Non-Invasive Measurements of Carboxyhemoglobin and Methemoglobin in Children with Sickle Cell Disease.

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Assessment of oxyhemoglobin saturation in patients with sickle cell disease (SCD) is vital for prompt recognition of hypoxemia. The accuracy of pulse oximeter measurements of blood oxygenation in SCD patients is variable, partially due to carboxyhemoglobin (COHb) and methemoglobin (MetHb), which decrease the oxygen content of blood. This study evaluated the accuracy and reliability of a non-invasive pulse co-oximeter in measuring COHb and MetHb percentages (SpCO and SpMet) in children with SCD. We hypothesized that measurements of COHb and MetHb by non-invasive pulse co-oximetry agree within acceptable clinical accuracy with those made by invasive whole blood co-oximetry.

Fifty children with SCD-SS underwent pulse co-oximetry and blood co-oximetry while breathing room air. Non-invasive COHb and MetHb readings were compared to the corresponding blood measurements.

The pulse co-oximeter bias was 0.1% for COHb and -0.22% for MetHb. The precision of the measured SpCO was ±2.1% within a COHb range of 0.4-6.1%, and the precision of the measured SpMet was ±0.33% within a MetHb range of 0.1-1.1%.

Non-invasive pulse co-oximetry was useful in measuring COHb and MetHb levels in children with SCD. Although the non-invasive technique slightly overestimated the invasive COHb measurements and slightly underestimated the invasive MetHb measurements, there was close agreement between the two methods.