

Accuracy of Noninvasive Total Hemoglobin Measurement after Acute Normovolemic Hemodilution in Urological Surgical Patients.

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Background

Acute normovolemic hemodilution (ANH) is a useful autologous transfusion method of saving red blood cells during surgical procedures that are associated with a high risk of significant blood loss. The maximal possible dilution of blood from individual patients is a concern for anesthesiologists and a mathematical model to predict hematocrit after hemodilution has been reported (1). However, this model is very complex and is therefore less than optimal for clinical use. A new pulse oximeter (Radical-7™, Mashimo Co., Irvine, CA, USA) has recently been developed for the continuous and noninvasive measurement of total hemoglobin in blood (SpHb). The present study compares mathematically calculated values with those obtained using a blood gas analyzer (ABL700™, Radiometer, Brønshøj Denmark) and the Radical-7™, pulse oximeter.

Materials and Methods

Twenty-one urological surgical patients participated in this study. A 22-G cannula was inserted into the radial artery for continuous blood pressure monitoring and blood gas analysis. A sensor was placed on the tip of a finger of each patient to measure SpHb. Blood 800 (mL) was drawn through an intravenous catheter placed in the radial artery of each patient after inducing anesthesia. Thereafter, 800 mL of 6% hydroxyethylated starch was rapidly delivered to compensate for the decrease in intravascular volume and to reduce the hemoglobin concentration. Both SpHb and hemoglobin (Hbgas) were simultaneously measured using the ABL700™ gas analyzer before and after ANH. The predicted values of hemoglobin (Hbcalc) were calculated as described (1). Data were compared using a two-way repeated-measures ANOVA.

Results

All data are presented as means \pm S.D. The SpHb, Hbgas, and Hbcalc values before and after ANH were 12.9 ± 1.7 vs. 10.5 ± 1.5 , 13.6 ± 1.0 vs. 9.6 ± 0.9 and 13.6 ± 1.0 vs. 10.8 ± 1.0 g/dL, respectively. All values measured by each method were significantly lower after, than before ANH ($p < 0.01$) and hemoglobin values did not significantly differ among the three methods ($p = 0.25$).

Conclusions

The SpHb value was accurately determined during surgery with ANH. Real-time SpHb monitoring might be useful for patients such procedures.

References 1) Monk and Goodnough *et al.*, *Anesthesiology* 1999; 91: 24-33.