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 Title : HEMODYNAMIC IMPACT OF INDUCTION IN PATIENTS WITH DECREASED CARDIAC RESERVE
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INTRODUCTION. The hemodynamic impact of anesthetic induction may pose a significant hazard to patients with decreased cardiovascular reserve. In order to minimize the hemodynamic changes during induction, various agents have been proposed. In healthy patients, we previously demonstrated, by use of M-mode echocardiography, a depression of pump and cardiac muscle function following thiopental or etomidate induction.¹ Using a similar protocol, (with invasive monitoring) the present study was undertaken to assess both the qualitative and quantitative effects of these induction agents on ventricular performance in patients with significant cardiovascular disease.

METHODS. Twenty (20) patients (age=57±2yr [SEM]) undergoing elective coronary artery bypass surgery were evaluated. Written informed consent was obtained from each patient in accordance with a Human Investigation Committee approved protocol. All patients were categorized ASA Physical Status Class IV and allocated alternately to either the thiopental or etomidate group. Propranolol was continued until six hours prior to induction (mean dose =145mg + 26mg/24 hrs). Morphine sulphate (0.15 mg/kg) and scopolamine (0.4 mg) was administered intramuscularly 90 minutes prior to arrival in the operating room, where vascular catheterization (radial artery, pulmonary artery and venous) was performed. Measurements were then made during a hemodynamic steady state (control) and 1, 2, 3 minutes following intravenous administration of thiopental 4 mg/kg or etomidate 0.3 mg/kg. Each set of measurements made at end exhalation included: heart rate (HR), mean arterial blood pressure (BP), mean right atrial pressure (RAP), pulmonary artery pressure (PAP), mean pulmonary capillary wedge pressure (PCWP) and thermodilution cardiac output (CO). Derived data includes: cardiac index (CI), left ventricular stroke work index (LVSWI) and systemic vascular resistance (SVR) and pulmonary vascular resistance (PVR).

RESULTS. (Table) In patients receiving thiopental, the heart rate increased by 25%, 36% and 36% at 1, 2 and 3 minutes respectively (p <0.05) from control values. No significant change in BP was observed. Cardiac index increased by 23% during the first minute (p <0.05) and returned to control values at 2 and 3 minutes. At 3 min a 20% increase in PCWP was associated with a 27% decrease in LVSWI (p <.05).

In the etomidate group no significant alteration in HR was observed. At 1 minute the BP increased by 12% (p <.05), and then returned to control values. At 3 minutes, although LVSWI decreased by 26% (p <.05), other hemodynamic indi-

cies were maintained at control values.

DISCUSSION. Both induction agents exerted similar qualitative effects in patients with clinically significant cardiovascular disease. However, under similar experimental conditions it appears that thiopental quantitatively caused greater alterations in cardiovascular performance. Specifically, the increase in heart rate seen with pentothal may have major hemodynamic consequences for these patients. In animal experiments, Jugdutt, et al. reported an increase in an infarct size following thiopental administration.² This adverse effect appears to be secondary to an increase in myocardial oxygen demand due to thiopental induced tachycardia.

In contrast, the etomidate group demonstrated clinically insignificant changes in hemodynamic function. HR, CI, PCWP were well maintained. The reduction in LVSWI at 3 min was secondary to a decrease in afterload.

The results of the present study parallel those of our previous report (healthy patients). In both patient groups, thiopental was associated with an earlier and more profound change in left ventricular function. We conclude that the 36% increase in HR in conjunction with a significant reduction (27%) in LVSWI seen with thiopental may be deleterious to patients with ischemic heart disease.

References.

1. Firestone SF, et al.: Human research and non-invasive measurement of ventricular performance: An echocardiographic evaluation of etomidate and thiopental. *Anesthesiology* 51:S22, 1979.
2. Jugdutt BI, et al.: Increased infarct size by barbiturates administration after coronary occlusion in conscious dogs. *Circulation* 59-60:II216, 1979.

	Hemodynamic Data (Mean + S.E.M.)			
	Thiopental (n=10)		Etomidate (n=10)	
	Control	3min	Control	3min
HR (bpm)	53.1±2.5	72.2±3.7*	54.1±3.3	55.4±3.4
BP (mmHg)	95.0±3.3	92.8±4.9	88.8±3.4	79.6±3.9
RAP (mmHg)	9.7±1.4	9.2±1.0	10.5±1.3	12.0±1.4
PAP (mmHg)	19.6±1.3	22.1±1.9	21.4±1.2	22.2±1.2
PCWP (mmHg)	13.2±1.3	15.9±1.4	14.6±1.5	15.0±1.7
CI (L/m ²)	2.8±0.2	2.9±0.2	2.4±0.1	2.2±0.1
SVR (R.U.)	29.9±1.6	32.6±3.4	33.2±2.3	30.8±2.6
PVR (R.U.)	2.09±0.3	2.34±0.4	2.83±0.4	3.51±0.3
LVSWI (gm-m/M ² /beat)	61.1±4.3	44.8±3.4*	47.1±4.4	34.9±1.9*

* = p < 0 .05 from control value