Title: REGIONAL DISTRIBUTION OF CEREBRAL BLOOD FLOW WITH HALOTHANE AND ISOFLURANE

Authors: TD Hansen, M.D., DS Warner, M.D., LH Vust, B.A., and MM Todd, M.D.

Affiliation: Neuroanesthesia Research Group, Department of Anesthesia, University of Iowa College of Medicine, Iowa City, Iowa 52240

Introduction. Halothane is considered to be a more potent cerebrovasodilator than isoflurane. However, some discrepancies exist in the literature.[1] For example, Murphy et al.[1] and Cucchiara et al.[2] have shown only small differences in global cerebral blood flow (CBF) when comparing 1MAC halothane and isoflurane anesthesia.[3] By contrast, Todd et al.[3] and Eintrei et al.[4] measured large differences in cortical CBF. These disparities suggest the possibility that isoflurane and halothane may have different effects on cortical vs whole brain CBF.

Methods. Sprague Dawley rats were anesthetized with either 1MAC isoflurane (1.4%) or halothane (1.0%) in 33% O_2, balance nitrogen. Intubation and insertion of vascular catheters required 35 min. The rats were then ventilated an additional 55 min with 1MAC agent. Mean arterial pressure was held between 90 and 100 mmHg by blood infusion as required, while normal temperature (36.8-37.0), $PaCO_2$ (38-42), and PaO_2 (110-130) were maintained. Local CBF was then determined by infusion of 14-C iodoantipyrine (75 μCi/kg) over 45 sec with timed arterial blood sampling. Frozen section generated serial coronal autoradiographs were analyzed for local CBF by optical density recalculations on an image analysis computer system using the equations of Sakurada et al.[5] At eight standardized intervals, cursor outlined hemispheric, cortical, and subcortical areas were determined. Subcortex was defined as total hemispheric area minus the area of the cortical mantle; ventricular areas were not included in calculations. Mean CBF values within each area as well as the cortical/subcortical ratio were evaluated by unpaired t-testing.

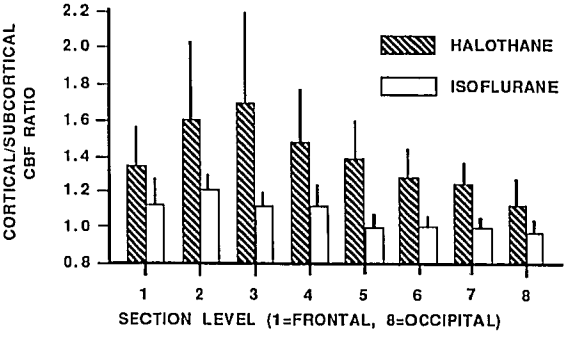
Results. No significant differences were seen between groups with respect to physiological variables. Table 1 summarizes our CBF results. Mean hemispheric CBF, taken as the average of eight standardized sections, was identical in the two groups. By contrast, cortical CBF was greater in the halothane group ($p=.01$), while subcortical CBF was greater in the isoflurane group ($p=.05$). At each standardized interval, the cortical/subcortical ratio was significantly greater ($p<.05$) in the halothane anesthetized animals (Figure 1). Examination of the cortical/subcortical CBF ratio along the rostrocaudal axis showed an apparent anterior cortical dominance in both groups relative to more caudal sections.

Discussion. The volatile agents examined in this study show regionally specific effects; cortical CBF is higher with halothane than with isoflurane in spite of identical hemispheric (global) values. These observations suggest that discrepancies in CBF previously reported may be due to differences in sampling sites among different techniques. The reasons for these anatomically selective CBF effects of the volatile agents is unknown, but may be indirectly related to their different cortical electrophysiologic effects.

Table 1. Comparative Local Cerebral Blood Flow (Mean S.D.) During Halothane and Isoflurane Anesthesia (CBF in ml/ 100g/min) *=p<.05, **=p<.01

Region	Halothane CBF n=8	Isoflurane CBF n=7
Hemispheric	124±5	122±7
Cortical	150±8**	127±7
Subcortical	125±10*	134±8
Cortical/ Subcortical ratio	1.38±.20**	1.07±.04
Amygdala	105±19*	126±4
Thalamus	154±19	172±23
Hippocampus	125±14	130±18
Caudate	155±10*	146±12

Figure 1. Comparative Cortical/Subcortical Cerebral Blood Flow Along the Rostrocausdal Axis During Halothane and Isoflurane Anesthesia (CBF in ml/100g/min)



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