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Research Article

Ultrasound Finding of Subclinical Joint and Tendon Inflammation of the Patients with Systemic Lupus Erythematosus

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ABSTRACT

Objective: Identify the frequency of subclinical inflammation with SLE (Systemic Lupus Erythematosus) patients, by ultrasound examination of joints, and tendons of elbows, wrists, hands, knees, ankles, and feet.

Methods: Joints and tendon ultrasound was done on 61 SLE patients, asymptomatic and symptomatic, by 2 ultrasonographers (of the mentioned joint and tendon regions), and magnetic resonance of a dominant hand (wrist and MCP (Metacarpophalangeal) joints) on 20 patients (from overall 61) by a radiologist, who didn't do the ultrasound. A correlation was made between ultrasound findings with the clinical and laboratory parameters of disease activity, and with previous therapy approach.

Results: For wrists, 32% of asymptomatic patients and 39% of patients without objective synovitis had a US (Ultrasound) effusion/synovial hypertrophy, with a PD (Power Doppler) signal of 5% and 4.9%. For extensor tendons of the wrist, 30.8% asymptomatic and 40.7% without objective tenosynovitis had effusion/PD signal. For knees, 37.5% asymptomatic and 39.7% without objective synovitis had effusion/synovial hypertrophy, with PD signal there were 8.3% and 12.1%. When it comes to MTP3 and MTP4, 44.6% asymptomatic and 43.1% without objective synovitis had effusion/synovial hypertrophy, with PD signal there were 5.4% and 5.2%. Neither the comparison of parameters of disease activity (SLEDAI 2K, C3, C4, anti-dsDNA At, SE, CRP) nor the consideration of previous therapy approach prove a statistically significant difference of those with clinical and subclinical inflammation.

Conclusion: The greatest frequency of subclinical inflammation was identified in the wrist region (joints, extensor tendons), knees, and some small joints of the feet.

Keywords: Systemic lupus erythematosus; Ultrasound; Musculoskeletal manifestations; Subclinical inflammation; Power doppler; Arthritis; Tenosynovitis

INTRODUCTION

According to clinical manifestations, Systemic Lupus Erythematosus (SLE) can be classified as a mild, moderate, or severe disease, which is significant for treatment selection. Musculoskeletal manifestations are considered mild, but in practice, they can often persist, relapse, and be resistant to treatment, requiring the use of multiple therapy modalities and potent immunosuppressants. Musculoskeletal manifestations occur in approximately 95% of patients, with around 50% experiencing them as the initial presenting symptom [1,2]. These manifestations can be symptomatic (clinically recognizable) or asymptomatic, causing significant disability and socio-economic consequences [3]. Subclinical joint and/or tendon inflammation, which is not objectively confirmed by clinical findings, is quite common [4,5]. This poses challenges as unrecognized inflammation of the musculoskeletal system not only leads to deformities and disability but also hampers the accurate assessment of disease activity. It is worth noting that musculoskeletal manifestations in SLE generally respond well to treatment, with only around 5% of patients developing chronically deforming arthropathy, such as Jaccoud's arthropathy [6,7].

Ultrasound (US) is a highly sensitive diagnostic procedure for detecting joint effusion, evaluating tendon and muscle integrity, assessing soft tissue swelling, and visualizing joint cartilage and bone surfaces. One of the key advantages of musculoskeletal ultrasound is its ability to detect changes in these structures during the subclinical phase of the disease [8,9].

Objectives

- To determine the frequency of subclinical joint and tendon inflammation in patients with SLE using ultrasound examination of the joints and tendons (including elbows, wrists, hands, knees, ankles, and feet).

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- To investigate the correlation between subclinical joint and tendon inflammation and other parameters of disease activity (clinical and laboratory).
- To assess whether subclinical joint and tendon inflammation correlates with previous treatment approaches involving glucocorticoids and/or immunosuppressive agents.

