and asymptomatic participants (**Table 3)**

Table (3): Comparison between the studied groups regarding demographics and disease characteristics.

Variable		With symptoms (n =62)	Without symptoms (n =38)	P-value
Age (years)	**Mean ± SD**	43.11 ± 11.12	39.68 ± 10.58	0.131
	Range	20 - 60	23 - 60	
Gender	**Male**	6 (10%)	1 (3%)	0.247
	Female	56 (90%)	37 (97%)	
BMI (kg/m^2)	**Mean ± SD**	28.53 ± 5.31	27.67 ± 4.95	0.420
	Range	15.2 - 47.9	20.2 - 39.8	
DAS 28 score	**Mean ± SD**	4.98 ± 1.04	4.15 ± 1.15	**<0.001***
DAS 28 category	**Low**	2 (3%)	13 (34%)	**<0.001***
	Moderate	22 (35%)	13 (34%)	1.000
	High	37 (60%)	12 (32%)	**0.007***
	Remission	1 (2%)	0 (0%)	1.000
ESR (mm/hr)	**Mean ± SD**	44.77 ± 10.68	39.13 ± 9.52	0.110
RF	**Positive**	54 (87.1%)	28 (73.7%)	0.111
	Negative	8 (12.9%)	10 (26.3%)	
Anti-CCP	**Positive**	62 (100%)	38 (100%)	1.000
	Negative	0 (0%)	0 (0%)	
Disease duration (years)	**Mean ± SD**	9.26 ± 5.52	7.32 ± 5.04	0.067
	Range	3 - 25	3 – 24	

BMI: Body mass index, SD: Standard deviation, n: number of patients, DAS: Disease Activity Score, ESR: Erythrocyte sedimentation rate, RF: Rheumatoid factor, SD: Standard deviation, *Statistically significant as p value ≤0.05.

No critical change was seen in right ankle joint anterior compartment affection by grey scale US between patients with or without symptoms except for anterior recess synovial hypertrophy affection which was considerably higher in participants with symptoms than asymptomatic participants (P=0.023).

Also, there was no significant difference in right ankle joint anterior compartment affection by power Doppler US among symptomatic and asymptomatic participants [**Figure 1 (A)].**

No critical difference in right ankle joint medial, lateral, and posterior compartments affection by grey scale US between patients with or without symptoms except for lateral compartment tendons PL and PB which were considerably higher in symptomatic than asymptomatic participants. Medial compartment TP tendon grade 1 affection by PDUS was considerably higher in symptomatic than asymptomatic participants, but no critical change was observed in the rest of medial, lateral, and posterior divisions among symptomatic or asymptomatic participants [**Figure 1 (B)].**

No critical difference was present in left ankle joint anterior compartment affection by grey scale US between patients with or without symptoms except for talonavicular synovial hypertrophy which was considerably higher in symptomatic than asymptomatic participants.

No critical change was present in the left ankle joint anterior compartment affection by power Doppler US between patients with or without symptoms [**Figure 1 (C)].** Regarding left ankle joint medial, lateral, and posterior compartments affection by grey scale US, medial compartment TP tendon, lateral compartment PL and PB tendons, and posterior tendon Achilles considerably higher in symptomatic than asymptomatic participants. No critical change was present in the left ankle joint medial, lateral, and posterior sections affection by power Doppler US between patients with or without symptoms [**Figure 1 (D)].**

