Kinematic and electrophysiological assessment of the patellar reflex shows a lack of hyperexcitability in patients with restless legs syndrome compared to healthy controls

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INTRODUCTION

Restless Legs Syndrome (RLS) is characterised by an uncomfortable sensation in the legs, exacerbated during periods of evening inactivity or sleep, resulting in voluntary leg movements which relieve the discomfort. The night time expression of RLS symptoms, and lack thereof in the morning, suggest that the aeitology of RLS has a possible circadian influence. RLS is presumed to be caused by a central deficiency of dopamine or other functional abnormalities of the central nervous system and, of particular interest in this study, hyperexcitability of the spinal cord. Therefore, the objective of the study was to compare the kinematic responses of spinal reflexes (as a measure of spinal excitability) in RLS patients at different times of the day as well as with healthy participants.

METHODS

Standard electromyographic techniques were used to quantify muscle activity of patellar and H-reflexes in RLS patients (n=11) and healthy age and gender matched control subjects (CONT, n=9).

Three dimensional kinematic data was collected during the elicitation of the patellar reflex. Small (6mm diameter) markers were placed on the medial and lateral femoral epicondyle, the medial and lateral malleoli and the lateral mid thigh of the dominant leg. From these markers, subsequent kinematic model construction made use of a plane which was defined by the three markers that define the upper thigh and axis which extended from the mid ankle to mid knee, to calculate knee angular velocity and displacement (figure1).

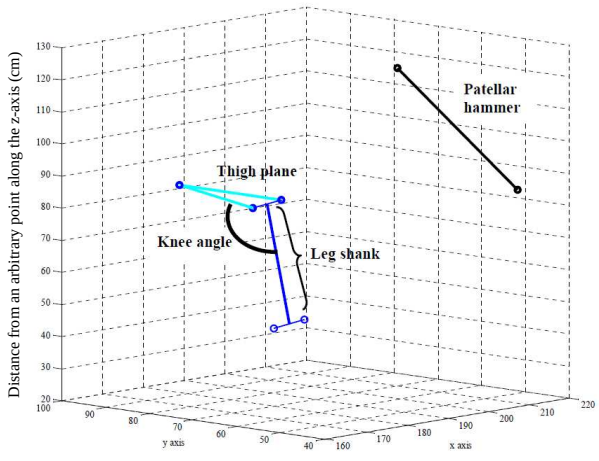

Figure 1: Three dimensional representation of the patellar reflex indicating the starting position of the patellar hammer with the leg at rest.

In addition to the above, attempts were also made to assess whether remote logger type, commercially available accelerometers (low frequency data acquisition) could be used to reflect movement during the patellar reflex. Accelerometers were placed on right ankle and logged data simultaneously with kinematic measurement of the reflex response. Both reflexes were tested in the evening (PM) and again the following morning (AM). The Visual Analogue Scale (VAS) was used to assess the pain perception of inducing the H-reflex.

RESULTS AND DISCUSSION

The RLS patients had a significantly attenuated patellar reflex amplitude in the evening compared to RLS morning measurements and compared to the control group (figure 1), as well as significantly less angular displacement in the evening (P = 0.0177). There were however no significant differences in any of the H-reflex measurements. The VAS pain score recordings were significantly greater in the control subjects than the RLS patients (P = 0.0451).

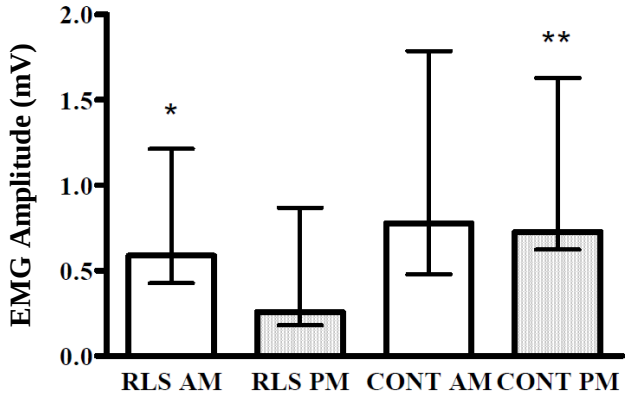

Figure 2: Morning (AM) and evening (PM) patellar reflex EMG amplitudes for the Restless Legs Syndrome (RLS, n=9) and control (CONT, n=9) groups. * P = 0.0078 (RLS AM vs. RLS PM, Wilcoxon signed rank test), ** P = 0.04 (RLS PM vs. CONT PM, Mann Whitney test). Data represented as median and interquartile range.

CONCLUSIONS

There was no apparent evidence of global spinal hyperexcitability in RLS patients as measured by these parameters. The various changes seen – attenuated patellar reflex amplitude and knee angular displacement, and altered pain perception - do indicate some discrete abnormalities in spinal cord function, amongst RLS patients.