

Title: Dose-Response Relationships of Succinylcholine at the Masseter and Adductor Pollicis Muscle in Humans.

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**Introduction:** Neuromuscular blocking agents are often employed in anesthesia to facilitate tracheal intubation. Paralysis of the masseter muscle, which acts to close the jaw, may play an important role in determining ease of intubation. However, the sensitivity of this muscle to neuro-muscular blocking agents is unknown. This study was designed to determine the effect of succinylcholine at the masseter and adductor pollicis muscles.

**Methods:** Ten adult patients scheduled for elective surgeries were studied. Institutional approval and informed consent were obtained. Anesthesia was induced with thiopental 3-5 mg/kg and fentanyl 1-2 ug/kg, and maintained with N2O 66% in O2 and enflurane (1-2% end-tidal). Tracheal intubation was performed without blocking agents, and enflurane was discontinued and ventilation controlled to maintain end-tidal CO2 30-35 mmHg. Supramaximal train-of-four (TOF) stimulation was applied to the ulnar nerve at the elbow, and to the mandibular branch of the trigeminal nerve inferior to the zygomatic arch, anterior to the mandibular condyle. Masseter contraction was measured by a force transducer system attached to both an oral airway and a metal frame fixed to the operating table 10 cm caudad to the chin. After stabilization of adductor pollicis and masseter muscle twitch, cumulative doses of succinylcholine were administered (initial dose = 0.1 mg/kg, incremental dose = 0.05-0.1 mg/kg). Incremental doses were given only after the effect of the previous dose had stabilized, defined as 2 equal consecutive TOF responses. To compensate for drug lost by redistribution or metabolism, an infusion was started once the maximal effect from the previous dose had been obtained. Linear regressions were obtained between the logit transformation of neuromuscular blockade and log dose. A regression line was calculated for each patient from which a mean dose-response curve was constructed. Effective doses (ED) for 50% and 90% block were derived from the curves and compared between muscles using paired Students' test. Results are expressed as mean values  $\pm$  SEM. A p value < 0.05 was considered significant.

**Results:** After the initial dose, maximum blockade occurred earlier at the masseter than the adductor pollicis muscle ( $1.0 \pm 0.06$  vs  $1.2 \pm 0.05$  min,  $p < 0.05$ ). All measurements were completed within 3-5 min. Control tensions were  $398 \pm 59$  g and  $580 \pm 104$  g at the masseter and adductor pollicis muscles respectively. There was no significant difference in the sensitivity of the two muscles to succinylcholine (Table). In 6 patients out of 10, there was a shift of the masseter baseline tension. Mean shift was 80 g with a range of 25-188 g. This shift was not present at the adductor pollicis. The end-tidal enflurane concentration was < 0.25% in all cases.

Table

	ED50 and ED90 (mg/kg $\pm$ SEM)	
	Adductor Pollicis	Masseter
ED50	$0.11 \pm 0.01$	$0.11 \pm 0.01$
ED90	$0.16 \pm 0.01$	$0.17 \pm 0.02$

**Discussion:** The present study demonstrated that the potency of succinylcholine at the masseter and adductor pollicis muscles was similar. There was a faster onset of blockade at the masseter muscle, probably because of its proximity to the central circulation. The baseline shift may represent a sub-clinical manifestation of masseter spasm. This phenomenon has been observed in children (1). The data suggest that clinically used doses of succinylcholine (1.0-1.5 mg/kg) are equivalent to 6-9 times the ED90. Succinylcholine-induced increases in baseline tension are usually small and easily overcome by the laryngoscopist.

#### References:

1. Van Der Speck AFL, Fang WB, Ashton-Miller JA, Stohler CS, Carlson DS, Schork MA. The effects of succinylcholine on mouth opening. *Anesthesiology* 67: 459-465, 1987.