

Effects of Nail Polish of Different Colors on SpHb Determined by Masimo Radical-7™
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Introduction

Hemoglobin (Hb) is one the most frequently ordered laboratory measurements. Currently, Hb can be determined invasively by analyzing blood via laboratory Co-Oximetry (tHb) or by point-of-care HemoCue (HCue). Recently, a new device that enables Hb concentrations to be continuously and noninvasively monitored using a Masimo Radical 7 pulse CO-Oximeter with SpHb™ (SpHb) has become available. SpHb can be determined by a multi-wavelength spectrophotometric method. A recent study has shown that SpHb measurement by Masimo Radical 7 is accurate within 1.0 g/dL (1 SD) compared with laboratory CO-Oximeter tHb measurement in subjects undergoing hemodilution. However, several factors including local low perfusion and body movement can affect the accuracy of SpHb measurement. Although it has been reported that nail polish of different colors can affect the accuracy of SpO₂ measured by pulse oxymetry using the two-wavelength spectrophotometric method, the effects of colored nail polish on SpHb remains to be elucidated. In this study, we examined the effects of nail polish of different colors on SpHb in volunteers.

Methods

The protocol for this study was approved by the human research committee of our institution. Ten healthy adult volunteers (5 males and 5 females, 25-45 yr old) without hematological disorders, skin disorders or impaired local perfusion participated in this study. SpHb was measured in the fourth and fifth fingers of the right and left hands using the Masimo Radical 7 pulse CO-Oximeter with SpHb™. The finger sensor probe was applied directly to the center of the fingernail on each forefinger to ensure that light passed through the finger from the dorsal to volar side. When stable readings of SpHb were obtained for at least 60 sec, SpHb was recorded. In each participant, SpHb was first measured in the finger without nail polish. Then each fingernail was coated with nail polish of a different color. We used eight different colors: red, yellow, blue green, purple, white, black and orange. After measurement of SpHb, the nail polish was cleaned off, and nail polish of a different color was applied on each fingernail. Each participant received nail polish of all eight colors. SpHb was repeatedly measured after cleaning of each nail polish. Finally, tHb in a radial arterial blood sample was measured using CO-Oximetry. Data were shown as means ± SD or median (25 - 75 percentiles).

Results

Mean tHb in all participants was 13.8 g/dL. There any differences in the change among SpHb first measured without nail polish and those after cleaning each nail polish. The figure shows the median difference between tHb and SpHb for each color. Nail polishes of green and blue significantly affected SpHb. The mean absolute differences between tHb and SpHb for green and blue colors (2.2 ± 1.4 and 2.4 ± 1.8 g/dL, respectively) were significantly larger than those on the finger without nail polish (0.8 ± 0.5 g/dL).

Conclusion

The results of our study showed that green or blue nail polish significantly affected the accuracy of SpHb measurement by a Masimo Radical 7 plus CO-Oximeter with SpHb™.

