Continuous Noninvasive Hemoglobin Monitor from Pulse Ox: Ready for Prime Time?

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Background

Advances in technology have allowed for continuous noninvasive hemoglobin monitoring (SpHb), which may enable earlier detection of hemorrhage and more efficient surgical and/or blood transfusion management. The use of SpHb has not been described in the trauma population. The purpose of the present study was to evaluate the accuracy of a SpHb measurement device in severely injured trauma patients.

Methods

We performed a prospective cohort analysis of severely injured trauma patients admitted to the intensive care unit (ICU) at our level I trauma center over a 6 month period. Serial IHb (invasive hemoglobin) levels and SpHb for the first 72 h were measured. Each SpHb measurement was matched with a corresponding IHb measurement. We defined normal Hgb as >8 mg/dL and low Hgb as <8 mg/dL. Data were then grouped based on Hgb level. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), accuracy, and Spearman correlation coefficient plot were calculated.

Results

A total of 23 trauma patients with 89 data pairs were reviewed. Eighty-six percent of the patients were male with a mean age of 32 years and a mean injury severity score (ISS) of 21.1 ± 14. Invasive hemoglobin had a range of 7.2-16.9 and SpHb had a range of 3.3-15.2. The average mean and difference between IHb and SpHb were 10.7 and 1, respectively. Continuous noninvasive hemoglobin measurement did not record data points 13.5% of the time. The Spearman correlation plot revealed a correlation of $R = 0.670$ ($p < 0.001$). After dichotomization with Hgb > 8, SpHb was found to have a sensitivity of 91%, PPV 96%, specificity 40%, NPV 20%, and an accuracy of 88%.

Conclusions

The continuous noninvasive hemoglobin monitor does not appear to represent serum hemoglobin levels accurately in severely injured trauma patients. However, we were able to identify utility for this noninvasive tool when Hgb was dichotomized into normal or low levels.