TITLE: CLINICAL EVALUATION OF THREE MIXED-VENOUS OXYGEN SATURATION CATHETERS

AUTHORS: PE Scuderi, MD, DL Bowton, MD, JW Meredith, MD, LC Harris, RN, J Brockschmidt, MS

AFFILIATION: Depts. of Anesthesia, Medicine, Surgery, and Public Health Sciences, Wake Forest University Medical Center, Winston-Salem, NC 27103

INTRODUCTION: Continuous measurement of mixed-venous oxygen saturation (SvO_2), using modified pulmonary artery (PA) catheters, has been available for several years. Three different catheters with this capability are available. Performance of two of the catheters has been compared (1,2). There are, however, no controlled clinical trials nor laboratory studies comparing the performance of all three. We compared the clinical accuracy of the three currently available PA oximetry catheter systems.

METHODS: Thirty patients gave informed consent to a study approved by our IRB. All patients were studied in the ICU and were randomly assigned to one of three catheters (n=10 for each group). Catheters produced by Abbott Critical Care Systems (A), Baxter Healthcare Corp. (B), and Viggo-Spectramed (V) were studied. All catheters were inserted by one investigator and studied during the next 24 hours. Each catheter was calibrated as recommended by the respective manufacturer. Mixed-venous samples were collected anaerobically q15 min for 3 hrs, q1h for 9 hrs, and at 24 hrs. Samples were analyzed immediately with an IL 282 CO-Oximeter (Instrumentation Laboratory, Lexington, MA). Catheter performance relative to CO-Oximetry was compared by linear regression; bias (mean difference between catheter reading and CO-Oximeter SvO_2) and precision (standard deviation of the bias); and ambiguity (absolute sum of bias and precision).

RESULTS: Comparison of PA versus CO-Oximetry SvO_2 are displayed in the table.

	MANUFACTURER		
STAT TEST	A	B	V
Regression	1.00x-2.11	1.04x-8.06	1.08x-7.75
r^2	0.85	0.63	0.83
Bias ± Precision	-1.98±3.07	-5.50±3.87	-2.28±5.24
Ambiguity	5.05	9.37	7.52

The data indicate that all three PA SvO_2 catheters correlate with CO-Oximetry and are capable of reflecting mixed venous oxygen saturation. There are, however, substantial differences in performance. The reasons for these differences are not known and will require further study.

References

1. Gettinger A, et al: Anesthesiology 1987;66:373
2. Karis JH, et al: J Cardiothorac Anesth 1988;2:440

A485

TITLE: IS PULSOXIMETRY USEFULL FOR PREOPERATIVE SCREENING OF PULMONARY DISORDERS ?

AUTHORS: J. Weindler, M.D., M. Schaller, M.D., E.M. Pscheidl, M.D. Georgieff M.D.

AFFILIATION: Anes. Dept., University Erlangen-Nuernberg, 8520 Erlangen, F.R.G.

In contrast to arterial blood gas analysis (ABGs) pulse oximetry is a non-invasive, quick and practicable procedure. If changes in oxygenation could be distinguished on the basis of the pulsoximetric saturation (SpO2) and, breathing room air, the PaCO2 can be evaluated according to the saturation (alveolar air equation), than pulse oximetry could in part replace ABGs and be used to screen patients preoperatively. It was the aim of the study to determine whether pulse oximetry is sufficient to recognize arterial blood gas disorders and whether there is a correlation between SpO2 and lung function parameters.

During the preoperative pulmonary function testing of all surgical patients, who were admitted to our lung function ambulance from April to August 1989, the following tests were performed (with informed consent and approval by the Human Research Committee, Univ. Erlangen F.R.G.). Breathing room air, oxygen saturation was measured with the Pulse Oximeter Nellcor N10 (Nellcor Incorporated, Hayword, California) and parallel to this an arterial blood gas sample was drawn. PaO2 and PaCO2 were determined with the IL System 1302 (IL GMBH, Lexington, Massachusetts), fractional and functional arterial saturation (SaO2) were determined by Hemoximeter OSM3 (Radiometer, Kopenhagen, Denmark). Vital capacity (VC), maximal expiratory flow at 50% (MEF 50) and at 25% (MEF 25) of VC were measured by bodyplethymography (Bodytest, Jäger, Würzburg, F.R.G.) or by flow-volume-loop (Transferscreen, Jäger, Würzburg F.R.G.).

254 patients were studied. The average age of the patients was 58 years. The correlation coefficient of SpO2 to functional SaO2 was 0.95. In the range of functional SaO2 of 92% to 98% the SpO2 values were 1% below the functional SaO2. Defining normal PaO2 above 70 mmHg, at SpO2 = 95% the sensitivity was 0.99 and the specifity 0.70, at SpO2 = 92% the sensitivity was 0.56 and the specifity 0.99. In the range of SpO2 above 92% only one patient with SpO2 = 93% had an elevated PaCO2 of 47 mmHg. Severe CO2 retention occured at SpO2 below 90%. There were significant correlations between functional SaOs and the lung function parameters. At functional SaO2 ≥ 96% severe disturbances of pulmonary ventilation are not found.

Our results demonstrate, that pulse oximetry is sufficient for screening clinically significant blood gas disorders and therefore optimizing the indication for ABGs. At SpO2 ≥ 95% the PaO2 is in over 99% above 70 mmHG and global insufficiency can be excluded. With increasing pulmonary disorders the alveolo-arterial diffusion gradient rises rapidly and oxygen saturation decreases but reactive hyperventilation ensures normal or reduced PaCO2 values. Severe pulmonary disorders at SaO2 > 95% can not be expected.