

POST ISCHEMIC NO-REFLOW AFTER 60 MINUTES HEPATIC WARM ISCHEMIA IN PIGS

Luigi Greco¹, Antonella Gentile¹, Piercarmine Panzera¹, Giorgio Catalano¹, Giuseppe Cicco², Vincenzo Memeo^{1*}

1. INTRODUCTION

Prolonged liver ischemia is a frequently required condition in liver surgery¹. During major resection for cancer or in cases of severe trauma, it may be necessary to interrupt blood inflow or outflow, by clamping the pedicle of Glisson's capsule (Pringle's maneuver), or even resorting to total vascular exclusion, by clamping the supra and subhepatic inferior vena cava, to limit intraoperative blood loss^{2,3}.

Although it is universally acknowledged that the organ can tolerate prolonged ischemia for a period of up to 60 minutes, the anatomical and functional variations of the liver parenchyma inevitably induced by the procedure are receiving ever greater attention^{4,5}. Ischemia-reperfusion damage is also an essential factor during liver transplant and the degree of damage suffered will affect the functional efficiency of the graft⁶.

In the present experimental study, the alterations of the liver microcirculation induced by warm ischemia lasting 60 minutes were studied by continuous measurement of the microcirculation with an intraparenchymal probe (Periflux).

2. MATERIAL AND METHODS

The study was conducted on 8 female pigs with a mean weight of 30 kg(±5). Under general anesthesia, a median laparotomy approximately 15 cm was made and the optical

* ¹ Department of General Surgery and Liver Transplantation, Faculty of Medicine, University of Bari

² CEMOT: Centre of research in Haemorrhology, Microcirculation and Oxygen Transport, University of Bari

fiber flowmeter probe, inserted in a spinal needle, was inserted in the liver parenchyma of the left lobe of the liver at a depth of about 5 cm.

The fiber was connected to the probe and protracted measurements lasting 30 minutes were started (T0). At this stage the left branches of the hepatic artery and portal vein were dissected and isolated and clamped for 60 minutes (T1). Flow measurement continued throughout this period. It was judged preferable to localize the ischemia in the left lobe only, in order to maintain normal portal blood flow through the right lobe and hence avoid prolonged bowel stasis. This is because the latter condition is ill tolerated in the pig and leads to massive release of toxic substances at the moment of declamping, which can themselves cause alterations in the circulation during reperfusion.

The clamps were removed after 60 minutes and the blood flow was recorded for a further 60 minutes (T2).

Great care was taken during all the surgical maneuvers to avoid disturbing the position of the optical fiber inserted in the liver parenchyma.

2.1. Technical Periflux Data

The data of the laser Doppler flowmeter are expressed in arbitrary units (PU). The device was calibrated in a suspension of 2-micron microspheres of latex^{7,8}.

3. RESULTS

The mean baseline value, expressed in PU, was $264(\pm 15)$. An abrupt reduction in blood flow was recorded immediately after clamping (PU 79 ± 10), the percentage reduction being by 70% ($\pm 10\%$).

After reperfusion, the T2 value rose quite quickly (PU 184 ± 18) but still remained constantly below the T0 value, by a mean of 30% ($5\pm\%$) (Fig.1). In this phase the blood flow remained virtually unchanged for the first 30 minutes, and then showed a mild positive trend in the second half of the measurement time. However, in no case did the T2 values return to the T0 values by the end of the experiment.