Fluid administration prevents renal dysfunction during hypotension under spinal anesthesia in a rat model.

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摘要

Abstract

BACKGROUND: Severe hypotension deteriorates renal functions and renal hemodynamics especially renal cortical blood flow. Systemic hypotension following high level spinal anesthesia may impair renal functions in spite of the blockade of renal sympathetic nerves that may help prevent vasoconstriction. Fluid loading is clinically applied for preventing hypotension but the effects on the changes of renal functions have not been studied. This study was designed to investigate the effects of fluid loading on systemic hemodynamics, renal hemodynamics and functions especially the blood distribution to renal cortex. METHODS: A rat model was used in our study. Intravenous normal saline infusion was started in both control group (5 ml/kg/h, 8 rats) and fluid loading group (15 ml/kg/h, 8 rats) 30 min before spinal anesthesia. A high level (above T4) spinal anesthesia was conducted via a preset intrathecal catheter with 0.5% hyperbaric bupivacaine. Blood pressure, heart rate and renal cortical microvascular blood flow (CMBF) were measured via a laser Doppler probe firmly contacted on renal cortex and recorded continuously after spinal anesthesia. Renal functions including glomerular filtration rates (GFR, by inulin clearance), effective renal plasma flow (ERPF, by P-aminohippurate clearance), urine flow rate (UFR) and electrolytes excretion were measured every 30 min after spinal anesthesia. RESULTS: Severe hypotension was notable within 5-10 min after intrathecal anesthesia and recovered with 30 min in both groups but the difference was not significant between groups. In the control group, GFR and ERPF decreased significantly in the first 30 min by 51.9 +/- 19.8% and 44.3 +/- 13.7% respectively ($P < 0.05$) and recovered after 60 min. Also the deteriorations of UFR and CMBF were significantly longer (over 60 min). In fluid loading group, ERPF, UFR and CMBF could maintain throughout the experiment but only GFR was affected in the first 30 min. CONCLUSIONS: Fluid administration did not prevent hypotension following high level spinal anesthesia but might have beneficial effects on renal hemodynamics especially on the renal cortical circulation and urine flow rate.