1097-102 **Does Transplantation in Early Infancy Protect Against Post-Transplant Coronary Artery Disease (PTCAD)? Evaluation by Intravascular Ultrasound (IVUS)**

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Background: It has been speculated that heart transplantation (htx) during very early infancy might result in relative immune tolerance and improved outcomes in neonatal htx compared to patients transplanted at an older age. The purpose of this study was to compare these groups (neonate group: htx < 2mos of age, older group: > 2 mos. of age) using IVUS to assess the incidence of PTCAD.
Methods: Morphometric analysis was performed on each IVUS study. Measurements included inner and outer diameter, total and luminal area, maximal intimal thickness (MIT), and intimal index. Severity of PTCAD was graded using the Stanford classification (SC). Outcome variables included total rejections in the first year, death, PTCAD, and re-htx. All results are given as mean ± SD.
Results: Since 1997, 109 studies were performed in 63 children (neonate group: n = 21, older group: n = 42) including those previously reported. For the purpose of this study only the most recent IVUS study was used. There was no significant difference in diameters or areas between the two groups. MIT was significantly higher in the older group (neonate group: 0.22 ± 0.09 vs. older group: 0.32 ± 0.26, p = 0.02). Intimal index was also significantly higher in the older group (neonate group: 0.07 ± 0.04 vs. older group: 0.10 ± 0.09, p = 0.05). Nineteen patients in the neonate group were graded SC 1 or 2 (90%) compared to 29 patients (69%) in the older group. There was a significantly greater incidence of SC 3 or SC 4 in the older group (neonate group, n = 2 vs. older group, n = 13, p = 0.038). There was no difference (p = 0.29) in total number of rejections, however, there was a greater incidence of rejections after the first year in the older group (p = 0.02). There was a significantly greater incidence (p = 0.05) of re-tx, death, and PTCAD in the older group.
Conclusions: These data suggest that infants transplanted before 2 mos of age have a decreased incidence of PTCAD as detected by IVUS than those transplanted after 2 mos of age.

ORAL CONTRIBUTIONS

809 Advances in Pediatric Cardiac Imaging

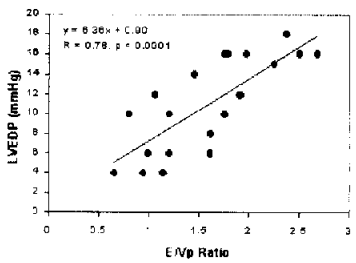
Monday, March 18, 2002, 9:15 a.m.-10:30 a.m.
Georgia World Congress Center, Room 367W

9:15 a.m.

809-1 **Validation of a New Echocardiographic Index for the Noninvasive Assessment of Left Ventricular Filling Pressures in Children**

William L. Border, Erik C. Michelfelder, Sandra A. Witt, Betty J. Glascock, David Shim, Robert L. Spicer, Robert H. Beekman, III, Thomas R. Kimball, *Cincinnati Children's Hospital Medical Center, Cincinnati, Ohio.*

Background: Estimation of LV end-diastolic pressure (LVEDP) by conventional Doppler echo has proven to be unreliable in children. Recent studies in adults have shown that the ratio of peak E mitral velocity (E) to flow propagation velocity (Vp), measured by color M-mode Doppler, correlates with LVEDP. We evaluated this index in children by simultaneous comparison with catheter measurements of LVEDP.
Methods: 20 children undergoing left heart catheterization had simultaneous high-fidelity LV pressure tracings recorded during standard Doppler and color M-mode Doppler evaluation of mitral inflow. Peak mitral E velocity was obtained and Vp was measured from color M-mode images as the slope of the first aliasing velocity during early LV filling. Vp was corrected for heart rate by dividing by the square root of the R-R interval. LVEDP was measured on the LV pressure tracing at end-expiration. The ratio E/Vp was calculated, and its relationship to LVEDP was determined using simple linear regression.
Results: We found a significant correlation between E/Vp and LVEDP (r= 0.78; p<0.001)(see Figure). A ratio of E/Vp > 1.9 predicted an LVEDP ≥ 15 mmHg with 71% sensitivity and 92 % specificity, with positive and negative predictive values of 83% and 86%, respectively.



