

Title : PANCURONIUM REDUCES HALOTHANE REQUIREMENT IN MAN

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Introduction. Since the introduction of muscle relaxants to anesthetic practice, controversy has existed over whether or not they possess anesthetic properties. The clinical impression that muscle relaxants decrease anesthetic requirement is countered by the charge that an inability to move in response to a stimulus masks inadequate anesthesia. To resolve this question we have determined whether pancuronium reduces halothane MAC in man.

Methods. We studied 35 male 24 to 62 year old patients presenting for elective surgery. The study was approved by the Human Experimentation Committee of the University of California and each patient gave his consent as a participant. Eighteen patients served as controls, and 17 received pancuronium. No premedication was given. Anesthesia was induced with up to 4 percent halothane in oxygen by mask. The trachea was intubated and ventilation controlled thereafter. Neuromuscular function was tested by ability to maintain compression of 10 ml air in a syringe in response to supramaximal tetanic stimulation of the median nerve. Pneumatic tourniquets were then inflated on one or both legs to 300 torr and one arm to 200 torr. In the pancuronium group only, 0.1 mg/kg of pancuronium was administered intravenously via the other arm. In both groups, end-tidal halothane concentration, measured by infrared analysis, was held at a predetermined level for at least 15 minutes before surgical incision. A positive response to surgical incision was recognized in both groups as a limb movement initiated distal to the tourniquets. MAC was determined by testing at alveolar concentrations which spanned movement and non-movement levels.¹ For patients below 30 years or above 55, an age correction was applied to the halothane concentration according to the data of Gregory et al.² After incision, response to tetanic stimulation of the median nerve was repeated and confirmed in all subjects. MAC for each group was determined by the quantal analysis technique of Waud and comparison made by unpaired t-test.³

Results. The groups were comparable in age, with a mean of 39 ± 3.1 years in the control group and 46 ± 3.4 years in the pancuronium group. The tourniquets were inflated for 23.4 ± 3.7 min in the control group, and 23.5 ± 2.7 min in the pancuronium group. MAC in the control group was $0.73 \pm .04$ percent halothane, whereas that of the pancuronium group was

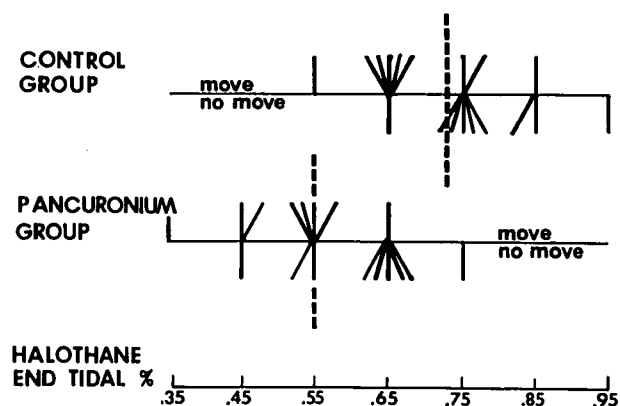
$0.55 \pm .04$ percent (Figure 1), a statistically significant reduction of 25 percent ($p < 0.01$).

Discussion. Our control MAC of 0.73 percent agrees with the 0.74 percent value reported by Saidman et al.¹ A well sustained tetanus after incision in the pancuronium group suggests that pancuronium did not interfere with neuromuscular transmission in the isolated limbs. Muscle relaxants may reduce anesthetic requirement through an action on synaptic transmission in the CNS. Alternatively relaxants may cause cortical deafferentiation by abolishing muscle spindle input to the reticular activating system.

Thus, muscle relaxation with pancuronium should be viewed as an adjunct to general anesthesia, which not only provides paralysis but also decreases anesthetic requirement. However, our findings do not imply that a patient paralyzed is a patient anesthetized. Muscle relaxation alone is no substitute for adequate anesthesia.

References

1. Saidman LJ, Eger EI: Effect of nitrous oxide and of narcotic premedication on the alveolar concentration of halothane required for anesthesia. *Anesthesiology* 25:302, 1964.
2. Gregory GA, Eger EI, Munson ES: The relationship between age and halothane requirement in man. *Anesthesiology* 30:488-491, 1969.
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Dotted line represents MAC in each group