Accuracy of Non-invasive Measurement of Hemoglobin using Pulse CO-Oximetry in an Intensive Care Unit.

Mimuro S., Aoki Y., Shiraishi Y., Suzuki A., Morita K., Sato S. *Proceedings of the 2011 Annual Meeting of the American Society of Anesthesiologists*. A888.

Background

The Masimo Rainbow SET for pulse CO-oximetry developed by Masimo Corporation uses multi-wavelength and an advanced signal processing technique to measure total hemoglobin (SpHb) values. The SpHb values can be objectively displayed and shared by multiple doctors via the monitor, which may lead to improvement of intensive care safety. Furthermore, the function of SpHb measurement is included in a pulse oximeter, which makes it much easier to operate the system. Objective: This study was performed to evaluate the accuracy of SpHb compared with laboratory CO-Oximeter measurement of total Hb (tHb) from arterial blood samples during transfusion of two units of Red Cells Concentrates-Leukocytes Reduce (RCC-LR, "Nisseki").

Methods

After IRB approval and informed consent were obtained, 11 patients receiving two units of RCC-LR in the intensive care unit were enrolled in the study. A Masimo Rainbow® Adult ReSposable probe (Rev E) was attached to the ring finger of each patient on the same hand as the arterial line, according to the manufacturer's instructions. The probe was covered with an ambient shield to prevent optical interference. SpHb values were compared with tHb values obtained from blood samples drawn via the arterial line and analyzed by CO-Oximetry (Radiometer ABL800 FLEX). The sequential organ failure assessment (SOFA) score was calculated at the same time.

Results

Forty-seven samples were obtained from 11 patients. The SOFA score was 10.6 ± 4.3 (mean ± SD). The weight of the two units of RCC-LR was 288 ± 26 g. The correlation coefficient between SpHb and tHb was 0.88, the bias was 0.26, and the precision was 0.57. A plot of the correlation between SpHb and tHb is shown in Figure 1 and a Bland-Altman plot is shown in Figure 2.

Conclusions

This is the first time that the Masimo Rainbow SET has been used for intensive care patients, and our data show that the measurement of SpHb is reliable in these patients. A limitation of the study is that we only examined data in 11 patients and further studies may be needed to validate the results. However, we conclude that non-invasive measurement of hemoglobin via pulse CO-oximetry can be performed reliably in patients in intensive care.

Fig 1 The correlation coefficient between SpHb and tHb

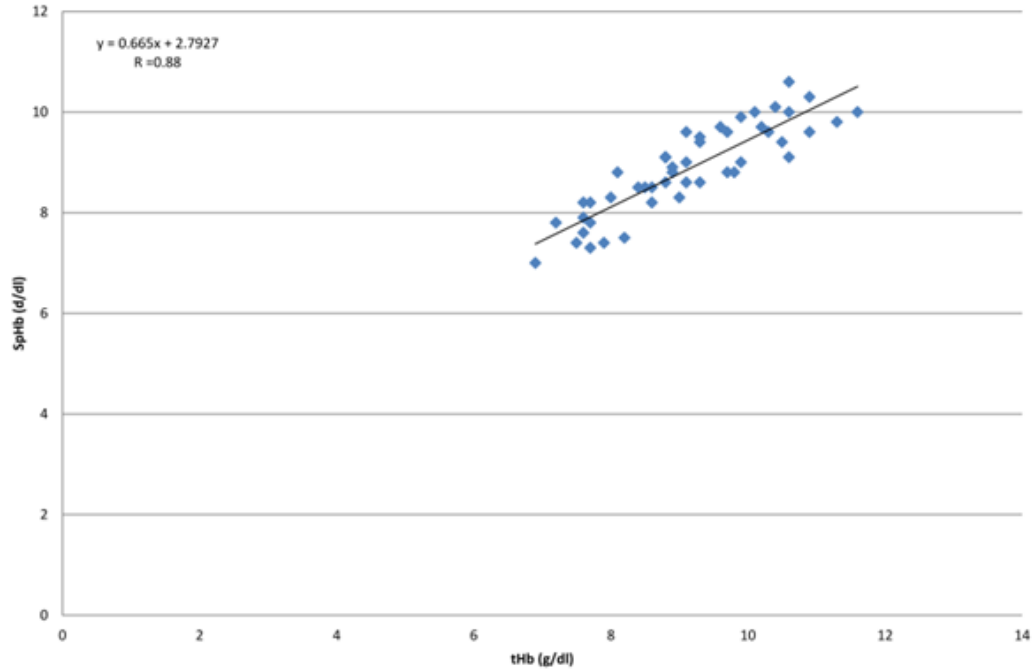

Figure 2

Fig 2 Bland-Altman Plot