



## When socks don't just cover the feet

Neil Baker OBE  
Consultant Podiatrist, 60 Degree Vascular and Diabetic foot Clinic,  
Bneid Al Gar, Kuwait

**D**ear readers, the paper I want to bring to your attention is by Soh et al from Malaysia, however, I would suggest that you also take time to read the systematic review on ulcer prevention by van Netten et al, alongside this. The evidence for first ulcer prevention interventions is very poor but we know that correct footwear, insoles and regular podiatry underpinned with health education is beneficial. Of course, the largest downfall with these interventions is that they perhaps do not address that the majority of weightbearing time is spent indoors.

The study by Soh et al was a non-randomised prospective study, examining the use of pressure-relieving StepEase™ socks worn indoors over a 12-week period. StepEase diabetic socks contain pockets of Ethylene Vinyl Acetate (EVA) microspheres within a cotton/lycra sock aimed to provide plantar pressure redistribution. The EVA microspheres mould to the contours of the plantar surface of the feet similar to a sand footprint. The objective of this study was to determine the plantar pressure efficacy of StepEase socks and to assess patients' satisfaction. Thirty-two subjects with a mean age and BMI of 57.9 years and 26 kg/m<sup>2</sup>, respectively, deemed to have 'high risk' feet were recruited to this study. The paper does not specify how high risk was determined exactly but states either sensory neuropathy or ischaemia were present. The former was determined by inability to feel a 10 g monofilament at one or more sites but the sites for testing were not described. No criteria were described for determining the presence of ischaemia. Study exclusion criteria were who could not stand or walk, had major or minor amputation, severe deformity, poor cognitive function, dementia or psychiatric conditions. Demographic data,

diabetes and medical history, diabetes mellitus control, type of footwear and usual activity levels were recorded by a questionnaire. Activity levels were classified into high (hiking, jogging), moderate (outdoor walking, household cleaning) and low (limited to household activities).

Dynamic plantar pressure readings both barefoot and with StepEase socked feet were recorded at day 0, 6 weeks and 12 weeks using the Novel Pedar-X pressure plate system. Patients' satisfaction and sock usage practice were recorded by questionnaire. The socks were worn for a mean of 4.39 days per week (SD 1.82). The highest mean peak plantar pressures were in the right forefoot, 267.6 kPa (SD 113.5 kPa) and left heel region 266.3 kPa (SD 94.6 kPa). The highest reduction was seen in the right toe region (47.5%). Mean peak pressures reduced significantly with a reduction range (53.2–117.4 kPa) of between 22.3% to 47.5% ( $P < 0.0001$  to  $P = 0.024$ ) in all masked regions except the left toe region. At 6 weeks, the significant peak pressure reduction range was sustained (46.1–100.6 kPa) of between 24.7% to 46.8% ( $P < 0.0001$  to  $P = 0.034$ ) and also at 12 weeks, which was 22.2% to 49.2% (40.6–91.9 kPa). Most of the subjects were satisfied or very satisfied with the StepEase socks (77.4%), while 87.1% agreed to continue using the socks. No new ulcers or any falls occurred during the study period.

Although this study is limited in several ways, it brings a focusing thought to managing preventative offloading in everyday life at home. This is a neglected area of prevention. ■

Soh EZF, Htwe O, Naicker AS et al (2020) StepEase™ diabetic socks: An answer to efficacious indoor foot pressure relief – a prospective study. *J Tissue Viability* pii: S0965-206X(19)30114-7 [Online ahead of print]

## Diabetes Res Clin Pract

### Toe brachial index predicts major acute cardiovascular events in patients with type 2 diabetes independently of arterial stiffness

Readability ✓✓✓  
Applicability to practice ✓✓✓  
WOW! Factor ✓✓✓

**1** The authors aimed to examine the predictive value of toe brachial index (TBI) in relation to major adverse cardiovascular events (MACE), as well as all-cause mortality in patients with type 2 diabetes (T2D).

**2** Established risk factors were estimated for vascular disease, in addition to non-invasive measurements, which included pulse-wave velocity (PWV) and intima-media thickness (IMT) of the carotid arteries. Cardiovascular death or hospitalisation for non-fatal myocardial infarction or non-fatal stroke were determined to be MACE. For this study, a total of 741 patients with T2D had their TBI measured between 2005 and 2008.

**3** A follow-up period of 9 years saw 97 patients experience MACE and 85 individuals died. TBI tertile (1 versus 3) was significantly related to MACE (HR 2.67, 95%CI 1.60–4.50;  $P < 0.001$ ), as well as to all-cause mortality (HR 1.98, 95%CI 1.16–3.83;  $P = 0.01$ ). When compared to TBI tertile 3, TBI tertile 1 predicted MACE, but did not predict all-cause mortality, independently of a range of factors, including age, sex, diabetes duration and treatment, body mass index and HbA<sub>1c</sub>, among others.

**4** In conclusion, the authors decided that low TBI predicts increased risk for MACE in patients with type 2 diabetes, independent of arterial stiffness.

