Cramp Protocol

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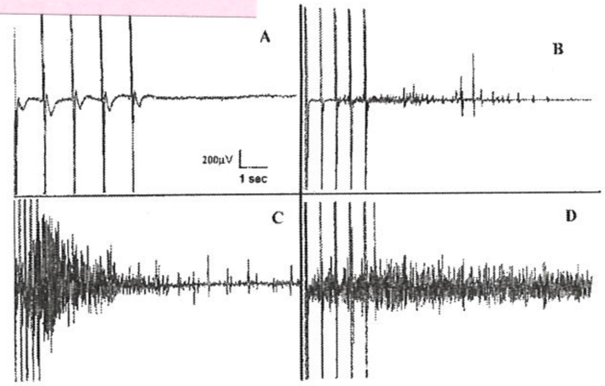

FIGURE 1. Examples of RNS tracings. **(A)** Normal study at 1 Hz. **(B)** Afterdischarges at 2 Hz. **(C)** Cramp potential at 5 Hz. **(D)** Continuous motor unit activity at 1 Hz.

Electrophysiology. Slow tibial RNS was performed using a Synergy electromyograph system (Oxford Instruments, Eynsham, UK). The recording and reference electrodes were placed according to the standard technique for routine tibial motor nerve conduction studies, with the surface electrode placed over the abductor hallucis brevis muscle and the reference electrode at the base of the first metatarsal. Five supramaximal stimuli at a frequency of 1, 2, or 5 Hz were delivered to the posterior tibial nerve at the ankle 9 cm proximal to the recording electrode. In order to minimize movement artifact, patients were instructed to maintain the foot in a relaxed position and the investigator visually monitored the limb during stimulus administration in order to verify the presence or absence of movement. Recordings were made with the sweep speed set at 1 s per division and a gain of 200 μV per division. Filters were set at conventional settings for motor nerve conduction studies: the low-frequency filter was set at 3 Hz and the high-frequency filter at 10 kHz.

Criteria for the identification of afterdischarges and cramp potentials with surface electrodes following RNS have been described previously.[1] All tracings were reviewed for quality of the baseline recording both prior and subsequent to the train of electrical stimuli. Individual electrical potentials identified following the train of stimuli that were not present at baseline were identified as afterdischarges. When the frequency of afterdischarges was too great to be counted and demonstrated maximal amplitude at onset with a smooth or gradual reduction in amplitude back to baseline, a cramp potential was identified. Continuous motor unit activity was determined to be present when baseline electrical potentials were too numerous to be counted both at baseline and after stimulation with the foot maintained in a relaxed position. RNS results were classified as either normal or abnormal based on a qualitative assessment of the presence or absence of afterdischarges, cramp potentials, or continuous motor unit activity (Fig. 1) by the two study investigators acting independently and blinded to the clinical history. For the purpose of this study, both investigators were required to agree on the assessment of each individual tracing; disagreements were resolved by consensus.

Reference Standard. No gold standard currently exists for a diagnosis of CFS. As such, for the purposes of this study CFS was operationally defined by the presence of both cramps and fasciculations as either clinical complaints or clinical findings. Cramps were defined as sudden, painful, and involuntary contractions of muscle that are associated with palpable hardening of the muscle; their presence was identified by documentation in either the electronic medical record or on a standardized questionnaire furnished by the electrophysiology laboratory. Fasciculations were defined clinically as brief and involuntary arrhythmic muscle twitches and were recognized electrically as characteristic random and spontaneous motor unit action potentials on EMG. CFS was considered either a primary disorder in the absence of other identified pathology or as secondary when both cramps and fasciculations occurred in the context of another underlying neuromuscular disorder. The term benign fasciculation syndrome was used to describe subjects with isolated fasciculations.

after 5 stimulations pull the head off stimulater.

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