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Title: REGIONAL BLOOD FLOWS DURING CONTROLLED HYPOTENSION

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Introduction: Sodium nitroprusside (SNP) and nitroglycerin (NTG) are vasodilator drugs used to produce hypotension in anesthetized patients. The adequacy of organ blood flows is a primary concern during the use of these agents. Regional blood flow changes during NTG-induced hypotension and anesthesia have not been reported before. In this study, we used the radioactive microsphere method to compare organ blood flows and vascular resistance changes during hypotension produced by SNP and NTG in dogs anesthetized with halothane.

Method: Ten mongrel dogs (mean wt=12±2.3kg) were studied. Anesthesia was induced with thiopental, 10 mg/kg IV followed by succinylcholine, 2 mg/kg IV and endotracheal intubation. Anesthesia was maintained with approx. 0.7-1% inspired halothane in oxygen. The animals were mechanically ventilated in the right lateral decubitus position at a tidal volume=10 cc/kg and a rate sufficient to maintain $PaCO_2$ at approx. 35 torr. Catheters were placed into the left atrium via a left thoracotomy and into the aorta and peripheral vein. After stabilization, control hemodynamic and regional blood flow measurements were made. SNP or NTG was infused IV for 5-15 minutes to produce a mean arterial pressure (MAP) of approx. 50 torr and measurements repeated. Drug infusion was then stopped and MAP allowed to return to normal. Approx. 60 min. later control measurements were repeated. The second drug was then infused to produce the same level of hypotension and measurements repeated. The sequence of drug administration was varied so that 5 animals received SNP first and 5 animals received NTG first. Regional blood flows during each measurement period were determined by injecting one of 4 radioactive labeled microspheres (^{46}Sc, ^{95}Nb, ^{85}Sr, or ^{51}Cr) approx. 15 micron in dia., into the left atrium. At the same time, a reference blood sample was withdrawn from the aorta at a rate of 4 ml/min. Organs were weighed post-mortem and their radioactivity determined by scintillation counter. Regional blood flows (ml/100g/min) were calculated as the tissue radioactivity times the reference sample flow rate divided by the reference sample radioactivity.

Results: SNP and NTG produced similar decreases in MAP.but no significant effect on cardiac output (Q_t) or heart rate (HR). Regional blood flows to cerebral hemispheres, heart, GI tract, liver, and carcass were well maintained by both drugs. SNP, however, caused a 44% reduction in renal blood flow ($p<.01$) and had no significant effect on renal vascular resistance. With NTG, renal blood flow was unchanged and renal vascular resistance decreased by approx. 33% ($p<.01$). There was good correlation ($r=0.98$) between blood flow to right and left kidney, indicating evenness of microsphere distribution. The systemic hemodynamic and regional blood flow values are shown below.

Discussion: SNP and NTG maintained blood flow to most vital organs at a MAP of 50 torr during halothane anesthesia. The sole exception was that SNP caused a significant reduction in renal blood flow, while NTG did not though both drugs are direct-acting smooth muscle relaxants. The depressant effect of SNP on renal blood flow during halothane anesthesia has been reported before. Further studies are needed to determine why SNP and NTG have different effects on renal blood flow.

Systemic Hemodynamics	Control		SNP	Control		NTG
HR (beats/min)	120 ±8		127 ±8	117 ±5		125 ±6
Q_t(L/min)	1.98 ±.20		1.82 ±.19	1.79 ±.14		1.91 ±.15
MAP (torr)	84 ±4	*	47 ±3	84 ±4	*	46 ±3
Regional Blood Flows (ml/100g/min)						
Cerebral Hemispheres	77 ±8		61 ±7	80 ±12		74 ±8
Heart	68 ±4		91 ±13	64 ±5		90 ±14
Kidney	648 ±72	*	376 ±45	572 ±19		488 ±51
GI Tract	152 ±27		134 ±27	145 ±20		135 ±21
Liver	113 ±24		106 ±24	139 ±40		114 ±23
Carcass (muscle, skin, bone)	12 ±1		13 ±2	13 ±1		13 ±1

Mean Values ± SEM * $p<.01$ between values

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