MATERIALS AND METHODS

Methods

Patients and study group: A cross-sectional study was conducted on 61 patients to identify the frequency of pathological findings on ultrasound scans of SLE patients. These patients, regardless of their symptomatic or asymptomatic status (referring to musculoskeletal symptoms and signs), were observed and treated at the Institute for Rheumatology in Belgrade. The inclusion criteria required patients to fulfill the 1997 revised American College of Rheumatology (ACR) criteria for SLE, while patients overlapping with another connective tissue disease were excluded [10]. The examination took place between December 2017 and December 2020 after obtaining approval from the Institute's Ethical Committee.

Clinical and laboratory evaluation: The examination process involved gathering patient history (including symptoms such as pain and/or painful joint swelling) and conducting a clinical examination of SLE patients. Additionally, the patient's previous disease history was assessed, a questionnaire was completed to collect general patient data, clinical and laboratory indicators of disease activity were recorded. The disease activity index for systemic lupus erythematosus (SLEDAI 2K modification from 2000-Systemic Lupus Erythematosus Disease Activity Index) was calculated [11]. Clinical examination of the musculoskeletal system included assessing joint tenderness, painful joint and tendon swelling, restricted and painful mobility, and joint deformity.

Procedure: Ultrasound examinations were performed using the ESAOTE My Lab 70 X-Vision ultrasound machine. The recording modalities used were GS (Gray Scale) and PD (Power Doppler). The ultrasound probes used were LA 523 (frequency range 4-13 MHz, used for elbows and knees) and LA 435 (frequency range 6-18 MHz, used for wrists, hands, ankles, and feet). Ultrasound scans were conducted on all patients simultaneously by two experienced doctors who worked independently on musculoskeletal ultrasound.

Magnetic Resonance Imaging (MRI) of the dominant hand (wrist and metacarpophalangeal joints) was performed on 20 out of the 61 patients (selected randomly) using the ESAOTE C-scan machine designed for musculoskeletal extremity examinations. The MRI was conducted with a magnetic field strength of 0.2 Tesla and was carried out by a radiologist who did not perform the ultrasound examinations.

Main outcome variable: Ultrasound abnormalities of joints were assessed according to the OMERACT (Outcome Measures in Rheumatology) group criteria, using GS and PD:

Joint effusion: assessed on a nominal scale (existent/nonexistent)

Synovial hypertrophy: defined and scored (GS scoring ≥ 1)

Synovitis with Power Doppler (PD) signal: scored (PD scoring ≥ 1)

Ultrasound abnormalities of tendons were assessed according to the OMERACT group criteria, using GS and PD:

Tendon effusion: assessed on a nominal scale (existent/nonexistent)

Tenosynovitis with Power Doppler (PD) signal: defined and scored (PD scoring ≥ 1)

Partial or complete rupture: evaluated using a binary system (existent/nonexistent) [12].

Statistical analysis: In addition to descriptive statistics (such as nominal data, ordinal data, numerically discontinued data, arithmetic mean with standard deviation, and median), analytical statistical methods were employed. These methods included Pearson's chi-squared test, Fisher's exact probability test of the null hypothesis, Mann-Whitney U test, McNemar's test, and Kappa's coefficient of agreement between two independent examiners.

RESULTS

The study involved 61 patients with an average age of 47.3 ± 14.5 years. The youngest patient was 21 years old, while the oldest was 79. Among the total patients, 86.9% were women, and 13.1% were men. The average SLEDAI 2K score, which measures disease activity, was 15.3 ± 10.8. The median score was 12, with a minimum of 2 and a maximum of 50. Based on the SLEDAI 2K score, patients were classified into four groups: mild disease activity (14.8%), moderate disease activity (27.9%), high disease activity (26.2%), and extremely high disease activity (31.1%).

The most common clinical manifestations were photosensitivity and facial erythema, followed by arthritis and hematological disorders. Musculoskeletal manifestations were present in nearly 80% of the patients. The majority of patients received glucocorticoids and antimalarials, while methotrexate was prescribed for 10% of the patients, and AZA was prescribed for 33.3% of the patients. Among the total number of patients, 42.6% were smokers, while 57.4% were non-smokers.

