POSTER SESSION XVI

A141

TITLE: EFFECTS OF PROSTAGLANDIN E_1 ON HEPATIC BLOOD FLOW AND OXYGEN BALANCE DURING ANESTHESIA OF LIVER SURGERY

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The purpose of this study is to clarify whether prostaglandin E_1 (PGE_1) can improve the hepatic blood flow and oxygen balance during hepatic surgery.

Eighteen patients (Age 41-70 yr) undergoing hepatic surgery were investigated after institutional approval and informed consent. The patients were classified into two groups by intravenous infusion doses of PGE_1 (0.05 or 0.01 μg/kg min). After anesthetic induction, oximeter catheters were placed into the pulmonary artery and the hepatic vein, respectively. Measurements included systemic and hepatic hemodynamic variables, and blood gas analyses of blood samples derived from hepatic (HA) and pulmonary arteries and hepatic and portal (PV) veins. HA and PV flows were measured by ultrasonic flowmeter (Transonic Systems Inc.). After 10 min of the start of of PGE_1 infusion, the same measurements were performed. The measurements were performed both before and after hepatic lobectomy in each patient. The results were expressed as mean ± SEM. For statistical analysis of the data, the Wilcoxon paired-samle test was used, and $p < 0.05$ was considered significant.

Table 1 and 2 summarized hepatic blood flow, oxygen uptake and transport at pre and during PGE_1 administration. HA flow and hepatic oxygen transport and uptake were significanly increased with 0.01 μg/kg min of PGE_1, but were all unchanged with 0.05 μg/kg min of PGE_1 administered before hepatic lobectomy. However, after hepatic lobectomy, oxygen uptake was unchanged in both groups although hepatic oxygen transport was increased with 0.01 μg/kg min of PGE_1. It might reflect plateaued oxygen uptake by hepatocytes immediately after hepatic lobectomy. There were no changes in PV flow and hepatic oxygen uptake/transport ratio following administration of both doses of PGE_1 before and after hepatic lobectomy.

In conclusion, 0.01 μg/kg min of PGE_1 could improve hepatic oxygen utilization before and after hepatic lobectomy, as shown by increased hepatic oxygen transport and uptake.

Table 1. Results at 0.05 μg/kg min of PGE_1 (n=9)

	Before Lobectomy		After Lobectomy	
	Pre	PGE_1	Pre	PGE_1
HA flow	98 ± 31	85 ± 22	70 ± 26	76 ± 22
PV flow	258 ± 89	253 ± 39	280 ± 50	316 ± 62
O_2 uptake	10 ± 2	13 ± 3	10 ± 3	10 ± 2
O_2 transport	51 ± 7	45 ± 8	39 ± 7	44 ± 3

(ml/min m^2, * P<0.05 vs pre PGE_1 value)

Table 2. Results at 0.01 μg/kg min of PGE_1 (n=9)

	Before Lobectomy		After Lobectomy	
	Pre	PGE_1	Pre	PGE_1
HA flow	104 ± 21	157 ± 24*	81 ± 15	108 ± 22*
PV flow	385 ± 37	440 ± 55	366 ± 18	401 ± 29
O_2 uptake	11 ± 2	14 ± 2*	10 ± 2	11 ± 1
O_2 transport	71 ± 8	85 ± 10*	53 ± 3	59 ± 4*

(ml/min m^2, * P<0.05 vs pre PGE_1 value)

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TITLE: RENAL EXTRACTION RATIO OF PARA AMINO HIPPURIC ACID DURING ANESTHESIA AND SURGERY IN HUMAN.

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The estimation of renal blood flow (RBF) by clearance techniques agree well with direct methods in the normal animal. The clearance technique can be used to measure renal plasma flow only if the substance used is completely cleared from plasma during one renal transit. Para amino hippuric acid (PAH) is almost such a substance. Normally the excretion rate is well over 90%. There is a gentlemen's agreement that the PAH clearance is calculated under this condition. In man, no investigation has been made into the validity of the indirect measurements during abnormal flow states which are a particular interest to the anesthesists or the surgeons because anesthesia and surgery induce a dramatic decline in renal function. Therefore many investigators use these techniques in abnormal and changing flow states in man. The aim of this study was to measure the extraction ratio of PAH (EPAH) during standartized anesthesia and surgery.

The protocol carried institutional approval and informed consent from each patient. 11 patients (5 males and 6 females), aged 40±10 years were scheduled for nephrectomy for living kidney donation. Patients had normal renal tests before surgery. Standardized anesthesia procedure was: premedication by 100mg of hydroxizine, then induction and maintenance by methohexital (451±118 mg), fentanyl (0.76±0.19 mg) and atracurium (86.4±26.5 mg). Patients were under mechanical ventilation with nitrous oxide (50% inspired). Intravenous fluid replacement (0.9% sodium chloride solution) was approximatively 500ml h^{-1}. Duration and procedure of surgery were similar in all cases. For the clearance studies, after anesthetic induction, a loading dose of 0.03g/kg of inuline (In) and 0.015g/kg of PAH were given, following by intravenous infusion of 0.04 g/kg/min of In and 0.003g/kg/min of PAH. During surgery and just before nephrectomy (S) we measured heart rate (HR), mean blood pressure (MBP), and peripheral plasma (P) and urinary bladder concentrations of In and PAH. Just before the nephrectomy, renal arterial (A) and venous (V) blood samples were taken. In clearance (Cln as glomerular filtration rate) and PAH clearance (CPAH) were calculated by the standard formula. Extraction ratio (E) was calculated as (A-V)/A. Results were expressed as mean± SD.

	HR	MBP	Cln	CPAH
	b/min	mmHg	ml/min/1.73 m^2	
Control	77±11	87±8.0	120±19	682±126
S	73±9	99±12*	83±19*	380±84*

*p<0.01 Wilcoxon test

Glomerular filtration changes (-31%) were similar to those reported in the literature during anesthesia and surgery.

The concentrations of PAH were 31.7±7.0 mg/l in P, 31.8±5.6 mg/l in A and 8.8±5.4 mg/l in V. The strong correlation between P and A of PAH concentrations was verified (r= 0.96, p=0.001). The EPAH was calculated at 0.73±0.13 (range from 0.41 to 0.88).

In all cases, EPAH were lower than 90%. In these conditions, PAH clearance underestimated effective renal plasma flow (ERPF). Moreover, ERPF cannot be calculated for both kidneys since EPAH was determinated only on one kidney and EPAH may be different in the opposite kidney.

Two mechanisms were involved to explain the decreased extration of PAH: first is an actual redistribution of flow from the cortex to the inner part of the kidney; second is a storage of PAH in tubular kidney cells.

Our results show that PAH clearance techniques are unsuitable for study of renal blood flow in acute pathologic conditions as anesthesia and surgery.

References

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