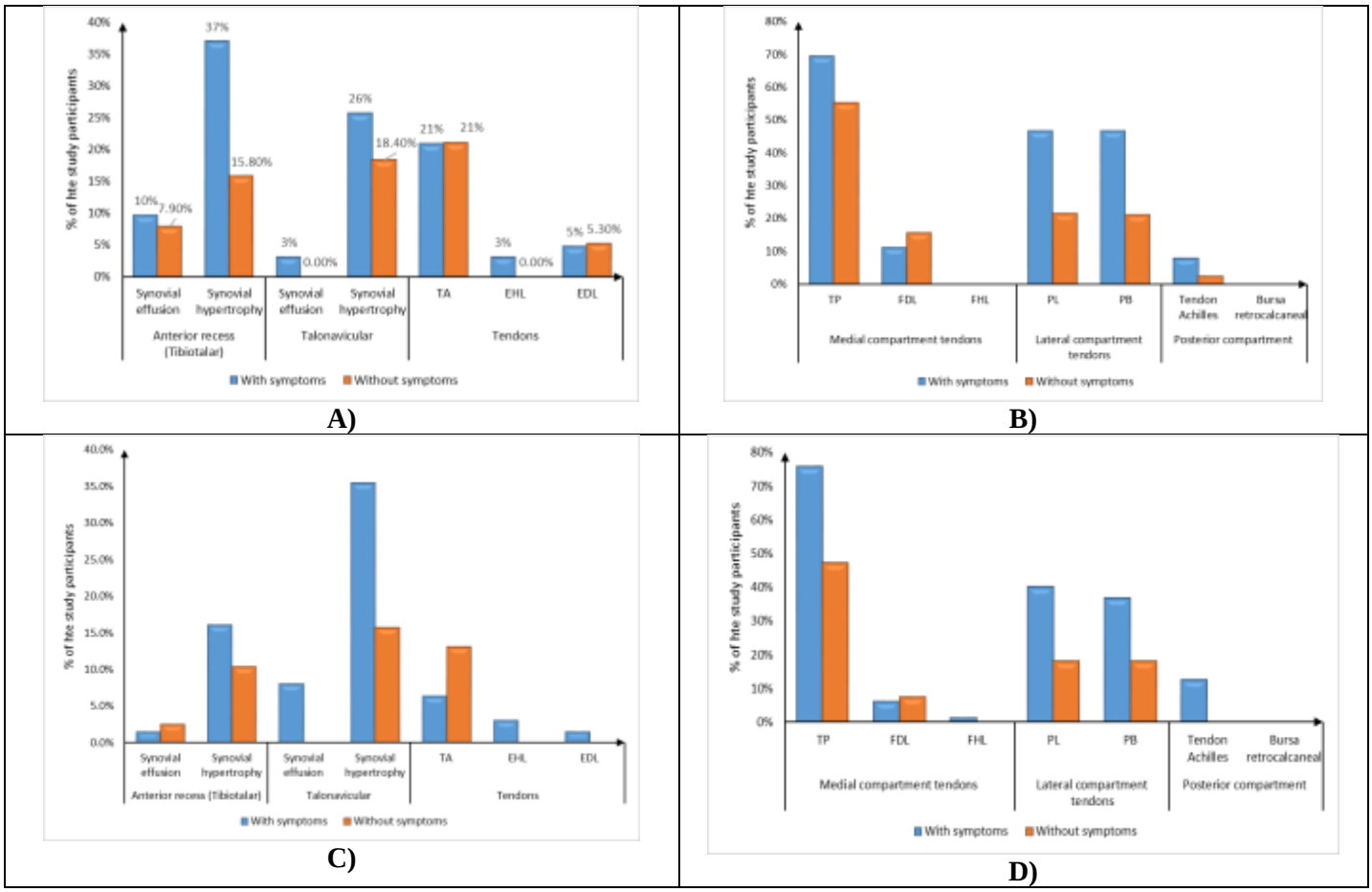


Figure (1): A) Right ankle joint anterior compartment affection by grey scale US in the studied groups, B) Right ankle joint medial, lateral, and posterior compartments affection by grey scale US in the studied groups, C) Left ankle joint anterior compartment affection by grey scale US in the studied groups.

Right and left ankle cortical erosion and PDUS affection were considerably higher in symptomatic than asymptomatic participants [**Figure 1 (A)]** Right ankle joint cortical erosion and power Doppler affection were considerably higher in moderate and high DAS 28 grades participants than in low DAS 28 participants, but no critical change was seen among participants with moderate and high DAS 28 grade. No critical change was observed in left ankle joint cortical erosion between patients with different DAS 28 grades. Left ankle joint power Doppler was considerably higher in high DAS 28 score than in low score participants [**Figure 2 (B)]**