Chisalita SI, Wijkman M, Ti Davidson L et al (2020) Toe brachial index predicts major acute cardiovascular events in patients with type 2 diabetes independently of arterial stiffness. *Diabetes Res Clin Pract* 161: 108040

## J Biomech

## Effects of vibro-medical insoles with and without vibrations on balance control in diabetic patients with mild-to-moderate peripheral neuropathy

Readability ✓✓✓

Applicability to practice ✓✓✓

WOW! Factor ✓✓

**1** The effects of total-contact insoles with and without subthreshold mechanical random noise on the balance control in patients with diabetes and mild-to-moderate peripheral neuropathy (PN) were examined by the authors. A prototype of a total-contact insole was created and vibratory motors were embedded into it.

**2** A total of 20 patients were studied and they undertook 30-minute walks wearing the shoe only, the shoe with vibro-medical insole inserted with and without vibrations. Parameters measured were amplitude, velocity and phase plane portrait (PPP). Centre of pressure amplitude, velocity and PPP were found to be significantly decreased in the anterior-posterior and medio-lateral directions when a vibro-medical insole without vibration was used ( $P < 0.05$ ), when compared to the shoe, and with vibro-medical insole with vibration ( $P < 0.05$ ) compared to the shoe only.

**3** Centre of pressure amplitude, velocity and PPP parameters significantly dropped when the vibro-medical insole with vibration was used as opposed to vibro-medical insole without vibration ( $P < 0.05$ ).

**4** It was concluded that vibro-medical insole with vibration may significantly improve balance control in patients with diabetes with mild-to-moderate PN.

Bagherzadeh Cham M, Mohseni-Bandpei MA, Bahramizadeh M et al (2020) Effects of vibro-medical insoles with and without vibrations on balance control in diabetic patients with mild-to-moderate peripheral neuropathy *J Biomech* 109656 [Online ahead of print]

## Diabetes Metab Res Rev

## Treatment of modifiable risk factors for foot ulceration in persons with diabetes: a systematic review

Readability ✓✓✓✓

Applicability to practice ✓✓✓✓

WOW! Factor ✓✓

**1** Acknowledging the importance of diabetic ulcer prevention, the authors determined to examine the effectiveness of interventions in ulcer prevention in terms of improving modifiable risk factors, which is currently unknown.

**2** A literature review of the PubMed, Excerpta Medica, and the Cochrane databases was conducted focusing on original research studies that examined six interventions used to treat modifiable risk factors for diabetic foot ulceration. These were: education for patients; education for professionals; pre-ulcer treatment; self-management; orthotic interventions; and foot- and mobility-related exercises.

**3** The results from 72 papers were included in the study (26 controlled study design; 46 non-controlled). Effective interventions included, but were not limited to, structured education, which could improve foot self-care behaviour, as well as yearly foot examinations and the foot disease knowledge of clinicians, while peak plantar pressure was reduced by Callus removal.

**4** Structured education for patients and clinicians, foot- and mobility-related exercises, callus removal and custom-made therapeutic footwear were found to be beneficial for improving modifiable risk factors for foot ulceration. However, the quality of evidence for interventions targeting modifiable risk factors for ulceration in those with diabetes was low.

van Netten JJ, Sacco ICN, Lavery LA et al (2020) Treatment of modifiable risk factors for foot ulceration in persons with diabetes: a systematic review *Diabetes Metab Res Rev* e3271 [Online ahead of print]

## Clin Biomech

## The impact of diabetic foot ulcers and unilateral offloading footwear on gait in people with diabetes

Readability ✓✓✓

Applicability to practice ✓✓✓✓

WOW! Factor ✓✓

**1** This study set out to investigate whether or not the use of unilateral offloading footwear in patients with diabetic foot ulcers (DFUs) has a negative impact on gait function beyond diabetic peripheral neuropathy (DPN). This type of footwear elevates one limb relative to the other, which may lead to limp and abnormal gait.

**2** Across three groups, 86 patients were recruited: 12 with diabetic peripheral neuropathy and unilateral foot ulcers wearing offloading footwear, 27 with DPN and 47 non-diabetic controls. Gait function was measured via a habitual speed walking test using a validated wearable platform.

**3** Deteriorated gait function was found in the offloading group compared to the non-diabetic group ( $P < 0.005$ ). The offloading group also had decreased gait speed ( $P < 0.001$ ), stride length ( $P < 0.001$ ), increased gait cycle time ( $P < 0.001$ ) and limp ( $P < 0.050$ ). The offloading group had increased gait unsteadiness compared to the neuropathy group, but was not statistical significant.

**4** Although DPN worsens gait function, the combination of DFU and offloading was found to amplify the deterioration beyond DPN. The authors, therefore, recommend caution in terms of current care standards for treating DFUs with offloading footwear.

Ling E, Lepow B, Zhou H et al (2020) The impact of diabetic foot ulcers and unilateral offloading footwear on gait in people with diabetes. *Clin Biomech (Bristol, Avon)* 73: 157–61

“While this study is limited in several ways, it brings a focusing thought to managing preventative offloading in everyday life at home, which is a neglected area of prevention.”