

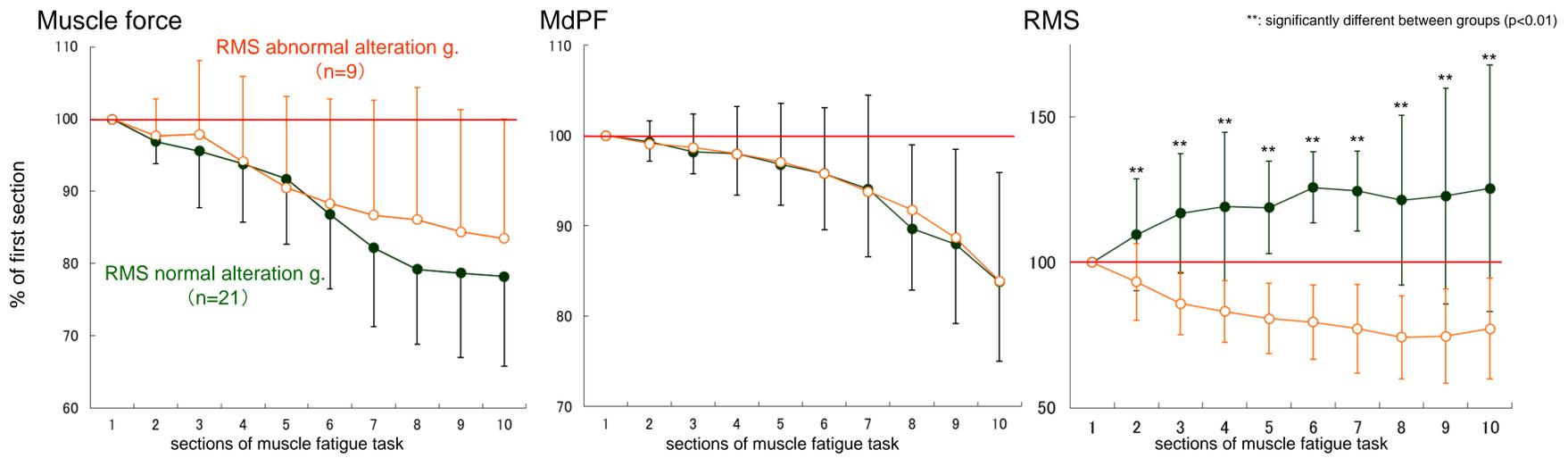
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BACKGROUND

Charcot-Marie-Tooth (CMT) disease is the most common hereditary motor and sensory neuropathy, resulting in prominent distal muscle atrophy that predominantly involves the intrinsic muscles of the feet and peroneal muscles. We found that muscle force and Median power frequency (MdPF) showed normal alterations in all participants, in contrast, amplitude of EMG (RMS; root mean square) declined during muscle fatigue task in a part of CMT patients.



This declines of RMS concomitant with possibly a drop in firing frequencies (Behm, 2004; Houtman et al., 2003; Kuchinad et al., 2004)

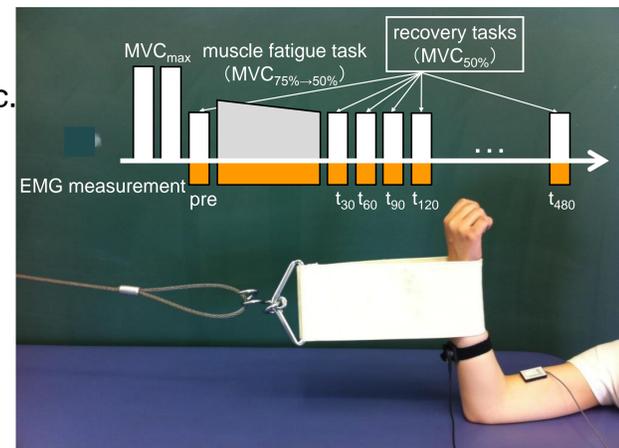
We hypothesize that a certain CMT patients has the recruitment disorder of motor units during muscle fatigue and this disorder may be a factor of "super fatigability" in CMT patients.

