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The Effectiveness of Acute Normovolemic Hemodilution and Autologous Prime on Intraoperative Blood Management during Cardiac Surgery

RESEARCH ABSTRACT

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Purpose

Intraoperative blood management during cardiac surgery is a multifaceted process incorporating various interventions directed at optimizing oxygen delivery and enhancing hemostasis. The purpose of this study was to evaluate the effects of acute normovolemic hemodilution (ANH) and autologous priming (AP) on preserving hematocrit during cardiopulmonary bypass (CPB).

Methods

Case records from a national registry of adult patients who underwent cardiac surgery with CPB between January and October 2016 from 172 hospitals were reviewed. Patients were categorized into one of four groups according to blood management technique: ANH, AP, ANH+AP or None. Differences in group means were assessed using Welch's ANOVA, while case distribution across categorical variables were assessed using a Chi-square test. All data are expressed either as mean + standard deviation or as count and percent. The primary endpoint was first hematocrit on CPB with secondary endpoints of intraoperative hematocrit drift and intraoperative red blood cell (RBC) transfusion rates.

Results

The study population included 18,024 consecutive patients with the following case numbers and ANH and AP volumes: ANH (n=334) 648.3mL+200.6, 0.0+0.0mL, AP (n=12,677) 0.0+0.0mL, 749.6+404.4mL, ANH+AP (n=2,792) 515.9+271.4mL, 774.7+463.2mL, and None (n=2,221) 0.0+0.0mL, 0.0+0.0mL. The first CPB hematocrit was lowest in the ANH group (26.5%+4.4%) and highest in ANH+AP patients (27.5%+4.8%) ($p < 0.001$). The change in hematocrit from the post-heparin to first on-CPB sample periods was greatest in the ANH group (8.3%+3.9%) compared to both the AP (6.4%+3.8%) and ANH+AP

(6.9%+4.1%) groups ($p<0.001$). Patients receiving intraoperative red blood cell transfusions were as follows: ANH 26 (7.8%), AP 2,531 (20.0%), ANH+AP 287 (10.3%), and None 592 (26.7%), ($p<0.001$).

Conclusions

The use of ANH resulted in the greatest decline in hematocrit values, but when ANH was combined with AP, higher resultant hematocrits and lower intraoperative transfusion rates were seen.