The concentrations of C3 and C4 complement components varied significantly within the examined group. There was a notable difference between the arithmetic mean and the median, which was particularly pronounced in this case. Among the ANA-positive patients (only one was ANA negative), 88.3% exhibited a homogenous fluorescence pattern, 5% had a speckled type, and 6.7% had a mixed pattern. The average concentration of anti-ds DNA antibodies in the serum of the subjects was 461.5 IU/mL.

When analyzing the examined joints and tendons in the region of elbows, wrists, hands, knees, ankles, and feet, the highest percentage of positive Ultrasound (US) findings and subclinical inflammation were observed in the wrists (joints and extensor tendons), knees, and small joints of the feet. In other regions, there were small percentages of ultrasound findings without significant analysis or statistical significance.

In the examination of the wrists (RC-Radiocarpal joints), the frequency of symptoms (pain and/or painful joint swelling) and objective findings (palpating painful joints and/or painful joint swelling) of arthritis was similar to those of the wrists. The frequencies of RC effusion/synovial hypertrophy and RC PD signal were analyzed in two dichotomous groups: symptomatic (pain and/or painful joint swelling of RC) and asymptomatic, using the Fisher's exact probability test as shown in Table 1 and the objective finding (palpating painful sensitivity and/or painful joint swelling) using the Fisher's exact probability test as shown in Table 2. Statistically significant differences were identified (by Fisher's exact probability test) in the frequencies of symptomatic patients and ultrasound findings recorded on the RC joint, regardless of whether it was a gray scale or a PD method examination. In 32% of asymptomatic patients, signs of RC effusion/synovial hypertrophy were identified, and 5% of asymptomatic patients exhibited a PD signal. The concordance between symptomatic findings and PD signal findings was weak, with only 42.9% of symptomatic patients showing a positive PD signal.

Table 1: Correlation between asymptomatic and symptomatic patients (pain and/or painful joint swelling of the wrist) and RC effusion/synovial hypertrophy and PD signal on ultrasound.

		Symptomatic patients				
		No		Yes		p-value
		N	%	N	%	
RC effusion/synovial hypertrophy	No	27	67.50%	3	14.30%	<0.001[a]
	Yes	13	32.50%	18	85.70%	
RC PD signal	No	38	95.00%	12	57.10%	0.001[a]
	Yes	2	5.00%	9	42.90%	

Note: [a]Fisher's exact probability test, RC-Radiocarpal, PD- Power Doppler signal

Table 2: Correlation between objective RC arthritis (palpating painful sensitivity and/or painful swelling of the RC joint) and RC effusion/synovial hypertrophy and PD signal on ultrasound.

		Objective RC arthritis				
		No		Yes		p-value
		N	%	N	%	
RC effusion/synovial hypertrophy	No	25	61.00%	5	25.00%	0.013[a]
	Yes	16	39.00%	15	75.00%	
RC PD signal	No	39	95.10%	11	55.00%	<0.001[a]
	Yes	2	4.90%	9	45.00%	

Note: [a]Fisher's exact probability test, RC-Radiocarpal, PD- Power Doppler signal

Statistically significant differences were identified (by Fisher's exact probability test) in the frequencies of objective arthritis (palpating painful joints and/or painful joint swelling) and ultrasound findings recorded on the RC joint, regardless of whether it was a gray scale (synovial hypertrophy) or a PD (PD positive synovitis) method examination. Among the patients without objective arthritis, 39% exhibited signs of RC effusion/synovial hypertrophy. Additionally, 4.9% of patients without objective arthritis exhibited a PD signal. The concordance between objective findings and PD signal findings was weak, with only 45% of patients with objective findings showing a positive PD signal.

When analyzing the knees, there was a discrepancy between symptomatic (pain and/or painful joint swelling) and objectively confirmed arthritis (palpating painful sensitivity and/or painful joint swelling). The percentage of effusion/synovial hypertrophy was much higher than that of symptoms and objectively confirmed arthritis. Differences in the frequency of two dichotomous groups were analyzed – effusions/synovial hypertrophies and PD signal of a knee joint in asymptomatic and symptomatic patients (pain and/or painful joint swelling of the knee) using the Fisher's exact probability test as shown in Table 3 and objective finding (palpating painful sensitivity and/or painful joint swelling) and US finding of a knee joint using the Fisher's exact probability test as shown in Table 4.

