

The Accuracy of Noninvasive and Continuous Total Hemoglobin Measurement by Pulse CO-Oximetry in Human Subjects Undergoing Hemodilution.

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Background

Total hemoglobin (tHb) is one the most frequently ordered laboratory measurements. Pulse CO-Oximetry™ (Masimo Corp., Irvine, CA) is a multi-wavelength spectrophotometric method for noninvasive and continuous hemoglobin monitoring (SpHb). In this study, we evaluated the accuracy of SpHb compared with laboratory CO-Oximeter measurement of tHb from arterial blood samples in 20 healthy volunteer subjects undergoing hemodilution.

Methods

After enrollment, approximately 500 mL of blood was drawn from subjects through an arterial or venous catheter. Each subject then rapidly received crystalloid IV fluid to compensate for the decrease in intravascular volume and reduce the hemoglobin concentration. Subjects received a maximum of 30 mL/kg IV fluid. SpHb was continuously monitored and recorded, and serial arterial blood samples were taken during the procedure. SpHb accuracy was analyzed by pairing SpHb and tHb measurements after the arterial blood draw with the resulting tHb test result. Bias, precision, and the average root-mean-square error were calculated.

Results

One hundred sixty-five tHb measurements were collected. The average decrease in tHb during the blood removal and hemodilution procedure was 2.4 ± 0.8 g/dL (mean \pm SD). The average difference between 335 paired measurements of SpHb and tHb was -0.15 g/dL, 1 SD of the difference was 0.92 g/dL, and the average root-mean-square difference was 0.94 g/dL. The difference between SpHb and tHb was <2.0 g/dL for 97% of the measurements. The difference was <1.5 g/dL for 97% of the measurements when tHb was <10 g/dL.

Conclusions

Pulse CO-Oximetry– based SpHb measurement is accurate within 1.0 g/dL (1 SD) compared with laboratory CO-Oximeter tHb measurement in subjects undergoing hemodilution.