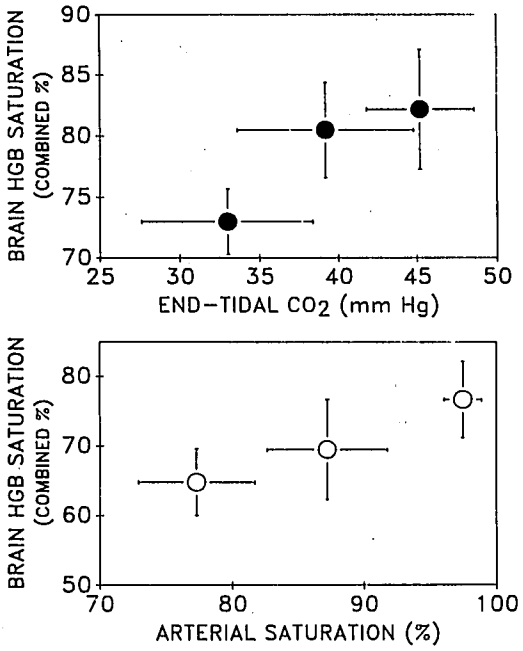
TITLE: INITIAL CLINICAL EXPERIENCE USING IN VIVO OPTICAL SPECTROSCOPY TO QUANTIFY BRAIN OXYGEN SATURATION

AUTHORS: DS Prough MD, PE Scuderi MD, G Lewis PhD, DA Stump PhD, M Goetting MD
AFFILIATION: Depts Anesthesia and Neurology, Wake Forest University Medical Center, Winston-Salem, NC 27103; Somanetics Corp and Henry Ford Hosp, Detroit, MI

Introduction: Several investigators have developed techniques that use near infrared light to qualitatively determine brain oxygenation (1). We report the initial clinical experience using a novel device that uses near infrared light to quantify brain oxygen saturation.
Methods: After IRB approval and informed consent, 6 healthy volunteers (mean age 40±2) underwent sequential measurements of SaO_2 using pulse oximetry, $ETCO_2$, and brain hemoglobin (Hgb) saturation using an in vivo optical spectroscope (INVOS®). Correlations were made under two sets of conditions: during inhalation of gas containing 2-5% CO_2, then during inhalation of gas containing 9.5-20.9% O_2. Results were analyzed using analysis of variance, $p \leq 0.05$ considered significant.
Results: During CO_2 inhalation, $ETCO_2$ significantly increased ($p<0.01$), accompanied by an increase in combined brain Hgb saturation (%) from 73.0±2.7 (SD) to 82.2±4.9 ($p<0.05$) (Figure 1). During inhalation of a hypoxic gas mixture, SaO_2 significantly decreased ($p<0.01$), accompanied by a decline in combined brain Hgb saturation from 76.7±5.5 (SD) to 64.8±4.8 ($p<0.01$) (Figure 2).
Discussion: These preliminary results suggest that in vivo optical spectroscopy rapidly tracks changes in brain saturation produced by a stimulus that increases cerebral blood flow (hypercarbia) and a stimulus that decreases SaO_2 (inhalation of a hypoxic gas mixture). Further studies are necessary to validate this technique using jugular bulb samples as a guide to cerebral venous saturation.

References:
1. Piantadosi CA. J Crit Care 1989;4:308.



TITLE: MEASUREMENT OFFSET WITH LIQUID CRYSTAL TEMPERATURE INDICATORS

AUTHORS: T.S. Shomaker, MD; D.G. Bjoraker, MD
AFFILIATION: Dept. of Anesth. , Univ. of Florida Coll. of Med., Gainesville, Fl. 32610

Because they are inexpensive, convenient, and noninvasive, liquid crystal temperature indicators (LCTIs) are used clinically, including in the operating room. Nearly all these devices have a built-in measurement offset such that the temperature displayed is intended to approximate core temperature. The magnitude of the difference (offset) is usually not noted in the product literature; thus LCTI measurements can be misinterpreted. We determined the offset of various LCTIs.

Two each of 14 types of LCTI strips were mounted on clear plastic and placed into a water bath with a heater and temperature regulator. The temperature of the bath was then increased slowly. The accuracy of the bath temperature was verified with a temperature monitor (LabTemp, Model DP-510, Sienco, Inc., accurate to within 0.1°C, traceable to National Bureau of Standards). The strips were read as per printed instructions at intervals of 1°C or 2°F and displayed temperature was recorded.

Offsets varied widely not only among the different LCTI types but also results with the same type varied over the temperature range tested (table). The only company that published offset data was Sharn, Inc., on the Tritemp, Protec, and Crystaline: 4.0°F.

If clinicians are unaware of the temperature offset of LCTIs, errors in clinical judgment can occur. LCTIs should only be used to establish temperature trends. When accurate temperature is required, core temperature should be obtained by a more established method.

TABLE. Offset Between Displayed and Actual Temperatures for Different Types of Liquid Crystal Temperature Indicators (LCTI)

	Temperature (°F)		
	Claimed	Offset	
LCTI	Accuracy	Mean	Range
Stat Temp II*	± 0.42	5.3	3.0-8.7
Stat Temp II WR*	± 0.42	6.2	3.4-9.0
RediTemp, oval†	± 0.04	4.5	3.2-5.2
RediTemp, strip†	± 0.04	3.1	2.6-4.0
TriTemp†	± 0.5	3.5	3.0-4.2
Temp-a-Strip†	--	0.6	0.2-1.0
Protec†	± 0.5	3.2	2.8-4.0
Crystaline†	± 0.5	4.9	4.5-5.0
EZ Temp§	--	1.7	0-2.5
Omni Combo¶	± 0.5	3.5	2.7-3.6
Omni II¶	± 0.5	5.0	3.8-5.8
Omni OR¶	± 0.5	5.3	4.4-6.6
Omni Wide Range¶	± 0.5	4.7	2.0-6.6
Anesthesia Monitor**	--	2.3	0.0-5.4

Mean offset was based on 8 readings; displayed temperature was always greater than actual temperature. *Trademark Medical Corp. †Medical Products of America. ‡Sharn, Inc., §Seven Cs, Inc. ¶Omnitherm, Inc. **Clinitemp, Inc.