

TITLE: EFFECT OF CARDIAC OUTPUT ON CBF DURING DELIBERATE HYPOTENSION

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The cerebral vasculature is believed to autoregulate to the extent that cerebral blood flow (CBF) is normally maintained at a constant level in the range of mean arterial pressure (MAP) from 60 to 130 mmHg.¹ The purpose of this study was to determine whether there is a relationship between changes in CBF and changes in cardiac output (CO) during deliberate hypotension in patients with intracranial arteriovenous malformation (AVM).

With IRB approval and informed consent, 30 patients scheduled for craniotomy were studied. Anesthesia was induced with thiopental and vecuronium and maintained with isoflurane 0.75% in N₂O:O₂, 3:2. Patients were monitored with radial and pulmonary artery catheters. CBF determinations were made using the intravenous ¹³³Xe washout method.² Baseline hemodynamic and CBF values were recorded after bone flap removal, after which MAP was reduced by 20% using sodium nitroprusside, esmolol or high-dose isoflurane (10 in each group). Measurements were repeated at this time and were completed prior to the ligation of major feeder vessels. Between group comparisons were made with analysis of variance, while the relationship between CO and CBF was evaluated using Fisher's exact test with statistical significance taken at p<0.05.

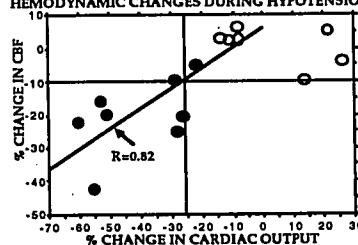
Simultaneous CO and CBF determinations could be obtained in 24 patients, at a temperature of 35.2±0.8°C, pCO₂ of 26.2±2.7 mmHg and hemoglobin of 12.1±1.6 gm/dl (mean±s.d.). There

were no significant differences in any of these variables between the control and hypotensive periods. MAP was decreased an average of 20% from 81±7 to 65±4 mmHg (p<0.0001), resulting in a decrease in CBF from 27.6±11.5 to 23.0±9.8 ml/100gm/min (p<0.05). For the 9 isoflurane patients, CBF fell from 28.8±11.6 to 22.5±13.8 ml/100gm/min (NS), with no correlation between changes in CO and CBF. There was a significant relationship between the decreases in CO and the change in CBF for the 8 esmolol and 7 nitroprusside patients, as shown in the figure. During hypotension, CBF is maintained, provided that there is no significant decrease in CO. Once CO decreases by more than 25%, CBF begins to fall significantly.

Although studies have shown that MAP may be lowered to 50-60 mmHg without a concomitant fall in CBF, in these earlier studies the hypotensive technique generally maintained or enhanced CO. Hypotensive techniques that decrease CBF may be useful in the prevention of complications attributable to hyperperfusion states.

REFERENCES: 1. Br J Anaesth 48:719, 1976. 2. Anesth Analg 67:1011, 1988. 3. Neurosurgery 22:765, 1988

HEMODYNAMIC CHANGES DURING HYPOTENSION



Closed circles = Esmolol, Open circles = SNP

A170

TITLE: THIOPENTAL EFFECT ON CEREBRAL BLOOD FLOW DURING CAROTID ENDARTERECTOMY

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Thiopental (TP) may be useful to prevent cerebral injury during periods of temporary vascular occlusion or after embolism of particulate matter. Previous studies of TP effect on cerebral blood flow (CBF) in humans during halothane anesthesia have shown only a modest decrease in CBF during craniotomy for tumor.¹ This study examined the effect of TP on CBF during carotid endarterectomy.

METHODS. After institutional approval and informed consent, 4 patients undergoing elective carotid endarterectomy were studied. Anesthesia was 0.75% isoflurane (ISO) in 1:1 N₂O/O₂. CBF was measured using ¹³³Xe washout as previously described.² During the period of temporary bypass shunting, a baseline measurement was taken. Immediately prior to carotid occlusion to remove the shunt, TP (range 225-350 mg) was titrated in 50 mg boluses to achieve burst-suppression, with electrical silence of at least 3 s. A second CBF was then measured. Data are expressed as mean ± SEM.

RESULTS. Age was 61 ± 7 years. TP resulted in a 52 ± 4 % decrease in CBF, as shown in Table 1.

DISCUSSION. This study demonstrates that during steady-state levels of isoflurane/N₂O anesthesia a small dose of TP is capable of suppressing the EEG and results in a profound

reduction in CBF, reflecting decreased cerebral metabolic activity. Application of TP in this patient population for short periods of cerebral protection may be accomplished without depression of systemic hemodynamics.

REFERENCES

1. Acta Anaesthesiol Scand 28:478-481, 1984
2. Anesthesiology 71:863-869, 1989

Table 1. Physiologic Data.		
	*significantly different than baseline (P = 0.009)	
	BASELINE	THIOPENTAL
CBF (ml/100g/min)	41 ± 5	20 ± 2*
Temperature (°C)	35.8 ± 0.31	35.8 ± 0.37
PaCO ₂ (mmHg)	43.6 ± 1.3	42.0 ± 1.8
Hematocrit (%)	41 ± 2	41 ± 2
Mean Arterial Pressure (mmHg)	102 ± 3	96 ± 5
Heart Rate (bpm)	63 ± 3	67 ± 3

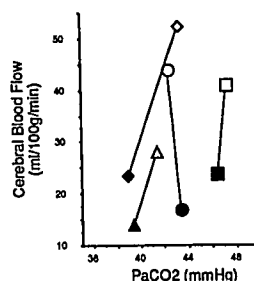


Figure 1. Individual patient responses. Open symbols are baseline and closed symbols are after thiopental.