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Titel des Beitrags:
A cardiopulmonary bypass with deep hypothermic circulatory arrest rat model for the investigation of the systemic inflammation response and induced organ damage.

Abstract:
Cardiopulmonary bypass (CPB) is a commonly used technique in cardiac surgery. CPB is however associated with a strong induction of systemic inflammatory response syndrome (SIRS) which in conjunction with ischemia and reperfusion may lead to multiple organ failure. The aim of the study was to establish and characterize a CPB rat model incorporating deep hypothermic circulatory arrest with a specific focus on the extent of the inflammatory reactions and organ damage as a groundwork for novel therapeutics against SIRS and I/R induced organ injury. Male Wistar rats (n = 6) were cannulated for CPB, connected to a heart-lung-machine (HLM) and cooled to a temperature of 16°C before they underwent 45 minutes of deep hypothermic circulatory arrest with global ischaemia. Arrest was followed by rewarming and 60 minutes of reperfusion. Haemodynamic and vital parameters were recorded throughout the CPB procedure. Only animals displaying sinus rhythm throughout reperfusion were utilized for analysis. Rats were euthanized and tissue samples were harvested. Blood gas analysis was performed and blood samples were taken. Induction of organ damage was examined by analysis of protein levels and
phosphorylation status of kinases and stress proteins. Results were compared to animals (n = 6) which did not undergo CPB. CPB induced leucocytosis and an increase of interleukin-6 and TNF-? plasma values indicating an inflammatory response. Markers of tissue damage and dysfunction, such as troponin T, creatinine and AST were elevated. Phosphorylation of STAT3 was induced in all examined organs. Activation of MAPK and induction of heat shock proteins occurred in an organ-specific manner with most pronounced effects in heart, lungs and kidneys. The presented CPB rat model shows the induction of SIRS and activation of specific signalling cascades. SIRS seems not to be provoked during DHCA and is elicited mainly during reperfusion. This model might be suitable to test the efficacy of therapeutics applied in major heart surgery with and without DHCA.