OBJECTIVE

If the "super-fatiguability" occurs, we would expect patients with this characteristic to become slower in recovery from muscle fatigue than patients without the characteristic. In order to verify this hypothesis, we measured characteristic of recovery from muscle fatigue in CMT patients with electromyographic study.

METHODS

Twenty three participants comprised five with CMT type 1, one with CMT type 2, one with CMT type 4 and sixteen with unknown were asked to maintain their 75% of maximal voluntary isometric contraction (MVC) of elbow flexor until exhaustion as the fatigue task. In addition, the participants asked to perform 5s of their 50% of MVC (MVC50%) at 30, 60, 90, 120, 180, 240, 300, 360, 420, 480s after the fatigue exercise as recovery tasks. The surface EMG (sEMG) signals of biceps brachii muscle were determined during the exercise and the recovery tasks. MdPF, sEMG amplitude (RMS) and muscle force were used as objective parameters of muscle fatigue. In addition, Borg scale was used as subjective parameter of muscle fatigue.



RESULTS

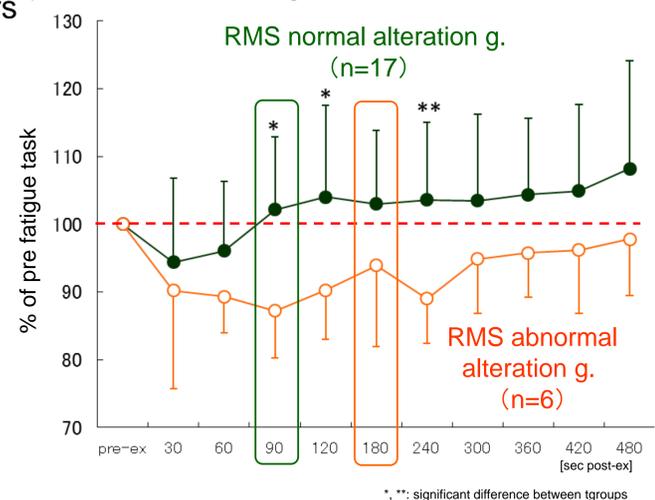
Six of twenty three participants showed the abnormal alteration of EMG amplitude (RMS), that is significant decrease of RMS during the fatigue task.

In consideration of this result, we compared alteration of MdPF in recovery task between six participants with decrease of RMS (abnormal alteration group) and seventeen participants with increase of RMS (normal alteration group).

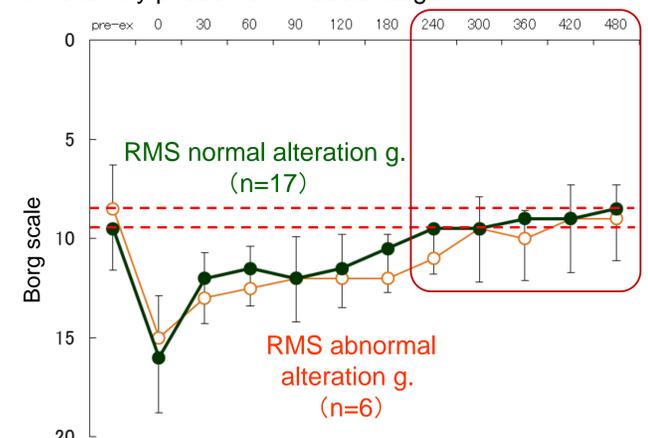
As the result, the abnormal alteration group had at least 180s as the recovery time from muscle fatigue in contrast with 90s of normal alteration group.

The recovery time from muscle fatigue in subjective parameter was shorter than the time in objective parameters (Borg scale) in both groups.

Subjective parameter (MdPF) alteration in recovery phase from muscle fatigue



Objective parameter (Borg scale) alteration in recovery phase from muscle fatigue



CONCLUSION AND CLINICAL IMPLICATION

Our data support the "super fatigability" hypothesis. We physical therapists should consider this "super fatigability" due to less recruitment of motor units and disagreement between subjective and objective parameters of muscle fatigue in the exercise or rehabilitation of CMT patients.