Second toe systolic pressure measurements are valid substitutes for big toe systolic pressure measurements in patients with diabetes: a prospective study

Venu Bhamidipaty¹, Anastasia Dean¹, Swee Leong Yap¹, Julia Firth²*, Michaela Barron², Bernard Allard¹, Steven Chan³

¹Department of Vascular Surgery, Western Health, Melbourne, VIC, 3011, Australia
²Department of Podiatry, Western Health, Melbourne, VIC, 3011, Australia
³Department of General Surgery, Western Health, Melbourne, VIC, 3011, Australia
*Julia.firth@wh.org.au

Background
Toe systolic pressure is a component of the standard vascular and diabetic foot assessment. Until now, clinicians have only measured big toe pressure given a lack of evidence for measurements of the other toes. In patients with diabetes, big toe measurements are often not possible due to ulceration or amputation. It was hypothesized that the adjacent second toe systolic pressure measurements would be interchangeable with those of the big toe.

Methods
A prospective study was performed on 100 participants with diabetes mellitus. Duplicate systolic toe pressures were measure in the big toe and adjacent second toe using the Systoe™ Automated Toe Pressure System, Systoe™ Photoplethysmograph Sensor Cuff and occlusion cuffs measuring 120 x 25mm for the big toe and 90 x 15mm for the second toe. Ordinary Least Products regression was used to detect and distinguish fixed and proportional bias between the two toe measurements. The acceptable limits of interchangeable results were defined as 5 to 10mmHg.

Results
No fixed or proportional bias was found between the two methods of measurement: second toe systolic pressure = (-0.579) + (1.038)* big toe systolic pressure. Ninety-five percent confidence interval for the intercept was -7.487 to 6.329; for the slope 0.970 to 1.106. Repeatability analysis showed a 0.5% variation between duplicate measurements.

Conclusions
This is the first study which demonstrates that second toe systolic pressures are interchangeable with those of the big toe. Second toe pressures can be used in patients with diabetes whose big toe pressures cannot be assessed. This ensures appropriate and timely assessment of a patients’ vascular status which leads to improved clinical decision making.