

**TITLE:** ESMOLOL VS NITROPRUSSIDE FOR HYPOTENSION: DOSE RESPONSE DURING ISOFLURANE ANESTHESIA.

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**INTRODUCTION:** Esmolol and nitroprusside (SNP) are both used for controlled hypotension during isoflurane anesthesia. To better understand the interaction between isoflurane and both SNP and esmolol, we undertook the following study using an IRB-approved protocol.

**METHODS:** Subjects were 15 consenting adult males undergoing radical genitourinary cancer surgery. Cardiovascular, endocrine (catecholamine levels and plasma renin activity) and blood gas data were collected at the following times: 1) prior to anesthesia, 2) during infusion of either SNP (0.5, 1.0 or 2.0 ug/kg/min) or esmolol (75, 150 or 300 ug/kg/min) while isoflurane concentration was adjusted to maintain mean arterial pressure at 60 mm Hg. The hypotensive agent and its dosage sequence were chosen randomly. Data were analyzed using ANOVA and linear regression.  $P < .05$  was regarded as significant.

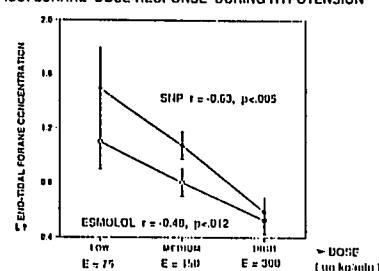
**RESULTS:** We observed a linear, dose-dependent reduction in isoflurane requirement

with increasing doses of both SNP and Esmolol (Figure). Comparing the 2 agents, SNP was associated with markedly greater HR and PRA during hypotension, although the mean values for these parameters did not change with increasing doses of hypotensive agent. No change in oxygenation or catecholamine values was noted at any time.

	Baseline		Hypotension	
	PRA	HR	PRA	HR
Esmolol	$0.6 \pm .1$	$72 \pm 4$	$1.1 \pm .3^*$	$68 \pm 3^*$
SNP	$0.8 \pm .2$	$72 \pm 3$	$3.1 \pm .8^*$	$91 \pm 3^*$

\* =  $P < .02$  vs SNP; + =  $P < .02$  vs baseline.

ISOFLURANE DOSE-RESPONSE DURING HYPOTENSION



**DISCUSSION:** During isoflurane anesthesia, esmolol appears to be more effective than SNP for controlled hypotension at the doses studied. This is due to esmolol's greater inhibition of baroreceptor and endocrine reflexes that oppose hypotension in man.

**EFFECT OF NITROGLYCERIN INFUSION ON EFFECTIVE PULMONARY CAPILLARY PRESSURE IN THE POST-OPERATIVE PERIOD OF MAJOR VASCULAR SURGERY.**

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Patients recovering from major aortic surgery often present signs of interstitial pulmonary edema even in the absence of major heart or respiratory disease (1). We took advantage of the cardiovascular monitoring of such patients by a Swan-Ganz catheter to measure the effects of a nitroglycerin infusion on effective pulmonary capillary pressure (EPCP). We estimated EPCP using a computerized analysis of the pressure time profile obtained during pulmonary arterial occlusion by the Swan-Ganz catheter balloon. This time pressure profile presents a fast-decaying segment reflecting the uncompliant arterial compartment emptying which is followed by a second slow-decaying segment before reaching the level of pulmonary capillary wedge pressure (PCWP). The second segment reflects the slow emptying of the compliant capillary compartment. An estimation of EPCP from the arterial occlusion pressure time profile was obtained from the backward extrapolation of the slow exponential-like segment to the time of complete occlusion. An apnea lasting 10 seconds was necessary to record a reliable pulmonary arterial pressure time profile. An average of 6 profiles was recorded before and after nitroglycerin infusion ( $0.25 \mu\text{g} / \text{kg} / \text{mn}$ ) and the EPCP

estimations were adjusted for a similar occlusion pressure. The capillary and venous to total resistance ratio (Rcv/Rt) was calculated as  $\text{EPCP} - \text{PCWP} / \text{PAPm} - \text{PCWP}$  (PAPm : mean pulmonary arterial pressure). Nitroglycerin induced a decrease in cardiac output ( $6.3 \pm 1.4$  to  $5.3 \pm 1.2 \text{ l/mn}$ ), a decrease in mean systemic arterial pressure ( $103 \pm 14$  to  $85 \pm 20 \text{ mmHg}$ ) and the following changes in lung hemodynamics:

n = 11	PAP	PCWP	PCPE	Rcv/Rt
control	14.9	4.8	9.2	0.44
$\pm \text{SD}$	6.2	3.4	4.4	0.09
nitroglycerin	10.8	2.6	6.7	0.51
$\pm \text{SD}$	4.9 *	3.3 *	4.0 *	0.08 *

(\* =  $p < 0.05$ )

In order to check if nitroglycerin induces a change in lung segmental vasomotion, nitroglycerin ( $0.08 \mu\text{g} / \text{kg} / \text{mn}$ ) was infused directly into the pulmonary circulation using the distal lumen of the Swan Ganz catheter in 7 patients : no changes in cardiac output, systemic arterial pressure and Rcv/Rt were observed.

In conclusion, nitroglycerin infusion into the systemic circulation of patients recovering from aortic surgery results in : (1) a decrease in the estimated EPCP; (2) an increase in Rcv/Rt with a decrease in cardiac output and systemic arterial pressure. We speculate that the decrease in cardiac output could increase capillary resistance through a partial derecruitment of the pulmonary capillary bed.

(1) - Ann. Surgery, 1989; 209 :231-236.