

## ALTERATION OF BRAIN OXYGENATION DURING “PIGGY BACK” LIVER TRANSPLANTATION

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### 1. INTRODUCTION

Cerebral blood flow (CBF), thanks to dilatation or constriction of the cerebral resistance vessels, is kept reasonably constant within a wide range of mean arterial blood pressure (MAP) values. This is commonly called CBF autoregulation. It works if the MAP is between the lower and higher limits of 60 to 150 mmHg<sup>1, 2</sup>. The systemic circulation of patients with liver failure is characterized by a low vascular resistance and a compensatory increased cardiac output (CO)<sup>3</sup>. Moreover, it has been demonstrated that because these patients show functional loss of CBF autoregulation, they are vulnerable to sudden relevant changes of MAP. For the same reason, paradoxically, these patients could be considered less suitable for major surgery with a considerable blood loss and fluid shifts, such as Orthotopic Liver Transplantation (OLT). Arterial hypertensive episodes during OLT could provoke cerebral hyperperfusion with an increase in cerebral vascular volume and subsequent elevation of intracranial pressure that could lead to aggravation of cerebral edema and even cerebral hemorrhage<sup>4, 5</sup>. On the other hand, hypotensive episodes could lead to ischemic lesions. Therefore, the present study indirectly investigated CBF by monitoring brain oxygenation (BO) during “Piggy Back” OLT using the noninvasive technique of near infrared spectrophotometry. The aim of the study was to evaluate if there are significant changes in cerebral oxygenation and, if so, to identify the surgical maneuver mainly causing such changes.

### 2. PATIENTS AND METHODS

#### 2.1 Patients

The last 15 patients undergoing OLT in our institute, 8 men and 7 women, aged 38 to 60 years, were enrolled for the study (patients with acute liver failure were not

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admitted). The protocol was approved by the institutional ethics committee. All the patients or their next of kin gave written informed consent for the study.

Seven patients had hepatitis C virus (HCV) and related cirrhosis (HCV<sup>+</sup>C), 4 had hepatitis B virus (HBV) and related cirrhosis (HBV<sup>+</sup>C), 1 had alcohol liver disease (ALD), 1 had ALD+ HBV<sup>+</sup>, and 2 had hepatocellular carcinoma (HCC) and HBV<sup>+</sup>. Four patients had encephalopathy on admission to hospital. For all patients the Child-Pugh score and the model for end stage liver disease (MELD) score were calculated to stratify the severity of their liver failure. Patient details are listed in table 1.

Table 1. Data on the study population

<i>Patient no.</i>	<i>Sex</i>	<i>Age</i>	<i>Diagnosis</i>	<i>Encephalopathy</i>	<i>Child-Pugh Score</i>	<i>MELD Score</i>
1	F	58	HCV <sup>+</sup> C	no	B/8	13
2	M	60	HCV <sup>+</sup> C	no	A/6	13
3	F	49	HBV <sup>+</sup> C	yes	C/11	27
4	M	38	HBV <sup>+</sup> C	yes	C/12	23
5	M	58	HCV <sup>+</sup> C	no	B/9	18
6	M	47	HCC+HBV <sup>+</sup>	no	A/6	12
7	M	51	ALD+HBV <sup>+</sup>	yes	C/11	26
8	M	55	HCC+HBV <sup>+</sup>	no	B/8	15
9	M	56	HCC+HCV <sup>+</sup>	no	A/7	12
10	F	56	HBV <sup>+</sup> C	no	B/8	14
11	F	51	HCV <sup>+</sup> C	no	B/8	14
12	M	55	ALD	yes	C/12	27
13	F	48	HCV <sup>+</sup> C	no	A/7	12
14	M	46	HCV <sup>+</sup> C	no	B/8	14
15	M	55	HBV <sup>+</sup> C	no	B/9	17

## 2.2. Surgery

All patients underwent OLT with the “Piggy Back” technique. After laparotomy and liver mobilization the first procedure (T1) was dissection of the liver hilus: first the ligation of the biliary duct then of the hepatic artery (T2) and then of the portal vein (T3). After dissection of the liver from the vena cavae, left in situ, the right suprahepatic vein was ligated (T4) and the common ostium of the medium and left suprahepatic vein was clamped (T5) at its origin from the vena cavae and the native liver was removed. Then the donor liver was implanted by the following anastomoses (in order): the donor retrohepatic vena cavae with the recipient ostium of the suprahepatic veins, portal vein, hepatic artery and biliary duct. After performance of the portal vein anastomosis the graft was flushed out (T6) with the recipient’s blood by temporary declamping of the portal vein and, after reperfusion of the organ (T7), by declamping of the portal vein and the suprahepatic common ostium. After the arterial anastomosis was completed the implanted liver also received arterial perfusion (T8). The main advantage of the “Piggy Back” technique is that caval blood flow is not interrupted during OLT, even without the use of extracorporeal perfusion.