Objective measurement of pain levels in patients with radicular pain treated by spinal cord stimulation

Presenter: Roi Treister[1]

Nir Ben-Israel[2], Yariv Amos[2], Mark Kliger[2], Galit Zuckerman[2], Erica Suzan[3], Elon Eisenberg[3]

[1]Department of Neurology, Massachusetts General Hospital, Harvard Medical School, Boston Massachusetts
[2]Medasense Biometrics ltd, Ramat Yishai, Israel
[3]Rambam Healthcare Campus, and Technion - Israel , Institute of Technology, Dept of Anaesthesiology, Haifa, Israel

1 Background and Goal of Study

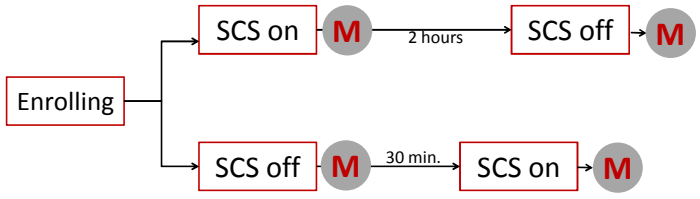
Although pain induces changes in autonomic parameters, the extent to which these changes correlate with the experience of pain remains under debate. In a recent study [1], we have shown that a combination of multiple autonomic parameters, rather than each parameter by itself, successfully differentiated between four categories of experimental pain intensity in healthy subjects.

The present study tests the ability of similar combination of autonomic parameters to differentiate between intensities of clinical pain in patients with chronic pain.

2 Material and Methods

Twelve patients with chronic radicular (neuropathic) pain in one lower extremity and permanent spinal cord stimulator (SCS) participated in the study. Patients were tested twice in a random order: 30 min after turning the SCS on and two hours after turning it off. Patients rated intensity of their pain on numerical pain scale (0-100) at the beginning of each test.

Photoplethysmogram (PPG) and skin conductance (SC) were recorded for 120 sec, using the PMD-100™ (Medasense Biometrics, Israel), and the following autonomic parameters were extracted: PPG wave amplitude, PPG wave amplitude variation, pulse rate (PR) interval, PR variability and SC fluctuations. The parameters were combined using a linear regression. Paired t-test was used for statistical analyses.

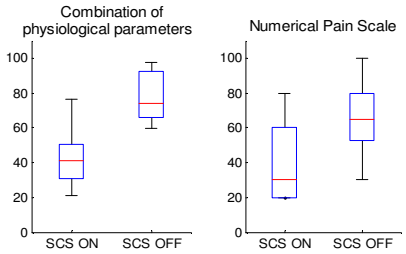


M

- measuring physiological response for 120 sec.
- Measuring patient's self pain report.

3 Results

The combination of the parameters, but not each parameter alone, showed significant difference ($p<0.001$) between the "on" versus the "off" SCS states (Table I), in concordance with the recorded pain ratings (Figure I).



Parameter	SCS Off mean [SD]	SCS ON mean [SD]	Paired t-test		
			P<0.001	P<0.05	P<0.1
PR variability	-0.06 [0.67]	1.1 [0.97]		√	
PR	0.19 [0.63]	0.81 [1.2]			
PPG wave amplitude	0.79 [1.2]	0.21 [0.63]			√
PPG wave amplitude variation	0.9 [1.3]	0.098 [0.22]			√
SC fluctuations	0.69 [1.2]	0.31 [0.72]			
Combination of physiological parameters	77 [14]	42 [17]	√		
Patient pain ratings (NPS 0-100)	67 [20]	38 [18]	√		

4 Conclusions

These preliminary findings suggest that autonomic-based multi-parameter assessment can reliably differentiate intensities of clinical pain.

Literature

[1] Treister R et al. Pain®. 2012 Sep. 153(9): 1807-14.