Table 3: Correlation between asymptomatic and symptomatic patients (pain and /or painful swelling of knee) and knee effusion/synovial hypertrophy and PD signal on ultrasound.

		Symptomatic patients				
		No		yes		p-value
		N	%	N	%	
Knee-effusion/synovial hypertrophy	No	30	62.50%	6	46.20%	0.349[a]
	Yes	18	37.50%	7	53.80%	
Knee-PD signal	No	44	91.70%	8	61.50%	0.016[b]
	Yes	4	8.30%	5	38.50%	

Note: [a]Pearson's chi-squared test [b]Fisher's exact probability test PD-Power Doppler signal

Table 4: Correlation between objective knee synovitis (palpating tenderness and/or painful joint swelling) and knee effusion/synovial hypertrophy and PD signal on ultrasound.

		Objective knee arthritis				
		No		Yes		p-value
		N	%	N	%	
Knee-effusion/synovial hypertrophy	No	35	60.30%	1	33.30%	0.562
	Yes	23	39.70%	2	66.70%	
Knee-PD signal	No	51	87.90%	1	33.30%	0.054
	Yes	7	12.10%	2	66.70%	

Note: [a]Fisher's exact probability test, PD-Power Doppler signal

Based on the frequency of patients, a significant difference was found in the finding of symptomatic patients and positive PD signal. In terms of effusion/synovial hypertrophy, this difference was not statistically significant, but it was found that 37.5% of patients without symptoms exhibited signs of effusion/synovial hypertrophy on the gray scale. Additionally, 8.3% of patients without symptoms exhibited a PD signal. The number of patients with a positive objective finding (palpating painful sensitivity and/or painful swelling) was only three, limiting the analysis. The statistically significant difference in the frequencies of objective and ultrasound findings detected in the joint was not proven, regardless of whether the examinations were conducted using the gray scale or the PD method. However, it was noted that 39.7% of patients without the objective finding exhibited effusion/synovial hypertrophy, while 12.1% of patients exhibited a PD signal.

In the examination of the tendons of the wrists and hands, there was an evident discrepancy between symptoms (pain and/or painful tendon swelling and/or immobility) and the objective finding (palpating painful tendon sensitivity and/or painful tendon swelling and/or immobility). Additionally, the highest percentage of positive ultrasound findings was observed in the extensors of the wrist. Differences in the frequency of two dichotomous groups (symptomatic and asymptomatic) and ultrasound finding of the wrist extensors were analyzed using Fisher's exact probability test as shown in Table 5, and the objective finding (palpating painful tendon sensitivity and/or painful tendon swelling and/or immobility) and ultrasound finding of the wrist extensors were analyzed using Fisher's exact probability test as shown in Table 5.

Table 5: Correlation between asymptomatic and symptomatic patients (pain and/or painful tendon swelling and/or immobility) and objective tenosynovitis (palpating painful tendon sensitivity, and/or painful tendon swelling, and/or immobility) and wrist extensor US findings

		Symptomatic patients				
		No		Yes		
		N	%	N	%	p-value
Wrist extensor tendons – effusion/PD signal	No	27	69.20%	9	40.90%	0.056[a]
	Yes	12	30.80%	13	59.10%	
Wrist extensor tendons –rupture	No	39	100%	21	95.50%	0.361[a]
	Yes	0	0%	1	4.50%	
		Objective wrist extensor tenosynovitis				
		No		Yes		
		N	%	N	%	p-value
Wrist extensor tendons-effusion/PD signal	No	35	59.30%	1	50%	1
	Yes	24	40.70%	1	50%	
Wrist extensor tendons-rupture	No	58	98.30%	2	100.00%	1
	Yes	1	1.70%	0	0.00%	
	Yes	0	0.00%	0	0.00%	

Note: [a]Fisher's exact probability test, PD-Power Doppler signal

The percentage of patients with a positive ultrasound finding was either higher or the same as those with symptoms (pain and/or painful tendon swelling and/or immobility) in the wrist extensor tendons compared to those without symptoms. Statistical analysis identified a significant difference in the wrist extensors only in the case of effusion/PD signal findings, where almost 30.8% of patients without symptoms exhibited US signs of effusion/PD signal. Additionally, when it comes to the hand extensors, 12.8% of patients without symptoms exhibited effusion/PD signal on the ultrasound.

