

the World Federation of Neurology El Escorial Criteria⁸ which label PMA as “suspected ALS” to reconsider inclusion of such patients in therapeutic trials.^{1,6}

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REFLECTIONS ON MOTOR UNIT NUMBER ESTIMATION

I was delighted to see the AANEM Technology Review on motor unit number estimation (MUNE).¹ Having first described MUNE (or “motor unit counting”),² I would like to express a few points:

1. It is important to know the number of studies contributing to the pooled data in Table 1. Also, there is no mention of the results for the vastus medialis,³ while the hypothenar values obtained with the statistical method are surely too low. This discrepancy, the conflicting results for the biceps, and anatomical estimates may have been commented upon.
2. There is no mention in the text of the automated incremental stimulation method, devised by my colleague, Hubert deBruin, and his graduate student, Richard Cavasin.³ Once the maximum compound muscle action potential (CMAP) had been determined (for ease, by hand), the software program took over stimulation and analysis, determining MUNE by both amplitude and area; a subprogram corrected for any alternation. This program was available previously on the Advantage electromyography (EMG) machine, but disappeared with the latter’s demise; it is unfortunate that it has not been resurrected elsewhere.

3. On page 885 the last paragraph states, in relation to the issue of alternation with the incremental stimulation method, that “...Soon after it was developed, investigators recognized...” In fact, the problem was clearly pointed out, and the term “alternation” introduced, in the original 1971 article describing motor unit estimation.²
4. In Table 2 the values for “mixed” muscles have limited significance, given the different sizes of the motor unit populations from 1 muscle to another.
5. In the Summary and Conclusions it is stated that “...MUNE is not as useful as traditional EMG and NCS in clinical management, principally because the wide range of MUNE values in the healthy population...” It is certainly true that the normal estimates vary considerably; moreover, the division step in the estimation makes for a skewed distribution of results, so that the use of 2 SD to indicate the lower range is inappropriate. Instead, our laboratory took the smallest value in the control population as the limit of normality and, for 40 years, employed MUNE in the diagnostic EMG laboratory and in various research projects. The method was found to be extremely useful, often providing the only evidence for muscle denervation and proving more sensitive than needle examination.⁴ As for NCS, it is well known that, through collateral innervation, surviving motor nerve fibers can compensate for up to 80% denervation and maintain the CMAP amplitude.⁵ Some of the results obtained in the diagnostic EMG laboratory with automated incremental MUNE have been reported elsewhere.⁶

These comments should not detract from an excellent and useful review of MUNE methodology, and those who have helped to develop the field should be congratulated. Incidentally, although I only became aware of this recently,⁷ as long ago as 1909 Keith Lucas reported the use of incremental stimulation and force recordings to determine the number of motor units in a cutaneous muscle in the frog. There were 4.⁸

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