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The effect of diabetic neuropathy on cutaneous circulation in patients with type 2 diabetes mellitus

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Background and aims: Transcutaneous oxygen tension (TcPO2) reflects the cutaneous microvascular perfusion status. TcPO2 levels are reduced in patients with type 2 diabetes mellitus (T2DM) and low TcPO2 values are associated with poor outcome in patients with foot ulcers. The purpose of the present study was to examine the potential effect of peripheral neuropathy (PN) on cutaneous circulation assessed by determination of TcPO2 in patients with T2DM. **Materials and methods:** A total of 100 patients (200 feet) with T2DM were recruited (mean age 66.5±8.7 years, duration of diabetes 14.0±10.8 years, male/female 62/38). Diagnosis of peripheral arterial disease (PAD) was based on the presence of either biphasic, monophasic or blunted waveforms in the posterior tibial artery. TcPO2 was measured using a TCM30 system and the electrode was placed on the dorsum between the first and second metatarsal heads. Diagnosis of PN was based on neuropathy symptom score (NSS), neuropathy disability score (NDS) and vibration perception threshold (VPT). **Results:** A total of 42 subjects had PAD. Patients with PAD had significantly lower TcPO2 values in comparison with patients without PAD (43.3±13.2 vs. 51.1±10.2 mmHg, $p<0.001$). Patients who had both PAD and PN had significantly lower TcPO2 values than patients with PAD but without PN (41.7±13.5 vs 48.0±11.5 mmHg, $p=0.04$). Among patients without PAD, those with PN tended to have lower TcPO2 values than those without PN (48.8±9.6 vs 52.21±10.3 mmHg, $p=0.08$). In the total sample, indices of severity of PN such as NDS ($r= -0.36$, $p<0.001$) and VPT ($r= -0.23$, $p=0.001$) were associated significantly with TcPO2. These correlations remained significant after adjustment for PAD status (NDS: $r= -0.28$, $p<0.001$, VPT: $r= -0.19$, $p=0.008$). **Conclusion:** Presence and severity of diabetic PN is associated with reduction in cutaneous perfusion irrespective of the presence of PAD. This finding explains in part the delay in healing of neuropathic or neuroischaemic diabetic foot ulcers.