Continuous Noninvasive Measurement of Total Hemoglobin Concentration during Major Liver Resection by Pulse CO-Oximetry.
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Background

The Masimo Radical-7 (V7.6.0.1, Masimo Corp, Irvine, USA) Pulse CO-Oximeter uses multi-wave length spectrophotometric analysis (sensor R2-25) to calculate total hemoglobin concentration (SpHb). SpHb is monitored continuously and non-invasively, which may reveal advantages over invasive, snap-shot hemoglobin concentration (Hbin) monitoring. We compared SpHb and Hbin during surgery for major hepatic resection.
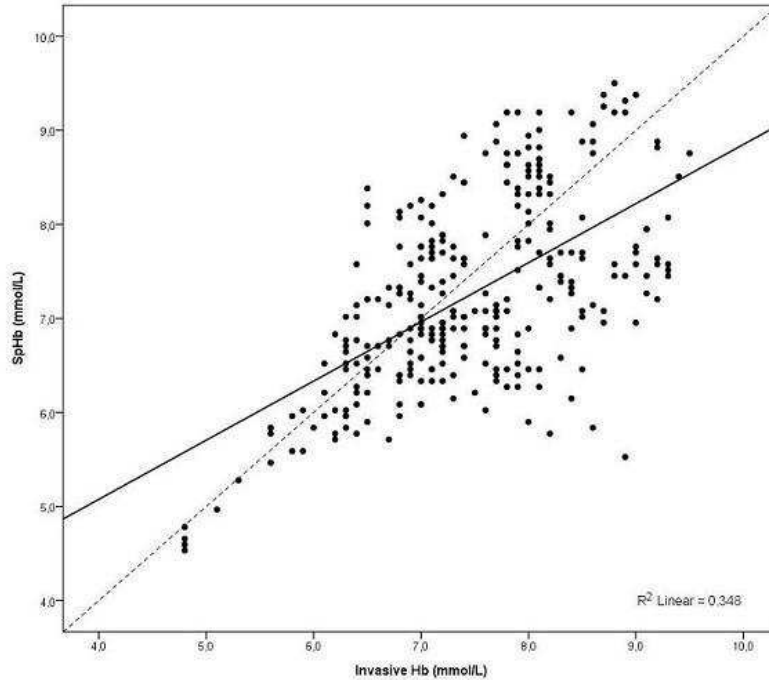
Methods

After local EC approval, 17 patients undergoing hepatic resection were included. Central venous blood samples were drawn every 30 min and analyzed using ABL 800 Flex (Radiometer GmbH, Copenhagen, Denmark). SpHb and Hbin were correlated and a regression curve was plotted. Prediction error analysis was done. Change in trend direction between consecutive Hbin measures in correspondence with a change in SpHb trend direction was studied.

Results

306 data points were obtained. Mean duration of surgery was 426 min ($\pm$ 97 min) and median blood loss was 420 ml (range 50 - 1500 ml). Hbin ranged from 4.8 to 9.5 mmol/L and SpHb ranged from 4.5 to 9.5 mmol/L. Mean Hbin and SpHb was 7.5$\pm$0.9 mmol/L and 7.2 $\pm$ 1.0 mmol/L, respectively. Regression was significant between SpHb and Hbin ($p< 0.01$, R^2 linear=0.348, fig.1).   Correlation between SpHb and invasive Hb] Pearson Correlation=0.59. Compared to Hbin, SpHb showed a median prediction error (=bias) of 3.4% (SD 1.0%) revealing a slight underestimation. Median absolute prediction error is 9.4% (SD 5.8%) revealing a moderate bias. Pulse CO-Oximetry failed to adequately predict the trend of changes in hemoglobin concentration at a threshold value of 0.3 mmol/L (good trend=51.2%; false trend=48.8%).

Conclusions

SpHb showed a significant relation and moderate correlation with Hbin. SpHb slightly underestimated Hbin with moderate bias. In patients undergoing major hepatic resection, SpHb might become an alternative for Hbin. Further studies have to reveal if SpHb might replace Hbin in its current version.

[Correlation between SpHb and invasive Hb]

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