

Title : QUANTITATIVE COMPARISON OF EVOKED ELECTROMYOGRAPHIC AND MECHANICAL RESPONSES OF THE ADDUCTOR POLLICIS MUSCLE DURING A REGIONAL NEUROMUSCULAR BLOCKADE TECHNIQUE WITH VECURONIUM.

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Introduction. The regional curare test (RCT) has been used in the diagnosis of neuromuscular diseases (1) or for studying neuromuscular blocking agents (2). The effect of vecuronium (V) on electromyography (EMG) and mechanomyography (MMG) have not been reported with this technique. The aim of the present study was the validation of a regional neuromuscular blockade method with V for comparing evoked EMG and MMG responses of the adductor pollicis muscle (AP), in healthy volunteers.

Materials and methods. Seven volunteers gave their informed consent to participate in the study. The ulnar nerve was stimulated at the wrist, using surface electrodes, with trains of four (TOF) supramaximal pulses of 0.1 ms duration and a frequency of 2 Hz. The MMG and EMG responses of the AP were simultaneously recorded. The EMG response was recorded via surface electrodes positioned over the thenar eminence and the first dorsal interspace of the hand. The MMG response was measured using a MEDAR APM force transducer. The preload tension was 300 g. The regional neuromuscular block was obtained with the technique used for intra-venous regional anaesthesia. The injected volume of standard concentration of V solution was tailored to the forearm size of each volunteer by displacement of water up to a line drawn horizontally through the humeral epicondyles (2). This volume was held constant in each patient for the four concentrations of V tested : 2, 4, 6 and 8 mcg/ml. The injection was made via a short catheter inserted in a dorsal vein of the hand. The arm was raised vertically for one minute. Then the cuff was inflated at a pressure 100 mmHg over the systolic arterial pressure previously measured. The solution was injected over 30 seconds after the arm was laid down. The cuff was maintained for 6 minutes. Recordings were made before injection (T0) and at 1, 4, 7, 9, 11, 16, 21, 26, 31 and 36 minutes after the end of injection. At least 15 minutes elapsed between the recuperation of a normal neuromuscular function and the next injection. The amplitude of the MMG responses and the amplitude of the EMG responses were compared using the following parameters : 1) the ratio (T1/T0) of the first response of each train of four (T1) to the first response of the control value (T0). For the evaluation of the EMG response the amplitude of the negative deflection was used, 2) the TOF ratio (T4/T1). EMG values were automatically measured via a microcomputer Apple II connected with the EMG system (Medelec MS92A). MMG values were manually measured on a hard copy. For statistical comparisons the paired Student's test was used.

Results. With the four concentrations tested all volunteers developed a block of the neuromuscular transmission. For T1/T0 ratio a significant correlation was found between EMG and MMG (figure 1). For T4/T1 ratio significant statistical differences were observed during the maximal blockade period between EMG and MMG, at any concentrations (figure 2).

Discussion. The RCT provides a method of evaluation of myorelaxants in healthy volunteers without general

anesthesia. The discrepancies observed between EMG and MMG are a matter of controversy. Evoked EMG and MMG responses to indirect muscle stimulation generally trend to the same direction, but they do not give identical information. EMG measures only electrical phenomena. MMG gives further information about muscle fatigue and inertia. In clinical practice, EMG vs MMG information must be carefully compared.

References.

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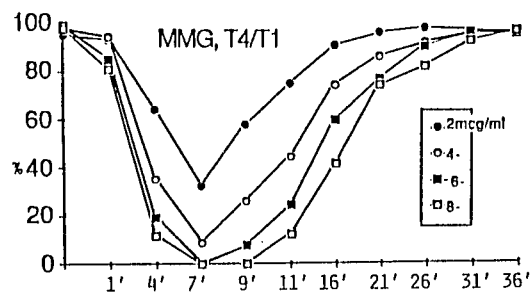
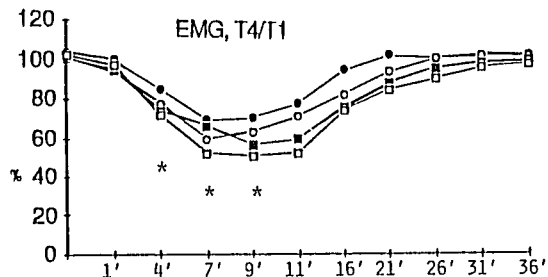
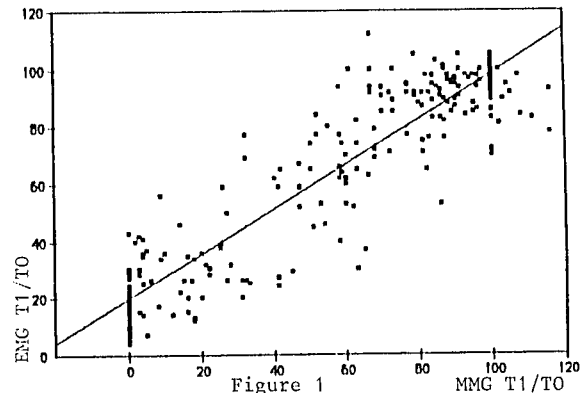


Figure 2
mean values, n = 7, * p < 0.05 for any concentrations