57

FI2016_Diabetic_Rheumatoid_Foot_03
Plantar soft tissue deformability and diabetic foot ulceration: Is there a link?

R. Naemi [1,*], P. Chatzistergos [1], L. Sundar [2], A. Ramachandran [2], N. Chockalingam [1]

[1] *Staffordshire University, UK*
[2] *AR Hospitals, UK*
*Corresponding author.

Background: Ultrasound elastography is getting popular in the area of musculo-skeletal assessment (Lin et al., 2015), with some preliminary studies demonstrating its use in differentiating between the deformability of plantar soft tissue of diabetic and non-diabetic patients (Matteoli et al., 2015).

While mechanical trauma has been recognised as a cause of foot ulceration in diabetic neuropathic patients, there has been no study comparing the mechanical properties of the plantar soft tissue in ulcerated vs non-ulcerated feet.

Aims: The aim of this study was to determine if a significant difference exist between the plantar soft tissue in the ulcerated vs non-ulcerated feet.

Methods: 69 patients with diabetic neuropathy volunteered to participate in this study. 11 out of the total 138 feet tested had an active ulcer at the forefoot. Realtime elastography (Esaote S.p.A., IT) using a linear probe attached to a stand-off interface material was used to enable comparison of deformability between different trials. The relative deformability of plantar soft tissue was measured at the forefoot and rear-foot, this was also normalised over the maximum deformation of the stand-off to account for the effect of loading magnitude.

Results: Independent sample *T*-test showed significantly higher deformability ($t(138) = 2.26$, $p = 0.044$, $\chi^2 = 0.036$) and normalised deformability ($t(138) = 2.553$, $p = 0.025$, $\chi^2 = 0.046$) at the heel in the ulcerated feet.

Summary/conclusions: The observed difference in deformability at the heel between the ulcerated and non-ulcerated feet clearly indicates a link between tissue mechanics and ulceration.

http://dx.doi.org/10.1016/j.fas.2016.05.064

58

FI2016_Diabetic_Rheumatoid_Foot_04
Improvement in the diagnosis of diabetic foot with the measurement of plantar soft tissue stiffness

T. Lee *, Y.-S. Kim, M. Koh, D.-G. Hwang, J.-J. Han

Dongguk University, Seoul, South Korea
*Corresponding author.

Diabetes mellitus occurs reducing sugar and cellular proteins that lead to the formation of advanced glycation end products (AGEs). AGEs change in skin and connective tissue decreasing elasticity and in turn making the soft tissues stiffer.

The objective of this study is to assess which parameters affect plantar soft tissue stiffness in diabetes patients. So we evaluate the relationship between plantar tissue stiffness and several parameters, e.g. age, diabetes duration, body mass index, HbA1C level. Understanding of these associations is certainly helpful to the clinicians so that more useful conclusions and objective decisions on the treatment options can be made.

Fifty diabetes patients were recruited. Indentation tests were conducted on to the 2nd sub-MTH (metatarsal head) at 0° MTPJ (metatarsophalangeal joint) angle by using in-house indenter. The tissue resistance to the deformation was quantified as stiffness constant, *K* (N/mm). Two out of the four factors were plotted against the plantar soft tissue stiffness of 2nd sub-MTH pad.

Among the factors examined, HbA1C scores, BMI and DM duration are positively associated with the change of tissue stiffness. Special consideration should be given to the group of BMI $> 25\ kg\ m^{-2}$, HbA1c score > 9 and DM duration > 20 years. Meanwhile, the age of patients does not show much influence in altering the tissue condition.

The study has successfully observed the association of BMI, HbA1c and DM duration with the health of plantar soft tissue. The high accuracy of predicting the stiffness measurement by considering all three criteria suggests the feasibility of this prediction method in assessing patient's foot health.

http://dx.doi.org/10.1016/j.fas.2016.05.065

59

FI2016_Diabetic_Rheumatoid_Foot_05
Frontal plane postural control: A comparison of people with diabetic peripheral neuropthy and healthy controls

S. Glasser [1,*], J. Paton [1], R. Collings [2], J. Marsden [1]

[1] *Plymouth University, UK*
[2] *Torbay and South Devon Health and Care NHS Trust, UK*
*Corresponding author.

Background: Poor balance is a major concern for people with diabetic peripheral neuropathy (DPN). Increased understanding of the pathophysiology of balance impairment and modification, in people with DPN is crucial to the development of a disease specific intervention to reduce falls risk.

Aim: To explore postural balance strategies in people with DPN compared to healthy controls.

Method: Three-dimensional motion analysis was used to capture the postural responses to hip vs ankle vibration (perturbation) in 38 participants (19 DPN and 19 healthy controls) during a 2-second balance perturbation.

Results: Postural strategies in the frontal are modified in people with DPN, with increased motion at more proximal segments of the shoulder ($p < 0.05$) and head ($p < 0.05$). The healthy group showed a response to hip vibration where the head and shoulder were stabilised in space. The response in the DPN group showed a strategy whereby the pelvis, shoulder and head were fixed on one another resulting in greater magnitudes of tilt at each segment compared to healthy controls.

Conclusion: People with DPN; chronic distal sensory loss, appear to modify their postural control differently to those with acutely induced distal sensory loss previously studied. The response differences could therefore reflect central nervous system adaptation in the acute vs chronic stages of distal sensory loss. A possible explanation is a re-weighting of proprioceptive information from the hips resulting in an increase in proximal motion. This may have a negative impact on balance through a reduction in visual acuity.

http://dx.doi.org/10.1016/j.fas.2016.05.066