[1534.582] NIRS Abdominal Somatic Tissue Oxygen Saturation Validation Model for Neonates ≤ 4kg

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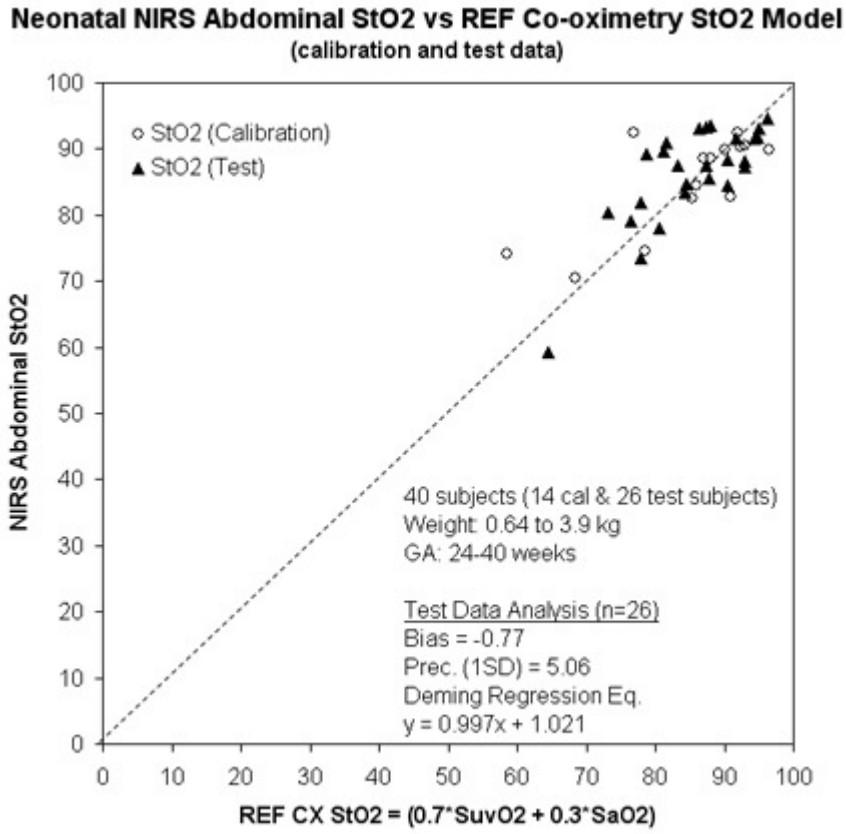
BACKGROUND: Near infrared spectroscopy (NIRS) is used in the measurement of cerebral and somatic tissue oxygenation (StO_2). Traditional NIRS algorithms have been primarily designed in the measurement of cerebral StO2, however, no formal validation studies exist for measurement of somatic StO_2.
OBJECTIVE: In this study, we present a method to validate a novel stool compensating somatic NIRS algorithm to measure abdominal tissue oxygen saturation (StO_2) in neonates ≤ 4 kg, using weighted umbilical venous and arterial oxygen saturation as a reference model.
DESIGN/METHODS: With parental agreement we enrolled neonates with an umbilical venous catheter (UVC) positioned in the inferior vena cava (IVC) to validate a NIRS tissue oximeter (FORE-SIGHT®, CAS Medical Systems, Branford, CT USA) to measure abdominal StO_2. A sensor was placed over left & right flank, liver, and intestine in three positions (infraumbilical, RLQ, LLQ) for a period of 2 minutes each. The StO_2 measurements from the six abdominal positions were averaged together to determine a composite abdominal StO_2, which better reflects global IVC blood. The composite abdominal StO_2 value from each subject was compared with co-oximetry measured oxygen saturation obtained from UVC ($SuvO_2$) and pulse oximetry (SaO_2) to determine a Reference co-oximetry StO_2 value from the equation ($0.7*SuvO_2 + 0.3*SaO_2$).
RESULTS: Data was obtained from 40 subjects weighing 0.64-3.9 kg, 1-13 days old, and GA of 24-40 weeks. Figure 1 illustrates a scatterplot of the composite NIRS abdominal StO2 vs Reference StO_2 with both monitor calibration data (n=14) and test data (n=26). The test data showed an overall bias ± precision (1sd) of -0.77 ± 5.06%. For the test data, the concordance correlation coefficient (CCC) was 0.789 demonstrating strong correlation.



CONCLUSIONS: This validation model demonstrates that the FORE-SIGHT new somatic algorithm, which compensates for the optical properties of stools, can be applied to abdominal tissue in order to yield accurate measures of abdominal StO_2.

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