Title: CONTINUOUS TRANSTRACHEAL DOPPLER CARDIAC OUTPUT DETERMINATION IN PEDIATRICS PATIENTS: CORRELATION WITH TRANSTHORACIC CONTINUOUS WAVE DOPPLER CARDIAC OUTPUT

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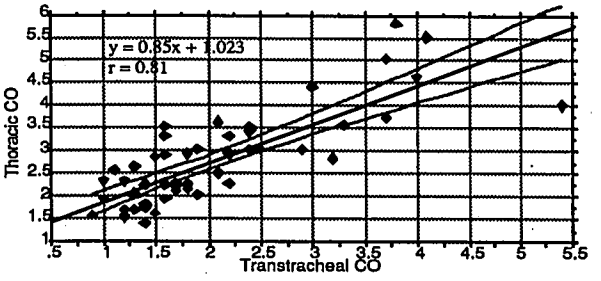
Introduction: Transtracheal Doppler, a relatively new technology, has been shown to provide accurate estimates of cardiac output in dogs, and recently to correlate well with thermodilution measurements of cardiac output in human adults.[1,2] Less data is available on the correlation and accuracy of this method in pediatric patients. Previous investigations have shown transthoracic continuous wave Doppler echocardiography determination of cardiac output to correlate well with thermodilution in the pediatric population.[3] This study was designed to compare cardiac outputs determined by transtracheal Doppler, with those from transthoracic continuous wave Doppler echocardiography.
Methods: After institutional review committee approval, eleven patients (age range 16 mos.- 12 yrs.) scheduled for for elective surgery with endotracheal intubation were included in the study. After induction of anesthesia, intubation was performed using an endotracheal tube with a 5 mm diameter, 5 mHz ultrasound transducer incorporated near its tip. The transducer is mounted in a molded polyvinyl chloride holder to maintain a fixed angle with respect to the axis of the endotracheal tube. Both visual and auditory representations of Doppler flow signals were used to position the tube for maximum forward flow as determined by Doppler shift and signal quality. Aortic diameter was then measured automatically by the transtracheal Doppler and recorded. Transthoracic Doppler cardiac output was determined using a parasternal long axis view to determine aortic valve diameter. An apical view as parallel as possible to aortic flow was then used to obtain aortic flow velocity curves. Stroke volume was determined by multiplying the average time velocity integrals by the aortic cross-sectional area, and cardiac output then determined by multiplying stroke volume by heart rate (as described by Morrow, et al.).[3] Measurements were made consecutively rather than simultaneously secondary to the interference between the Doppler signals.

Results: Fifty-eight comparisons were made in the eleven patients with modest correlation found between the two methods for cardiac output determination using simple linear regression, r = 0.81 with P < 0.0001 (see figure below with 95% confidence levels). Poor signal quality on the transtracheal Doppler was predictive of poor correlation between measurements, and improvement of signal quality was not possible in all patients despite experienced operators.
Discussion: The documented correlation indicates that transtracheal Doppler is a promising monitor of cardiac output trend in pediatric patients. Accuracy of this method depends on optimum Doppler signal from the ascending aorta which we were unable to achieve in all patients. Maintenance of signal quality often required many manipulations, limiting its usefulness in surgeries involving the head and neck. Transtracheal Doppler consistently underestimated cardiac output in our study indicating that the angle Ø may be incorrect for the pediatric population. Consistent underestimation of aortic diameter by the transtracheal Doppler may also play a role. The incorporation of median velocities rather than mean velocities in the transtracheal doppler software may help improve correlation and accuracy.



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2. Anesthesiology 71: 11- 15, 1989.
3. Pediatr Cardiol 9: 131- 136, 1988.

A1127

TITLE: **ISOPROTERENOL FOR TEST-DOSING IN PEDIATRIC REGIONAL BLOCKADE**

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Introduction
In children, epidural anesthesia is often established after general anesthetic induction. Epinephrine is widely used for test-dosing, though it may be unreliable in halothane (H)-anesthetized children[1]. Studies in a newborn lamb model[2] and in pregnant women[3] suggest that isoproterenol (ISO) may be more efficacious. The purpose of this study was to evaluate ISO as a marker of intravascular injection in anesthetized children.
Materials and Methods
44 unpremedicated ASA I children ages 2 months to 10 years undergoing elective minor surgery under general anesthesia were studied following parental informed consent as approved by the Committee on Clinical Investigation. Anesthesia was induced with H and nitrous oxide (50% in oxygen) and maintained until steady state with end-tidal H at 1.2 MAC adjusted for age. Baseline heart rates (HR) and oscillometric systolic and diastolic blood pressures (SBP, DBP) were recorded pre-induction, post-induction at steady state, and at intervals following administration of an intravenous dose of ISO. Patients received ISO, either 0.05 μg/kg (Group 1) or 0.075 μg/kg (Group 2), in a double-blind, randomized fashion. Increases in HR of 10 beats per minute (bpm) and changes in SBP and DBP > 20% of pre-ISO steady state were considered significant[1,3]. Data were analyzed using repeated measures ANOVA.

Results
HR increased in both groups following administration of ISO. The mean maximum increases in HR were 16.5 bpm and 21.5 bpm, respectively in Groups 1 and 2. 5/21 patients in Group 1 and 1/23 patients in Group 2 did not show HR increases greater than 10 bpm at any time point. No patient had significant changes in SBP or DBP.
Discussion
ISO appears to be an effective marker of intravascular injection in anesthetized children. 0.075 μg/kg approximates a minimal effective test dose, with a false negative rate of roughly 4% (versus 23% for 0.05 μg/kg). Testing of ISO for neural toxicity in a realistic animal model is warranted prior to consideration for human epidural administration.
References
1. Anesthesiology 72:249-251,1990. 2. Anesthesiology 71: A1022, 1989. 3. Anesthesiology 71:206-209, 1989.

Figure 1