In Vivo Reflectance Confocal Microscopy of Meissner's Corpuscles as an Objective Measure of Diabetic Polyneuropathy

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INTRODUCTION

• Distal symmetric polyneuropathy (DSP) is a common complication of diabetes mellitus (DM), leading to impairment in quality of life and morbidity including limb loss.1

• Glycemic control remains the only disease-modifying therapy for diabetic DSP despite numerous clinical trials, which may in part be due to suboptimal markers for early intervention.2

• Meissner's corpuscles (MC) touch-pressure sensory receptor density via glabrous skin biopsies is a sensitive measure of diabetic DSP.3,4

• In vivo reflectance confocal microscopy (RCM) of skin is a non-invasive way to quantify MC density (MC/cm²). RCM of MC density has shown potential utility as a measure of sensory neuropathy in studies in HIV-associated and hereditary peripheral neuropathies.

• However, the role of MC density via RCM imaging as a rapid, painless, and objective measure of diabetic DSP has not been established.

AIMS

1) Compare MC density by RCM, as well as standard peripheral neuropathy measures, between healthy control subjects and patients with diabetes, with and without DSP.

2) Determine the relationship between MC density by RCM and standard peripheral neuropathy measures.

METHODS

• Subjects with known DM (type 1 and 2) and healthy controls aged 18-65 years without evidence of other systemic conditions or toxin exposure predisposing to neuropathy, hereditary neuropathy, mononeuropathy or myopathy were recruited to participate in a cross-sectional study.

• Subjects with diabetes were subdivided into groups with and without DSP using the AAN research case definition for DSP (presence of neuropathic symptoms, decreased ankle reflexes, and decreased distal sensation).5

• In vivo RCM of MCs was performed in the distal phalanges of digit V, threnar eminence (TE), and medial side (arch) of all subjects, and MC density was determined using systematic random sampling by a blinded observer.6

• Subjects underwent upper and lower limb nerve conduction studies (NCS), ankle skin biopsy for epidermal nerve fiber density (ENFD), and monofilament (MF) touch-pressure threshold and timed vibration testing.7

• Comparisons across groups were conducted using analysis of covariance (ANCOVA) adjusted for age, sex, weight, and hand surface area as appropriate.

• MC densities were lower in both diabetic groups (with and without AAN criteria for DSP) than controls at digit V.

• Age related variability and a floor effect appear to limit the role of RCM of MC density at the arch as a marker of diabetic DSP.

• Further prospective studies are needed to determine whether RCM of MCs can identify quantitative changes in DSP associated with disease progression or treatment.

REFERENCES