Intraperitoneal Metabolic Consequences of Supra-celiac Aortic Balloon Occlusion versus Superior Mesenteric Artery Occlusion - Animal Study Utilising Microdialysis

Tal M. Hörer MD¹; Per Skoog MD¹; Kristofer F. Nilsson¹, MD, PhD; Ioannis Oikonomakis MD²; Thomas Larzon MD, PhD¹; Lars Norgren, MD, PhD² and Kjell Jansson, MD, PhD²

¹Department of Cardio-Thoracic and Vascular Surgery, ²Department of Surgery
Örebro University Hospital and Örebro University, Sweden

Objective

To investigate the effect of aortic supra-celiac balloon occlusion (ABO) and superior mesenteric artery (SMA) occlusion on abdominal visceral metabolism in an animal model by using intraperitoneal microdialysis (IPM) and laser Doppler flowmetry.

Methods

Nine pigs with ABO and seven pigs with SMA occlusion for one hour followed by three hours of reperfusion (Fig. 1, 2). Seven animals used as controls.

Hemodynamic data, arterial blood samples, urinary output and intestinal mucosal blood flow (IBF) were followed hourly. IPM glucose, glycerol, lactate and pyruvate concentrations and lactate-pyruvate (l/p) ratio were measured by IPM.

Results

Compared to baseline, ABO reduced IBF by 76% and decreased urinary output. SMA occlusion reduced IBF (Fig. 3) by 75% without affecting urinary output.

ABO increased the i.p l/p ratio from 18 at baseline, peaking at 46 in early reperfusion (Fig. 4). ABO increased the IPM glycerol concentration from 87 µM at baseline to 579 µM after three hours of reperfusion (Fig. 5). SMA occlusion and reperfusion increased the IPM l/p ratio, peaking at 36 after one hour reperfusion.

Conclusions

Supra-celiac aortic balloon occlusion causes severe hemodynamic, renal and systemic metabolic disturbances.

The IPM l/p ratios and the glycerol concentrations increases during ischemia and reperfusion and may serve as markers of these events and indicate Anaerobic metabolism and cell damage.