ORIGINAL ARTICLE

A comparative study between ultrasonographic hand features in systemic sclerosis and rheumatoid arthritis patients: Relation to disease activity, clinical and radiological findings

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Abstract *Aim of the work:* To compare ultrasonographic (US) hand features in systemic sclerosis (SSc) and rheumatoid arthritis (RA) patients and to investigate their relationship with disease activity, clinical and radiographic data.

Patients and methods: Forty SSc and 30 RA patients were consecutively included. All patients underwent clinical examination, X-ray and US on the hand and wrist joints to detect synovitis, tenosynovitis, and calcinosis. Disease activity score-28 (DAS28) and European Scleroderma Activity index were used for RA and SSc patients respectively. Health Assessment Questionnaire-Disability Index (HAQ-DI) was used in all patients.

Results: The frequency of synovitis and tenosynovitis detected by US was found to be higher than that found by clinical examination in both RA and SSc patients ($p = 0.01$, $p = 0.02$, respectively). US synovitis was detected in 10 SSc (25%) and in 17 RA patients (56%). US tenosynovitis was found in 18 SSc (45%) versus 11 RA patients (36.6%). US synovitis and tenosynovitis in RA patients showed a statistically significant correlation with the erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), rheumatoid factor, HAQ-DI and DAS28. Positive intrasynovial power Doppler signal was significantly frequent in RA than SSc patients ($p < 0.001$). Sclerosing tenosynovitis appeared to be specific to SSc patients. Calcifications were observed in both SSc and RA patients, but with no statistically significant difference ($p = 0.69$).

Conclusion: US provided valuable disease activity information in both RA and SSc patients more than clinical examination. US articular involvement in SSc is less frequent compared to that in RA, with specific appearance of sclerosing tenosynovitis in SSc patients.

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1. Introduction

Musculoskeletal ultrasound (MSUS) nowadays plays an important role in diagnosing and treating rheumatic diseases [1]. The presence of synovitis detected by MSUS is useful in the diagnosis of undifferentiated arthritis (UA) [2] and in inflammatory arthritis it is predictive of persistent disease [3], joint damage [4], and acute disease flare [5]. It has dramatically improved joint and tendon evaluation in rheumatoid arthritis (RA) and other inflammatory diseases [6]. However, MSUS also has its limitations as the technique is operator dependant, and assessments are time consuming if a large number of joints are examined.

In RA, MSUS is more sensitive than clinical examination for detecting synovitis [7,8] and the presence of MSUS synovitis correlates with future radiographic progression [9]. Consequently, it has been suggested that MSUS should be included in the definition of remission [10] and that MSUS assessment of disease activity could be utilized to inform therapeutic decisions as part of a treating to target strategy [11].

Regarding systemic sclerosis (SSc), joint symptoms are reported by 24–97% of SSc patients during the course of their disease, and are frequently disabling [12–16]. Manifestations of SSc hand are ranging from arthralgias to frank arthritis, contractures, and tendon friction rubs [12]. Clinical assessment is limited by concomitant skin disease.

Radiographic studies in SSc and RA have shown that the commonly affected areas are the joints, soft tissue, and bones of the hands [13,14,17–19]. However, radiographs exhibit some limitations regarding their sensitivity to detect early inflammatory changes, such as effusion or synovitis, and they cannot assess tendon damage. Therefore, radiographic and clinical evaluations are imperfect for assessing the whole spectrum of articular involvement in SSc and RA [6].

The objectives of our study were to compare the characteristics of US hand involvement in SSc and RA patients and to determine the correlations between US findings with disease activity, clinical and radiological parameters.

2. Patients and methods

2.1. Study design

The work was conducted as a comparative study between ultrasonographic hand features in SSc and RA patients and to study their relation to clinical and radiological findings. All subjects were recruited from Rheumatology departments, Cairo and Fayoum University hospitals and were all informed about the study and a written informed consent was obtained from each patient and healthy controls in accordance with the ethical principles for human investigations, as outlined in the 2nd Helsinki Declaration.

2.2. Patients

We studied 40 SSc patients (30 females and 10 males) who fulfilled ACR criteria [20] with a mean age of 34.4 ± 8.5 years, together with 30 RA patients (22 females and 8 males) who satisfied the 2010 ACR/EULAR criteria [21] with a mean age of 44.0 ± 9.4 years. The SSc patients were further subdivided into diffuse (dSSc) and limited (lSSc) according to the criteria proposed by Le Roy and his colleagues [22]. All patients were assessed for sex, age, disease duration and medications taken. For the disease activity measures, we used the disease activity score-28 (DAS 28) for RA patients [23] and the European Scleroderma Study Group activity index was used for SSc patients [24]. The Health Assessment Questionnaire and Disability Index (HAQ-DI) was used for both SSc and RA patients [25].

2.3. Laboratory data

The ESR was measured by the Westergren method; serum CRP by nephelometry; Rheumatoid factor (RF) by latex test; anti-cyclic citrullinated antibody (anti-CCP) by ELISA; and Anticentromere antibodies and Anti nuclear antibodies (ANA) by immunofluorescent while anti-Scl70 by ELISA.

2.4. Clinical assessment

Clinical evaluation on each patient was performed by 2 rheumatologists, blinded to the X-ray and US characteristics. Tender and swollen joint counts, together with the presence of tendon friction rubs and contractures were recorded [26].

2.5. X-ray evaluation

Standard antero-posterior views of the hands and wrists were obtained from SSc and RA patients. The following features were noticed for each joint: juxta-articular osteoporosis, space narrowing, marginal and central erosions and deformity. X-rays were evaluated by a radiologist blinded to the identity of patients and to the clinical and ultrasonographic characteristics.

2.6. US examination

US was performed on the joints of both hands and fingers (metacarpophalangeal [MCP], proximal interphalangeal [PIP], and distal interphalangeal [DIP] joints) and the wrists (radiocarpal [RC], ulnarcarpal [UC] and intercarpal [IC] joints), with LOGIQ P5/A5/A5Pro ultrasound machine using a near focused linear array transducer with a center frequency of 10–14 MHz. US examination aimed at the detection of synovitis, tenosynovitis and calcinosis. PD was graded using a validated semiquantitative scoring system, which consists of a scale of 0–3, where (0) represented no PD signal, (1) one or two vessels in small joints or up to three single vessels in large joints, (2) less than half of the synovial area and (3) more than half of the synovial area [27].

Data analysis was performed through Statistical Package of Social Sciences (SPSS) software program for windows version 21. Data were expressed as number and percentage for qualitative variables or mean and standard deviation for quantitative ones. Comparison between groups was performed through the Chi square or Fisher's exact test for qualitative variables and independent sample t-test (if parametric) or the Mann Whitney test (if non-parametric) for quantitative ones. p values less than 0.05 were considered significant.