Non-invasive and quantitative assessment of sudomotor function for peripheral diabetic neuropathy evaluation

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Abstract

Aims: Perturbation of pain sensation is considered one of the major initiating risk factors for diabetic foot ulcer. Sweat dysfunction leading abnormal skin conditions, including dryness and fissures, can increase foot ulcer risk. The aim of this study was to evaluate Sudoscan, a new, quick, non-invasive and quantitative method of measuring sudomotor dysfunction as a co-indicator of the severity of diabetic polyneuropathy (DPN).

Methods: A total of 142 diabetic patients (age 62±18 years, diabetes duration 13±14 years, HbA1c 8.9±2.5%) were measured for vibration perception threshold (VPT), using a biothesiometer, and for sudomotor dysfunction, using electrochemical sweat conductance (ESC) based on the electrochemical reaction between sweat chloride and electrodes in contact with the hands and feet. Retinopathy status was also assessed, as well as reproducibility between two ESC measurements and the effect of glycaemia levels.

Results: ESC measurements in the feet of patients showed a descending trend from 66±17 µS to 43±39 µS, corresponding to an ascending end in VPT threshold from <15 V to >25 V (p=0.001). Correlation between VPT and ESC was −0.45 (p<0.0001). Foot ESC was lower in patients with fissures, while VPT was comparable. Both VPT and foot ESC correlated with retinopathy status. Bland–Altman plots indicated good producibility between two measurements, and between low and high glycaemia levels.

Conclusion: Sudoscan is a reproducible technique with results that are not influenced by blood glucose levels. Sweating status may be a quantitative indicator of the severity of polyneuropathy that may be useful for the early prevention of foot skin lesions.