TITLE: PERIOPERATIVE DECREASE IN HEPATIC VENOUS OXYGEN SATURATION AFFECTS SERUM TRANSAMINASES AFTER LIVER SURGERY

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Hepatic blood flow may be altered by surgical manipulations and anesthetics. Although continuous monitoring of hepatic venous oxygen saturation ($Shvo_2$) might provide valuable information concerning hepatic oxygen supply and demand[1], it still remains unidentified how perioperative $Shvo_2$ affects postoperative serum transaminases and bilirubin.

METHOD. From July 1988 to January 1990, $Shvo_2$ was monitored in consecutive seventy-seven patients undergoing hepatic lobectomy, after institutional approval and informed consent. An oximeter catheter (Oximetrix Corp,) were introduced through the internal jugular vein into the hepatic vein. Anesthesia was maintained with 67 % nitrous oxide and oxygen with 1-2 % enflurane, and supplemented with low dose of fentanyl. The lowest $Shvo_2$ and the duration of $Shvo_2$ below 40, 30, 20 and 10 % were compared with the postoperative serum glutamic-oxaloacetic transaminase (GOT), glutamic pyruvic transaminase (GPT), total (TB) and direct (DB) bilirubin, estimated blood loss and the duration of the surgery. Data were statistically evaluated with regression analysis.

RESULTS. Significantly positive relationships were observed between the duration of $Shvo_2$ below 30 % and postoperative serum transaminases (Table 1). Correlation coefficients became weaker when the duration of $Shvo_2$ below 40, 20 or 10 % were taken. The lowest value of $Shvo_2$ was not significantly correlated with either GOT and GPT. The duration of the surgery was not correlated with serum transaminases. Estimated blood loss was correlated with serum TB and DB.

Table 1.
Correlation Coefficients
: vs the duration of $Shvo_2$<30 %

	Ist	IInd	IIIrd post-op day
GOT	0.71(P<.05)	0.65(P<.05)	0.64(P<.05)
GPT	0.65(P<.05)	0.66(P<.05)	0.64(P<.05)
TB	0.30	0.30	0.32
DB	0.25	0.29	0.34

DISCUSSION. The interesting result of this study is close relationship between the duration of $Shvo_2$ below 30 % and postoperative serum transaminases. It might suggest that the postoperative liver function is influenced by perioperative oxygen supply-demand ratio in the liver. With a continuous $Shvo_2$ monitoring, we could minimize postoperative hepatic damage by shortening the duration of $Shvo_2$ below 30 %.

REFERENCE

1. Kainuma et al. Anesthesiology 71:A383,1989

TITLE: OXYGEN SATURATION OF HEPATIC VEIN REFLECTS THE CHANGES IN HEPATIC ENERGY CHARGE IN RATS.

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Evaluation of the metabolic status of liver is important for the anesthetic management of hepatic surgery. We previously reported the usefulness and safety of the continuous monitoring of hepatic venous oxygen saturation ($ShvO_2$), using an oximeter catheter (Oximetrix Co.) placed in hepatic vein, during hepatic surgery[1]. The purpose of this study is to verify that the $ShvO_2$ reflects the changes in hepatic energy charge (HEC).

The study protocol was approved by our institutional Research Committee. Thirty male Sprague-Dawley rats (300-400g) were anesthetized with pentobarbital 40mg/kg, tracheotomized, breathing room air spontaneously. Catheters were placed in femoral artery and hepatic vein for sampling blood. Then, to change the $ShvO_2$, they inspired varying concentrations of O_2/N_2 mixed gas (FiO_2 0.1, 0.15 and 0.2) spontaneously. After three minutes, hepatic venous and arterial blood were drawn and the whole liver was immediately removed. The liver was frozen in liquid nitrogen, and ATP, ADP, and AMP were measured by using a liquid chromatography. HEC was calculated as follows: HEC=(ATP+0.5ADP)/(ATP+ADP+AMP). PaO_2, $PaCO_2$, and $ShvO_2$ were measured by a blood gas analyzer (ABL-3: Radiometer) and oximeter (OSM-3: Radiometer).

$PaCO_2$, PaO_2 and $ShvO_2$ are shown in the table, and the correlation between $ShvO_2$ and hepatic energy charge is shown in the figure. HEC was plateaued when the $ShvO_2$ was above 30%, but it decreased as $ShvO_2$ decreased when $ShvO_2$ was below 30%.

Our results suggest that $ShvO_2$ could reflect the changes in hepatic energy charge, and the critical level of $ShvO_2$ would be about 30%. We consider that the continuous measurement of $ShvO_2$ might be a useful and valuable indicator of metabolic status of liver during hepatic surgery.

References

1.Kainuma M. et al:Anesthesiology 71:A383, 1989

FiO2	0.1(n=13)	0.15(n=6)	0.2(n=11)
PaCO2 mmHg	40.7±13.2	36.1±12.3	45.7±8.7
PaO2 mmHg	35.0±15.4	59.5±18.3	78.9±22.8
ShvO2 %	20.9±9.0	49.9±19.1	58.6±13.5