

Of these 126 patients, 99 patients (79%) survived to hospital discharge, including 63 of 80 patients (79%) who underwent neonatal cardiac surgery. There were 9 additional late postoperative deaths. Of the 46 patients who did not undergo neonatal surgery, 36 (80%) are still alive. Chromosomal abnormalities ( $p < 0.0005$ ), gestational age  $< 35$  weeks at birth ( $p < 0.0005$ ) and  $< 24$  weeks at diagnosis ( $p < 0.0005$ ) were independently associated with families opting for no active management. No independent predictors of hospital survival following neonatal surgery were identified. Seventy-eight of these 126 patients (62%) are currently alive. Birth weight  $> 2.5$  kg ( $p = 0.01$ ) and absence of extracardiac anomalies ( $p = 0.014$ ) were associated with survival at last known follow up. Conclusions: Patients who are diagnosed prenatally with SHD constitute a cohort that is subject to significant mortality. Chromosomal abnormalities, prematurity, low birth weight and extracardiac anomalies are independently associated with mortality in these patients. The specific type of SHD does not appear to affect measured outcomes.

**1057-205 Current Diagnostic Accuracy of Fetal Echocardiography: A Cardiac Segment-Specific Analysis**

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**Background:** Advancing ultrasound technology has led to significant improvements in both temporal and spatial cardiac image resolution. Our purpose was to assess the current diagnostic accuracy of fetal echocardiography (ECHO) specific to individual cardiac segments. **Methods:** All fetal ECHO ( $n = 769$ ) performed between 1/01 and 6/03 were reviewed. 58 studies were identified where complete postnatal ECHO was available for comparison. Studies were not systematically excluded for late gestational age or quality of acoustic windows. Studies were performed with an experienced cardiologist using available 2D, M-mode, and Doppler modalities. An independent observer, using standards of accuracy expected of postnatal ECHO, assessed accuracy of fetal ECHO for the following cardiac segments: abdominal situs, systemic venous return (VR), pulmonary VR, atria, atrioventricular valves (AVV), ventricular septum, ventricular hypoplasia, ventricular morphology, semilunar valves, great arterial relation, and aortic arch. Sensitivity, specificity, and positive and negative predictive values (PV) were calculated for each segment. **Results** (Table):

	Sensitivity	Specificity	Positive PV	Negative PV
Abdominal Situs	100	98	75	100
Systemic VR	44	98	80	90
Pulmonary VR	100	96	33	100
Atria	92	100	100	94
AVV	88	88	91	84
Ventricular Septum	84	81	88	74
Vent Hypoplasia	100	100	100	100
Vent Morphology	100	98	89	100
Semilunar Valves	75	93	91	79
Great Arterial Relation	100	95	86	100
Aortic arch	79	90	73	93

**Conclusions:** Fetal ECHO has excellent diagnostic accuracy in describing intracardiac anatomy. Despite both technological advances and improved physician awareness, assessment of systemic VR, pulmonary VR, and aortic arch anatomy remains challenging. False negative findings also impact accuracy of semilunar valve, AVV, and ventricular septal findings.

**1057-206 Fetal Pulmonary Venous Doppler Patterns in Hypoplastic Left Heart Syndrome: Relationship to Atrial Septal Restriction**

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**Background:** Abnormal pulmonary venous Doppler (PVD) patterns have been demonstrated in fetuses with hypoplastic left heart syndrome (HLHS) in association with restrictive atrial septal defect (rASD).

**Objective:** We hypothesize that PVD patterns are abnormal in fetuses with HLHS even in the absence of rASD. We sought to compare the relationship of PVD patterns to the degree of rASD.

**Methods:** Twenty-seven fetuses with HLHS and 70 healthy fetuses underwent pulsed Doppler echocardiography of pulmonary veins between 19 and 38 weeks gestation. The peak systolic (S), diastolic (D) and atrial reversal (A) velocities were measured. The S/D ratio, velocity time integral of forward (VTI<sub>f</sub>) and reversed (VTI<sub>r</sub>) flows and VTI<sub>f</sub> expressed as percentage of VTI<sub>r</sub> (%) were calculated. Independent examiners reviewed neonatal echocardiograms to categorize HLHS into HLHS-A (no rASD), HLHS-B (mild-moderate rASD) and HLHS-C (severe rASD or intact atrial septum). Analysis of covariance was performed with gestational age as co-variate and Bonferroni correction was employed.

**Results:** Compared to controls, HLHS group as a whole showed increase in all PVD indexes except VTI<sub>f</sub> and D. Four subjects were excluded from subgroup analysis due to termination of pregnancy ( $n = 2$ ) continuing pregnancy ( $n = 1$ ) and fetal atrial septostomy ( $n = 1$ ). HLHS-A ( $n = 11$ ) when compared to controls, had higher S ( $36.6 \pm 2.9$  vs.  $21.4 \pm 0.9$  cm/s [mean  $\pm$  S.E];  $p < 0.001$ ), S/D ( $2.2 \pm 0.2$  vs.  $1.2 \pm 0.06$ ;  $p < 0.001$ ), A ( $16.1 \pm 2.8$

vs.  $0.37 \pm 0.9$  cm/s;  $p < 0.001$ ), VTI<sub>f</sub> ( $1.3 \pm 0.3$  vs.  $0.05 \pm 0.08$  cm;  $p < 0.001$ ) and %R ( $18.4 \pm 4.0$  vs.  $0.8 \pm 1.3$ %;  $p < 0.001$ ). D and VTI<sub>r</sub> showed no difference. Pair-wise comparison showed trend towards increase in S, S/D, A, VTI<sub>f</sub> and %R and decrease in D from HLHS-A to HLHS-C, with only A and S/D achieving statistical significance.