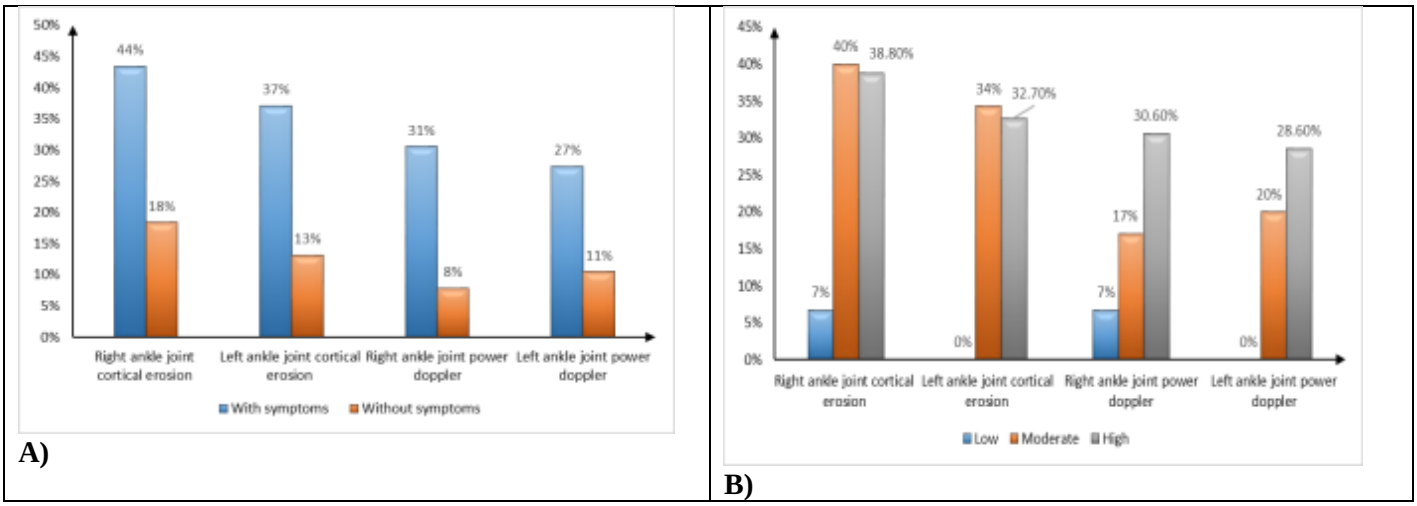


Figure (2): A) Left and right ankle cortical erosion and power Doppler affection in the studied groups and B) Left and right ankle cortical erosion and power Doppler affection in patients with different DAS 28 grades.

Participants were divided regarding DAS 28 grade:

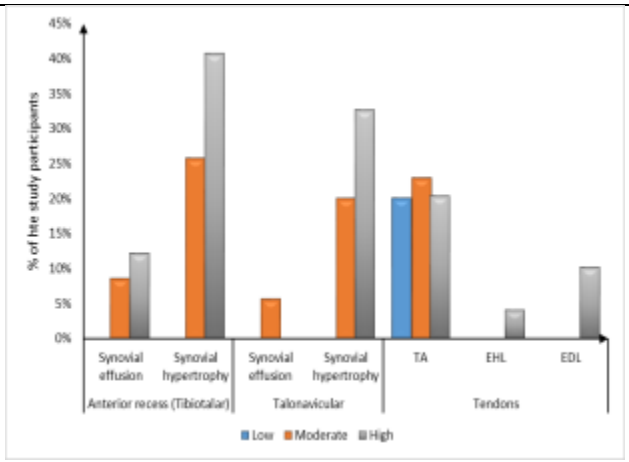
No critical change was seen in age and gender among different DAS 28 grades participants. BMI in patients with low DAS 28 was significantly lower than patients with moderate DAS 28, but no critical change was present in BMI among low and high DAS 28 participants, and between moderate and high DAS 28 participants. ESR was significantly lower in low DAS 28 score than moderate and high DAS 28 score participants and was considerably higher in moderate DAS 28 score than in high score participants. Participants with no ankle symptoms were significantly higher in low DAS 28 score than in moderate and severe DAS 28 score participants, but no critical change was seen in absence of symptoms among moderate and high DAS 28 score participants. No critical change was seen in right and left ankle symptoms between the three grades. Bilateral Symptoms was considerably higher in high DAS 28 score than in mild and moderate DAS 28 score participants [**Table 4].**

