NEUROMUSCULAR EFFECTS OF SUCCINYLCHOLINE ON THE VOCAL CORDS AND ADDUCTOR POLLICIS MUSCLE

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Succinylcholine is used almost exclusively to facilitate tracheal intubation. Its effects can be assessed by monitoring adductor pollicis contraction following ulnar nerve stimulation, but this response may be different in other muscles. This study was designed to compare the effect of succinylcholine on the adductor pollicis and vocal cord muscles.

METHODS : The protocol was approved by the Hospital Ethics Committee. Eight ASA I and II women, 20-65 yr old, were studied after giving informed consent. Anesthesia was induced with fentanyl, 2-5 ug/kg and propofol, 2-4 mg/kg. Tracheal intubation was performed without neuromuscular blocking drugs, and the inflatable cuff of the tube was positioned between the vocal cords under direct vision. The pressure inside the cuff was measured with an air-filled transducer. Mechanical ventilation was instituted, and end-tidal CO2 was maintained within normal limits. Anesthesia was maintained with a continuous infusion of propofol, without the use of nitrous oxide or volatile agents. Bilateral adduction of the vocal cords was produced by supramaximal stimulation of the recurrent laryngeal nerve over the thyroid cartilage notch every 10 seconds. The ulnar nerve was also stimulated at the wrist and the force of contraction of the adductor pollicis muscle was measured. Succinylcholine, 0.5 mg/kg, was given. The height of the first twitch (T1) of the train-of-four response was measured.

RESULTS : Succinylcholine produced maximum blockade more rapidly on the vocal cords (0.9 min) than on the adductor pollicis (1.7 min). Intensity of blockade was not statistically different. Times to 50 % and 90 % recovery were similar at both muscles (Table).

DISCUSSION : A dose of 0.5 mg/kg was chosen because onset times and intensity of blockade are defined more easily with subparalyzing doses. The study showed that succinylcholine produces vocal cord relaxation more rapidly than adductor pollicis blockade, suggesting that tracheal intubation may be possible before maximum adductor pollicis blockade is observed.

TABLE (mean ± SEM)

Variable	Vocal cords	Add. poll.	P
Max. Block (%)	92 ± 2	85 ± 6	NS
Onset (min)	0.9 ± 0.1	1.7 ± 0.2	0.001
Rec. 50 % (min)	3.0 ± 0.4	3.9 ± 0.7	NS
Rec. 90 % (min)	4.5 ± 0.6	5.4 ± 0.9	NS

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EFFECTS OF THE CONCENTRATION OF ISOFLURANE ON THE RECOVERY OF PIPECURONIUM NEUROMUSCULAR BLOCKADE FOLLOWING NEOSTIGMINE ADMINISTRATION

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Isoflurane produces a dose-dependent potentiation of neuromuscular blockade (NMB) (1). However, few data exist on its influence on neostigmine-assisted recovery. The aim of the study was to compare the rate of recovery from pipecuronium NMB at different end-tidal concentrations of isoflurane, after administration of neostigmine.

METHODS : The protocol was approved by our ethical committee. Informed consent was obtained from 40 patients (ASA I or II), aged 20-50 years with no disease known to alter neuromuscular transmission. Anesthesia was induced with thiopental (4-5 mg/kg) and fentanyl (2-3 ug/kg). Supramaximal train-of-four stimulation (TOF) was applied to the ulnar nerve at the wrist every 20 seconds and the mechanical response of the adductor pollicis was monitored. Pipecuronium (0.07 mg/kg) was injected IV. After tracheal intubation, controlled ventilation was used to maintain end-tidal CO2 in a normal range. Anesthesia was maintained with nitrous oxide, fentanyl. Patients were randomly devided into 4 groups of ten ; group A : isoflurane 0 %, group B : isoflurane 0.5 %, group C : isoflurane 1 %, group D : isoflurane 1 % which was switched off at the time of injection of neostigmine. In all the patients neostigmine (40 ug/kg) and atropine (10 ug/kg) was administered when first twitch height (TH) reached 25 % of the control value. Then TOF ratio was recorded during 20 minutes. ANOVA and Newman-Keuls test were used for statistical analysis. Results are expressed as mean ± SD.

RESULTS : Time from injection of pipecuronium until 25 % TH recovery was significantly shorter in group A (47 ± 8 min, $p<0.01$) than in group B (72 ± 13 min), group C (87 ± 33 min) and group D (91 ± 30 min). It was also significantly shorter in group B ($p<0.05$) compared with group C and group D. Following neostigmine, TOF ratio did not differ significantly between the four groups. Twenty minutes after neostigmine TOF reached a value of 0.77 ± 0.15 in group A, 0.72 ± 0.09 in group B, 0.64 ± 0.15 in group C, 0.71 ± 0.10 in group D.

DISCUSSION : Isoflurane produced a significant, dose-related prolongation of pipecuronium blockade. However, when given at 25 % TH recovery, isoflurane had no effect on the rate of neostigmine-assisted recovery. Discontinuing isoflurane at the time of neostigmine administration as commonly happens in clinical practice, did not improve recovery.

REFERENCES :

1. Anesthesiology 60 : 102-105, 1984.