

ABSTRACT #93

MOTOR UNIT NUMBER ESTIMATION USING THE INCREMENTAL METHOD IN NORMAL DOGS. L Vásquez¹, S Kanazono¹, JA Villamil¹, U Dhand², DP O'Brien¹, JR Coates¹. University of Missouri 1. College of Veterinary Medicine, 2. School of Medicine, Columbia, MO.

Canine degenerative myelopathy (DM) is an adult onset fatal neurodegenerative disease. The initial upper motor neuron spastic paraparesis and general proprioceptive ataxia progress to a flaccid lower motor neuron tetraparesis. Recently, a missense mutation in the superoxide dismutase 1 gene was found to be a risk factor for DM suggesting that DM is homologous to human amyotrophic lateral sclerosis (ALS). Motor unit number estimation (MUNE) is an electrophysiologic technique for quantifying motor unit function and has proven useful in assessing disease progression in ALS patients. If the technique can reliably be established in normal dogs and applied to DM affected dogs, MUNE could be used as a biomarker for DM and an outcome measure for monitoring therapeutic trials. The objective of this study was to adapt the incremental method for MUNE in normal healthy dogs and establish a reference range.

A version of the McComas incremental stimulation technique was used to study MUNE in extensor digitorum brevis (EDB) muscles of nine neurologically normal dogs (age: 1–9 years; body weight 4.9–13.4 kg). Both pelvic limbs were evaluated. Monopolar stimulating needle electrodes were inserted caudal to the long digital extensor muscle tendon at the level of the tuber calcanei to stimulate the deep peroneal nerve. Direct evoked muscle potentials were recorded with the active surface electrode placed over the EDB motor point and the reference surface electrode over digit IV. The ground electrode was placed subcutaneously between cathode and recording electrode. Supramaximal compound muscle action potential (CMAP) negative peak area was first recorded. Then starting at the subthreshold level, stimulus intensity was slowly increased until the first all-or-none single motor unit potential (SMUP) was evoked. Successive small increments (0.026mA, 50µsec) were applied to elicit a total of 10 SMUP responses. The mean SMUP negative peak area was divided into the maximum CMAP negative peak area to yield the MUNE value. Multiple trials were performed on each limb to assess reproducibility.

EDB MUNE values were obtained from all dogs. The median CMAP area was 4.48 mV·mS (range 2.00–9.32) with 25 and 75 percentile of 3.67 and 5.37, respectively. The median SMUP area was 0.09 mV·mS (range 0.03–0.78) with a 25 and 75 percentile of 0.06 and 0.13, respectively. The MUNE median was 53.5 (range 8 – 154) with 25 and 75 percentile values of 30 and 71, respectively. There was no significant difference in MUNE between age groups older and younger than 7 years ($P=0.301$), between right and left limbs ($P=0.735$) or trials performed per limb ($P=0.677$).

We show that EDB MUNE using the incremental method can be reliably recorded from normal dogs. These results provide potential to apply the described technique for longitudinal monitoring of lower motor neuron signs in DM affected dogs.