Table (4): Demographics and Disease characteristics of studied patients with different DAS 28 grades

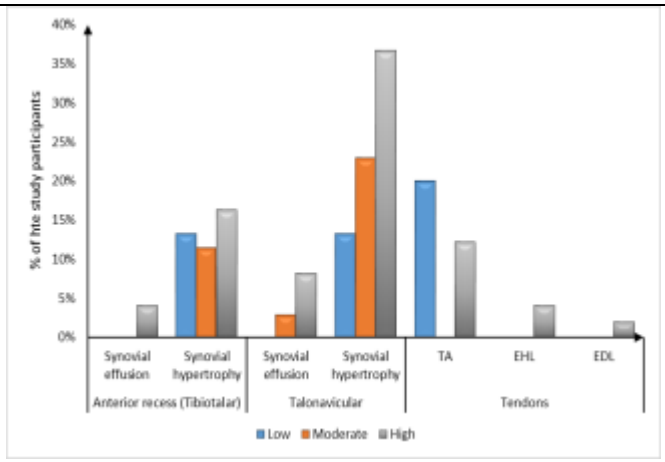
Variable		**Low (n =15)**	**Moderate (n =35)**	**High (n =49)**	**P value**
Age (years)	**Mean ± SD**	38 ± 959	43.8 ± 10.6	41.6 ± 11.6	0.240
	Range	23 – 60	25 - 60	20 – 60	
Gender	**Male**	1 (6.7%)	2 (5.7%)	4 (8.2%)	0.908
	Female	14 (93.3%)	33 (94.3%)	45 (91.8%)	
BMI (kg/m^2)	**Mean ± SD**	25.5 ± 4.2	29.1 ± 4.6	28.2 ± 5.6	**0.021*** P1: **0.018*** P2: 0.074 P3: 1.000
	Range	21.8 – 35.6	22.6 – 41.1	15.2 – 47.9	
		Low (n =15)	**Moderate (n =35)**	**High (n =49)**	**P value**
DAS 28 score	**Mean ± SD**	2.9 ± 0.13	4.18 ± 0.49	5.58 ± 0.69	**<0.001*** P1: **0.002*** P2: **<0.001*** P3: **<0.001***
ESR (mm/hr)	**Mean ± SD**	28.5 ± 6.82	36.3 ± 8.71	52.1 ± 12.8	**<0.001*** P1: **0.033*** P2: **<0.001*** P3: **<0.001***
Anti-CCP	**Positive**	15 (100%)	35 (100%)	49 (100%)	1.000
	Negative	0 (0%)	0 (0%)	0 (0%)	
Disease duration (years)	**Mean ± SD**	6.33 ± 5.69	8.4 ± 5.3	9.4 ± 5.3	0.056
	Range	3 – 25	3 – 24	3 - 21	
Symptoms	**No symptoms**	13 (86.7%) [a]	13 (37.1%) [b]	12 (24.5%) [b]	**<0.001***
	Right ankle	0 (0%) [a]	4 (11.4%) [a]	5 (10.2%) [a]	
	Left ankle	0 (0%) [a]	7 (20%) [a]	7 (14.3%) [a]	
	Bilateral	2 (13.3%) [a]	11 (31.4%) [a, b]	25 (51%) [b]	

BMI: Body mass index, DAS: Disease Activity Score, ESR: Erythrocyte sedimentation rate, RF: Rheumatoid factor, SD: Standard deviation, P1: Significance between low and moderate, P2: significance between low and high, P3: significance between moderate and high, * Statistically significant as p value ≤0.05.

