The Relative Trending Accuracy of Noninvasive Continuous Hemoglobin Monitoring during Hemodialysis in Critically Ill Patients

Yamada H., Saeki M., Ito J., Kawada K., Higurashi A., Funakoshi H., Takeda K. *J Clin Monit Comput.* 2014 May 3.

The pulse CO-Oximeter (Radical-7; Masimo Corp., Irvine, CA) is a multi-wavelength spectrophotometric method for noninvasive continuous monitoring of hemoglobin (SpHb). Because evaluating the relative change in blood volume (ΔBV) is crucial to avoid hypovolemia and hypotension during hemodialysis, it would be of great clinical benefit if ΔBV could be estimated by measurement of SpHb during hemodialysis. The capability of the pulse CO-Oximeter to monitor ΔBV depends on the relative trending accuracy of SpHb. The purpose of the current study was to evaluate the relative trending accuracy of SpHb by the pulse CO-Oximeter using Crit-Line as a reference device.

In 12 patients who received hemodialysis (total 22 sessions) in the intensive care unit, ΔBV was determined from SpHb. Relative changes in blood volume determined from SpHb were calculated according to the equation: ΔBV(SpHb) = [starting SpHb]/[current SpHb] - 1.

The absolute values of SpHb and hematocrit measured by Crit-Line (CL-Hct) showed poor correlation. On the contrary, linear regression analysis showed good correlation between ΔBV(SpHb) and the relative change in blood volume measured by Crit-Line [ΔBV(CL-Hct)] ($r = 0.83$; $P \leq 0.001$). Bland-Altman analysis also revealed good agreement between ΔBV(SpHb) and ΔBV(CL-Hct) (bias, -0.77 %; precision, 3.41 %). Polar plot analysis revealed good relative trending accuracy of SpHb with an angular bias of 4.1° and radial limits of agreement of 24.4° (upper) and -16.2° (lower).

The results of the current study indicate that SpHb measurement with the pulse CO-Oximeter has good relative trending accuracy.