Effects of Different Colloids Resuscitation on Brain Edema after Brain Trauma and Hemorrhage

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Background: The incidence of brain trauma varies by age, gender, region and other factors but ranges 100–600 people per 100,000 (1, 2). All patients with trauma receive different colloids; however the guidelines for fluid resuscitation in the treatment of brain edema are still insufficient. We evaluated the effects of different colloid solutions (6% hydroxyethyl starch 130/0.4 vs. 20% human albumin) in head trauma with major blood loss.

Our hypothesis is that 6% hydroxyethyl starch has similar and/or better effects than the albumin on brain edema, evaluated histopatologically and brain water content.

Material and Methods: Brain trauma was performed to Sprague-Dawley rats by lateral fluid percussion model under general anesthesia. Following tracheotomy mechanical ventilation was applied to achieve normocapnia. Heart rate, arterial pressure, SpO2, and temperature were monitored.

The abdominal aorta and inferior caval vein was catheterized for monitorization, blood sampling and acute hemorrhage. Rats other than Sham group TI was bled for 10ml/kg in 10 minutes. Group HS (Hydroxyethyl starch, n=10) received 10 ml/kg 6% hydroxyethyl starch, Group A (Albumin, n=10) received 10 ml/kg 20 % human albumin, Group TI (Sham group, n=10) was operated but was not allowed to bleed and did not receive fluid and Group TII (Sham group, n=10) was operated and received 10ml/kg saline. After fluid replacement mechanical ventilation was continued for 4 hours and blood gasses and oncotic pressures and osmolarity and urine output was recorded. At the end of the study all rats were sacrificed and in 6 of each group cortical fluid volume was calculated and a blinded pathologist histopathologically evaluated the rest. Brain water content was also evaluated.

Results: Subarachnoid hemorrhage, hyperemia and edema were observed in all rats. Mean arterial pressure, central venous pressure, hemoglobin and hematocrit values were statistically significant in Sham group TI ($p<0, 05$). 6% hydroxyethyl starch and human albumin had similar effect on brain edema. There were no differences between groups in regards to biochemical results and brain water content.

Summary: Albumin and 6% hydroxyethyl starch were not different in brain trauma and hemorrhagic rat model in regards to brain edema. Other then known clinical contraindications these fluids can be used in brain trauma with hemorrhage. Although, future human studies are warranted to make a definite conclusion.

Key words: Albumin; Voluven; Colloid; Brain edema; Hemorrhage; Rat

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