Ultrasound in the assessment of musculoskeletal involvement in Systemic sclerosis

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Abstract

Systemic sclerosis (SSc) is a chronic connective disease in which the musculoskeletal involvement affects especially the hands and feet. Ultrasound (US) represents an important tool in the assessment of the joint and soft tissue involvement in this rheumatic disorder. Few authors have investigated the role of US in the evaluation of joints and peri-articular tissues in SSc patients. The current available literature regarding US applications in the assessment of musculoskeletal involvement in SSc has shown that US seems to be a useful tool in detecting the presence of inflammatory and structural abnormalities involving both joints and soft tissues. The aim of the present paper is to review the role of US in the assessment of musculoskeletal involvement in SSc.

Keywords: systemic sclerosis, ultrasound, musculoskeletal involvement.

Introduction

Systemic sclerosis (SSc) is a chronic autoimmune connective tissue disorder of not completely understood aetiology, affecting commonly women and characterized by vascular and fibrotic abnormalities in the skin and visceral organs. Musculoskeletal involvement represents the major cause of disability in SSc and it is localised especially at the level of the hands and feet [1-4].

In recent years, musculoskeletal ultrasound (US) has become a reference imaging tool in the evaluation of joint and soft tissues abnormalities in rheumatic diseases due to its advantages (non-invasiveness, limited-costs, multiregional joint evaluation during the same scanning session), and to the development of more sophisticated equipment that offer an improved assessment of musculoskeletal structures. In particular, using US, we are able to define the presence of inflammatory abnormalities, such as synovitis, tenosynovitis, enthesitis and bursitis, and structural bone lesions, such as erosions and osteophytes. Furthermore, the application of Doppler modalities consents an estimation of the pathological vascularisation in active disease [5-7].

The aim of the present paper is to review the role of US in the assessment of musculoskeletal involvement in SSc.

Ultrasound in SSc

Over the last decade, several studies have underlined the role of US in detecting musculoskeletal inflammatory and structural abnormalities in rheumatic disease (arthritis, osteoarthritis and connective tissue disease) [8-12]. Conversely, few studies have investigated the usefulness of US in the assessment of joints and peri-articular tissue in SSc.

In 2009, Cuomo et al conducted a study to investigate the applications of US with power Doppler (PD) for the detection of hand and wrist abnormalities in SSc patients and their correlations with clinical and radiographic (X-
In a recent review Boutry et al described the imaging features of musculoskeletal involvement in SSc, including radiographic, sonographic and magnetic resonance (MR) findings [15]. They concluded that X-ray remains the mainstay technique for diagnosis and monitoring of SSc; MR can be useful to assess bone erosion and synovitis, and in detecting overlap conditions (SSc and RA or SSc and myositis), while US is able to visualize digital calcifications even before conventional X-ray.

More recently, Tagliafico et al evaluated by US the A1 pulley thickness in 28 SSc patients and in 40 healthy controls, to describe the possible usefulness of this measurement in the assessment of hand mobility in SSc [16]. The duration of disease and hand mobility using the HAMIS test (Hand Mobility in Scleroderma Test) was calculated in all patients. US was performed by 2 expert radiologists who assessed volar longitudinal and transverse view of each finger of both hands; pulley thickness was measured on transverse planes at A1 pulley level. The A1 pulley thickness was greater in SSc patients compared to controls (0.38±0.11mm vs 0.26±0.07mm; p < 0.05); furthermore a strongly correlation was found between pulley thickness and both HAMIS test (r = 0.78; p < 0.018) and disease duration (r = 0.54; p < 0.05). On the basis of these results the authors concluded that US can be considered a useful tool in the assessment of hand disability in scleroderma.

In 2010, an interesting ultrasonographic study evaluated the occurrence of carpal tunnel syndrome (CTS) in asymptomatic SSc patients and its correlation with clinical features [17]. Sixty-four SSc patients and 30 healthy controls were recruited. Duration of disease, subset (limited, diffuse), phase of skin involvement, modified Rodnan skin score (mRSS) and friction tendon rub were evaluated by 2 different rheumatologists. By US examination, median nerve cross-sectional area (MNA), transverse (major axis) (MNT) and anteroposterior (minor axis) (MNAP) diameters were measured on a volar scan at the proximal inlet of carpal tunnel in the transverse plane between the scaphoid tubercle and the pisiform bone; furthermore the MN flattening ratio (MNFR) was calculated. The authors used the cut off proposed by Duncan for MNA > 9 mm² and MNFR >3.3 mm², and by Naranjo for MNA > 12 mm². Statistically significant results were found for MNA (p<0.001), MNT (p<0.005) and MNFR (p<0.005) in SSc patients in comparison with healthy subjects. No correlations between the median nerve and SSc clinical features were found. On the basis of these data the authors concluded that CTS can be present in all disease phases and independently to clinical features in asymptomatic SSc patients.

More recently Chitale and colleagues compared US and magnetic resonance imaging (MRI) in detecting...
synovial inflammation in a limited number of SSc patients with arthralgia [18]. Seventeen SSc patients had a baseline US of both hands and wrists. Thirteen of them had a second US six months later; 8 out these 13 had MRI of their most symptomatic hand. US was performed by a sonographer who evaluated both hand and wrist joints for the occurrence of synovitis, and extensor and flexor tendons at the level of wrist to assess the presence of tenosynovitis. On US, evidence of inflammation were identified in a high proportion of patients; in particular tenosynovitis was present in 8 of 17 (47%) at baseline examination and in 6 of 13 (46%) at second US, while synovitis was found in 1 of 17 (6%) and in 3 of 13 (23%) at baseline and second US, respectively. No erosions were individualized on US. MRI showed signs of synovitis in all 8 (100%) patients and tenosynovitis in 7 out 8 (88%); furthermore MRI showed bone oedema and erosions in 63% and 75% of the 8 patients, respectively. In conclusion MRI seems to be more sensitive than US in the assessment of synovial inflammation in SSc.

In 2011, Cuomo et al used US to investigate the tendon friction rubs (TFR) in 55 SSc patients [27 with a limited form (lcSSc) and 28 with a diffuse form (dcSSc)] and in 30 healthy controls [19]. Tendon involvement was assessed by physical examination and US to evaluate tendon features, tendon sheath and retinacula in patients with or without clinical features of TFRs. US was performed on MCP areas (extensor and flexor tendons), wrist (extensor and flexor tendons), knees (patellar) and ankles (anterior, posterior, medial and lateral tendons). The thickness of retinacula was calculated using measurement calipers. Tenosynovitis and/or tendinitis were present in 21 patients. Retinacula had a hyperechoic aspect compared to adjacent tendons in SSc patients, while the aspect was hypoechoic respect adjacent tendons in healthy controls. Statistically significant results were found concerning the measurement of thickness of the retinacula on both wrist extensor and ankle anterior in dcSSc patients with TFRs compared to healthy subjects (p = 0.001 and p = 0.002), in dcSSc with TFRs compared to lcSSc (p = 0.002 and p = 0.003) and in dcSSc with TFRs in comparison with dcSSc without TFRs (p = 0.001 and p = 0.003).

In conclusion, this brief analysis of the current available literature about US applications in the assessment of musculoskeletal involvement in SSc, evidences that sonography is a useful imaging technique for evaluating a wide range of inflammatory (fig 1) and structural abnormalities involving both joints and soft tissues. It seems to be of value particularly in the assessment of hand and wrist joints involvement, giving an added value to clinical examination in SSc patients. For the limited number of publications on this field, additional studies on a greater number of patients and in multiple joints are recommended.

References