Monitoring tissue blood oxygen saturation in the internal jugular venous area using near infrared spectroscopy

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ABSTRACT. Central venous blood oxygen saturation (ScvO2) is an important monitoring index of fluid resuscitation. However, monitoring of ScvO2 is not continuous and invasive. Near infrared spectroscopy (NIRS) is an optical technology for the noninvasive detection of hemodynamic changes, with advantages of being real-time, continuous, low-cost, and portable. The present study aimed to determine whether a correlation exists between the tissue blood oxygen saturation in the internal jugular venous area (StO2) data obtained with NIRS and the ScvO2 and whether these two quantities are equivalent. Data were collected from 13 patients. We used ultrasound to locate the placement site for the NIRS light source outside the internal jugular vein. Meanwhile, a sample for blood gas analysis was obtained through the
central venous catheter. A correlation analysis between the \( \text{StO}_2 \) and \( \text{ScvO}_2 \) of 13 samples was performed (Pearson correlation coefficient), suggesting a high correlation between them (\( r = 0.906, \text{StO}_2 =1.0018 \text{ScvO}_2 +2.8524 \)). Bland-Altman analysis was also performed between the \( \text{StO}_2 \) and \( \text{ScvO}_2 \). Results were as follows: 100% of monitored points fell within the range of the mean ± 1.96 SD of the difference between the \( \text{StO}_2 \) and \( \text{ScvO}_2 \); range of the mean ± 1.96 SD of the difference between the \( \text{StO}_2 \) and \( \text{ScvO}_2 \) was 3 ± 10.2; confidence interval of the difference between the \( \text{StO}_2 \) and \( \text{ScvO}_2 \) was -7.2 to 13.2%. The \( \text{StO}_2 \) monitored with NIRS correlated highly with the \( \text{ScvO}_2 \) measured in the internal jugular vein. Therefore, the \( \text{StO}_2 \) can be used for directing clinical treatment with further research.

**Key words:** Central venous blood oxygen saturation; Internal jugular venous; Near infrared spectroscopy