

Title : EFFECTS OF ISOFLURANE VS HALOTHANE ON HUMAN ARTERIAL HEPATIC BLOOD FLOW (AHBF) AND PORTAL VEIN BLOOD FLOW (PVBF) AFTER SURGICAL STRESS

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INTRODUCTION : No human data are available on partition of total hepatic blood flow (THBF) in AHBF and PVBF during halogene anesthesia. This study was designed to quantitate the effects of Isoflurane (I) and Halothane (H) on AHBF and PVBF using implantable pulsed Doppler microprobes after surgical stress. This period was chosen because of the necessity of surgical implantation of the probes and of the well known effects of surgery on THBF (1).

MATERIAL AND METHODS : 6 patients (43 ± 12 SD Yrs) were studied after given written informed consent and after the approval of the local Ethical Committee. All of them were free of any cardiovascular and hepatic disease and were operated for cholecystectomy. Anesthesia was induced by thiopental and intubation was performed after curarisation (pancuronium bromide). Then anesthesia and analgesia were maintained by isoflurane and fentanyl as needed. The protocol was conducted without any complication and the time delay for recovery due to the protocol was always lower than 1 hour.

Hemodynamic parameters : systemic mean arterial blood pressure (MAP, mmHg) and heart rate (HR, bpm) were non invasively monitored (Dinamap). AHBF and PVBF were measured via implantable microprobes by a 8 MHz pulsed Doppler. This flowmeter provided the ability to measure the vessel diameter (D in mm) and the mean cross sectional blood flow velocity (Vm in cm/s). Blood flow was then calculated according to the formula : flow = $\pi D^2/4 \times Vm \times 60$ in ml/min. The laboratory built microprobes were designed in such manner that the ultrasonic incidence angle was 60° (2). They were surgically implanted and fixed by four stitches on the adventitia of the vessels and the connecting electrodes were passed through the abdominal wall. The probes were pulled out at the 3rd day by a gentle traction without any damage. AHBF and PVBF were simultaneously measured and averaged over 10 cardiac cycles in order to eliminate the influence of the mechanical ventilation. We calculated THBF as AHBF + PVBF, the fractionnal flow supply as the ratio AHBF/PVBF in % and an indice of arterial hepatic resistances (AHR, IU) using the ratio MAP/AHBF assuming right atrial pressure negligible.

PROTOCOL : Immediately after the end of the surgery the patient was moved to the recovery room and received only small dose of flunitrazepam IV infused to be kept sleeping. The protocol was then started when patients were hemodynamically stable and when I end tidal concentration was close to 0. After this point (C), I was adapted to produce a slight

decrease in MAP (-10 %) (I mean concentration : 1.5 %) and data were recorded at the 20th min (I). H was then given with the same goal during 20 min (H mean concentration 1 %). This set of measurement corresponded to the 3rd point (H). Statistical study was made by the Wilcoxon and Mann Whitney non parametric tests.

RESULTS : They are expressed in mean ± SEM and summarized on the table. PVBF variations were negatively correlated with MAP variations during I administration : r = 0.96 ; p < 0.01.

	C	I	H	C vs I	C vs H	I vs H
MAP	92 ±2.5	84 ±4.2	80 ±4.6	p<.05	p<.05	NS
HR	70 ±2.1	67 ±4.2	63 ±5	NS	NS	NS
AH.D	4.1 ±.4	4.3 ±.4	4.1 ±.4	NS	NS	NS
AHBF	302 ±123	344 ±161	242 ±125	NS	p<.05	NS
AHR	.38 ±.08	.33 ±.07	.47 ±.1	NS	p<.05	p<.01
PV.D	12 ±.08	12 ±.08	12 ±.08	NS	NS	NS
PVBF	818 ±144	1077 ±183	458 ±174	p<.05	p<.05	p<.005
THBF	1120 ±236	1399 ±307	712 ±276	p<.05	p<.05	p<.005
AHBF/PVBF	33 ±10	29 ±9.2	58 ±19	p<.05	NS	p<.05

DISCUSSION : At the similar MAP and HR, I induces an increased PVBF associated with a maintained AHBF and AHR allowing to a significant increase in THBF. This effect was so marked that the fractionnal flow supply was directed to a predominant supply role to the portal vein. In the same conditions, H produces a proportional decrease in both flows with an increase in AHR, effect which was largely different than with I. PVBF increase during I could be due to the vasodilating effect of this drug on splanchnic circulation (3). However, this effect seems to be enhanced by an associated MAP decrease, suggesting an amplification of the phenomenon by an autoregulatory mechanism.

REFERENCES :

- GELMAN SI, Arch Surg, III-881, 1976
- D PAYEN et al, Circulation 74 ,III-61, 1986
- LUNDEENG G et al. Anesth Analg 62, 499, 1983.