

Noninvasive Estimation of Hemoglobin by Pulse-CO-Oximetry in Infants Undergoing Major Surgery.

Renner J., Broch O., Scheewe J, Gruenewald M, Bein B. *Proceedings of the 2010 Annual Meeting of the American Society Anesthesiologists*. Abs. 1668.

Introduction

Noninvasive continuous measurement of instantaneous hemoglobin especially in infants and neonates may translate into a considerable improvement with respect to the perioperative decision making process whether to transfuse red blood cells or not. The recently introduced noninvasive Pulse-CO-Oximetry monitoring system (Masimo Rainbow SET Pulse CO-Oximetry) offers the ability to continuously estimate total hemoglobin (SpHb). Currently only few data are available concerning the application of SpHb neither in adults nor in infants and neonates. The purpose of the present study was to evaluate the accuracy of SpHb compared with hemoglobin values obtained by repeatedly drawn arterial blood gas analyses (Hb_{ABGA}) in infants and neonates undergoing major surgery.

Methods

31 patients scheduled for major abdominal surgery (n=10) and congenital heart surgery (n=21) were enrolled in this study. Intraoperative monitoring included a central venous line, invasive measurement of blood pressure using either a femoral artery or a radial artery and the non-invasive hemoglobin sensors (Masimo Corp. Irvine CA). Hemodynamic variables included central venous pressure; mean arterial pressure, heart rate, SpHb and Hb_{ABGA}. Data pairs for comparison were obtained each time the attending anesthesiologist deemed it necessary to update the instantaneous total hemoglobin with an arterial blood gas analysis.

Results

Mean age of the patients was 23±30 months, and mean body weight was 11±9kg. A total of 116 data pairs comparing SpHb with Hb_{ABGA} were collected. SpHb values ranged from 5.8 to 18.2 g/dL, and Hb_{ABGA} values ranged from 6.2 to 16.8 g/dL. The noninvasive assessment of hemoglobin showed a significant correlation with the invasive standard laboratory measurement of total hemoglobin ($r=0.73$, $p<0.0001$). Bland Altman analysis revealed an acceptable bias of 0.66 ± 1.71 g/dL with a percentage error of 28%.

Conclusion

The presented data in this patient population of infants and neonates undergoing major surgery suggest an acceptable agreement between the non-invasive continuous estimation of hemoglobin using the Pulse-CO-Oximetry with the clinical standard of invasive, intermittent arterial blood gas analysis. Summary: The noninvasive continuous estimation of total hemoglobin using Pulse-CO-Oximetry showed clinical acceptable agreement with standard laboratory hemoglobin measurement.

Figure 1

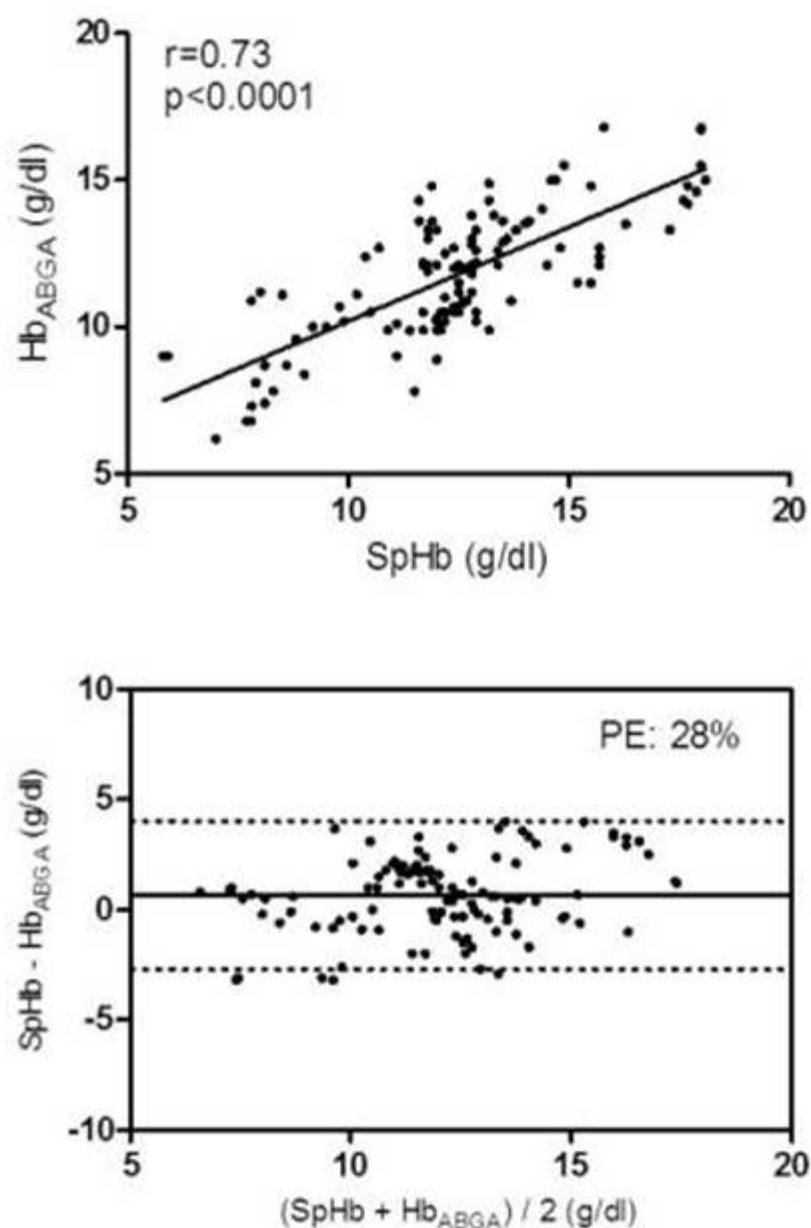


Figure 1: Correlation and Bland Altman analysis between non-invasive measurement of total hemoglobin (SpHb) and standard laboratory measurement of total hemoglobin using arterial blood gas analysis (HbABGA) in infants and neonates.