

Comparison of Pulse Hemoglobin to Arterial Blood Gas Hemoglobin during Major Surgical Procedures. Barr S.J., Collier C.L. Applegate, R. L., Rook, J., Allard M. *Proceedings of the 2010 Annual Meeting of the American Society Anesthesiologists.* A1151.

Introduction

Major surgical procedures are associated with the risk of significant intraoperative blood loss. Both anemia and blood transfusion have been reported to be associated with increased morbidity and mortality in critically ill patients. Pulse hemoglobin (SpHb) is an evolving tool capable of continuously measuring hemoglobin (Hb) noninvasively based on absorption of multiple wavelengths of light by various blood components. SpHb may respond differently when large blood loss or fluid shifts occur in surgical patients than in the population used for validation. However, SpHb has the potential to help maintain patients within a target hemoglobin range during major surgical procedures, which may improve patient outcomes.

Methods

This is a prospective sequential nonrandomized trial to determine SpHb accuracy in adult patients undergoing major surgery with expected blood loss $\geq 15\%$ of the patient's estimated blood volume. Pulse CO-Oximetry, SpHb and Perfusion Index (PI) were monitored continuously during each procedure using an FDA approved device (Masimo Rainbow® SET). Radial arterial catheters were placed for blood gas analysis (ABG) and blood pressure monitoring. When a decision was made to obtain an ABG, time matched measurements of SpHb and arterial hemoglobin (ABG Hb) were done to establish accuracy of SpHb. Blood volume was managed utilizing arterial pulse waveform contour analysis to maintain stroke volume variation $<12\%$.

Results

Analysis from this ongoing trial includes data from 14 patients with 52 time matched SpHb to ABG Hb measurements. The mean difference of SpHb to ABG Hb for all measurements was 1.07g/dL. The mean difference was 1.04g/dL when PI was above 0.75 and 1.15g/dL when PI was below 0.75. Table 1 demonstrates measured accuracy of SpHb to ABG Hb for all data points and a comparison of accuracy within a range of ABG Hb values. Comparison of SpHb to ABG Hb is shown in Figure 1a. The effect of PI on SpHb to ABG Hb difference is shown in Figure 1b. Discussion: Initial data analysis shows that the trend of SpHb can be used to help guide intraoperative blood transfusion management. SpHb appears to be more accurate when ABG Hb is below 10g/dL or with higher PI values. While the mean difference of SpHb to ABG Hb was 1.07g/dL, differences were measured as high as 3.3g/dL during rapid blood loss and low PI. A confirmatory ABG seems advisable prior to transfusion in these conditions.

Conclusions

Further investigation is warranted to determine whether SpHb can substitute for current methods of measuring intraoperative Hb, but its ability to allow practitioners to follow Hb trends is promising.

