Don’t be thick - avoid foot ulcers
A novel in-shoe ultrasound method of assessing soft tissue properties in the forefoot during walking - work in progress
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3CHOI, C., WEE, L. 2012. A innovative assessment of the biomechanical properties of plantar soft tissues and diabetic foot ulcer: Hong Kong Polytechnic University [Hong Kong]

1 Introduction

Keywords & Abbreviations:
Biomechanical & Activity Factors (BAFs)
Plantar Soft Tissues (PSTs)
Ultrasound (US)

Problem & Population
260,000 people in Scotland have diabetes1
6.1% of diabetic individuals will develop diabetic foot ulcers (DFUs)2
DFUs are linked to increased mortality & amputation2 and result in social & financial costs

Research & Gap
Plantar soft tissues (PSTs) provide cushioning & protection
PST changes may reduce tissues’ ability to protect against DFUs3,4
No method exists to measure forefoot PSTs during walking

Proposed Study
Develop and test a novel method for measuring PSTs during walking in healthy and diabetic populations

2 Aims
• Test reliability of an in-shoe ultrasound method for PST measurement (i.e. thickness, strain) during walking.
• Evaluate group differences in PSTs

3 Proposed methods
• Participant pathway (Fig. 1)
  • Assessment: via modified shoe (Fig. 2)
  • Trials: walk 220 steps for 3 sites on each foot (Fig. 3a)
  • Analysis: ultrasound (US) images - max. & min. PST thickness (Fig. 3b) & strain (Table 1)

4 Outcome Measures and Data Analysis
(a) Reliability Assessment
• Reliability tested in two ways (Table 1)
• Also, is method more/less reliable in:
  • Healthy population?
  • Disease population?

(b) PST Parameter Assessment
• Between group PST differences (Table 1).

Max. Strain = + Max. PST thickness
Max. PST thickness

5 Conclusions, Future Work & Implications for Rehabilitation
Conclusions
Predicted Outcomes: Novel method reliable for use in diabetic and healthy populations?
Trend towards between group (HC, DPN, DPNU) differences in PST parameters?

Future Work
Cross-sectional (DPNU, DPN, HC) study: biomechanical & activity factors (BAFs)
Identify significant associations between BAFs and DFUs
Prospective studies: quantify links between BAFs and DFUs (e.g. prediction modelling)

Implications for rehabilitation
• Novel method: early clinical detection of PST changes
• Links: ID who at highest risk of DFUs
• Enable early clinical intervention
• Reduce ulcer/re-ulceration rates
• Visualise PST changes - facilitate patient education

References:
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