

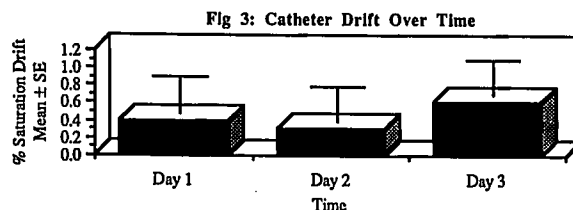
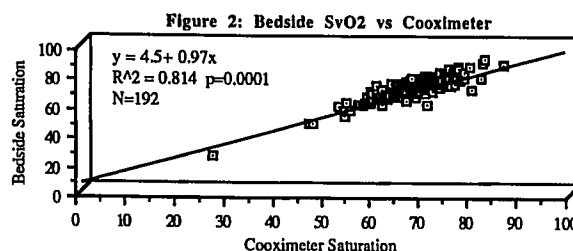
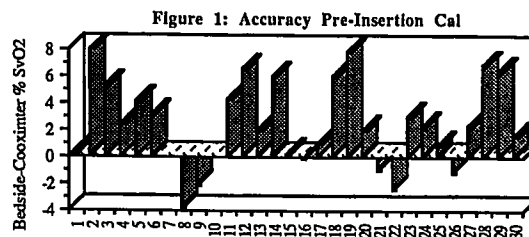
TITLE: CLINICAL ACCURACY OF A NEW MODULAR MIXED-VEINUS SATURATION OXIMETER

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INTRODUCTION: Mixed venous saturation (SvO₂) can be accurately measured by a stand alone oximeter connected to a fiberoptic pulmonary arterial catheter. This study examines the accuracy of a modular oximeter integrated with the patient monitor, the pre-insertion calibration, and drift over time.
METHODS: With institutional approval, adult patients in whom SvO₂ pulmonary arterial catheters were placed for monitoring had baseline pre-insertion or in-vivo calibration done. Initial and subsequent (q12^h for up to 3 days) comparisons were made between bedside SvO₂ (Model P7110 Opticath®, Abbott Critical Care, Mountain View, CA and SvO₂ module with v.1.02 operating software, SpaceLabs, Redmond, WA and a Model 282 Cooximeter (Instrumentation Labs, Waltham, MA). The cooximeter was calibrated and standardized daily. Pulmonary arterial blood was collected anaerobically in duplicate syringes for comparison with the bedside SvO₂ during stable periods of normal light intensity and radiographically confirmed catheter position. Cooximetry measurements were accepted if the two paired saturation values agreed to within one percentage point. Cooximeter saturations were adjusted for the effect of carboxy and methemoglobin.

RESULTS: Fifty-six patients (30 with pre-insertion and 26 with in-vivo calibration) were studied. Pre-insertion calibration was an average of 2.4% ± 3.2 SD higher than the cooximeter (range -3.8 to 8% See Figure 1) (p<0.001, paired T-test). The regression line between cooximeter and bedside saturation is shown in Figure 2. Catheter drift over time (defined as sequential change from the preceding difference between the cooximeter and the bedside saturation) is shown in Figure 3. No drift over time was demonstrated (one factor ANOVA with repeated measures, p=0.829).

DISCUSSION: This study confirms the accuracy of a new modular SvO₂ oximeter integrated within the primary bedside monitor. Pre-insertion calibration was accurate on average but individual catheters were found to differ from cooximeter by up to 8%. No meaningful catheter drift over time was seen for up to three days, the duration of the study.



TITLE: SHIVERING IN THE CARDIAC PATIENT: EVALUATION OF THE BAIR HUGGER® WARMING SYSTEM
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INTRODUCTION: Shivering in the post-operative period following cardiac surgery can lead to hemodynamic changes that may be deleterious. Shivering can increase the metabolic demand for oxygen and may be poorly tolerated in this compromised population. Increases in central core and decreases in peripheral (skin) temperatures occur as a result of peripheral-to-central redistribution of heat, shivering, and non-shivering thermogenesis (1).

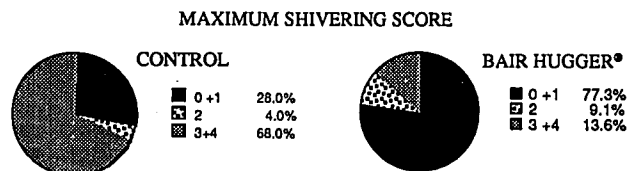
The Bair Hugger® was evaluated for its ability to limit post-cardiac surgery shivering and to decrease the peripheral-to-central temperature difference.

METHODS: Forty nine patients undergoing valve replacement and/or CABG were randomly assigned to be warmed following surgery with either the Bair Hugger® (BH, n=23) or warmed cotton blankets (C, n=26). Measurements of central and peripheral temperatures were collected every 30 minutes over 5.5 hours. EMG recording of pectoral, biceps and quadriceps muscle groups was conducted to verify shivering. A visual observation shivering score (VOSS) ranging from 0 to 4 (4=continuous vigorous shivering) was recorded for each study epoch (2). The nursing staff administered narcotics, sedatives and muscle relaxants according to patients' needs and clinical judgement. Patients receiving relaxants following CPB were excluded from analysis and Train-of-Four (TOF) was evaluated in participants to ensure lack of clinical motor blockade.

RESULTS: Both groups were demographically similar in regards to length of CPB and OR time, temperature & duration of warming and cooling on CPB, ICU room temperature & ventilator gas temperature. Overall, 19 of 26 (C) and 8 of 23 (BH) displayed shivering (VOSS 1 to 4). Three patients (1 C & 2 BH) were shivering upon return to the ICU and

were excluded from further shivering assessment. Vigorous shivering (VOSS 3,4) was observed in 17/25 (C) and 3/21 (BH) (P<0.001). Total epochs of shivering during the 5.5 hour hours were 67 (C) and 12 (BH) (P<0.001). Total dosage of morphine administered during the observation period was 19mg (SD=9.4) in controls and 11.1 mg (SD=6.9) in the Bair Hugger® group (P<0.005). Pharmacological interventions with muscle relaxants to control shivering occurred 11 times in (C) and once in (BH). No difference was noted between PA catheter, esophageal, rectal or nasopharyngeal temperatures in the two groups, yet the Bair Hugger® resulted in significant (p<0.001) increases in shoulder, palm, thumb, index, 5th digit, thigh, ankle and toe temperatures. Statistical analysis included student's t test, chi-square, and normal approximation of binomial distribution where appropriate.

CONCLUSIONS: It appears the Bair Hugger® is beneficial in limiting the incidence, magnitude and duration of shivering when used in a prophylactic manner to rewarm patients following hypothermic cardio-pulmonary bypass. Significant increases in peripheral temperatures were noted and may have contributed to a blunting of peripheral thermoreceptor influence on shivering. Pharmacologic intervention by the nursing staff to control shivering or its hemodynamic consequences appeared to be reduced by the active rewarming of the Bair Hugger®.



REFERENCES: 1. Anesthesiology, Vol. 71, No.3, A411.
2. J Cardio Thor Anesth, Vol.1, No.1, 1987, pp24-28.