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S-120.

TITLE: RELATIONSHIP OF CEREBRAL OXIMETRY MEASURED HEMOGLOBIN PER VOLUME OF TISSUE TO ARTERIAL BLOOD HEMOGLOBIN

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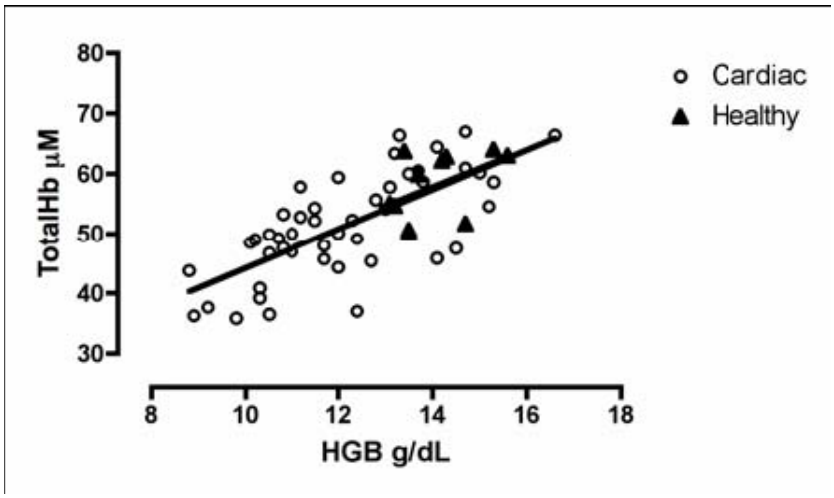
INTRODUCTION: In addition to measuring cerebral tissue oxygen saturation (SctO2), the FORE-SIGHT cerebral oximeter (CASMED, Branford, CT) also measures the concentration of hemoglobin per volume of brain tissue (TotalHb) given as micromoles (μM) per liter of tissue. We hypothesized that TotalHb would correlate to arterial HGB (hemoglobin concentration in blood: units g/dL) and arterial carbon dioxide tension (PaCO2) measured from arterial blood gas (ABG) analysis.

METHODS: With informed consent, the FORE-SIGHT cerebral oximeter was used to measure TotalHb. Simultaneous HGB and PaCO2 were measured from ABGs. Data was taken from healthy subjects breathing room air (spontaneous ventilation) and from cardiac subjects prior to incision (controlled ventilation).

RESULTS: Data was collected from 57 subjects (36 males & 21 females; 11 healthy & 46 cardiac). Correlation by linear regression of TotalHb and HGB was R2 = 0.53 (figure). Mean TotalHb (males) was 56.0 μM (CL 53.7 - 58.2); (females) was 46.9 μM (CL 43.1 - 50.7). Mean HGB (males) was 13.2 g/dL (CL 12.6 - 13.7); (females) was 11.4 g/dL (CL 10.7 - 12.1). Using t-tests, there was a significant difference between genders for both TotalHb and HGB.
Mean TotalHb (healthy subjects) was 58.0 μM (CL 54.2 - 61.7); (cardiac subjects) was 51.3 μM (CL 48.8 - 53.9). Mean HGB (healthy) was 14.0 g/dL (CL 13.5 - 14.6); (cardiac) was 12.1 g/dL (CL 11.6 - 12.7). Using t-tests, there was a significant difference between healthy and study subjects for both TotalHb and HGB.
PaCO2 ranged from 24 - 56 mmHg. Correlations between PaCO2/HGB: R2 = 0.056 and PaCO2/TotalHb: R2 = 0.112.



DISCUSSION:
TotalHb is an optically-derived estimate of hemoglobin within a given volume of brain tissue. This study has shown that it correlates with measured arterial hemoglobin. The sites from which the two measures are taken are dissimilar. HGB is derived from per unit volume of blood whereas TotalHb is derived from heterogeneous brain tissue, consisting mostly of brain cells and blood vessels.
In this data set TotalHb correlated predominantly to HGB as opposed to $PaCO_2$. In the clinical setting TotalHb could potentially be used to provide a non-invasive and continuous estimation of brain tissue hemoglobin levels.

REFERENCE: Anesthesia Analgesia 2006; 102(2S):S162