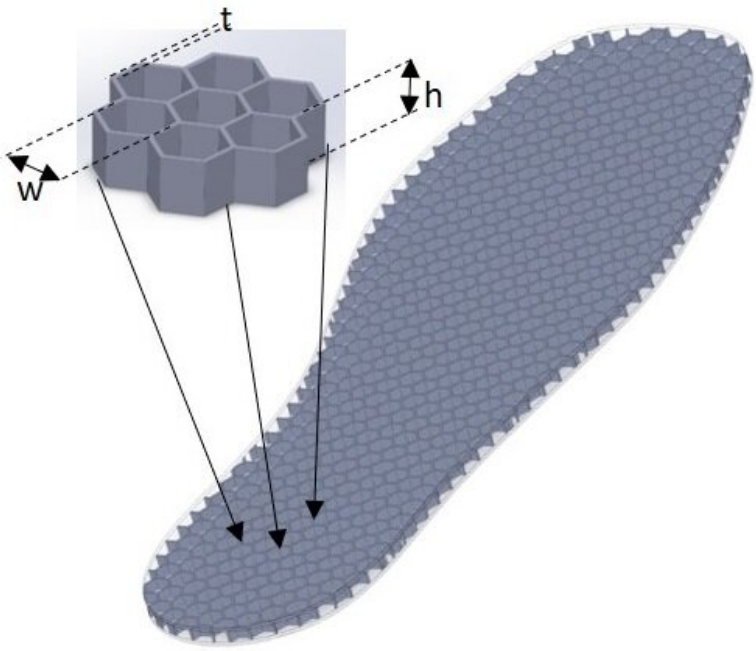
New research a 'step change' for diabetes patients

June 10 2021



Low-cost sensor-insoles can be used to assess the risk of foot ulcers. Credit: Staffordshire University

Millions of people with diabetes are at risk of developing foot ulcers, which often lead to amputations and other health complications. Now, Scientists from the Centre for Biomechanics and Rehabilitation

Technologies (CRBT) have developed a new method to reliably detect this risk without the need for complex electronic in-shoe sensors.

Dr. Panagiotis Chatzistergos, Associate Professor in Orthopaedic Biomechanics, explained: "In the UK alone, 169 people have a toe, foot or limb amputated as a result of diabetes every week, yet importantly up to 80% of these amputations could have been prevented with correct management.

"Routine overloading of the sole of the foot during daily activities can trigger the onset of foot ulcers, so being able to identify which areas in the sole of the foot are most affected is extremely important."

A common method involves assessing plantar pressure to prescribe special footwear or insoles, however many clinicians cannot use this because it is expensive and difficult to use. Dr. Chatzistergos and colleagues have developed a novel concept to address this problem, using 3-D-printed, tuneable structures that will help clinicians better understand the cause of ulcer development and lead to improved patient outcomes.

Dr. Chatzistergos, who led the study, said: "Our work has demonstrated a method to reliably detect overloading using a low-cost non-electronic technique. We have used a 3-D-printed thin-wall structure that changes its properties when repeatedly loaded above or below a tuneable threshold. We believe that this is a step change from current practice."

Patients would be required to wear the sensor-insoles in their everyday footwear for a representative time period, for example a day or a week, before returning them for analysis. During the analysis of the sensor-insole, plantar areas that were routinely subjected to higher pressures should be identifiable, against those where pressure was below that threshold.

The concepts behind the work, published in *Royal Society Open Science*, have been fully developed at Staffordshire University and the intellectual property has been protected.

Professor Nachi Chockalingam, Director for CRBT who co-authored the study, said: "Plantar pressure assessment is common amongst clinical practice and it contributes to insoles and footwear prescription. However, the current technologies are expensive and difficult to use in an everyday clinic.

"Each year more than 26 million people worldwide develop diabetic foot ulcers and the lifetime incidence of foot ulcers in developing countries is more than 20% among people with diabetes. Establishing low-cost methods to help prevent foot ulcers will reduce the global socioeconomic burden of diabetes and ultimately save lives. The concept reported within this paper, with further development, has the potential to transform clinical management of foot ulcer risk across the world."

More information: Panagiotis E. Chatzistergos et al, A novel concept for low-cost non-electronic detection of overloading in the foot during activities of daily living, *Royal Society Open Science* (2021). DOI: 10.1098/rsos.202035

Provided by Staffordshire University