

Near Continuous Pulse Oximetry during Newborn ECLS.

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Introduction

The more a patient's condition deteriorates, the less likely a conventional pulse oximetry will detect a signal. A new pulse oximeter technology (Masimo SET) was designed for low signal-to-noise conditions. Masimo SET is a combination of unique sensor construction and signal processing software which has shown improved reliability compared to conventional oximetry in routine NICU use. However, Masimo SET has not been studied during ECLS where the peripheral perfusion is marginal.

Methods

Six neonates were studied with two types of pulse oximetry while in the first few hours of ECLS. A Masimo SET pulse oximeter used their neonatal sensor and a Nellcor N-200 oximeter used the N-25 sensor. To address site bias, one foot was randomly selected for Masimo use and the Nellcor was secured to the other; half way into each study the sensors were switched to the opposing feet. Demographics included: male/female of 3/3, gestational age of 40 ± 1 week and a weight of 3.3 ± 6 kgs. The types of ventilation were IMV (3) and HFOV (3). ECLS was veno-arterial (2) or veno-venous (4) and all had a cephalad drain. One child had a congenital diaphragmatic hernia (CHD), and cardiac stun syndrome (CCS), two had meconium aspiration syndrome with persistent pulmonary hypertension of the newborn (MAS/PPHN) and two with PPHN only. All survived.

Results

A total of 41.75 hours of simultaneous monitoring occurred. The Masimo SET pulse oximeter displayed values for 39.1 hours (94% of the time), whereas the Nellcor oximeter for 29.7 hours (or 71% of the time). There was a significant improvement with use of Masimo SET, $p < 0.005$). During the time of monitoring, 16 blood specimens were analyzed by CO-Oximetry and compared to the Masimo and Nellcor values. The bias and precision versus the measured functional oxygen saturation revealed that the enhanced performance of Masimo SET occurs without a loss in accuracy of the displayed SpO₂.

Conclusions

Masimo SET has dramatically fewer failures than conventional pulse oximetry during ECLS of infants. Access to the near continuous output of pulse oximetry with Masimo SET was valuable to the clinical management of these infants in ECLS.