Despite the small sample size, a statistically significant difference was found in the wrist extensor tendons in terms of effusion/PD signal, with 40.7% of patients without objective finding (palpating painful tendon sensitivity and/or painful tendon swelling and/or immobility) showing signs of effusion/PD signal.

In the examination of the small joints of the feet, the highest percentage

of positive ultrasound findings and findings of subclinical inflammation were observed in Metatarsophalangeal (MTP)3 and MTP4 joints. Among asymptomatic patients, 44.6% had effusion/synovial hypertrophy, while among those without objective arthritis (palpating painful joints and/or painful joint swelling), 43.1% had effusion/synovial hypertrophy using the gray scale. Regarding the PD signal, 5.4% of asymptomatic patients and 5.2% of patients without objective arthritis exhibited a PD signal.

Based on symptoms, objective findings, and ultrasound findings, patients were classified into four groups:

- Patients with symptoms and/or objective findings who also had positive ultrasound findings.
- Patients who did not have symptoms and/or objective findings but had a positive ultrasound finding (subclinical inflammation).
- Patients who did not have symptoms and/or objective findings and also had negative ultrasound findings.
- Patients with symptoms and/or objective findings but had negative ultrasound findings.

Using this classification, 34 patients were symptomatic and had a positive ultrasound finding (clinical inflammation), while 22 patients were asymptomatic but had a positive ultrasound finding (subclinical inflammation). Only 3 patients were asymptomatic and had negative ultrasound findings, while 2 patients were symptomatic and had negative ultrasound findings.

Descriptive statistics of these first 2 groups (clinical and subclinical inflammation) according to SLEDAI score, complement (C3, C4) level, anti-ds DNA antibody, and inflammation (ESR-Sedimentation Rate, CRP-C Reactive Protein) indicators, as well as correlation analysis, are presented in Table 6. Due to the small number of patients, a difference test was conducted only between these first two groups (clinical and subclinical inflammation). The statistical analysis using the Mann-Whitney U test did not identify a statistically significant difference between these 2 groups according to the mentioned parameters. The table shows that the groups (with confirmed clinical inflammation and with subclinical inflammation) had the same median SLEDAI 2K score, with slightly higher C3 and C4 values in the group with subclinical inflammation. The medians of anti-ds DNA antibody were very similar in both examined groups, as were the median values of ESR and CRP. Note: the correlation of subclinical joint and tendon inflammation with the disease activity index was conducted summarily in the joint and tendon regions.

Matching of ultrasound and MRI findings was conducted for the RC, CMC, MCP 1 to 5 joints, as well as for the extensors and flexors of the wrist and hands. The MRI findings were based on effusion/synovial joint hypertrophy, and for tendons, effusion/synovial hypertrophy and rupture were considered. Considering the distribution of positive findings on ultrasound and/or MRI of the joints and tendons in question, the comparison of these methods is debatable.

The matching percentage between these two methods for the RC joints was 60%, for the CMC joint 75%, for MCP1 70%, for MCP2 95%, for MCP3 100%, for MCP4 90%, and for MCP5 70%. The McNemar's test found no statistically significant difference between these two methods for the RC joints, CMC joint, MCP2, MCP3, MCP4, and MCP5 joints. However, there was a statistically significant difference between these two methods for the MCP2 joint (p=0.031). The matching of these two methods was analyzed using the Kappa test, and slight matching was found with the RC, CMC, MCP1, and MCP5 joints (kappa between 0.1 and 0.5), and high matching was found with MCP2, MCP3, and MCP4 (kappa between 0.5 and 1.0).

