

Accuracy and Trending of Continuous Noninvasive Hemoglobin Monitoring in Patients Undergoing Liver Transplantation.

Transplant Proc. 2016 May;48(4):1067-70. doi: 10.1016/j.transproceed.2015.12.121.

Huang PH(1), Shih BF(1), Tsai YF(2), Chung PC(2), Liu FC(2), Yu HP(2), Lee WC(3), Chang CJ(4), Lin CC(5).

Author information:

(1)Department of Anesthesiology, Chang Gung Memorial Hospital, Guishan, Taoyuan, Taiwan. (2)Department of Anesthesiology, Chang Gung Memorial Hospital, Guishan, Taoyuan, Taiwan; College of Medicine, Chang Gung University, Guishan, Taoyuan, Taiwan. (3)College of Medicine, Chang Gung University, Guishan, Taoyuan, Taiwan; Department of General Surgery, Chang Gung Memorial Hospital, Guishan, Taoyuan, Taiwan. (4)Clinical Informatics and Medical Statistics Research Center, Chang Gung University, Guishan, Taoyuan, Taiwan; Biostatistical Center for Clinical Research, Chang Gung Memorial Hospital, Guishan, Taoyuan, Taiwan. (5)Department of Anesthesiology, Chang Gung Memorial Hospital, Guishan, Taoyuan, Taiwan; College of Medicine, Chang Gung University, Guishan, Taoyuan, Taiwan. Electronic address: chihchung@cgmh.org.tw.

BACKGROUND: Shift in large fluid volumes and massive blood loss during liver transplantation frequently leads to rapid changes in hemoglobin (Hb) concentration; thus, to ensure adequate tissue oxygenation, accurate and rapid determination of Hb concentration is essential in transplant recipients. The Radical-7 Pulse CO-Oximeter provides a noninvasive and continuous way to monitor Hb concentration (SpHb) in real time and is an ideal candidate for use during liver transplantation. In this study, we assessed the relationship between SpHb and total Hb (tHb) obtained from arterial blood samples during surgery.

METHODS: Forty patients undergoing liver transplantation were enrolled in this study. tHb and time-matched SpHb were measured at 5 different phases throughout surgery. Paired SpHb and tHb levels were assessed using linear regression, Bland-Altman analysis, and the Critchley polar plot method.

RESULTS: A total of 161 paired measurements with sufficient signal quality were analyzed. The correlation between SpHb and tHb was 0.59 ($P < .001$). Bland-Altman analysis revealed that a bias between SpHb and tHb was 2.28 g/dL, and limits of agreement (LoA) were from -0.78 to 5.34 g/dL. Trending analysis showed that 87% of data were located within the acceptable trending area, indicating that the trending ability was not satisfied.

CONCLUSIONS: The Radical-7 Pulse CO-Oximeter was not sufficient to monitor Hb levels and trends during liver transplantation surgery in our cohort. In particular, in critical patients and in those with low Hb levels, invasive Hb measurement should be used for assessment.