Chronic Porcine Two-Hit Model with Hemorrhagic Shock and Pseudomonas aeruginosa Sepsis

Abstract:
Background: Sepsis is still a major cause of death despite well-developed therapeutical strategies such as antibiotics and supportive medication. The aim of this study was to characterize the long-term effects of a two-hit porcine sepsis model with a hemorrhagic shock as ‘first hit’ followed by a Pseudomonas aeruginosa infusion as ‘second hit’. Materials and Methods: Twelve juvenile healthy pigs were anesthetized and hemodynamically monitored. The two-hit group (n = 6) underwent a hemorrhagic shock with a 50% reduction of the mean arterial pressure and/or cardiac index for 45 min, followed by resuscitation, while the control group (n = 6) received no pretreatment. All chronically catheterized conscious pigs were challenged with a P. aeruginosa infusion (1.6 × 10⁷ CFU/kg/h for the first 24 h followed by 1.6 × 10⁶ CFU/kg/h for the next 24 h) and observed for another 48 h. Results: The two-hit group showed the following significant differences to the control group: higher APACHE II scores prior to sepsis induction, increased persisting mean pulmonary arterial pressure (MPAP) and pulmonary vascular resistance index (PVRI) during bacterial challenge. In contrast, systemic vascular resistance (SVRI) was reduced at the end of the study. Throughout the observation period, the mean arterial pressure (MAP) was significantly reduced. Conclusions: The present
study shows that the clinical course and hemodynamic effects of a P. aeruginosa sepsis will be aggravated by a preceding hemorrhagic shock during an observation period of 96 h. This two-hit model represents a valid, clinically relevant experimental protocol in sepsis research.

Stichworte: Two-hit model; Sepsis; Hemorrhagic shock; *Pseudomonas aeruginosa*; Pig

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