Relationship between peripheral vascular disease and higher plantar pressures in diabetic neuro-ischaemic patients

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Dear Sir,

We read the above study with great interest [1]. The authors conclusion that “peripheral vascular disease (PVD) has an important impact on peak plantar pressure (PPP) and on duration of foot-floor contact in patients with diabetes mellitus” and indeed “could be a predictive factor” are intriguing concepts. There are, however, certain aspects of the study which could have been addressed by the authors, with advantage.

Greater credence could have been given to the study by a more robust method of vascular assessment. The gold standard non-invasive method is colour duplex imaging [2]. With regard to the use of ankle-brachial pressure index (ABI) to characterise the “degree of peripheral vascular disease” in diabetic subjects; increasing evidence highlights the inconsistencies of pedal pulses palpation and ABI measurement due to medial sclerosis secondary to autonomic neuropathy [2]. In the method, the authors state “all subjects had normal values of blood pressure taken on the arm (<140/90)” and an ABI ≤ 0.90. However, this is inconsistent with Figures 1-6 which show dorsalis pedis artery pressures of up to 240 mm Hg and posterior tibial artery pressures of up to 205 mm Hg in some patients. These values could reflect vessel calcification and given the 36% prevalence of autonomic neuropathy estimated by the EURODIAB IDDM Complications Study [3] this is perhaps not surprising when the age and duration of diabetes for the sample population is considered.

Furthermore the regression analysis plots include 22 values of arterial pressure, suggesting both limbs of each subject were included (though this is not described in the method). It is unclear how many values were averaged to give the mean arterial pressures recorded in the patient characteristics table (n = 11). PVD is not symmetrical in its distribution and the usual clinical scenario is for the patient to present with unilateral or bilateral symptoms of differing severity. Hence it might have been pertinent to list the actual symptoms and ABI for each limb studied.

Regarding the technique of plantar pressure measurement: the authors state “walking speed was standardised at one step per second and monitored” (method not stated). It should be noted that by setting cadence in this way, step length and actual velocity are not standardised but patient selected. Alterations in velocity are known to significantly alter PPP and other loading variables including foot-floor contact time [4] which may have had some bearing upon the results observed.

The authors reported a statistically significant relationship between ABI and elevated PPP (and duration of foot-floor contact) and concluded the former may contribute to the latter. For the reasons previously stated, we believe this should be interpreted with caution. The finding of a statistical association does not, as the authors suggest, imply the association is necessarily a causative one. Given the complexity and the overlap in predisposing factors contributing to the development of diabetic complications, a more straightforward interpretation might be that PVD and elevated plantar pressure simply develop in tandem.

References
Dear colleagues,

Measurement of the ankle brachial index (ABI) by Doppler ultrasound is a simple and commonly used method for the detection of peripheral vascular disease [1]. We are agreeing with the comment that the applicability of this technique to patients with diabetes is in some doubt because diabetic patients often develop calcification of the lower limb arteries. The presence of calcification may invalidate the ABI as the arterial wall becomes stiffer and resistive to compression, which could give a falsely high ankle systolic pressure [2].

However, it has been found that as long as ABI is normal or low, arterial calcification does not invalidate the ABI [3]. In order words, as long as the ABI is not obviously falsely elevated (i.e. $\geq 1.3$) it can be relied upon to make clinical decision [3].

The sensitivity of the ABI is 90%, and the specificity is 98% for an angiographically defined stenosis of 50% or more in a major leg artery [4-6].

Recently, the American Diabetes Association has published the consensus statement on peripheral arterial disease in diabetic patients. The recommendations confirm that the ABI is a reproducible and reasonably accurate, non-invasive measurement for the detection of peripheral arterial disease and the determination of disease severity [7].

However, an ABI value $>1.3$ suggests poorly compressible arteries at the ankle level due to the presence of medial arterial calcification. This renders the diagnosis of peripheral arterial disease by ABI alone less reliable [7]. For such patients, as well as for patients in whom revascularization is considered, an evaluation with a duplex ultrasound may be valuable [7].

References