TITLE : AN EVALUATION OF TWO MIXED VENOUS SATURATION CATHETERS IN PATIENTS WITH CIRCULATORY SHOCK AND RESPIRATORY FAILURE

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Although mixed venous saturation catheters are widely used in the critically ill, a controversy still exists as to whether the system should have two or three wavelengths. In an experimental study[1], the three-wavelength system was found more accurate than the two-wavelength system for tracking SvO2 changes over a period of 10 hours. In a clinical study performed in critically ill patients over a longer period of time[2], these results were not confirmed , but in-vivo recalibrations were done if the difference between in-vivo and in-vitro saturation was greater than 3 %. We undertook this study to evaluate both systems during a limited period of time in patients with critical hemodynamic and respiratory functions.

METHODS

Patients : Twenty critically ill patients (mean age 55 ± 20 yrs) were prospectively studied after informed consent had been obtained and authorization given by the Ethical Comittee of our Institution. To be included in the study, each patient had to present either acute respiratory failure, or circulatory shock, or both. Acute respiratory failure was defined as the association of bilateral pulmonary infiltrates with a PaO2 < 60 mmHg using FIO2 0.6. Circulatory shock was defined as a systolic arterial pressure < 80 mmHg related to sepsis or cardiac failure. Since invasive cardiac monitoring was required to optimize treatment, a mixed-venous saturation catheter and a radial artery catheter were inserted in each individual. Patients were then randomly divided in 2 groups : in 12, an Oximetrix® Opticath catheter (three-reference wavelengths) was inserted ; in 8, an Edwards® Sat-one catheter (two-reference wavelengths) was inserted.

Procedure : Before catheter insertion, an in-vitro calibration was done according to manufacturers' instructions. After positionning the catheter in the pulmonary artery, patient's hemglobin and hematocrit were updated on the Edwards computer. Before any therapeutic intervention, hemodynamic measurements were made and arterial and mixed venous blood samples were simultaneously withdrawn anaerobically. $S\bar{v}O2$ was measured using a calibrated OSM3 Co-Oximeter. Therapeutic interventions were then started, such as progressive increase in FIO2, administration of PEEP (5 to 15 cmH2O), administration of vasoactive drugs (Dopamine and Dobutamine 5 to 20 mcg/kg/min, Amrinone 5 mcg/kg/min), or fluid depletion (Furosemide 20-80 mg). Therapeutic interventions were performed one at a time and hemodynamic measurements and blood gas analysis were done at each step after hemodynamic parameters had become stable. Comparisons between in-vivo and in-vitro $S\bar{v}O2$ were continued until the maximum $S\bar{v}O2$ obtained after therapeutic interventions had been reached. During the study period which lasted between 90 minutes and 6 hours, no in-vivo calibration was performed and both the investigators at the bedside and in the laboratory were totally unaware of the $S\bar{v}O2$ value they were not measuring. In-vivo and in-vitro $S\bar{v}O2$ were analysed by the method of least squares and slopes, intercepts and correlation coefficients of each regression line were calculated.

RESULTS

The regression line of each catheter is shown in figures 1 and 2. The dispersion of $S\bar{v}O2$ values was much more prononced with the Edwards Sat-one catheter and the coefficient correlation R was higher with the Oximetrix Opticath catheter.

DISCUSSION

Our study shows that the three-wavelength system is more accurate than the two-wavelength system for measuring acute changes in $S\bar{v}O2$ induced by therapeutic interventions in patients with critical hemodynamic and respiratory function over a limited period of time (1.5 to 6 hours). This confirms previous experimental results reported by Gettinger et al[1]. In order to compare the accuracy of both systems during long-term use, the drift of each catheter should be studied over predetermined periods of time without in-vivo recalibration.

REFERENCES

1 - Gettinger A. Anesthesiology 66 : 373, 1987
2 - Reinhart K. Anesthesiology 67, A 182, 1987

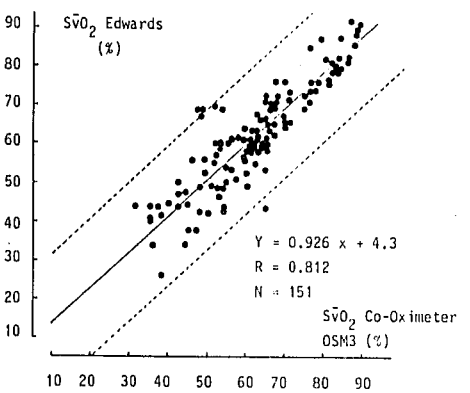

FIGURE 1 Regression line of the Edwards Sat-one catheter

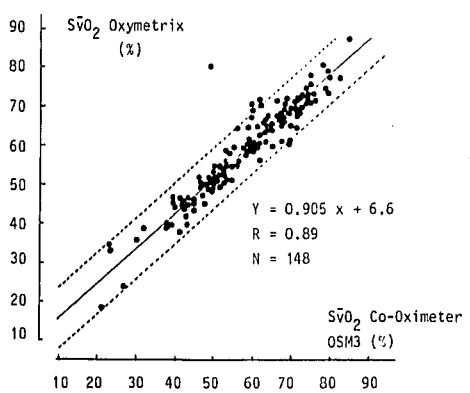

FIGURE 2 Regression line of the Oximetrix Opticath-catheter