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Title : CARDIOVASCULAR EFFECTS OF PANCURONIUM AND DIMETHYL TUBOCURARINE IN PATIENTS ON PROPRANOLOL

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Introduction. Pancuronium is the most frequently used muscle relaxant in the anesthetic management of coronary artery bypass surgery. Tachycardia and hypertension following administration of large doses of pancuronium is well shown. Minimal cardiovascular changes have been reported with the use of dimethyl tubocurarine during enflurane, halothane and narcotic anesthesia. The aim of this study is to evaluate the hemodynamic effects of pancuronium and dimethyl tubocurarine in patients who are on propranolol (20-80 mg every 6 hrs.) with coronary artery disease during high dose fentanyl-oxygen anesthesia.

Methods. Fifteen patients who underwent elective coronary artery bypass surgery were studied after obtaining written consent. Seven in group 1 with pancuronium and eight in group 2 with dimethyl tubocurarine (DMTC). Patients with normal or mild left ventricular dysfunction, only, were studied. All of these patients were on propranolol 20-80 mg every six hours until the night before surgery. The patients were premedicated with morphine 0.1 mg/kg. The patients were monitored with an arterial line, a pulmonary artery catheter, an EKG, temperature monitor. Anesthesia was induced with fentanyl citrate 200-400 µg/min. The patients who developed chest rigidity were excluded from the study. When the patients were no longer responsive to verbal stimuli (600-900 µg fentanyl) and hemodynamically stable, they were given either pancuronium 0.12 mg/kg or dimethyl tubocurarine 0.4 mg/kg over a period of 3 minutes. During this period, patients were given 100% oxygen. Arterial blood gases were drawn at 5' and 10' intervals to ensure adequate oxygenation and normal $PaCO_2$. Heart rate (HR), systolic, diastolic, mean arterial pressure (MAP), mean right atrial pressure ($\overline{RAP}$), mean pulmonary arterial pressure ($\overline{PAP}$), pulmonary capillary wedge pressure (PCWP), cardiac outputs were recorded as control before giving muscle relaxants and 2½', 5', 7½' and 10' intervals after giving muscle relaxants. Cardiac index (CI), rate pressure product (RPP) and other hemodynamic indices were calculated from above data. The above data were analyzed statistically by using non paired t test.

Results. The results showed a significant statistical difference between pancuronium and DMTC groups for HR and rate pressure product ($p<0.025$ and 0.01). The MAP was statistically different at 2½' and 7½' intervals between both groups. Even though the decrease in MAP with DMTC was significant ($p<0.05$), the CI remained unchanged from control. There was no change in $\overline{PAP}$, PCWP, $\overline{RAP}$. The CI increased with pancuronium at 7½' and 10' intervals.

Discussion. Muscle relaxants are a necessary part of the anesthetic management in coronary artery bypass surgery. The increase in HR and RPP with pancuronium places undue oxygen demand on the heart. Even the patients who are on propranolol are highly responsive to sympathetic and vagolytic effects of pancuronium. DMTC caused less change in HR and RPP and even decreased both, with little change in CI, which is beneficial to the heart. The increase in CI by pancuronium resulted at the expense of increased myocardial oxygen consumption. In patients with coronary artery disease, there are times, when even small increases in myocardial oxygen consumption is not tolerated well, in spite of an increase in cardiac index. Based upon these results, DMTC may be preferable to pancuronium in the anesthetic management of coronary bypass surgery.

	Group	Control[a]	AVERAGE CHANGE FROM CONTROL 2½'	5'	7½'	10'
HR	1	63±1.6	14.6*	21.1#	24.3#	26.1#
beats/min	2	67±4.3	2.8	-2.3	-1.1	-1.5
MAP	1	83±3.1	3.3@	2.7	6 @	2.7
(torr)	2	105±6.7	-11.4	-15.1	-13.7	-15.6
RPP	1	8451±534	1589@	2493*	3199*	3055*
	2	10504±937	-1273	-2200	-1715	-1865
$\overline{RAP}$	1	9±1.6	0.86	0.71	0.71	-0.42
(torr)	2	8.3±1.8	0.88	1.0	1.75	1.3
PCWP	1	14.1±1.2	1.42	2.85	3.57	-0.4
(torr)	2	13.8±2.4	0.5	0.37	0.88	0
$\overline{PAP}$	1	17.4±1.6	1.71	3.28	2.57	3.71
(torr)	2	18.6±2.7	0.88	1.0	0.25	1.0
CI	1	2.09±0.2	0.31	0.41	0.76#	0.49#
$L/min/M^2$	2	2.46±0.1	-0.03	0.08	0.02	-0.08

#$p<0.01$, *$p<0.025$, @$p<0.05$, [a]Mean ± Standard Error

RPP = HR x Systolic Blood Pressure