

Title: INTRAPULMONARY SHUNTING DURING DELIBERATE HYPOTENSION WITH NIFEDIPINE, DILTIAZEM AND LABETALOL.

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**Introduction.** The effect of vasodilators on intrapulmonary shunting during deliberate hypotension is conflicting. Labetalol, an  $\alpha$  and  $\beta$  blocker and nifedipine and diltiazem, calcium entry blockers, are used increasingly to reduce blood pressure.

**Methods.** Pulmonary shunting ( $Q_s/Q_t$ ) was calculated in 42 mongrel dogs weighing 18-20 kilograms while mechanically ventilated during deliberate hypotension with nifedipine (group A), diltiazem (group B), and labetalol (group C). A 30% decrease in mean arterial blood pressure occurred after 2 minutes of nifedipine infusion, 3½ minutes after diltiazem, and 5 minutes after labetalol which lasted for 2 hours.

**Results.** Intrapulmonary shunting and cardiac output increased significantly starting two minutes after nifedipine infusion. This increase persisted for at least 2 hours. Shunt increased from  $9.7 \pm .8$  to  $18.25 \pm 1.05\%$  at two minutes ( $p < .005$ );  $19.05 \pm 1.2\%$  at 30 minutes ( $p < .005$ );  $17.5 \pm 1.6\%$  at 2 hours ( $p < .01$ ); and  $12 \pm 1.1\%$  at 3 hours ( $p < .025$ ). Arterial oxygen tension decreased significantly from  $146 \pm 11.5$  to  $105 \pm 3.5$  mmHg two minutes after infusion; to  $89.5 \pm 3$  mmHg 30 minutes after; to  $115 \pm 4.75$  mmHg two hours after; and to  $130 \pm 10.75$  mmHg three hours later. Cardiac output increased from  $2.25 \pm .3$  to  $3.95 \pm .25$  L/min at 1 minute ( $p < .005$ ) to  $3.85 \pm .35$  L/min after 30 minutes ( $p < .005$ ) to  $3.7 \pm .3$  after 2 hours ( $p < .01$ ) and to  $2.9 \pm .4$  L/min after 3 hours.

No significant increase in intrapulmonary shunting occurred during deliberate hypotension with diltiazem and labetalol. The cardiac output was unchanged after the administration of diltiazem and labetalol. The tachycardia seen after nifedipine was not seen after diltiazem and labetalol.

**Conclusion.** Those results suggest that nifedipine infusion significantly alters oxygenation in dogs and therefore its use warrants caution in the presence of preexisting abnormal  $Q_s/Q_t$ . This effect may be due to inhibition of hypoxic pulmonary vasoconstriction and to the increased cardiac output therefore increasing blood flow to nonventilated alveoli. This effect was not seen with labetalol and diltiazem.

**References.**

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Table: Hemodynamic and Pulmonary Shunting During Intravenous Nifedipine, Diltiazem and Labetalol.

	Pre-Infusion	After nifedipine infusion		
		30 minutes	2 hours	3 hours
BP $\phi$	a) 80±5 b) 83.5±5 c) 80.5±4.5	65±2.55 60.5±2.5 62.5±2	67±4.15 70±4 67±4.5	87.5±10.5 82±8 81±7.5
SVR $\eta$	a) 2631±180 b) 2695.6±195 c) 2483±175	1184±140 1937±115 1891.21±160.5	1264±150 2226±140 1191±165	3340±201 2655±167.5 2500±176.5
CO $\S$	a) 2.25±.3 b) 2.30±.25 c) 2.40±.35	3.85±.35 2.25±.27 2.39±.30	3.7±.3 2.30±.3 2.45±.45	2.9±1.1 2.29±.4 2.40±.4
Qs/Qt	a) 9.7±.8 b) 9.15±.9 c) 9.37±1.05	19.05±1.2 9.30±1.1 9.35±1.15	17.5±1.6 9.40±1.2 9.32±.90	12±1.1 9.2±1.15 9.30±1.1
HR $\Omega$	a) 110±9 b) 115±7 c) 120±10	140±7.5 105±7 130±8.5	115±8 100±8.5 125±9	115±7 110±9 127±9.5
PaO $\phi$	a) 14.6±11.5 b) 130±10.5 c) 140±14.5	89.5±3 122.5±9.75 135±13.5	115±4.75 120±10 142±14.2	130±10.75 127.5±10.5 137.5±13.5

$\phi$  mmHg  
 $\eta$  dynes/sec/cm<sup>-5</sup>  
 $\S$  L/min  
 $\Omega$  beat/min