Firing rates and variability differences between motor units and spontaneous activity in needle EMG

Introduction: Motor unit action potentials (MUAP) can look like positive sharp waves in configuration based upon the needle relationship to the motor unit territory. The regularity and consistency of firing, however, distinguish spontaneous activity (SA) from MUAPs. A measure to assess the degree of firing regularity is needed for quantitative evaluation of SA in the paraspinal muscles of the neck and back. Previous studies have shown marked differences in prevalence of paraspinal SA.

Objective: To quantify firing rates and regularity of SA and MUAPs using a modern, digital interface — DQEMG and Audacity.

Methods: Prospective recordings were obtained from patients referred for routine EMG evaluation of a variety of complaints. The recordings were interfaced through a version of DQEMG software customized to calculate descriptive statistics for these waveforms.

Results: 48 MUAP recordings (41 subjects) and 83 fibrillation/positive sharp wave (Fib/PSW) recordings (63 subjects) were analyzed. 107/131 recordings successfully interfaced with DQEMG. The remaining were analyzed with Audacity. Mean firing rates for MUAPs were 11.2 Hz (SD 3.6) and for SA, 6.9 Hz (SD 2.6). The average proportional consecutive interval differences (APCID) showed 11.3-67.8 (ratio) for MUAPs and 0.6-35 (ratio) for Fibs/PSWs. Only 4/83 of APCID values from SA exceeded the lowest value for MUPs. There was significant overlap for mean consecutive differences and standard deviation of inter-potential intervals. The distributions of the above parameters were skewed to the right.

Conclusions: APCID appears to well differentiate SA from MUAPs and will be useful for future quantitative studies examining the prevalence of SA in tested muscles.