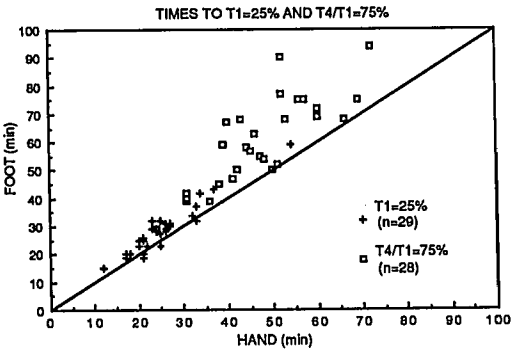
TITLE: EFFECTS OF VECURONIUM ON THE FLEXOR HALLUCIS BREVIS COMPARED WITH THE ADDUCTOR POLLICIS IN ANESTHETIZED CHILDREN

AUTHORS: B.W. Brandom, M.D., E. Georgiu, M.D., D.R. Cook, M.D.
AFFILIATION: Anes. Dept., Children's Hospital of Pittsburgh, University of Pittsburgh, Pittsburgh, PA 15213

Introduction: Monitoring of neuromuscular blockade is often performed with ulnar nerve stimulation and observation of adductor pollicis (AP) response. The flexor hallucis brevis (FH) is an alternative site which may be clinically useful in children. This study was undertaken to compare the effects of vecuronium (VEC) on the evoked electromyogram at AP and FH in anesthetized children.
Methods: Thirty-one healthy children between the ages of 2 and 10 years having elective surgical procedures during halothane (H) anesthesia were studied. The study was approved by the appropriate Institutional Review Board. After inhalation induction of halothane anesthesia an intravenous catheter was placed. Atropine 5-10 µg/kg was administered iv and inspired H concentration was decreased to 1%. After cleaning the skin with alcohol, 5 surface electrodes were placed over both the wrist and palmar aspect of the hand and over the ankle and medial aspect of the sole of the foot to record AP and FH responses, respectively. The nerves were stimulated with supramaximal trains-of-four stimuli (2 Hz for 2 sec at 10 sec intervals). The electromyograms were recorded with two Datex NMT monitors. All patients received 75 µg/kg VEC. During spontaneous recovery of function, end-tidal H was kept at 0.8%. Times to 50, 90, and 100% depression of neuromuscular function, and to 10, 25, and 75% recovery of initial twitch height (T1) (compared to the final baseline), and to the recovery of the train-of-four to 75% (T4/T1 $\geq$ .75) were noted. The data were analyzed by paired t-test with Bonferonni correction. Results are presented as mean ± standard deviation.
Results: Onset of 50% depression of T1 occurred 20 seconds sooner in AP than in FH ($p<0.001$), but there was no statistically significant difference in time to 90% or 100% blockade at the two sites. Time to 90% blockade was 1.6 ± 0.7 min in AP and 1.9 ± 0.8 min in FH. Spontaneous recovery was slower in FH at each point examined ($p<0.001$) (Fig. 1). Recovery index T25-75 was 10.4 ± 4.7 min in AP and 12.8 ± 4.5 min in FH ($p<0.005$).
Discussion: The little difference between AP and FH in onset of blockade at this dose of VEC is consistent with a prior study in adults.[1] However, the statistically significant delay in recovery of FH relative to AP differs from previous results [1] and demonstrates that VEC effect is not identical at these 2 sites. This may be of clinical significance when precise monitoring is required.
Reference: 1. Anesthesiology 69:129-131, 1988



A1113

TITLE: DIFFERENTIAL RATE OF RECOVERY OF NEUROMUSCULAR FUNCTION IN THE ADDUCTOR POLLICIS AND THE FLEXOR HALLUCIS AFTER VECURONIUM

AUTHORS: B.W. Brandom, M.D., R.L. Stiller, Ph.D., D.R. Cook, M.D., A.M. Sclerka, M.S.
AFFILIATION: Anes. Dept., Children's Hospital of Pittsburgh, and the University of Pittsburgh, Pittsburgh, PA 15213

Introduction: Previous studies reached differing conclusions as to the similarity of function of the adductor pollicis (AP) and the flexor hallucis brevis (FH) following administration of a neuromuscular blocker.[1,2] Therefore, we performed this study with temperature monitoring and standardized anesthetic exposure to examine the rate of recovery (RR) of the initial response (T1) and the final response (T4/T1) to a train-of-four stimuli at AP and FH.
Methods: Five healthy children between 2 and 9 years of age having elective surgical procedures and general anesthesia were studied. The study was approved by the appropriate Institutional Review Board. After inhalation induction of halothane/nitrous oxide anesthesia, an intravenous catheter was placed. Atropine 5-10 µg/kg was administered iv. Inspired halothane concentration was decreased to 1%. After cleaning the skin with alcohol, 5 surface electrodes were placed over both the wrist and palmar aspect of the hand and over the ankle and medial aspect of the sole of the foot to record the function of AP and FH, respectively. A YSI-421 skin temperature probe was secured between the active and reference electrodes at both sites. The ulnar and posterior tibial nerves were stimulated with supramaximal TOF stimuli (2 Hz for 2 sec at 10 sec intervals). The evoked compound electromyograms were recorded with two Datex NMT monitors. All patients received 75 µg/kg of vecuronium (VEC). During recovery of function, end-tidal halothane was kept at 0.8%. Times to 10, 25, 50, 75, and 90% recovery of T1 and T4/T1 were noted. In all cases neuromuscular function at the end of the study was $\geq$ 80% of initial baseline and there was less than 1°C difference between AP and FH during recovery. Linear regression of percent recovery versus time was performed. Data were then analyzed by paired t-test. Results are presented as mean ± standard deviation. Statistical significance was accepted at $p<0.05$.
Results: The RR of T1 and T4/T1 was linear from 10 to 90% ($R=0.99$). The RR of T1 and T4/T1 were significantly slower in FH than in AP. T1 recovered more rapidly than T4/T1 at both sites. Assuming $t1/2\beta$ equal to 40 minutes[3], the exponent of the Hill equation [s] was calculated for each site.[4]

	Percent recovery per minute ($\bar{x}$ ± SD) and [s]			
	T1	[s]	T4/T1	[s]
AP	5.8 ± 1.1	[13]	3.7 ± 0.9	[8]
FH	3.6 ± 0.8	[9]	2.6 ± 1.1	[5]

Discussion: The RR from a bolus of VEC is different at different sites. In contrast to a previous study of pancuronium[5], T4/T1 recovered more slowly than T1. In the case of VEC[1], and atracurium[2], the differences in RR are small. One explanation for these significant differences in drug effect could be a site dependent (AP vs FH and T1 vs T4/T1) difference in s.
References:
1. Anesthesiology 69:129-131, 1988
2. Anesth Analg 70:S408, 1990
3. Clin Pharm Ther 37:402-406, 1985
4. Br J Anaesth 64:28-32, 1990
5. Anesthesiology 65:579-583, 1986