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Absolute and trend accuracy of a new regional oximeter in healthy volunteers during controlled hypoxia.

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BACKGROUND: Traditional patient monitoring may not detect cerebral tissue hypoxia, and typical interventions may not improve tissue oxygenation. Therefore, monitoring cerebral tissue oxygen status with regional oximetry is being increasingly used by anesthesiologists and perfusionists during surgery. In this study, we evaluated absolute and trend accuracy of a new regional oximetry technology in healthy volunteers.

METHODS: A near-infrared spectroscopy sensor connected to a regional oximetry system (O3, Masimo, Irvine, CA) was placed on the subject's forehead, to provide continuous measurement of regional oxygen saturation (rSO₂). Reference blood samples were taken from the radial artery and internal jugular bulb vein, at baseline and after a series of increasingly hypoxic states induced by altering the inspired oxygen concentration while maintaining normocapnic arterial carbon dioxide pressure (PaCO₂). Absolute and trend accuracy of the regional oximetry system was determined by comparing rSO₂ against reference cerebral oxygen saturation (SavO₂), that is calculated by combining arterial and venous saturations of oxygen in the blood samples.

RESULTS: Twenty-seven subjects were enrolled. Bias (test method mean error), standard deviation of error, standard error of the mean, and root mean square accuracy (ARMS) of rSO₂ compared to SavO₂ were 0.4%, 4.0%, 0.3%, and 4.0%, respectively. The limits of agreement were 8.4% (95% confidence interval, 7.6%-9.3%) to -7.6% (95% confidence interval, -8.4% to -6.7%). Trend accuracy analysis yielded a relative mean error of 0%, with a standard deviation of 2.1%, a standard error of 0.1%, and an ARMS of 2.1%. Multiple regression analysis showed that age and skin color did not affect the bias (all P > 0.1).

CONCLUSIONS: Masimo O3 regional oximetry provided absolute root-mean-squared error of 4% and relative root-mean-squared error of 2.1% in healthy volunteers undergoing controlled hypoxia.