**Conclusions:** PVD flow patterns are abnormal in HLHS even in the absence of restrictive ASD, suggesting that factors other than impaired left atrial egress play a role. The A velocity and S/D ratio correlate best with the degree of restriction, the latter being clinically most useful due to its independence from insonation angle. Further study of PVD patterns can provide important insights into fetal pulmonary vascular development in HLHS.

POSTER SESSION

**1076 Interventional Catheterization in Pediatric and Congenital Heart Disease**

Monday, March 08, 2004, 9:00 a.m.-11:00 a.m.  
Morial Convention Center, Hall G  
Presentation Hour: 9:00 a.m.-10:00 a.m.

**1076-199 Coil Occlusion of Patent Ductus Arteriosus in Small Infants (Less Than or Equal to 5 Kg)**

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**Background:** Occlusive devices for closure of patent ductus arteriosus (PDA) can protrude into the descending aorta in small infants. Coils can fit into the duct ampulla better but coil occlusion can be technically demanding. We present our experience in coil occlusion ducts in infants weighing less than or equal to 5kg.

**Methods:** We reviewed our 5-year institutional database of all children undergoing catheter closure of PDA at our institution and identified all infants with weighing 5 Kg or lesser. Case selection was through echocardiography. Duct diameter of less than 5 mm and adequate size of ampulla were prerequisites

**Results:** Forty-five (6%) of 752 children who underwent transcatheter occlusion of PDA were identified (median weight: 4.5 Kgs, range: 0.96-5 Kg; median age: 4 months; range: 18 days – 12 months). The mean duct size was  $3.2 \pm 0.8$  mm. Four infants were mechanically ventilated for heart failure with pneumonia. The procedure was successful in all ( $1.8 \pm 1.1$  coils used /patient; fluoroscopy time:  $11.4 \pm 8.5$ min). Bioptrone assistance was used in 27 (60%) infants (multiple coils were delivered simultaneously in 14). Coil turns were cut to "fit the ampulla" in 20 (44%) patients. Arterial puncture was avoided in 25 (55%) patients. There were 6 episodes of embolization (all coils retrieved). Seven (16%) had small residual flow at the end of the procedure. All 4 infants on mechanical ventilation were successfully weaned off over 48-72 hours. On follow-up, 3 (6.6%) had a new-onset Doppler gradient (24-32 mm Hg) across the LPA and 4 had trivial residual flow. There was no hemolysis or vascular complication.

**Conclusions:** Coil occlusion of PDA is feasible as a less invasive option to surgery in selected small infants. The limitations of the procedure include the potential for embolization and occurrence of LPA stenosis in a small proportion of patients.

**1076-200 Differences in Pulmonary Artery Angioplasty by Proximal Versus Distal Dilation Sites**

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**Introduction:** We sought to determine the acute efficacy, late efficacy, and adverse event rate for modern balloon technology and explore differences in procedure, techniques, and outcomes by dilation site, proximal vs. distal pulmonary artery (PA).

**Methods:** Angiograms and medical records were reviewed in a random sample of 104 PA dilation procedures between 1/96 and 12/00. Differences in technique, adverse event rate, and acute and follow-up changes in lumen diameter were analyzed by dilation site.

**Results:** Of 100 patients (diagnosis TOF 11, TOF/PA 35, PPS 16, Truncus 12, other 26) undergoing 104 procedures (proximal 55, distal 39, both 10), 203 vessels were dilated, 78 (38%) proximal (R or LPA) and 125 (62%) distal. High pressure balloons were more commonly used in distal angioplasty procedures ( $p < 0.001$ ). Median balloon size relative to minimum lumen diameter was larger for distal dilations,  $2.7$  vs.  $2.0$  ( $p < 0.001$ ) for the first balloon and  $2.9$  vs.  $2.7$  ( $p = 0.09$ ) for the second balloon. Elimination of a waist with the first balloon angioplasty was more likely when dilating proximal vessels (78 vs 63%,  $p = 0.03$ ), but recoil was more frequent, requiring stent placement in 19 of 78 (24%) vs 2 of 125 (2%),  $p < 0.001$ . For the 92 vessels with follow-up angiography, 9 (10%), CI [5%, 18%], experienced restenosis, defined as a return to pre-dilation diameter. Vessel trauma occurred in 11% of dilations (intravascular tear with flow obstruction in 11, confined tear in 8, and unconfined tear in 2) with no differences based on location. Other adverse events were also similar between the 2 groups, including cardiac arrest (1), hypotension (3), arrhythmias (5), and pulmonary edema (6). Vessel rupture occurred in 2 of 203 dilations (1%) and was successfully managed with coil embolization; no patients died.

**Conclusion:** Distal vs Proximal PA angioplasty procedures differ in technique employed and expected outcome. Distal dilation sites required larger balloon to vessel ratios and were more often resistant to low pressure angioplasty. Proximal sites were more likely to experience recoil and require stent placement. Despite these differences, no differences in restenosis, vessel trauma or other adverse events were observed.