†97 DOPPLER CHARACTERIZATION OF NORMAL PULMONARY ARTERY (PA) VELOCITIES IN CHILDREN, John M. Eckerd, Allan G. Cougle, Gerald A. Serwer, Duke University Medical Center, Dept of Pediatrics, Durham, NC

Before continuous wave Doppler(CWD) is useful for evaluating abnormal PA velocity patterns, nl values of measured variables must be established. The effects of factors such as age and heart rate(HR) upon such variables must also be known. This study describes the range in nl children for peak velocity(PV), time from onset of ejection to peak velocity(TPV), peak mean velocity(PMNV), peak modal velocity(PMOV), peak median velocity(PMDV), and the effects of both age and HR upon them. 33 nl children ages 1-18 yrs (mean 7.7 yrs) with HR 51-145 (mean 88/min) comprised the study group. CWD exams were performed with a 2.5 or 5.0 MHz probe positioned at the upper left sternal border to produce maximal signal avoiding valve clicks. Spectral data were collected by an online computer with velocities calculated assuming a zero angle of incidence. All above parameters and ejection time(ET) were measured via computer. All velocities were age and HR independent. Mean values ± SD were: PV:1.02±.31 M/S; PMOV:.74±.22 M/S; PMNV:.46±.10 M/S; PMDV:.48±.11 M/S. TPV and TPV/ET were age indepedent but varied inversely with HR, p<.01 with the linear estimating equation for TPV being TPV=182-0.79 X HR. Predicted TPV (TPVN) was calculated from this equation and the ratio TPV/TPVN, mean 1.00±.16(SD), was calculated. It was age and HR independent p>.05. Use of this ratio allows for comparison of pts with differing HRs not possible with TPV or TPV/ET. This ratio and these velocity measurements permit characterization of nl PA flow and potential evaluation of abnormal states.

●98 MYOCARDIAL ATP REPLETION WITH RIBOSE INFUSION. Stanley Einzig, John A. St. Cyr, Richard Bianco, Joseph Schneider, Elizabeth Lorenz, John E. Foker, Univ. of Minnesota, Depts. of Surgery & Pediatrics, Minneapolis.

Myocardial ATP levels are depressed following global ischemia (ISC) and require 9-10 days for recovery(REC). We have been investigating the role played by ATP precursor loss in prolonged REC. In previous studies adenine and ribose(R) enhanced ATP REC to 86% by 24° after ISC. This study attempted to identify the rate limiting step in ATP REC by providing R alone. Dogs on cardiopulmonary bypass(CPB) were subjected to 20' of normothermic ISC, weaned from CPB, and followed for 24°. Following ISC and for 24°, either R(80 mM) or normal saline(NS) was infused (1 ml/min). LV biopsies were analyzed for adenine nucleotide content (table). Cardiac output(CO), LV and renal blood flows(BF) were measured (radioactive microspheres).

	Normal Saline(n=7)		Ribose(n=10)	
(mean±SE)	ATP(μmol/g)	EC	ATP(μmol/g)	EC
Pre-ISC	5.06±0.20	0.88±0.01	5.14±0.20	0.84±0.01
20' ISC	2.54±0.17	0.72±0.02	2.41±0.25	0.66±0.03
4°af ISC	2.33±0.21	0.75±0.02	3.34±0.27*	0.74±0.02
24°af ISC	2.58±0.29	0.77±0.02	4.64±0.36*	0.81±0.01

In both groups, ATP fell 50% at 20' ISC. There was no ATP recovery by 24° in S dogs. In R dogs, however, ATP was 90% of control, and the energy charge (EC=ATP+½ADP/ATP+ADP+AMP) was 96% of control. LV and renal BF were similar in NS and R dogs. CO, however, was increased in R dogs (204±16 vs 142±13 ml/min/kg, p<0.05). We conclude: recovery of ATP following global ISC is accelerated by R, and R may be the most essential ATP precursor. (*p<0.01)

●99 EFFECTS OF CHRONIC HYPOXIA ON CARDIAC ELECTROPHYSIOLOGICAL FUNCTION. Michael L. Epstein, Stephen P. Baker, Philip Posner, (Spon. by I. H. Gessner). University of Florida College of Medicine, Dept. of Pediatrics, Gainesville, Florida.

