Effects of thermoregulatory vasoconstriction on pulse hemoglobin measurements using a co-oximeter in patients undergoing surgery

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Study Objective
To validate intraoperative pulse hemoglobin (SpHb) measurements in anesthetized patients with large forearm temperature – fingertip temperature gradients.

Design
prospective and observational study.

Setting
Operating room of a university hospital.

Patients
28 patients undergoing surgery during general anesthesia, requiring arterial blood withdrawal.

Interventions
Radial arterial blood pressure, forearm and fingertip skin surface temperatures, and SpHb were monitored.

Measurements
Paired SpHb and arterial hemoglobin (Hb) measurements at different skin-surface temperature gradients.

Main Results
A total of 175 paired SpHb and arterial Hb measurements were analyzed. The mean SpHb to arterial Hb differences in each group were 0.33 ± 1.41 g/dL in the < 1°C group of the forearm temperature – fingertip temperature gradient, -0.31 ± 1.24 g/dL in the 1 - 2°C group, - 0.59 ± 1.11 g/dL in the 2 - 3°C group, and - 0.53 ± 0.87 g/dL in the > 3°C group (P < 0.05). The percentage of nonmeasurable SpHb due to low perfusion state was 0% (0 of 115 paired measurements) in the < 1°C group, 6.7% (2 of 30 pairs) in the 1 - 2°C group, 16.7% (3 of 18 pairs) in the 2 - 3°C group, and 66.7% (8 of 12 pairs) in the > 3°C group.

Conclusion
SpHb measured at fingertip was significantly affected by the perfusion state, with lower perfusion associated with lower SpHb. Thermoregulatory vasoconstriction affects measurement of SpHb.