A454

TITLE: A PULSE CONTOUR METHOD OF CONTINUOUS CARDIAC OUTPUT BASED ON THE ESTIMATION OF ADMITTANCE

AUTHORS: I. Gratz, D.O., J. Kraidin, B.A., G.E. Larijani, Pharm.D., N. deCastro, M.D.

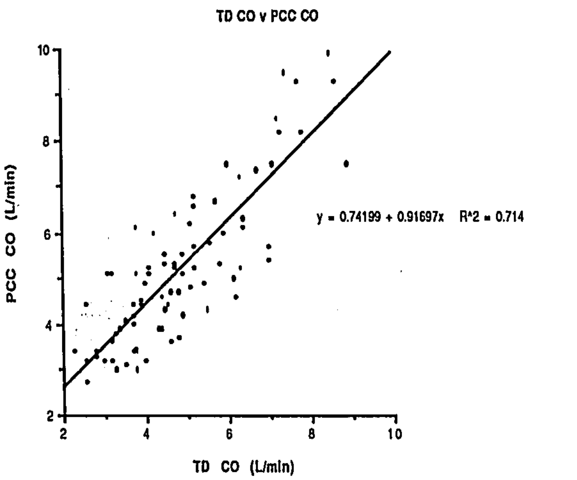
AFFILIATION: Departments of Anesthesia, Medical College of PA, Philadelphia, PA

INTRODUCTION: The pulse-contour curve (PCC) has been used to estimate cardiac output (CO) in many studies. However, as a result of subsequent changes occurring in the arterial tree the results obtained vary according to clinical conditions. Two problems thwarting the determination of CO from the PCC are an unknown vascular impedance and the presence of reflected waves. In an effort to minimize these changes and improve the performance of this method, we attempted to estimate the admittance (Y) continuously from the pulse wave form and to minimize the influence of reflected waves by an algorithm that modifies the amplitude and shape of the PCC. This study was designed to assess the agreement between continuous cardiac outputs derived from the PCC with thermodilution (TD) CO measurements.

METHOD: Twenty patients (pts.) undergoing CABG gave written informed consent to participate in this IRB approved study. Pts. were premedicated with morphine (0.1 mg/Kg) and scopolamine (0.4 mg) and were anesthetized with sufentanil (10-20 mcg/Kg). Intubation of the trachea was facilitated by vecuronium (0.1-0.15 mg/Kg) and ventilation maintained with an FiO2 of 1.0. Arterial blood pressure was measured by a 20 gauge catheter inserted percutaneously under local anesthesia in the radial artery. An Edwards 7.5 TD catheter was utilized for all CO using 10 ml of iced 5% dextrose on a Space Labs CO computer. All CO were performed in triplicate at 4 predetermined times. The pressure output from the arterial monitor was continuously recorded through a preamplifier and the signal recorded on a standard audio cassette tape. The cassette was played back through a preamplifier, amplifier and A/D convertor and connected to a direct memory access board, which served as the port of data entry into the 386 computer operating at 20 mHz. We empirically derived the (Y) equation for the algorithm by generating a best-fit equation from a different previous learn population. The first order approximation is in the general form: $Y=A+B^{*}\exp(-K^{*}PP)$ where A,B,K are constants and PP is pulse pressure.

RESULTS: Data were analyzed for all pts at the 4 predetermined periods (pre- and postinduction, postbypass and prior to leaving the OR). A total of 83 paired CO were made on the 20 patients. The average (TD) CO was 4.82±1.54 L/min, and PCC was 5.13±1.68 L/min (95% Cl of the difference = 0.119 to 0.516 L/min). The pooled data for the 2 methods showed a correlation coefficient of 0.84 (p<0.001). See Figure 1.

DISCUSSION: Because the algorithm can determine the individuals Y at any given time, no calibration is needed. We believe that different Y equations will be necessary for other vascular sites. The pulse contour method for estimating CO can be used as an alternate to (TD) CO for the measurement of CO.



A455

TITLE: VENOUS OXYGEN SATURATION : CENTRAL VENOUS (CV) OR PULMONARY ARTERY (PA) CATHETER ?

AUTHORS: J.P. Auffray, M.D., C. Martin, M.D., F. Prima, M.D., L. Papazian, M.D., F. Gouin, M.D.

AFFILIATION: Anes. Dept., University of Marseilles, Sainte Marguerite Hospital 13009 France.

Monitoring of central venous oxygen saturation (Sc O_2) would be a less hazardous and a less expensive alternative than mixed venous oxygen saturation (SVO_2) monitoring. The aim of this study was to compare simultaneous measurements of SVO_2 and Sc O_2 obtained from PA and CV catheters inserted in critically ill patients.

In a prospective study, eight consecutive patients requiring monitoring of PA pressure and parenteral nutrition were catheterized with an Opticath® PA catheter 2710, 7.5 F (Abbott) and an Opticath® CV catheter V440, 4F (Abbott). There were 5 men and 3 women (mean age 63 ± 9 APACHE II Score 18 ± 2). They suffered from severe sepsis (2 patients), septic shock (5 patients) or acute cardiac failure (1 patient). During the study period SVO_2 and ScO_2 values were simultaneously recorded every hour. The statistical significance of difference between these values was analyzed by paired student t test. The systematic error (bias) and the random error, or variability (standard deviation of the bias) between the two techniques were calculated following guidelines of Bland and Altman (1). The protocol was approved by the human investigation committee of our institution.

The catheters were used for 58 ± 22 hours (24-86 hours). During the study period 700 comparative measurements of SVO_2 and ScO_2 were obtained.

	Stable conditions n = 499	
	SVO2	ScO2
mean ± SD (range)	68±10(38- 91)	69±9,3*(40-93)
	lSc02 - SVo2l	
Diff < 3 %	n = 168 (34 %)	
3 %≤diff<5 %	n = 88 (18 %)	
5%≤diff≤10 %	n = 112 (23 %)	
10 %<diff	n = 131 (25 %)	

* p < 0.005

TABLE 1

	Clinical instability n = 201	
	SVO2	ScO2
mean ± SD (range)	69 ± 10 (45 - 90)	68 ± 11 (43 - 88)
	lSc02 - SVo2l	
Diff < 3 %	n = 78 (39 %)	
3 %≤diff<5 %	n = 21 (11 %)	
5%≤diff≤10 %	n = 32 (16 %)	
10 %<diff	n = 70 (34 %)	

TABLE 2

SVO2 and ScO2 values under stable and instable conditions are given in tables 1 and 2, respectively. (lScO2-SVO2l absolute value of difference between ScO2 and SVO2).

Poor correlation was observed between the values measured under period of stability (r = 0,53) and period of instability (r = 0.57). A better, but still less than ideal correlation was obtained for changes in SVO2 and ScO2 during periods of stability (r = 0.73) and periods of instability (r = 0.78).

The bias were 1.1 ± 9.3 % and 1.1 ± 9.9 % in periods of stable conditions and periods of instability respectively. Although there is a need to develop a simple technique to monitor mixed venous oxygen saturation, the present study indicates that ScO2 is not reliable in the study patients.

Références.
1. Lancet 1 : 307, 1986.