

Comparison of the Accuracy of Noninvasive Hemoglobin Monitoring by Spectrophotometry (SpHb) and HemoCue with Automated Laboratory Hemoglobin Measurement.

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Background

The reference method for hemoglobin concentration measurement remains automated analysis in the laboratory. Although point-of-care devices such as the HemoCue 201+ (HemoCue, Angelholm, Sweden) provide immediate hemoglobin values, a noninvasive, spectrophotometry-based technology (Radical-7; Masimo Corp., Irvine, CA) that provides continuous online hemoglobin (SpHb) measurements has been introduced. This clinical study aimed to test the hypothesis that SpHb monitoring was equivalent to that of HemoCue (the automated hemoglobin measurement in the laboratory taken as a reference method) during acute surgical hemorrhage.

Methods

Blood for laboratory analysis was sampled after induction of anesthesia, during surgery according to the requirements of the anesthesiologist, and finally after the transfer of the patient to the recovery room. When each blood sample was taken, capillary samples were obtained for analysis with HemoCue. SpHb monitoring was performed continuously during surgery. Using the automated hemoglobin measurement in the laboratory as a reference method, the authors tested the hypothesis that SpHb monitoring is equivalent to that of HemoCue. The agreement between two methods was evaluated by linear regression and Bland and Altman analysis.

Results

Eighty-five simultaneous measurements from SpHb, HemoCue, and the laboratory were obtained from 44 patients. Bland and Altman comparison of SpHb and HemoCue with the laboratory measurement showed, respectively, bias of -0.02 ± 1.39 g/dl and -0.17 ± 1.05 g/dl, and a precision of 1.11 ± 0.83 g/dl and 0.67 ± 0.83 g/dl. Considering an acceptable difference of ± 1.0 g/dl with the laboratory measurement, the percentage of outliers was significantly higher for SpHb than for HemoCue (46% vs. 16%, $P < 0.05$).

Conclusions

Taking automated laboratory hemoglobin measurement as a reference, the study shows that SpHb monitoring with Radical-7 gives lower readings than does the HemoCue for assessment of hemoglobin concentration during hemorrhagic surgery.