TITLE: MONITORING ANTICOAGULATION AND REVERSAL - EFFECT ON BLOOD LOSS

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Introduction:

Management of anticoagulation for cardiopulmonary bypass has become more precise with the introduction of techniques and equipment to monitor heparin effect. Overdosage of heparin and more recently protamine are suggested to contribute to postoperative hemorrhage. Precision monitoring should result in lower effective doses and might decrease postoperative bleeding. This study was designed to determine the results of monitoring heparin effect and its neutralization on these two parameters.

Methods:

50 patients having cardiopulmonary bypass for aorta to coronary artery vein grafts only were randomized prospectively into two groups. Group I followed a standard protocol: heparin 3 mg/kg + 1½ mg/kg at 2 hrs; protamine 1 mg/1 mg total heparin + 50 mg for pump prime heparin. Group II patients received heparin 3 mg/kg, additional heparin administration guided by automated protamine titration performed every 30 min.[1] Protamine was given according to protamine titration at the end of bypass. Blood loss was measured post-bypass to the end of surgery as well as all chest tube drainage in the postoperative period. Statistical analysis was by t test for unpaired data with $p<.05$ considered significant.

Results:

One patient in Group I was reoperated and a surgical etiology for bleeding was found. Three other Group I patients had bypass times well beyond the range of Group II. The data from these four patients were not included. The results from the remaining patients are summarized in Table I. The total doses of heparin were similar. There was a marked difference in total protamine with the monitored group receiving 40% less. No other differences were observed between the groups including both periods of blood loss.

TABLE I

	Group I (N=21) ± SEM	Group II (N=25) ± SEM
Age yrs	54 1.7	52 1.7
Weight Kg	79.9 1.7	79.3 2.7
Bypass Time Minutes	90 6.5	87 5.6
Total Heparin mg	316 13.2	309 9.8
Total Protamine* mg	429 13.9	258 10.4
Protamine/ Heparin	1.4:1	0.8:1
Blood Loss Post Bypass - O.R.	548 61.0	588 74.0
Blood Loss Chest Tube-ICU	469 37.3	405 22.4

* $p<.05$

Summary:

Other studies have attributed decreased postoperative blood loss to decreased protamine doses and monitoring anticoagulation. This randomized prospective study of patients having identical non-intracardiac surgical procedures and carefully matched for duration of bypass demonstrated no difference in postoperative blood loss. However, it has shown that with appropriate monitoring lower doses of protamine can be safely administered.

Reference:

1. Hepcon, Hemotec Inc., Englewood, Colorado 80112