

- Title** : THE EFFECT OF TRIMETHAPHAN INDUCED HYPOTENSION ON SPINAL CORD BLOOD FLOW WITH AND WITHOUT SPINAL DISTRACTION, IN DOGS
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INTRODUCTION. Controlled hypotension is frequently used during scoliosis surgery to minimize blood loss and improve operating conditions; but there is concern that hypotension plus spine distraction with Harrington rods may compromise spinal cord blood flow (SCBF), resulting in permanent neurological deficit. The effect of sodium nitroprusside on SCBF has been reported.¹ Trimethaphan induced hypotension is associated with a more favorable homeostatic and hormonal response in the patient than sodium nitroprusside.² The present study was designed to investigate the effects of controlled hypotension using trimethaphan, with and without spine distraction, on SCBF as measured in duplicate by hydrogen washout (H_2) and radioactive microsphere (MS) techniques.

METHOD. Mongrel dogs (mean weight 20.0 kg; range 16-22 kg) were anesthetized with intravenous pentobarbital (30 mg/kg) and maintained with morphine sulphate (4 mg/kg), nitrous oxide 66% and oxygen 33%, with pancuronium (0.1 mg/kg) for neuromuscular blockade. The dogs were ventilated at a tidal volume of 20 ml/kg and the rate adjusted to maintain a normal $PaCO_2$, confirmed by serial blood gas analysis. Arterial pH was maintained within the normal range using incremental doses of 4.2% sodium bicarbonate. The left carotid artery and left femoral artery and vein were cannulated, and a catheter passed into the left ventricle via the right carotid artery for injection of microspheres. A balloon tipped thermodilution catheter was inserted into the pulmonary artery for measurement of pulmonary capillary wedge pressure (PCWP) and cardiac output (CO). The vessels of the splenic pedicle were ligated to prevent the canine compensatory response to hypotension. A laminectomy was performed at T_7 - T_8 , the dura incised, and a 250 μ m teflon coated platinum wire, bared to a distance of 1 mm, inserted into the lateral funiculus of the spinal cord to measure H_2 . Harrington hooks were inserted at T_4 and L_2 and connected to a distraction device. All dogs were hydrated using 5% dextrose in Ringers lactate solution and maintained to keep the PCWP at 8 mmHg prior to hypotension. Baseline measurements were repeated at normotension then the mean arterial pressure (MAP) was reduced by half using a trimethaphan infusion. SCBF was measured at 15, 30, and 45 min following hypotension; at 60 min with 2 cm of spine distraction and again after normotension was reestablished. The slope of the hydrogen washout curve was calculated, the half-life determined, and the flows derived in ml/100 g/min.

Radioactive microspheres (^{141}Ce , ^{46}Sc , ^{51}Cr , ^{85}Sr) were injected into the left ventricle to measure SCBF at normotension and 15, 30, and 45 min after hypotension. Samples were withdrawn from the carotid and femoral arteries during microsphere injection to ensure adequate mixing. The spinal cord was removed at necropsy and radioactivity counted in the spinal cord section which had been distracted. Statistical analysis was performed using Student's t test for paired data.

RESULTS. Induction of hypotension was associated with a decrease in SCBF as measured by the H_2 technique (from 17.7 ± 1.6 at normotension to 11.3 ± 1.6 ml/100 g/min with initial hypotension; $p < 0.05$). The SCBF was decreased throughout the period of hypotension and remained so after the drug was terminated and the MAP increased (see table). The changes in SCBF were paralleled using the MS technique. CO fell significantly with hypotension but improved on return to normotension while SCBF remained decreased.

DISCUSSION. These results demonstrate a decrease in SCBF during trimethaphan induced hypotension, as measured by both the H_2 and MS techniques. The decrease in SCBF continued during the period of hypotension and for up to 15 min following restoration of MAP. This differs from the findings reported for controlled hypotension using sodium nitroprusside as SCBF autoregulation has been shown to occur within 30 min.¹ Clinical extrapolation of this data suggests that trimethaphan may not be the ideal drug for controlled hypotension during scoliosis surgery despite apparently favorable homeostatic and hormonal responses.

REFERENCES.

1. Fergusson NV, Kling TF Jr, Tait AR, Leach AB, Hensinger RN, Lane GA, Knight PR: The effect of induced hypotension and spinal distraction on spinal cord blood flow in dogs. *Anesthesiology* 59:A371, 1983
2. Knight PR, Lane GA, Hensinger RN, Bolles RS, Bjoraker DG: Catecholamine and renin-angiotensin response during hypotensive anesthesia induced by sodium nitroprusside or trimethaphan camsylate. *Anesthesiology* 59:248-253, 1983

All values are Means \pm SE

	NORMO TENSION	HYPOTENSION (duration in min)				NORMO TENSION
		15	30	45	60 +stretch	
MAP (mmHg)	94.0 +4.2	46.0 +3.3	48.7 +1.1	52.0 +1.5	52.8 +2.3	78.2 +3.1
CO (l/min)	1.9 +0.2	1.5 +0.3	1.4* +0.3	1.3* +0.2	1.2* +0.2	1.6 +0.4
H_2	17.7 +1.6	11.3* +1.6	13.1* +1.6	14.6 +0.9	13.0* +2.0	12.5* +0.9
PCO_2 (mmHg)	37.4 +1.5	39.4 +1.4	38.0 +1.8	37.3 +2.1	38.4 +1.4	40.9 +1.4

* $p < 0.05$

H_2 in ml/100 g/min

N = 6