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A comparison of Neuropad test with cardiovascular autonomic and distal neuropathy assesment in diabetic patients with Charcot foot

V. Woskova, A. Jirkovska, R. Bem, M. Dubsky, V. Fejfarova, M. Krizova, J. Skibova

Diabetes Center, Institute for Clinical and Experimental Medicine, Prague, Czech Republic

Background and aim: Both distal sensorimotor and autonomic neuropathy play a central role in the pathogenesis of foot ulceration and development of Charcot's neuroarthropathy (CNO). Neuropad (NP) is a simple test for "at risk foot" screening. While the importance of peripheral sensorimotor neuropathy and cardiovascular autonomic neuropathy (CAN) in patients with CNO was confirmed, the role of Neuropad test for screening of patients with CNO remains unknown. The aim of the study was to compare NP test as a method for evaluation of peripheral sympathetic dysfunction with cardiovascular autonomic neuropathy and peripheral neuropathy assesment in patients with CNO.

Material and methods: The study included 28 diabetic patients (15M/13F, 14 DM1/14 DM2, mean age of 55±12 years) treated at a diabetic foot clinic with Charcot foot during a 12-month period. The diagnosis of CNO was determined by clinical finding and positive bone scan. Neuropad plaster was applied according to the instruction of the use for 10 minutes. NP was evaluated as normal (pink color of the reaction pad) or abnormal, indicating impairment of sudomotoric function (partial color changes or a stable blue color). The VPT was measured using biothesiometer applied at the dorsum of the first toe.  $VPT \geq 15V$  indicated some neuropathy (cut-point based on VPT age related mean value in non-diabetic population),  $VPT \geq 25$  indicated severe neuropathy. CAN was evaluated by the power spectral analysis of heart rate variability (PSA of HRV). Fifth percentile of PSA cumulative parameter of low-frequency (LF) and high-frequency (HF) bands indicated severe autonomic neuropathy. Results: An abnormal Neuropad test was detected in 25/28 (89%), somatic neuropathy measured by VPT ( $VPT \geq 15V$ ) was diagnosed in 26/28 (93%) and CAN in 26/28(93%) patients. In 25 patients with abnormal NP, 88% had both somatic neuropathy ( $VPT \geq 15$ ) and severe CAN. Concordance NP test with somatic neuropathy evaluation ( $VPT \geq 15V$ ) was achieved in 89 (95%CI 78-100)%, with severe neuropathy ( $VPT \geq 25$ ) in 79 (95%CI 64-94)% and with CAN in 82 (95%CI 68-96)%. Conclusions: The study demonstrated a good concordance of NP test with VPT measured by biothesiometer and CAN measured by PSA in patients with Charcot foot. We suggest that a Neuropad test could be a part of screening assesment in patients with suspected Charcot foot. Supported by grant MZO 00023001.