No critical change was seen in right ankle joint anterior compartment affection by grey scale US between patients with different grades of DAS 28 score except for anterior recess (tibiotalar) and talonavicular synovial hypertrophy which were significantly higher in high DAS 28 score than in moderate and low scores participants and were considerably higher in moderate score than in low score participants. There was no significant difference in right ankle joint anterior compartment affection by power Doppler US between patients with different DAS 28 grades [**Figure 3 (A)].** There was no significant difference in left ankle joint anterior compartment affection by grey scale US between patients with different DAS 28 grades except TA tendons which was significantly higher in low DAS 28 score than in moderate score participants, but no critical change was seen among high and moderate score participants or patients with low and moderate scores. No critical change was seen in the left ankle joint anterior compartment affection by power Doppler US between patients with different DAS 28 grades [**Figure 3 (B)].**



A)

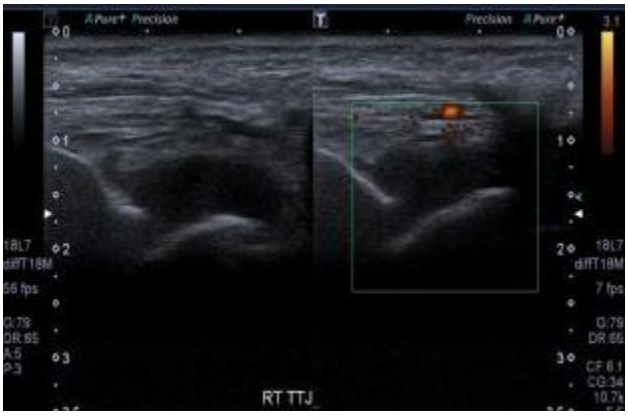


B)

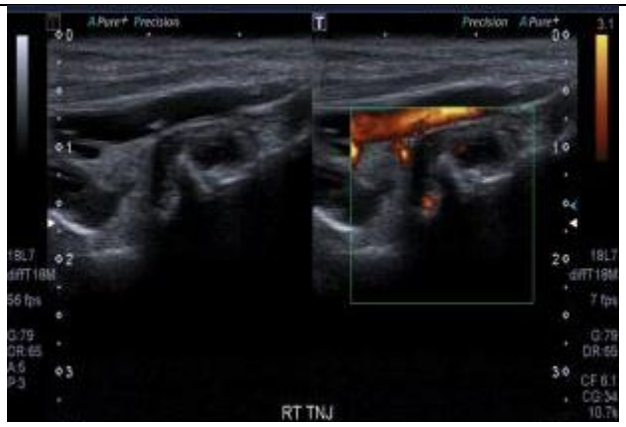
Figure (3): A) Right ankle joint anterior compartment of studied patients with different DAS 28 grades and B) Left ankle joint anterior compartment of studied patients with different DAS 28 grades.

CASES

Female patient 55 years old with history of rheumatoid arthritis. Complaint: bilateral ankle pain, Disease duration: 20 years, Rheumatoid factor: positive, Anti-CCP: positive, ESR: 65, DAS 28(ESR): 5.9 (High disease activity) [**Figure 4 (A-G)].**



A)



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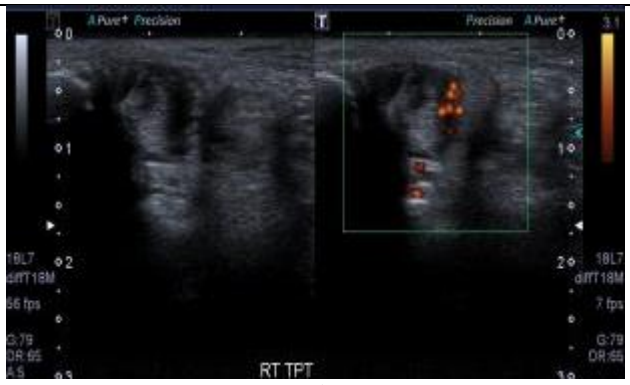

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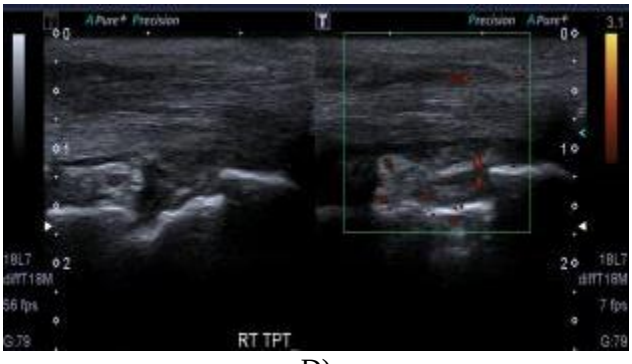

