

Title: HYDROXYETHYL STARCH VS ALBUMIN FOR COLLOID INFUSION AFTER CPB IN PATIENTS UNDERGOING CABG

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**INTRODUCTION:** The purpose of this study was to compare the less expensive synthetic colloid hydroxyethyl starch (HES) to human serum albumin for colloid infusion following cardiopulmonary bypass (CPB) in patients undergoing myocardial revascularization.

**METHODS:** Twenty patients anesthetized by the same anesthesiologist for elective myocardial revascularization by the same surgeon were studied. Patients were excluded for the following reasons: 1) previous cardiac surgery, 2) significant coagulopathies, 3) anemia, 4) chronic renal failure and 5) failure to obtain informed consent according to Institutional Review Board approval. Anesthetic, operative and CPB techniques were the same for all patients. Following the termination of CPB, the contents of the pump oxygenator reservoir were returned to the patient. Heart rate was controlled at 90 beats per minute with atrial pacing and mean arterial pressure at 80-90 mmHg with a nitroprusside infusion. Fifteen minutes after the reversal of heparin, baseline hemodynamic and metabolic determinations were obtained including left and right atrial pressure, cardiac index, hemoglobin and colloid osmotic pressure using a Wescor osmometer. At this point, the patient population was randomized into two groups of ten. In the HES group, 6% hydroxyethyl starch solution was infused over 24 hours to maintain left atrial pressure between 6-10 mmHg and cardiac index greater than 2.0 l/min/m<sup>2</sup>. In the albumin group, 5% albumin was infused over the same time period to meet the same hemodynamic criteria. Post-bypass, in addition to the colloid solutions, all patients received packed cells to maintain hemoglobin greater than 9.0 gm% and maintenance D<sub>5</sub>W 500 ml/m<sup>2</sup>/24 hours. Baseline hemodynamic and metabolic determinations were repeated after each 500 ml infusion of colloid and 4, 8, 12, and 24 hours after starting the colloid. In addition to these determinations, platelet, prothrombin, partial thromboplastin and fibrinogen levels were obtained prior to bypass and at 12 hours and 7 days after the start of colloid administration. Urine output and chest tube drainage were recorded continuously for 24 hours by computer automated techniques.

**RESULTS:** All patients received at least one liter of either albumin or HES solution. Most of the colloid was administered during the first 4 hours. At the end of 24 hours, there was no significant difference in the total amount of colloid infused to HES or albumin patients (Fig. 1). There was also no difference in the amount of crystalloid or packed cells infused. Urine output and chest tube drainage were similar for both groups. In these patients whose heart rate and afterload were controlled by atrial pacing and nitroprusside infusion respectively, relatively small amounts of either colloid were effective in maintaining cardiac index throughout the study (Fig. 2).

HES and albumin were equally effective in normalizing the low colloid osmotic pressures observed shortly after termination of CPB (Fig. 3). Coagulation studies revealed no intergroup differences between the HES and albumin groups with regard to all parameters

measured (Table).

**CONCLUSION:** We can document no major differences between hydroxyethyl starch and albumin solution for colloid infusion following termination of CPB. Substitution of the less expensive HES for albumin will result in an average savings of \$60 per patient.

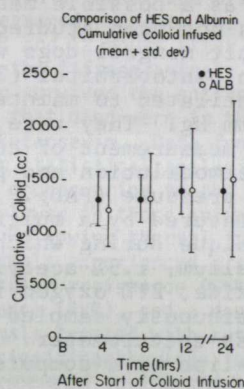


Fig. 1

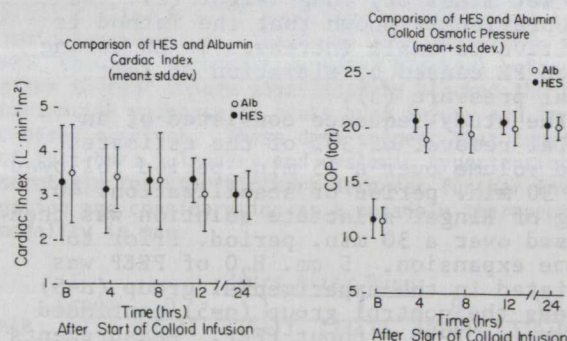


Fig. 2

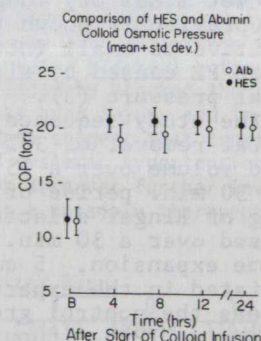


Fig. 3

COAGULATION DATA SUMMARY  
Averages ± Stand. Dev.

| Period | PT                       | PTT                | PLATELET                 | FIBRINOGEN         | ACT              |
|--------|--------------------------|--------------------|--------------------------|--------------------|------------------|
| B1     | HES 12.3 ± 0.5           | 28.7 ± 2.2         | 229333 ± 40307           | 268 ± 67           | 164 ± 27         |
|        | ALB 12.7 ± 1.0<br>N.S.   | 29.2 ± 6.8<br>N.S. | 158667 ± 28626<br>N.S.   | 270 ± 87<br>N.S.   | 152 ± 22<br>N.S. |
| 12 HR  | HES 14.2 ± 0.4 *         | 32.8 ± 4.2         | 187000 ± 15470 *         | 248 ± 56           | 134 ± 30         |
|        | ALB 13.5 ± 1.1 *<br>N.S. | 28.2 ± 2.2<br>N.S. | 130400 ± 31069 *<br>N.S. | 243 ± 65<br>N.S.   | 140 ± 30<br>N.S. |
| DAY 7  | HES 16.9 ± 1.7 *         | 29.5 ± 1.7         | 410500 ± 34348 *         | 505 ± 69 *         | 119 ± 37         |
|        | ALB 17.0 ± 2.5 *<br>N.S. | 36.3 ± 8.7<br>N.S. | 355000 ± 57872 *<br>N.S. | 590 ± 50 *<br>N.S. | 134 ± 31<br>N.S. |

N.S. Indicates no significant difference between treatment group & at the significance level p = .05.

\* Indicates significant difference from baseline B1 at the significance level p = .05.