

Perioperative Use of Noninvasive Hemoglobin Monitoring: A Multi-Center Study in a Large HMO.

Qiu C., LaPlace D., Smith M., Friedman M, Etrata R. *Proceedings of the 2010 Annual Meeting of the American Society Anesthesiologists*. Abs A393.

Introduction

Intermittent measurements of hemoglobin (Hb) concentration have been the standard of practice for patients undergoing surgeries with major blood loss. Points of care measurements do not necessarily reflect the true and dynamic nature of intraoperative Hb changes. Ongoing intraoperative blood loss along with concurrent fluid replacement and blood transfusions often undermine the results of point of care measurements of Hb levels. The recent introduction of a non-invasive hemoglobin monitor not only makes the detection of real time intraoperative Hb levels possible, but also provides a valuable tool in trending information in guiding transfusion therapy. We sought to compare the hemoglobin values obtained from a continuous noninvasive hemoglobin device with those from the clinical laboratory to validate its intraoperative application and value.

Methods

This pilot study involved 25 patients who underwent major surgeries. Patients were randomly selected from several Kaiser Permanente Southern California Medical Centers. The non-invasive hemoglobin (SpHb) monitor, Radical 7 (Masimo Corp, Irvine, CA), was used on all study subjects by using an adhesive sensors (Revision E) that was placed on the patients' finger. Random blood samples were drawn and invasive hemoglobin (tHb) levels were measured in our laboratory using a CO-Oximeter (Beckman Coulter, Brea, CA). SpHb was recorded at the time when the blood was drawn. SpHb values were retrospectively compared to invasive hemoglobin (tHb). Correlation coefficient was calculated and a value greater than 0.8 was considered as strong positive correlation.

Results

The bias, precision and A_{RMS} were 0.4 g/dl, 0.23 g/dl and 0.47 g/dl respectively. A correlation plot is shown in Figure 1; the R^2 is 0.94.

Conclusions

Blood transfusions have saved many lives since its introduction. Recent data suggests that over transfusion (2) occurs frequently in many ORs and ICUs especially in cases of massive bleeding. Transfusion risks in this patient population are unacceptably high and stricter indications for blood transfusion needs to be called upon. The introduction of a continuous noninvasive Hb monitor provides an opportunity for accurate Hb detection in real time and direct transfusion therapy. Our pilot study demonstrated a strong correlation between the noninvasive Hb readings and invasive Hb values. Our study shows that the Radical-7 continuous noninvasive hemoglobin device displays an acceptable accuracy over a wide range of hemoglobin values. The ability to measure hemoglobin noninvasively and continuously has the significant potential to facilitate real time decisions and to avoid the complications, expense and discomfort associated with invasive blood draws.

References: 1) *Anesthesiology*. 107; A1545; 2) *BMC Musculoskeletal Disorders* 2009, 10:167.

Table 1.	
n	25
Range (tHb)	7.0-15.5 g/dl
Mean tHb ([start_en]00B1; SD)	10.2 ± 2.0
Bias SpHb vs tHb	0.41
Precision	0.23
% A RMS	0.47

Figure 1

