

NON-INVASIVE MEASUREMENT OF BIOMECHANICAL PROPERTIES OF SKIN IN SYSTEMIC SCLEROSIS PATIENTS

A Balbir-Gurman*, B Nichols[#], CP Denton, CK Knight, G Martin[#], CM Black

Centre for Rheumatology, Royal Free Hospital, London, UK. [#]Fibrogen Inc, South San Francisco, USA. *Department of Rheumatology, Rambam Medical Center, Haifa, Israel.

The extent of cutaneous involvement may reflect disease severity and outcome in systemic sclerosis (SSc). Currently the most widely used method of assessment is by modified Rodnan skin score. We have used a newly developed suction device (BTC-2000 SRLI Technology, Nashville, USA) to examine the biomechanical properties of skin in SSc patients and compared these with healthy controls. This device uses a laser beam to determine the height of a skin dome induced by application of subatmospheric pressure (50 mmHg) through a 10mm vacuum chamber during 5 consecutive cycles at three sites.

25 patients with limited SSc (lcSSc), 20 patients with diffuse disease (dcSSc) and 25 age-matched healthy controls were evaluated. Viscoelastic deformation (VED-mm), ultimate deformation (UD-mm), pressure-deformation ratio (PDR-mmHg/mm) were measured on the dorsal surface of forearm (F), shoulder (S) and above the trapezius muscle on the back (B).

Indices of skin extensibility (UD, VED) were reduced and resistance to stress (PDR) was increased in dcSSc compared with healthy controls, or lcSSc, at all three sites ($p < 0.001$). Interestingly, lcSSc extensibility was also significantly reduced at the shoulder. Thus, BTC-2000 appears to be a sensitive tool for clinical evaluation of skin involvement in patients with SSc and may be a valuable adjunct to skin sclerosis score in disease monitoring.

Site	control mean(sd)			lcSSc mean (sd)			dcSSc mean(sd)		
	F	S	B	F	S	B	F	S	B
VED	0.06(0.01)	0.06(0.01)	0.07(0.01)	0.05(0.02)	0.06(0.01)	0.07(0.01)	0.04(0.01)	0.05(0.01)	0.06(0.01)
UD	0.54(0.18)	0.79(0.20)	0.63(0.13)	0.43(0.13)	0.53(0.18)	0.58(0.16)	0.30(0.10)	0.44(0.16)	0.43(0.12)
PDR	82 (29)	48 (16)	75 (24)	140 (52)	86 (32.)	82 (28)	182 (90)	139 (53)	107 (33)

Financial support for this study from Fibrogen, The arthritis research campaign (UK) and The Raynaud's and Scleroderma Association (UK).