

A LARGE ANIMAL MODEL OF LOW CARDIAC OUTPUT SYNDROME FOR STUDIES OF THE GASTROINTESTINAL TRACT

Jenny Seilitz, Tal M. Hörer, Per Skoog, Birger Axelsson, Kjell Jansson, Kristofer F. Nilsson

¹ Department of Cardiothoracic and Vascular Surgery, Örebro University hospital

² Department of Surgery, Örebro University hospital

³ Faculty of Medicine and Health, Örebro University, Sweden

Background

20% of cardiac surgical patients suffer from postoperative cardiac dysfunction. This may cause dysfunction of the gastrointestinal tract and a systemic inflammatory reaction. We aimed to create a large animal model of low cardiac output (CO), where the impact on the gut of low CO itself and in combination with inotropic and vasoactive drugs can be studied.

Material and methods

Central hemodynamics, superior mesenteric arterial blood flow and intestinal mucosal perfusion were measured in anaesthetised pigs. Arterial, mixed venous and mesenteric venous blood samples and intraperitoneal metabolites by microdialysis were analysed. CO was stepwise reduced to 75% (CO75%), 50% (CO50%) and 35% (CO35%) of the baseline value during one hour each, by instillation of fluid in the pericardial sack to create a cardiac tamponade (n=6) or by partial inflation of a balloon catheter in the inferior caval vein (n=6). Six pigs were controls.

Results

Both methods caused a stable and controllable lowering of CO whereas the controls maintained CO. At CO75% mean arterial blood pressure (MAP) was unchanged compared to baseline values in both groups. At CO50% MAP was reduced to 35 ± 4 mmHg in the tamponade group and 42 ± 3 mmHg in the balloon group. The blood flow in the superior mesenteric artery and the intestinal mucosal perfusion decreased proportionally to the cardiac output in both groups. Both methods progressively increased arterial and mesenteric venous lactate. In parallel the intraperitoneal lactate concentration and lactate/pyruvate ratio gradually increased.

Conclusion

The two methods for lowering CO were similar in effects, but the caval vein balloon method was technically easier. Low CO impaired the splanchnic circulation and the intestinal metabolism, even at a reduction by 25%, when MAP was well maintained. A reduction of CO to approximately 60% of the baseline value is suitable for further studies of inotropic and vasoactive drugs.