CASE REPORT

The Penile Vasculature in Systemic Sclerosis: A Duplex Ultrasound Study

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ABSTRACT

Introduction. Systemic sclerosis is a connective tissue disease characterized by Raynaud's phenomenon, degenerative changes and vascular lesions in the presence of thickened, sclerotic skin lesions determined by cellular proliferation, and excess of extracellular matrix production. The role of ultrasound in the investigation of penile pathology is well established as vasculogenic impotence accounts for more than 30% out of overall causes.

Aim. In this article, we report for the first time the extent of penile vascular damage in a series of 15 sclerodermic patients (mean age 47 ± 12.5 SD) under current treatment for their disease irrespective of their sexual dysfunction complaints.

Methods. After disease classification (mean duration of disease 7.2 ± 5.1 years), all patients were interviewed about the presence or absence of erectile dysfunction (ED) by using the Sexual Health Inventory for Men (SHIM) questionnaire, and then blood flow velocity in the cavernous artery following standardized pharmacostimulation was determined with Duplex ultrasonography along with the intima media thickness (IMT) of the common carotid artery, a valid index for atherosclerosis.

Results. Mean SHIM scores revealed the presence of moderate-to-severe ED (mean 13.3 ± 6.3). Interestingly, in all patients diffuse hyperechoic "spots" inside the corpora cavernosa along with thickening of the tunica albuginea were found. Severely impaired mean peak systolic velocities (20.2 ± 5.5 cm/second) in the presence of mild venous leakage as expressed by mean end diastolic velocities (4.6 ± 2.9 cm/second) were found along with normal IMT (0.065 ± 0.010 cm) and acceleration time (92.3 ± 32.7 cm/second).

Conclusion. Penile fibrosis almost invariably occurs in sclerodermic patients and this determines incomplete penile arterial and smooth muscle cell relaxation and ED despite the absence of indirect signs of early atherosclerosis, that is, abnormal IMT and acceleration time. **Aversa A, Proietti M, Bruzziches R, Salsano F, and Spera G. The penile vasculature in systemic sclerosis: a Duplex ultrasound study. J Sex Med 2006;3:554–558.**

Key Words. Examination Diagnostic Testing; Systemic Sclerosis; Fibrosis; Pulmonary Hypertension

Introduction

The term scleroderma encompasses a heterogeneous group of conditions linked by the presence of thickened, sclerotic skin lesions. Systemic sclerosis (SSc) is a subset of scleroderma, and includes both diffuse disease (diffuse cutaneous systemic sclerosis—DcSSc) and limited disease (limited cutaneous systemic sclerosis—LcSSc) defined on the basis of extent of skin involvement; the latter has also been called CREST (calcinosis, Raynaud's phenomenon, esophageal malfunction, sclerodactyly, telangiectasia) syndrome based on its cardinal features [1]. Other scleroderma syndromes include localized scleroderma or morphea, eosinophilic fasciitis, and scleredema. Men with DcSSc are at increased risk of developing erectile dysfunction (ED) compared with men with other autoimmune disorders, and it is reported that the prevalence may be as high as 81% [2].

Dynamic color power Doppler (CPD) sonography allows for the precise evaluation and characterization in power energy of the cavernosal arteries and a specific visualization of the pattern of the helicine arterioles along most of the penile crura and the entire penile shaft. The measurements of peak systolic velocity (PSV) to evaluate arterial inflow, the end diastolic velocity (EDV) and the resistive index (RI) (i.e., [PSV – EDV]/PSV) to evaluate the cavernous veno-occlusive function, represent the least invasive and more sensitive diagnostic approach in men affected by ED of any etiology [3]. Furthermore, additional markers of vascular atherogenic disease have been used such as the intima media thickness (IMT) of the common carotid artery and the acceleration time (AT).

In order to better characterize the etiology of ED in men with SSc, a small number of patients irrespective of their complain of ED underwent penile blood flow studies by dynamic Duplex ultrasound.

Patients and Methods

The patients were recruited among a series of 200 nonconsecutive SSc patients attending the rheumatologic outpatient clinic of the Clinical Immunology and Allergology Unit (Rome, Italy) during the last 10 years. A total of 17 male patients were enrolled in this study, two of them were excluded from analysis because of the presence of comorbidities associated with ED (prior myocardial infarction and unstable angina treated with nitrates). Age (mean ± SD) of the SSc patients was 47 ± 22.5 years. The median disease duration was 7.2 ± 5.1 years (range 1–16). Duration of disease was calculated from the time of onset of the first clinical event (other than Raynaud's phenomenon) that was a clear manifestation of SSc.

All patients fulfilled the criteria proposed by the American College of Rheumatology [4] and they were grouped according to the classification system proposed by LeRoy et al. [5] in patients with limited and diffuse skin involvement. Modified Rodnan Skin Score was performed in all patients [6]. Anti-nuclear antibody (ANA) were determined by indirect immunofluorescence using Hep-2 cells as substrates and autoantibodies specificities were further assessed by enzyme-linked immunosorbent assay (ELISA) (Inova Diagnostics Inc., USA). Exclusion criteria were cigarette smoking and current use of immunosuppressive drugs.

After the approval of the Ethical Committee of our institution, all 15 sclerodermic males (mean age 32 ± 0.55 years SE) volunteered to enter the sonographic study. Erectile function at baseline was investigated by the Sexual Health Inventory for Men (SHIM)-International Index of Erectile Function (IIEF) 5 [7], with scores higher than 21 considered as normal. All subjects were asked to abstain from sexual activity and alcohol for at least 2 days before the sonographic session of the study [8]. Evaluation of the flow inside cavernous arteries expressed as average between left and right sides was performed between 08:00 and 10:00 AM with a dedicated machine (TERASON 2000, Burlington, MA, USA) equipped with a linear transducer with a broad-band frequency of 5–10 MHz, according to a previously published procedure, at least 48 hours from the last dose of the use of oral drugs for ED [9]. Flow parameters were continuously recorded by one of us (A.A.) and included PSVs, EDVs, and the RI before and after a standardized pharmacostimulation with 20 mg prostaglandin E_1 (PGE_1). Arteriogenic ED was defined by the presence of a reduced PSV (normal values above 30 cm/second) [10] but normal EDV (normal values below 5 cm/second) in the cavernous arteries determined by Duplex ultrasound 20 minutes after pharmacostimulation for at least three consecutive measurements at the peno-scrotal junction [8–11]. In addition, the AT was evaluated to confirm the presence of atherosclerotic involvement of the vascular wall, with a cut-off value of normality for atherosclerotic ED below 100 m/second [12]. IMT was measured by a trained vascular technologist (A.A.) with the patient supine and the head rotated approximately 45° away from the side being scanned. A segment was scanned bilaterally of the common carotid artery 1 cm distal to the carotid bifurcation during diastole. The best image was selected and two measurements were taken of the same segment of the common carotid artery with a length of 0.5 cm. This process was repeated for the adjacent segment of 0.5 cm and the mean IMT of the two segments was calculated.

The IMT is increasingly used in clinical trials as a surrogate end point for determining the success of interventions that lower risk factors for atherosclerosis. Standard use of IMT measurements is recommended in all epidemiological and interventional trials dealing with vascular diseases to improve characterization of the population investigated even if normative values are not well established, being proposed as higher than 0.65 in patients with chronic autoimmune disease [13,14].