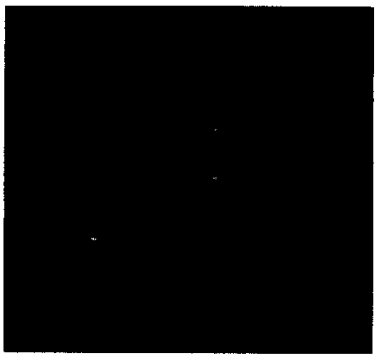
Conclusions: The E/Vp ratio, derived from standard transmitral and color M-mode Doppler, relates closely to LVEDP in our study group and is a promising noninvasive method of predicting elevated LV filling pressures in children.

9:30 a.m.

809-2 **Quantifying Pulmonary Regurgitation as the Difference Between RV and LV Stroke Volumes Using Real-Time Three-Dimensional Echocardiography: Studies in a Chronic Animal Model**

Rosemary A. Rusk, Yoshiki Mori, Timothy Irvine, Antoinette Kenny, Arthur D. Zetts, Vandana Sachdev, David J. Sahn, *Oregon Health & Science University, Portland, Oregon, NHLBI, Bethesda, Maryland.*

Background: Accurate quantification of pulmonary regurgitation (PR) is particularly important in managing congenital heart disease, especially postoperative tetralogy of Fallot. Conventional Doppler flow techniques have been limited by disorganized flow and altered flow profiles. Distorted geometry of the ventricles limits the accuracy of cavity volume analysis by 2D methods. We studied the accuracy of real time 3D echo for computing pulmonary regurgitant volumes as the difference between left and right ventricular stroke volumes (SV) in an animal model of chronic PR. **Methods:** Eight sheep (18-57kg) were studied, 3 to 6 months after surgery to induce PR. A repeat thoracotomy was performed and real time 3D echo scanning obtained epicardially (Volumetrics® Medical Imaging) to image the RV and LV for 19 steady hemodynamic states. PA and Ao electromagnetic flow probes were used for reference. ,



Results: RV SV: RV end diastolic - end systolic volume from 3D images correlated well with the reference data (r = 0.92, SEE 3.7ml/bt, p<0.0001, mean difference -1.9 ± 3.6ml/bt). LV SV (LVEDV-LVESV) also agreed well with the reference values (r = 0.90, SEE 2.3ml/bt, p<0.0001, mean difference -0.01 ± 2.8ml/bt). PR volumes, computed as the difference between RV and LV SV showed good correlation with EM regurgitant volumes (r = 0.84, SEE 4.4ml/bt, p<0.0001, mean difference -1.9 ± 4.2ml/bt). **Conclusions:** Real time 3D echo permits accurate quantification of pulmonary regurgitation volume.

9:45 a.m.

809-3 **Integrated Visualization of MRI Anatomy and Blood Flow Patterns for Evaluation of Aortic Coarctations**

W. James Parks, Marijn E. Brummer, Charles B. Kitchen, Chung-Yi Hong, Shiva Sharma, Derek Fyfe, *Emory University, Atlanta, Georgia, Children's Healthcare of Atlanta, Atlanta, Georgia.*

Background
Conventional magnetic resonance imaging (MRI) evaluation of coarctation of the aorta has relied on two-dimensional (2-D) cine display of structural MRI data, sometimes augmented with quantitative blood flow information from phase-contrast encoded images. The purpose of this study was to evaluate a novel, interactive visualization technique, integrating 3-D display of anatomical MRI co-registered with flow patterns from phase contrast MRI in children with aortic coarctation.
Methods
Imaging is performed by a standard pediatric protocol which includes static T1-weighted coronal, axial, and cine axial images covering the heart and great vessels, and sagittal cine images in the aortic plane. All cine images are acquired with through-plane velocity encoding (350 cm/sec max velocity). 3-D Visualization shows, in cine mode, slice images in texture-mapped aspect view and shows flow patterns as dynamic fields of arrows, using in-house developed software. This report is based on initial experience from 42 cases of aortic coarctation.
Results
Patients ranged in age from 15 months to 23 years (median: 12 years). Additional diagnoses: aortic stenosis (13), mitral stenosis (2) and subaortic stenosis (1). Satisfactory velocity profiles were obtained in all studies. Typically, flow visualization was generated at the aortic valve, transverse aortic arch, coarctation sites, and through aortic collaterals. Flow dynamics at multiple sites could be visualized simultaneously, synchronized with cine display of multiple original and reformatted anatomical images.
Conclusions
3-D Visualization of flow patterns in anatomical context enhanced understanding of flow dynamics in aortic coarctations. This type of presentation allows critical comparison of normal and abnormal blood flow patterns. Clinical application of the described visualization concepts is made possible by a real-time, interactive software implementation with a graphical user interface.