Regarding the wrist and hand extensors, especially effusion/synovial hypertrophy findings, the overall matching percentage was 55%. The McNemar's test found no statistically significant difference between these two methods (p=1.000). In regards to the matching of these methods, a Kappa test was performed, which revealed poor agreement that was not statistically significant (Kappa=0.043; p=0.848). However, when examining the wrist and hand extensors, specifically for tendon rupture findings, only one patient showed a positive result on the ultrasound, thus no further analysis was conducted in this regard.

Considering the inherent subjectivity in these methods, an inter-examiner analysis was carried out. Two examiners independently assessed the ultrasound findings and observed a high level of agreement between their assessments (Kappa values ranging from 0.895 to 1.000).

Table 6: Subclinical inflammation and SLEDAI score, complement (C3, C4) level, antibodies (anti ds DNA), and inflammation markers (ESR, CRP)

		Finding				p-value*
		N	Median	Percentage 25	Percentage 75	
SLEDAI 2K	symptomatic, U/S+	34	12	8	23	0.762
	asymptomatic, U/S+	22	12	8	20	
C3	symptomatic, U/S+	34	4.8	0.9	78	0.847
	asymptomatic, U/S+	22	9	0.9	89	
C4	symptomatic, U/S+	34	0.26	0.14	11	0.185
	asymptomatic, U/S+	22	10	0.18	17	
anti ds DNA Ab	symptomatic, U/S+	34	154.25	16	403	0.808
	asymptomatic, U/S+	22	157.6	42	576	
ESR	symptomatic, U/S+	34	16	13	34	0.518
	asymptomatic, U/S+	22	16.5	8	32	
CRP	symptomatic, U/S+	34	11	3.5	28.7	0.712
	asymptomatic, U/S+	22	13	2	24	

Note: *Mann-Whitney U test, U/S+-positive ultrasound finding, SLEDAI-Systemic Lupus Erythematosus Disease Activity Index, ESR-Erythrocyte Sedimentation Rate, CRP-C reactive protein

DISCUSSION

In the systematic review by Ahmed Zayat et al., almost all patients with clinical symptoms and signs of Systemic Lupus Erythematosus (SLE) involving the musculoskeletal system had confirmed Ultrasound (US) abnormalities. However, there was a wide range of variability (5-49%) in the prevalence of abnormalities, and a significant number of asymptomatic patients also had confirmed US abnormalities. A positive correlation was found between US abnormalities and disease activity index scores (SLEDAI score) and immunological disease activity index, but the correlation was weak to moderate [13].

In the systematic review by Di Matteo et al., a high percentage of joint and tendon abnormalities confirmed by ultrasound were found in both symptomatic and asymptomatic patients. Subclinical inflammation was observed in 30% of patients, with some studies reporting a prevalence of over 50% for positive Power Doppler (PD) signals [14]. In our study of wrist joints, joint effusion/synovial hypertrophy was confirmed in 50% of patients, with 18% showing positive PD signal. The percentage of inflammation was higher in the group with clinical confirmation but was not insignificant in the group without symptoms and objective signs either (32% effusion/synovial hypertrophy and 5% PD signal in patients without symptoms, 39% effusion/synovial hypertrophy and 4.9% PD signal in patients without objective findings). Correlations of ultrasound abnormalities with Fisher's exact probability test showed statistically significant differences in the group with symptoms and positive objective findings. In the knee joint, 41% of patients had US joint effusion/synovial hypertrophy, and 14.8% showed a positive PD signal. The percentage of patients with ultrasound findings of inflammation in the group without symptoms and objective musculoskeletal involvement was not insignificant (37.5% effusion/synovial hypertrophy and 8.3% PD signal in patients without symptoms, 39.7% effusion/synovial hypertrophy and 12.1% PD signal in patients without objective findings). Due to the small number of patients with positive findings in this group, it was not possible to determine the statistical significance of the difference between the groups with or without symptoms and positive or negative objective findings. However, a higher percentage of positive ultrasound findings was found in the extensor tendons of the wrist, with 41% of patients showing tenosynovitis and a significant percentage of subclinical inflammation (30.8% effusion/PD signal in patients without symptoms, 40.7% effusion/PD signal in patients without objective findings). Tendon ruptures, both partial and complete, were present in a small percentage of cases across all tendon regions.