D)

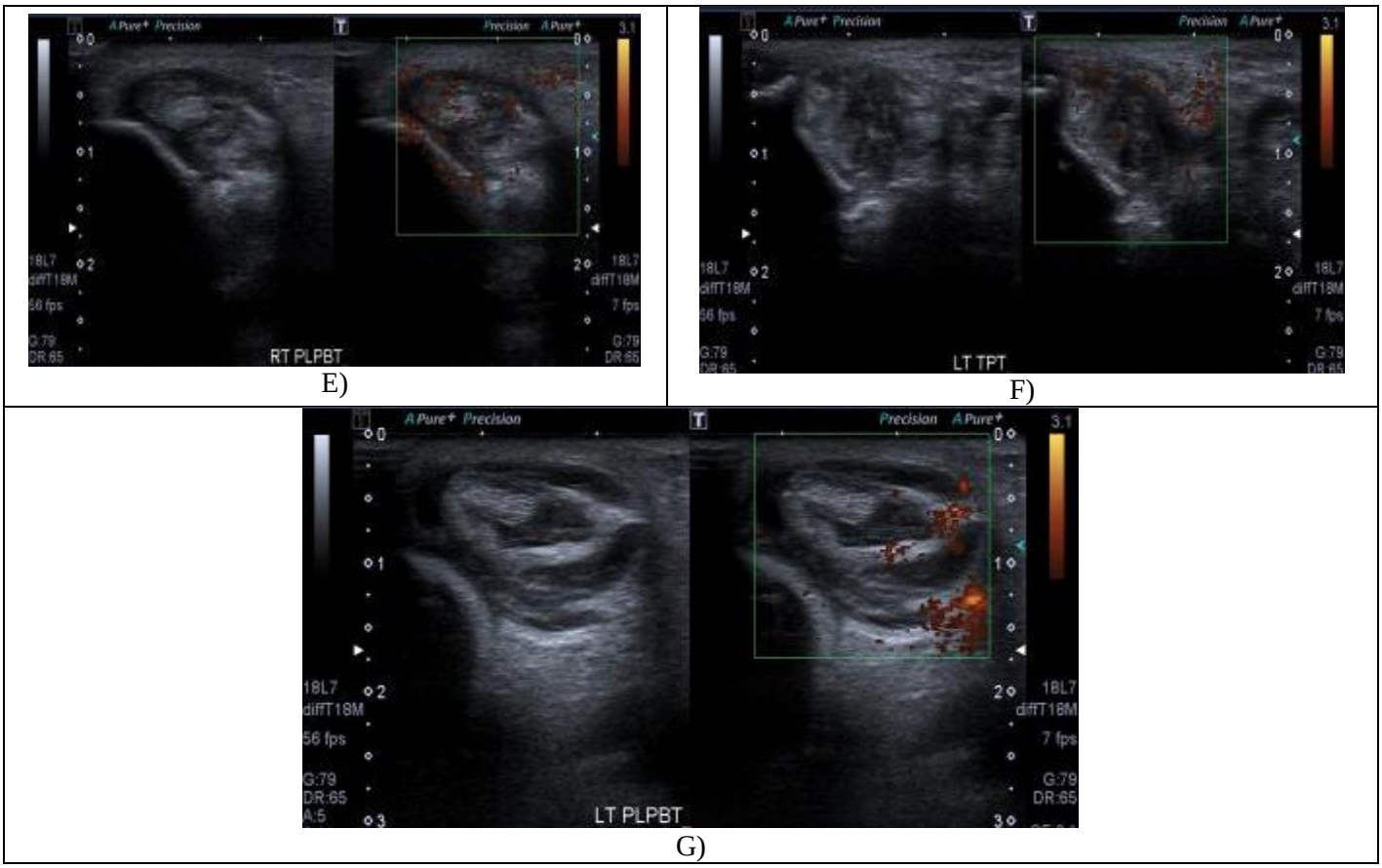

Figure (4): A) GSUS and PDUS of the right tibiotalar joint displaying synovial hypertrophy denoting synovitis. B) GSUS and PDUS of the right talonavicular joint displaying synovial hypertrophy and power Doppler signal denoting synovitis. C) GSUS and PDUS of the right tibialis posterior tendon (short axis) displaying tenosynovitis and power Doppler signal. D) GSUS and PDUS of the right tibialis posterior tendon (long axis) displaying tenosynovitis and power Doppler signal. E) GSUS and PDUS of the right PLBT displaying tenosynovitis and power Doppler signal. F) GSUS and PDUS of the left tibialis posterior tendon displaying tenosynovitis and power Doppler signal. G) GSUS and PDUS of the left PLBT displaying tenosynovitis and power Doppler signal.

DISCUSSION

RA is a progressive and chronic systemic illness that causes gradual joint deterioration and impairment. Half of individuals with RA describe foot or ankle joint symptoms as the first presentation of the illness, and 71% of these patients acquire gait difficulty over time [16]. Regarding the baseline characteristics of the current study, a recent study came in line with ours, where it was carried out on 152 RA patients and 52 healthy controls. Patients were exposed to a medical history review, physical examination and US scan. Foot function index and a health evaluation questionnaire were used to examine the effect on health. They reported that the patients had a mean age of 43.23 (SD 12.5) years, with a greater proportion of female (84.9%) than male (15.1%) [17].

A recent study reported that the DAS-28 score extended between 1.2 and 5.8 with an average value of 3.8, ESR ranged from 5 to 125 mm/h with a median value of 46.5 mm/h [17]. Similarly, another study reported that the RA mean disease duration was 72 months [18].

In the present work, of the study participants, 38 (38%) participants had no symptoms, and 62 (62%) had symptoms, of them 9 (9%) participants were in right ankle, 15 (15%) participants were in left ankle, and 38 (38%) bilateral. Supporting our results, a study reported symptoms with 200 ankles 104 were without symptoms [17]. Parallel to our results, a study reported total of 97 painful ankles, while 63 ankles had no symptoms [19].

