Title: CEREBROVASCULAR EFFECTS OF FLUID IN ENDOTOXIC SHOCK: HYPERTONIC SALINE VERSUS RINGER'S LACTATE SOLUTION

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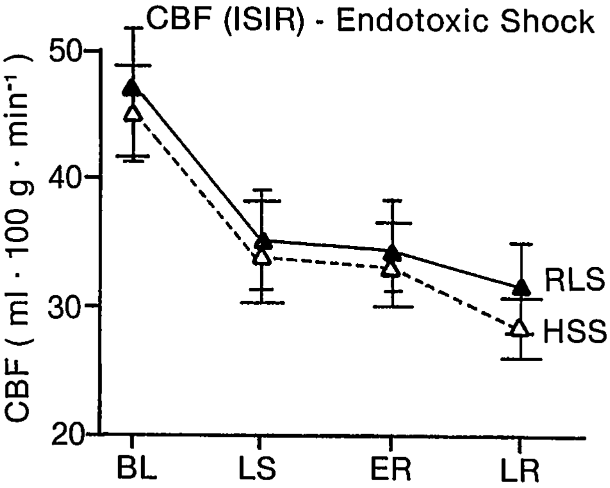
Introduction. 7.5% hypertonic saline (HSS) (2400 mosm/L) effectively resuscitates dogs from severe hemorrhagic shock[1] and may be useful in clinical practice.[2] In dogs resuscitated from hemorrhagic shock, intracranial pressure (ICP) remains low if HSS is used but returns to pre-shock levels or beyond in animals resuscitated with Ringer's Lactate Solution (RLS). The present study compares the effects of resuscitation from endotoxic shock with HSS compared to RLS on cerebral blood flow (CBF) and ICP.

Methods. Thirteen 15-25 kg mongrel dogs were randomly selected for the treatment with HSS or RLS. Dogs were anesthetized with pentobarbital 30 mg/kg, paralyzed with iv succinylcholine, and ventilated with tidal volumes of 15 ml/kg at a frequency that maintained a $PaCO_2$ of 35-45mmHG. A 16 ga femoral artery catheter and a 7.0 Fr. pulmonary artery catheter were placed. The temporalis muscle was dissected from the skull, a subarachnoid bolt was placed to monitor ICP and a cadmium telluride scintillation probe was positioned over each parietal hemicranium for measurement of CBF by Xe^{133} clearance. Endotoxic shock was produced by rapid infusion of endotoxin (Difco Labs) 1.5 mg/kg. After 30 minutes of shock, HSS 6 ml/kg or RLS 60 ml/kg was infused over 5 minutes. The following data were compared at baseline (BL), late shock (LS), early post resuscitation (ER) and late-resuscitation (LR): cerebral perfusion pressure (CPP), MAP, ICP, cardiac output (CO), total peripheral resistance (TPR), pulmonary artery systolic, diastolic, mean, and occlusion pressures. Data were analyzed using multivariate analysis of variance with a p value < 0.05 considered significant.

Results. CPP decreased to a similar extent in both groups at LS compared to BL ($p < 0.01$) and increased in both groups during resuscitation ($p < 0.01$). The RLS group returned toward BL CPP at both ER and LR but remained below BL ($p < 0.03$). CPP after resuscitation in the HSS group was not significantly different from BL. ICP at LR was not significantly different than BL in the RLS group. However, at LR in the HSS group, ICP was less than BL ($p < 0.01$) ICP at LR was different in the two groups ($p < 0.01$). MAP changed similarly in the two groups. CBF decreased in both groups ($p < 0.01$) and failed to recover in either, remaining at LS levels.

Discussion. Resuscitation with 7.5% HSS increases MAP, CPP, and CO in animals with hemorrhagic shock. No major differences are detectable in the hemodynamic response to HSS and RLS if RLS is given in approximately 10 times the volume of HSS.[3] The response of ICP to resuscitation with RLS versus HSS is similar to that previously described in hemorrhagic shock.[3] During LR, ICP in the RLS group exceeded normal levels. Although CPP and MAP improved in both groups, CBF did not recover in either group. These data suggest that cerebrovascular resistance is increased by endotoxic shock and that CBF is not a function of CPP in the presence of endotoxic shock. If similar effects are seen in septic patients, this would explain failure of adequate hemodynamic resuscitation to restore normal mental status.



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