

Noninvasively Measured Hemoglobin Concentration Reflects Arterial Hemoglobin Concentration Before but Not After Cardiopulmonary Bypass in Patients Undergoing Coronary Artery or Valve Surgery

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OBJECTIVE: This study compared noninvasively measured hemoglobin and arterial hemoglobin before and after cardiopulmonary bypass in patients undergoing coronary artery or valve surgery.

DESIGN: Observational study with retrospective data analysis.

SETTING: Veterans Affairs hospital.

PARTICIPANTS: Thirty-five men.

INTERVENTIONS: None.

MEASUREMENTS AND MAIN RESULTS: Hemoglobin values were measured noninvasively by co-oximetry to corresponding arterial hemoglobin concentrations taken at clinically relevant time points chosen at the discretion of the cardiac anesthesiologist. Thirty-five and 27 pooled pairs of data were obtained before and after cardiopulmonary bypass, respectively. Arterial hemoglobin concentration was analyzed using i-STAT CG8+test cartridges routinely used in the authors' operating rooms and those of other institutions. Linear regression and Bland-Altman analysis revealed a significant positive bias, wide limits of agreement, and low correlation coefficients between the noninvasive and arterial hemoglobin measurements. These findings were especially notable after compared with before cardiopulmonary bypass.

CONCLUSIONS: The results suggested that noninvasive measurement of hemoglobin overestimates arterial hemoglobin by almost 1 g/dL when compared to iSTAT. A lack of precision also was observed with noninvasive measurement of hemoglobin, especially after cardiopulmonary bypass. These findings supported the contention that sole reliance on noninvasive measurement of hemoglobin for transfusion decisions in cardiac surgery patients may be inappropriate.