

Title: CARDIAC FUNCTION DURING FLUID CHALLENGE WITH ALBUMIN, HETASTARCH OR SALINE IN PATIENTS WITH CIRCULATORY SHOCK

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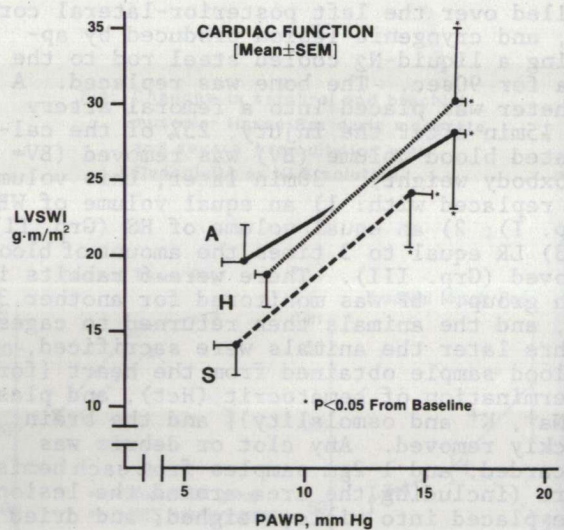
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Introduction. Circulatory shock is a clinical syndrome manifested by reduced nutrient tissue flow, anaerobic metabolism and lactic acidosis. Absolute or relative intravascular volume deficits are frequently central to the pathophysiology of the shock syndrome. General agreement exists in the literature regarding the need for plasma volume expansion as an important part of therapy for shock states. Controversy exists, however, in the choice of asanguineous fluid best suited for resuscitation. Recently, one group reported decreased myocardial function resulting from volume resuscitation with an albumin rich fluid regimen.¹ We compared the effects of fluid resuscitation on cardiac function in 26 shock patients randomized to treatment with either 5% Albumin (A), 6% hetastarch (H) or 0.9% sodium chloride (S) solutions.

Methods. Twenty-six consecutive patients in shock and meeting the following criteria were entered into the study: 1) systolic intra-arterial blood pressure less than 90 mm Hg, or 2) cardiac index less than 2.2 l/min/m², or 3) arterial lactate greater than 18 mg/dl, and 4) pulmonary artery wedge pressure less than 15 mm Hg. Patients were monitored with femoral intra-arterial catheters and flow directed pulmonary artery catheters placed percutaneously prior to initiation of the study. Thermodilution cardiac outputs were obtained by averaging triplicate measurements utilizing 10 ml of 5% D5/W injectate cooled to less than 1°C. Baseline measurements were made prior to fluid challenge. Fluid challenge consisted of infusion of 250 ml of test fluid (A, H or S) every fifteen minutes. Fluid challenge was completed when the PAWP was equal to 15 mm Hg, at which time end challenge measurements were made. Data are reported as mean±SE.

Results. Eighteen patients (69%) with septic shock and 8 patients (31%) with hypovolemic shock were resuscitated. The ages of the patients ranged from 54 to 97 years with a median age of 79 years. Sixteen patients (65%) were male. Only 9 patients (35%) survived the hospital stay. Nine patients were in the A group, 9 in the H group and 8 in the S group. At baseline mean arterial pressure (MAP) was A=60±3, H=64±5 and S=55±3 mm Hg, pulmonary artery wedge pressure (PAWP) was A=7.7±1.0, H=7.8±0.5 and S=7.1±1.1 mm Hg, left ventricular stroke work index (LVSWI) was A=19.4±2.7, H=18.4±2.9 and S=13.6±2.2 gm-m/m² and cardiac index (CI) was A=2.45±0.24, H=2.43±0.29 and S=1.85±0.23 l/min/m². At baseline there

were no statistical differences among the groups. To complete the fluid challenge the A group received 1083±213 ml, the H group 1639±413 ml and the S group 3906±946 ml of test fluid (S>A, H; p<0.05). At end challenge PAWP, LVSWI and CI increased compared to baseline in each group (p<0.05). The end challenge PAWP was A=16.4±0.4, H=16.4±0.3 and S=14.3±1.2 mm Hg and LVSWI was A=27.9±5.3, H=30.2±5.0 and S=23.9±3.5 gm-m/m². At end challenge there were no differences among the groups for PAWP or LVSWI (see figure below). The CI was greater at end challenge in the A and H groups compared to the S group (A=3.49±0.22, H=3.34±0.29, S=2.45±0.2 l/min/m²; p<0.05).



Discussion. This study documents that fluid challenge with albumin, hetastarch or saline improves cardiac performance in patients with circulatory shock. Two to 4 times the volume of saline as albumin or hetastarch is required to resuscitate the patients to the same hemodynamic endpoints. Our data demonstrate that cardiac function is not adversely affected by albumin administration, as suggested by Dahn et al.¹ Rather, when titrated to equal levels of preload fluid resuscitation with albumin, hetastarch or saline results in comparable increases in ventricular function.

References.

1. Dahn MS, Lucas CE, Legerwood AM, et al: Negative inotropic effect of Albumin resuscitation for shock. *Surgery* 1979; 86: 235-241.