Because of arrhythmias seen in children with cyanotic congenital cardiac disease, we compared electrophysiological (EP) function in normoxically raised rabbits (N) with EP function in rabbits raised in an hypoxic environment (H, ambient pO_2=60 torr). Twelve week-old rabbits (N,H) were anesthetized with pentobarbital sodium and alpha-chloralose. Insulated stainless steel wires were sutured directly to the right atrium for pacing. Surface ECG and arterial blood pressure (BP) were recorded. An intra-cardiac electrogram was recorded from a bipolar catheter inserted via the left superior vena cava into the coronary sinus. Data are presented in milliseconds and are compared as mean ± standard error of the mean. Significance was set at p<0.02.

The control cycle length in H (330±9.9) was significantly longer than in N (281±16.2). Rapid atrial pacing resulted in a corrected pacemaker recovery time (CPRT) that was not significantly different between the two groups. Single programmed extra stimuli were used to evaluate atrial and AV nodal effective (AERP,AVNERP) and functional refractory periods (AFRP,AVNFRP). Statistically significant differences were found in AFRP, AVNFRP, and in AERP when results of N were compared to H. AVNERP was not significantly different.

	AFRP	AVNFRP	AERP	AVNERP
N	117±4.2	175±2.2	107±4.2	135±9.9
H	100±4.8	159±5.5	86±6.5	131±7.4

BP did not differ between H and N prior to or during the pacing protocol.

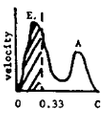
We conclude that, in this model, chronic hypoxia during maturation alters control cycle length and influences cardiac EP function. This information may be important in evaluating arrhythmias in children with cyanotic congenital cardiac disease.

●100 GATED MAGNETIC RESONANCE IMAGING OF THE IN VIVO HEART: DETERMINATION OF LEFT VENTRICULAR MASS IN DOGS. Michael Florentine, Cynthia Grosskreutz, Wei Chang, James Ehrhardt, Val Dunn, David J. Skorton, Melvin Marcus, (Spon. by Edward B. Clark) University of Iowa Hospitals and CV Ctr, Depts. of Pediatrics, Radiology, and Medicine, Iowa City, IA

Alterations in left ventricular (LV) mass characterize many congenital and acquired cardiac diseases. Gated magnetic resonance (MR) imaging is a nonionizing, tomographic technique which permits delineation of cardiac morphology without contrast agents. To test the accuracy of MR-derived LV mass determinations, we imaged 10 anesthetized closed-chest dogs (median weight 20.3 kg, range 9-23 kg) using a 0.5 tesla, superconducting MR system with ECG gating. Transaxial images were acquired at end-diastole using a spin echo sequence with an echo time (TE) of either 13 or 20 msec. The heart was imaged sequentially from apex to base using a slice thickness of 10 mm. Endocardial and epicardial edges in each image were identified using an operator-interactive computer program, based upon a half-contour definition of edge points. The surface area of each cardiac slice was determined by planimetry and, after correcting for specific gravity (x 1.05), the individual slices were summed providing calculated LV mass. Post-mortem LV weights (median 83 gm, range 37.6-132.7 gm) were compared to calculated masses by linear regression analysis. We found a close correspondence between MR-derived and actual LV mass (r = .95, MR mass =.97 true mass + 6.2 gm, SEE = 7.8 gm). Thus, gated magnetic resonance imaging is capable of accurately determining in vivo LV mass. This noninvasive imaging technique should be clinically applicable in a variety of settings in which alterations of LV mass occur.

