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Association between the abnormal test of sudomotor function (Neuropad®) and markers on increased cardiovascular risk and the chronic complications of diabetes

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Background and aims: We have explored the possible role of using a commercially available test of distal autonomic function (Neuropad®) in routine clinical practice by examining clinical and metabolic factors associated with an abnormal response to a test in a population of 499 patients with diabetes. Materials and Methods: 499 patients were recruited from those attending a routine specialist diabetes clinic. All had were assessed for the quality of glycaemic control, cardiovascular risk factors and the presence of complications. Somatic sensory neuropathy was documented using the Neuropathy Disability Score, and autonomic neuropathy (sudomotor neuropathy) was determined on the sole of the foot using the Neuropad® response including time to colour change. Patients were divided into two groups: those with normal (pad pink at ten minutes) and abnormal (pad wholly or patchily blue). Results: There were 151 patients with type 1 (72 male, mean age 41.2±13.7y; mean disease duration 15.4±10.3y) and 348 with type 2 (159 male, mean age 62.0±8.8y; mean disease duration 14.8±8.6y). NDS was >5 (abnormal) in 130 (26.1%) and no change in Neuropad colour by 10 minutes was observed in 121 (24.2%). An abnormal Neuropad test was observed in 70 (19.0% of 369) patients with a normal NDS. Mean time to complete Neuropad colour change was 10.8±7.3 mins in patients with an abnormal NDS, and 7.0±5.5 mins in those without neuropathy ($p<0.001$). Significant direct correlations were observed between an abnormal Neuropad test and age ($rs=0.31$, $p<0.001$), waist circumference ($rs=0.17$, $p=0.003$), BMI ($rs=0.25$, $p<0.001$); significant negative correlations were observed with height ($rs=-0.17$, $p<0.001$) and serum HDL cholesterol ($rs=-0.13$, $p=0.003$). Patients with abnormal sudomotor function were older (60.8±10.5y) than those who were normal (54.0±14.9y, $p<0.001$), as well as having a longer disease duration (16.8±9.4 vs. 14.8±9.7, $p=0.045$), high BMI (29.4±5.8 vs. 27.4±2.5) and a higher prevalence of hypertension (54.6% vs. 42.1%, $p=0.018$). Patients with an abnormal sudomotor response also had a higher prevalence of maculopathy (29.8% vs 16.7%, $p=0.008$), symptomatic neuropathy (62.8% vs 48.5%, $p=0.04$), history of myocardial infarction and/or stent and/or bypass surgery (20.7% vs. 13.2%, $p=0.05$), peripheral arterial disease (9.1% vs 4.5%, $p=0.04$), history of foot ulcers (5.8% vs 0.8%, $p=0.003$) and major amputations (2.5% vs 0.0%, $p<0.001$). Conclusions: These findings illustrate the close association between the finding of an abnormal test of sudomotor function, markers on increased cardiovascular risk and the presence of chronic complications of diabetes. There may be a place for inclusion of routine testing of sudomotor function in the routine assessment of people with diabetes. These preliminary data suggest that it may be more sensitive than the NDS in detecting distal neuropathy.