The results of this study, in terms of frequency distribution and correlations examined, align with those presented in the two systematic reviews by Ahmed Zayat et al. and Di Matteo et al. [13,14]

The examined group showed a significant percentage (36%) of patients with subclinical inflammation of musculoskeletal structures. This percentage is consistent with findings from the literature and the studies cited in the systematic reviews. Mann-Whitney U test analysis didn't find a statistically significant difference for the groups of patients with the clinical and subclinical inflammation, concerning the value of SLEDAI 2K score, C3, and C4 complement components, and anti-ds DNA antibodies, as well as ESR and CRP. However, in the group with the subclinical inflammation of C3, C4 values and anti-dsDNA antibodies, ESR and CRP, and SLEDAI scores are almost very close to those in a group with positive anamnestic, objective, and ultrasound findings. The high percentage of subclinical inflammation of the musculoskeletal system is shown also in the Ruano and contributors study. The percentage was between 60% to 70%, depending on the gradus od synovitis [15].

In terms of previous therapy, it was noted that 45% of patients with subclinical inflammation had received more potent immunosuppressive medications such as Azathioprine (AZA), Methotrexate (MTX), or Mycophenolate-Mofetil (MMF). Methotrexate, a commonly used therapy for musculoskeletal manifestations of SLE, was only used by 9% of patients. Similarly, in the group with clinically confirmed inflammation, 35.2% of patients had received more potent immunosuppressive medications, while methotrexate was used by only 5.8%. The median doses of other medications, except for chloroquine (250 mg) and glucocorticoids (10 mg daily), were relatively low (hydroxychloroquine 200 mg daily, methotrexate 11.25 mg weekly, azathioprine 75 mg daily). Statistical analysis did not find significant differences between the groups with clinical and subclinical inflammation in terms of the type of therapy, including glucocorticoids, antimalarials, methotrexate, and/or azathioprine. It would have been more significant to compare these groups with a group of patients without ultrasound inflammation, but the number of patients in that group was small, precluding meaningful analysis. A study by Piga et al. identified glucocorticoids and antimalarials as common therapies in patients who developed Jaccoud's arthropathy, with a higher prevalence of clinical and subclinical inflammations in that group [16].

To evaluate the sensitivity of ultrasound examinations, a statistical comparison of US and MRI findings was performed. The analysis focused on the wrists and MCP joints of the dominant hand (joints and tendons). McNemar's test found no significant difference between the two methods ($p=1.000$). The percentage of matching findings between ultrasound and MRI was generally high, exceeding 75% and reaching over 90% in some cases. The lower degree of matching was observed in the wrists and wrist extensor tendons (50%-60%), but this can be attributed to the fact that MRI can detect joint effusion and/or synovial hypertrophy but cannot quantify it or provide a score. Additionally, there is a certain amount of physiological effusion in the joints and tendon sheaths. Inter-examiner analysis showed high agreement between the ultrasound findings of the two examiners, with a Kappa value ranging from 0.895 to 1.000.

CONCLUSION

The study concluded that subclinical inflammation in SLE is most commonly found in the region of the wrist (joints and extensor tendons), knees, and small joints of the feet. The researchers did not find a statistically significant difference in subclinical inflammation between different patient groups based on disease activity scores, levels of certain antibodies, or previous therapy approaches. However, they noted that the detection of inflammation itself can lead to a change in therapy and potentially improve outcomes for SLE patients.

The study also compared ultrasound and Magnetic Resonance Imaging (MRI) findings and found a high level of agreement between the two methods overall. However, there was a lower degree of agreement in the region of the wrist joints and extensor tendons. The inter-examiner analysis showed a high degree of agreement between the two examiners.

The researchers emphasized the importance of ultrasound in detecting low-level inflammation and subclinical inflammation in SLE. They recommended that ultrasound can be used as a valuable tool in assessing musculoskeletal involvement in SLE patients, even in the absence of clinical symptoms.

Statements and Declarations

There were no financial interests in the research, the interest was non-financial, as the part of a doctoral dissertation.

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