

## Effects of early postoperative hyperbaric oxygen therapy on energy metabolism and hepatic regeneration after hepatectomy

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### Abstract

*Aims:* Effects of early hyperbaric oxygen therapy (HBOT) on energy metabolism and hepatic regeneration after hepatectomy for liver cancer were prospectively evaluated.

*Materials and methods:* A total of 39 patients who underwent hepatectomy for liver cancer were divided into two groups; 19 patients who received postoperative HBOT (HBOT group) and 20 patients who did not receive HBOT (control group). Each group was further subdivided into noncirrhotic and cirrhotic subgroup. HBOT was performed twice; 3 and 24 hrs after hepatectomy.

*Results:* (1) Hepatic venous oxygen saturation (ShvO<sub>2</sub>) and arterial ketone body ratio (AKBR) in patients with cirrhotic liver were significantly higher in the HBOT group than in the control group, 12 hrs after the operation. (2) The first passage of flatus and peroral intake of meal were obviously earlier in the HBOT group. In addition, the postoperative recovery of serum albumin level was earlier in the HBOT group, particularly in patients with cirrhotic liver. (3) As a result, the hepatic regeneration was promoted in the HBOT group.

*Conclusions:* These results suggest that early postoperative HBOT has a beneficial effect on the hepatic regeneration by improving an imbalance between oxygen demand and delivery, and by enhancing the energy metabolism, and that HBOT is particularly beneficial to patients with cirrhotic liver.

**Key words:** hyperbaric oxygen therapy, postoperative hepatic failure, hepatic regeneration, cirrhotic liver

### Introduction

In the surgical treatment of liver cancer, surgical insult occasionally triggers hepatic failure. In particular, cirrhotic residual liver has insufficient functional reserve. Thus, the hepatic impairment rapidly progresses in patients with cirrhotic residual liver, and they are difficult to treat. It has been reported that decreased oxygen delivery to the liver parenchyma due to microcirculatory failure largely contributes to the progression of hepatic

impairment<sup>1)</sup>. In fact, postoperative mechanical ventilation<sup>2)</sup> and hyperdynamic state<sup>3,4)</sup> have been reported to improve the failure of tissue oxygen metabolism, and to be beneficial in the prevention of hepatic failure. In order to prevent the posthepatectomy hepatic failure through improvement of an imbalance between oxygen demand and oxygen delivery, we have used hyperbaric oxygen therapy (HBOT), and reported increase in dissolved oxygen tension and reduction in the injury of sinusoidal endothelium mediated by inhibition of neutrophil

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