Abstract

Background: Cerebral edema is a well-known and fatal complication of acute liver failure (ALF). The influence of the treatment by artificial liver devices on the cerebral damage caused by ALF is usually monitored by only measuring the intracranial pressure (ICP). The aim of this work was to determine the influence of Fractionated Plasma Separation and Adsorption (FPSA), nonbiological artificial liver device, on the intracranial pressure. The second goal of this work was to determine the potential role of cerebral microdialysis in monitoring of the efficiency of fractionated plasma separation and adsorption (FPSA) treatment of ALF.

Methods: Two types of surgical resection model of ALF were used in two separate experiments in pigs. In the first study data from monitoring of the intracranial pressure of ALF group (animals with ALF only) and FPSA group (animals with ALF treated by FPSA) were compared. In the second study data from monitoring by cerebral microdialysis and ICP of the ALF group (animals with ALF only), FPSA group (animals with ALF treated by FPSA) and SHAM group (animals with only laparotomy) were compared using statistical analyses.

Results: In both experiments, the ICP was significantly higher in the ALF group than in the FPSA group from the 9th hour of the experiment. In the second experiment, a significant increase in ICP in the FPSA-treated group and the ALF group compared to the SHAM group was observed.

The lactate/pyruvate (L/P) ratio was significantly lower in the FPSA group than in the ALF group already from the 5th hour of the experiment, much earlier than when any significant change in ICP was observed. Moreover, the change in L/P ratio was significant already after one hour of the treatment.

Glutamine levels were significantly higher in both ALF and FPSA groups than in the SHAM group. Glutamine levels were significantly lower in the FPSA group than in the ALF group in the 6th – 10th hour of the experiment.

Conclusions: Our study shows clearly, that the treatment with FPSA decreases the rise of ICP in ALF. We also demonstrate that cerebral microdialysis is a valuable and promising technique that reflects the efficacy of FPSA treatment of ALF earlier than other monitoring modalities such as ICP. Monitoring the parameters of cerebral metabolism reflects the positive influence of the FPSA-treatment earlier than changes in ICP. The role of glutamine as a marker for the efficiency of FPSA treatment of ALF seems to be promising, but needs further evaluation.