Regarding right ankle joint anterior compartment in grey scale US, in harmony with our findings, a study documented that in respect to activity of PDUS at the tendons, 20 percent of the 44 ankles with tenosynovitis in the medial segment tendons of GSUS (tibialis posterior, flexor digitorum, and flexor hallucis longus) did not exhibit power Doppler activity (4 cases of grade 1, 3 cases of grade 2, and 2 cases of grade 3) [19].In the present study, DAS 28 score was considerably higher in symptomatic than asymptomatic participants (P<0.001). Low DAS 28 score was considerably higher in asymptomatic participants (P<0.001), but high score was considerably higher symptomatic participants (P=0.007). Confirming our results, a study reported that a high score of DAS 28 was always considerably higher in symptomatic participants.

No critical change was seen in right ankle joint anterior compartment affection by grey scale US between patients with or without symptoms except for anterior recess synovial hypertrophy affection which was considerably higher in symptomatic than asymptomatic participants (P=0.023).

Parallel to our results, a study reported that substantially greater synovitis was detected in symptomatic than asymptomatic ankles [19].

That present work reported that BMI in low DAS 28 was substantially lower than in moderate DAS 28 participants, but no critical change was seen in BMI among low and high DAS 28 participants, and between moderate and high DAS 28 participants.

Confirming our results, a study reported that BMI in patients with low DAS 28 was substantially lower than moderate DAS 28 participants [17]. Interestingly, a research indicated that US-observed ankle inflammation was substantially associated with RA activity. Patients with higher DAS-28 scores were much more likely to experience ankle affection and bilateral ankle affection; both differences were statistically significant. Tenosynovitis was related with the lowest DAS-28 value, following erosions, and synovitis had the highest DAS-28 score. Nonetheless, there was no statistically significant difference in the mean disease activity across the individual US results[20].

CONCLUSION

US enables rapid identification and precise detection of joint and/or tendon inflammatory involvement at ankle level in individuals with RA. Clinicians should be recommended to utilize US more often to identify pathological ankle problems.

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