Title: SYSTEMIC VASCULAR RESPONSES TO ATRACURIUM DURING ENFLURANE-NITROUS OXIDE ANESTHESIA IN HEALTHY PATIENTS

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Introduction. Atracurium is a nondepolarizing neuromuscular relaxing drug with minimal cardiovascular hemodynamic changes.[1] This lack of change of systemic vascular responses to atracurium has mainly been studied in animals and in the presence of background anesthesia (nitrous oxide, intravenous drugs) which produces minimal alterations in baseline cardiovascular hemodynamic variables. Data obtained from patients during background anesthesia (nitrous oxide, potent inhalation anesthetic drugs) that significantly alters baseline hemodynamic variables is needed to confirm the safety or hazard of atracurium. Therefore, we studied the systemic vascular effects of atracurium in 15 healthy, adult patients during enflurane, nitrous oxide anesthesia.

Methods. Fifteen healthy, adult patients were studied. All patients gave their informed consent to participate in this study and the study protocol was approved by appropriate institutional review committees. Preanesthetic medication was with intramuscular morphine (10-15mg) and glycopyrrolate (0.2mg). Induction of anesthesia was with thiopental (4-6mg/kg) immediately followed by the inhalation of nitrous oxide (70% inspired) and enflurane (1.0 to 1.25% inspired). Endotracheal intubation was accomplished without muscle relaxants. Radial arterial cannulae were inserted for measurement of arterial blood pressure. A central venous catheter was inserted through the right internal jugular vein for recording mean right atrial pressure (RAP) and for injecting indocyanine dye for determination of cardiac output (CO) by the dye-dilution technique. Heart rate (HR) was calculated from the electrocardiogram. Control measurements were obtained after patients breathed enflurane and nitrous oxide for 30 minutes and achieved a stable heart rate and systemic arterial pressure. Following control measurements, 7 patients received atracurium (0.2mg/kg) and 8 patients received atracurium (0.4mg/kg) as an intravenous bolus injection. All measurements were repeated at 2, 5, and 10 minutes following atracurium administration. Ventilation was controlled during the entire study period.

Results. Data are summarized in Table 1. Compared with control measurements, the administration of atracurium (0.2 or 0.4mg/kg) resulted in no significant change in heart rate, cardiac index, mean right atrial pressure, and systemic mean arterial pressure (MAP). Systemic vascular resistance (SVR) was minimally decreased at 10 minutes compared to control measurements following both doses of atracurium. However, no significant difference existed between these two SVR values. Furthermore, no patient demonstrated a decrease in systemic mean arterial pressure greater than 6 torr.

Discussion. The effect of atracurium on the systemic circulation in man has not been extensively studied. During halothane and oxygen anesthesia Payne and Hughes[1] observed insignificant changes in HR and MAP following atracurium (0.2 to 0.6mg/kg) administration to 9 patients. Our study of 15 healthy adult patients determined the systemic circulatory responses to doses of atracurium previously determined to produce adequate skeletal muscle relaxation (ED_{95} equals 0.2mg/kg) and adequate intubating conditions (0.4mg/kg). At these doses, atracurium produced no clinically significant alteration in either measured or calculated hemodynamic variables. These results are similar to those determined during metocurine administration during halothane anesthesia.[2] However, metocurine (0.4mg/kg) produced decreases in MAP greater than 20 torr in 4 of 10 patients, respectively. In our study no patient demonstrated a decrease in MAP greater than 6 torr following doses of atracurium producing similar degrees of skeletal muscle relaxation. In this regard, atracurium is less likely to produce undesirable systemic circulatory changes compared to metocurine. This stable circulatory hemodynamic pattern of atracurium may provide a desirable choice for patients with severe systemic illness or limited cardiac reserve.

References.

1. Payne JP, Hughes R: Evaluation of atracurium in anaesthetized man. Br J Anaesth 53:45-54, 1981

2. Stoelting RK: Hemodynamic effects of dimethyltubocurarine during nitrous oxide-halothane anesthesia. Anesth Analg 53:513-515, 1974

Hemodynamic Changes (% change from control)

Time (min)	2		5		10	
Dose (mg/kg)	0.2	0.4	0.2	0.4	0.2	0.4
HR	2	2	2	2	-1	-.4
MAP	-1	-1	2	-.5	2	-1
CI	-2	5	.4	4	4	3
CVP	-7	3	-7	0	-7	3
SVR	2	5	-1	.5	-7*	-7*

*Significant ($0.01 < p < 0.05$) difference from control