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TITLE: COMPARISON OF ROOM TEMPERATURE VS. ICED INJECTATE USING THE REF-1™ PULMONARY ARTERY CATHETER

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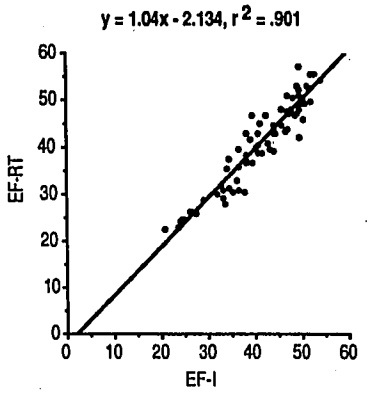
INTRODUCTION: The REF-I™ Pulmonary Artery Catheter (Model 93A-434H-7.5F)*, in conjunction with the REF-I™ Ejection Fraction/Cardiac Output Computer * using an iced injectate, allows for the simultaneous determinations of right ventricular: cardiac output (CO), ejection fraction (EF), stroke volume (SV), end-diastolic volume (EDV), and end-systolic volume (ESV). This study compares the reproducibility of CO, EF, SV, EDV, and ESV using 10ml room temperature (18-25°C) injectate (RT) versus 10ml iced (6-12°C) injectate (I).

METHODS: After institutional approval was obtained, 26 patients undergoing cardiac surgery requiring a pulmonary artery catheter were enrolled in the study. During a period of stable hemodynamics postoperatively, two or three sets of RT and I measurements, at least one hour apart , were made for each patient. The average of 4 injections made during the same phase of expiration was used to generate each I measurement and another 4 injections for each RT measurement. Approximately 50% of the time, RT determinations were obtained first followed immediately by I determinations and 50% vice versa. The CO-Set+, Closed Injectate Delivery System, Model 93-600 * was used for I injections and Model 93-610 * for RT injections. Computation constants used were .561 (I) and .573 (RT). Comparisons between RT and I measurements for CO, EF, SV, EDV and ESV were by linear regression.

RESULTS: 75 simultaneous measurements were obtained. The comparisons of RT vs. I for CO, EF, SV, EDV, and ESV are shown in the Table.

Parameter (Unit)	Equation of the Regression Line	r^2
CO (LPM)	RT = 1.070 x I - 0.26	0.954
EF (%)	RT = 1.040 x I - 2.13	0.901
SV (ml)	RT = 1.064 x I - 3.24	0.972
EDV (ml)	RT = 0.983 x I + 5.27	0.925
ESV (ml)	RT = 0.978 x I + 4.39	0.854

The regression line of EF-RT vs.EF-I is shown below:



DISCUSSION: The data suggests that using 10ml of RT injectate yields results comparable to those obtained using I injectate for measuring multiple hemodynamic parameters. RT injectate requires less maintenance, and provides a less expensive, easier technique than I injectate.

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Title: TRANSTRACHEAL DOPPLER IN PEDIATRIC PATIENTS: EFFECTS OF GROWTH ON THE MEASUREMENTS

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Introduction: Transtracheal Doppler (TTD) measurements of Cardiac Output (CO) have been used in pediatric patients.[1] TTD method currently used calculates CO using fixed value for the angle of the ultrasound beam with respect to the blood flow vector. Therefore, the accuracy of TTD method depends on the anatomical relationship between the ascending aorta and trachea,[2] which may be altered by development. This study was designed to test whether the growth affects TTD measurements or not.

Methods: With institutional approval and informed parental consent, sixteen patients (age range: 4 months- 9 yrs.) scheduled for elective surgery were included in this study. After induction of anesthesia, endotracheal intubation was performed using an endotracheal tube (I.D.: 3.0-5.5 mm) with TTD probe. The optimal position of TTD transducer was determined by the maximal Doppler signals. Ascending aortic diameter (Ao) was measured by TTD and two-dimensional echocardiography (ECHO). Following the hemodynamic stabilization, CO was determined by TTD and ECHO, consecutively. Values measured by TTD were compared with those measured by ECHO, which were considered as control values in this study. Statistical analysis was made by linear regression method. P less than 0.05 was considered significant.

Results: Both Ao and CO measured by TTD showed good correlation to those measured by ECHO (correlation coefficients were 0.95 for Ao and 0.76 for CO, respectively). As shown in figures, age of the patient did not alter either Ao-TTD (Ao measured by TTD) v.s. Ao-ECHO (Ao measured by ECHO) ratio or CO-TTD (CO measured by TTD) v.s. CO-ECHO (CO measured by ECHO) ratio.

Discussion: Ao-TTD compared favorably to Ao-ECHO in all patients studied disregard to their age. The change in the angle of the ultrasound beam with respect to the blood flow vector was concluded to be small enough to use TTD method in the pediatric patients studied. But CO-TTD, which is determined from blood flow velocity and Ao,[2] was consistently underestimated in comparison to CO-ECHO. Using the mean blood flow velocity to calculate CO could be responsible for smaller value of CO determined by TTD.[1] In conclusion, growth did not affect TTD measurements. TTD is a promising monitor of CO trend in pediatric population.

References: 1. Anesthesiology 73: A1126, 1990.
2. Anesthesiology 71: 11-15, 1989.