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Strength-duration time constant and rheobase measurements: comparison of the threshold tracking method and a non-automated procedure

12/ Nerve and muscle excitability

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Objectives

Compare the strength-duration time constant (SDTC) and rheobase measurements obtained by the threshold tracking method (TT) and by a non-automated method (NA).

Content

Methods

NA consists in measuring with a routine electrodiagnostic device, for four stimuli duration (1.0, 0.7, 0.5, 0.2 ms), the intensity necessary to evoke a motor response whose amplitude corresponds to 40% of the maximum amplitude, then in studying the linear relation between stimulus charge and stimulus duration (slope = rheobase, intercept on the x-axis = SDTC). Using TT (regular TROND protocol) and NA, 20 successive healthy subjects (mean age = 38 y.o.) underwent a prospective evaluation of SDTC and rheobase of the median nerve motor axons at the wrist. Nerve stimulation (cathode-anode) and bipolar recording of evoked motor responses are performed with disposable self-adhesive surface electrodes. These are positioned only once for both techniques. The skin temperature is between 31 and 33°C and the impedance under the stimulation electrodes less than 3 kΩ on average.

Results

Median values obtained by TT and NA are respectively 0.430 ms and 0.420 ms for SDTC and 3.11 mA and 3.02 mA for the rheobase. The Spearman correlations between the two methods are 0.81 ($p < 0.0001$) for SDTC and 0.94 ($p < 0.0001$) for

the rheobase. The Bland-Altman analysis does not reveal any systematic bias of NA compared to TT.

Conclusion

Methodologically, the two methods are equivalent. The advantage of NA is that it can be performed on a routine electrodiagnostic device and without any particular software program.

Key words

Rheobase

Chronaxia

Threshold tracking