On the metabolic consequences of abdominal compartment syndrome

av

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Akademisk avhandling

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Abstract


Intra-abdominal hypertension (IAH) and the progression to abdominal compartment syndrome (ACS) are known complications of vascular and abdominal surgery, trauma, sepsis, and burns. ACS is associated with high mortality. In ACS, hypoperfusion, hypoxia, onset of inflammatory pathways and increased levels of oxygen reactive species are believed to cause tissue damage and initiate organ failure. Early detection of IAH is central in order to stop the pathological processes. Microdialysis is a method to determine extracellular metabolic changes through analysis of glucose, pyruvate, lactate and glycerol. Microdialysis is known to be feasible in the abdomen to detect early signs of postoperative complications. The ratio of lactate and pyruvate (l/p ratio) reflects the intracellular relationship between aerobic and anaerobic metabolism. Glycerol is elevated when cells have increased energy needs and in cell damage. Our hypothesis was that IAH and ACS cause early metabolic changes in the abdomen which could be determined by microdialysis, and possibly serve as clinical markers for organ failure due to IAH. In Paper I methodology was established using a porcine model with CO₂ pneumoperitoneum. Using the model in Paper II and III, we showed that metabolic changes (elevated l/p ratio and glycerol) occurred early in the abdomen as IAH was induced and also restituted after decompression. Decrease in urine output, circulatory changes and impaired mucosal circulation indicated that the model mimicked ACS well. In a clinical study (Paper IV), patients that underwent endovascular surgery for rAAA and later needed decompression due to IAH with organ failure, had more pronounced early metabolic alterations than patients without severe IAH. In conclusion, early abdominal metabolic changes due to IAH are seen experimentally in a model and in patients after rAAA. These changes can be measured with microdialysis and they could, if the results are verified in further studies, be used as clinical markers for IAH and ACS.

Keywords: Intra-abdominal hypertension; Intra-abdominal metabolism; Microdialysis; Laserdoppler flowmetry; Lactate; Pyruvate; Glycerol; Lactate/pyruvate ratio; Ruptured abdominal aortic aneurysm.

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