101 DOPPLER ASSESSMENT OF MITRAL FLOW IN HYPERTROPHIC CARDIOMYOPATHY

S Gidding, R Snider, J Gretka, A Rocchini, Univ of Michigan, Ann Arbor, and Children's Mem Hosp, Chgo



Potential indices of left ventricular compliance were assessed by Doppler (DOP) measurement of blood flow velocity across the mitral valve. We measured time intervals (OC time, OE time, 0 to pressure half time), E velocity (EV), A velocity (AV), EV/AV ratio (E/A), OC area, and % of OC area during the first 1/3 (1/3 area) and first 1/2 (1/2 area) of diastole in 7 normal children (N) and 10 children with hypertrophic obstructive cardiomyopathy (HOCM). Diastolic dysfunction was documented in our patients with HOCM by the presence of prolonged isovolumic relaxation time (31±5 msec - N vs 56±7 msec - HOCM; p 0.05). Comparisons between N and HOCM were made using both raw data and time intervals indexed for heart rate. Heart rate, OC time, and OC area were similar in both groups. The 1/3 area and EV were significantly lower in HOCM (p< 0.05). In contrast, comparison of OE time, AV, E/A and other measurements did not demonstrate a statistical difference between groups (Table). We conclude that diminished 1/3 area and EV reflect diminished flow during rapid filling phase of diastole and that 1/3 area and EV may be more sensitive measurements of diastolic function than other DOP indices in children with HOCM.

	1/3 area (%)	1/2 area (%)	EV (m/s)	AV (m/s)	E/A	OE (msec)
HOCM	46±3*	62±3	0.71±0.07*	0.51±0.03	1.43±0.18	9±0.6
N	58±8	69±2	0.91±0.04	0.50±0.03	1.87±0.15	10±0.5

Mean ± S.E.M., *p < 0.05

102 ESTIMATION OF SYSTOLIC PRESSURE DIFFERENCE IN AORTIC AND PULMONARY STENOTIC LESIONS BY CONTINUOUS WAVE DOPPLER ECHOCARDIOGRAPHY Dharam Goel, Soraya Nouri, and Alan Waggoner(Sponsored by Jen Yih Chu), St. Louis University School of Medicine, Department of Pediatrics, St. Louis, MO.

Continuous wave Doppler (CWD) echo has become progressively useful in estimating the systolic pressure gradient (SPG) in stenotic lesions. To determine the reliability of CWD in estimating SPG, we evaluated 34 patients (pts), 16 with aortic (A) and 19 with pulmonary (P) stenosis (S) by CWD and cardiac catheterization (CC). Pts ages ranged 7-216 months (mean 69). All pts had CC and CWD within 24 hours. CWD gradient was estimated from maximum velocity distal to the obstruction and CC gradient from pull back pressure. CC peak (Pk) SG ranged 5-110 mmHg, (mean 41). SPG estimated by CWD ranged from 5-100 mmHg (mean 38). SPG measured by CWD and CC showed good correlation (R-0.88) in 34 pts. In our last 17 pts r was 0.95 due to improved technique. The difference between SPG by CWD and CC Pk SG varied from -42 to 16, (mean -3.0). CWD overestimated the SPG in 13/34 (3 > 6mmHg). CWD underestimated the SPG in 16/34 (in only 5 was the difference >10 mmHg). Presence of semilunar valve insufficiency or aorto-pulmonary shunt did not affect CWD reliability. Conclusion: CWD accurately assesses SPG in AS and PS. Discrepancies occur between the 2 methods, the reasons for which my be: CWD measures simultaneous SPG while CC measures Pk SG. Pk SG in CC decreases slightly with the distance between the site of measurement and the site of obstruction due to Bernoulli effect. Presence of a catheter through a narrow orifice may overestimate Pk SG at CC, in severe stenosis. The equation used for estimating gradient by CWD is less accurate for mild stenosis.