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## Chronic fatigue syndrome and impaired peripheral pulse characteristics on orthostasis-a new potential diagnostic biomarker.

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### Abstract

Autonomic nervous system dysfunction is frequently reported in chronic fatigue syndrome (CFS) with orthostatic intolerance, a common symptom that can be objectively assessed. The frequent finding of autonomic dysfunction and symptoms on standing has the potential to provide a diagnostic biomarker in chronic fatigue. In this study we explored the clinical value of non-invasive optical multi-site photoplethysmography (PPG) technology to assess cardiovascular responses to standing. Multi-site PPG pulses were collected from tissue pads of the ears, fingers and toes of 14 patients with CFS and 14 age-matched sedentary subjects using a measurement protocol of a 10 min baseline (subject supine) followed by 3 min of tilting on a tilt table (head-up to 70°). Percentage change in pulse timing (pulse transit time, PTTf) and pulse amplitude (AMP) at each site were calculated using beat-to-beat pulse wave analysis. A significant reduction in the overall pulse timing response to controlled standing was found for the CFS group (using summed absolute percentage change in PTTf for ear, finger and toe sites, median change of 26% for CFS and 37% for control with  $p = 0.002$ ). There were no significant differences between subject groups for the AMP measure at any site. Changes in AMP with tilt were, however, weakly significantly and negatively correlated with fatigue severity ( $p < 0.05$ ). Receiver operating characteristic (ROC) analysis of timing measures produced an area under the curve of 0.81. Experimental linear discriminant classification analysis comparing both timing and amplitude measures produced an overall diagnostic accuracy of 82%. Pulse wave abnormalities have been observed in CFS and represent a potential objective measure to help differentiate between CFS patients and healthy controls.

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