169 DEVELOPMENTAL CHANGES IN MYOCARDIAL MECHANICAL FUNCTION AND SUBCELLULAR ORGANELLES. Jay M. Jarmakani, Toshio Nakanishi. UCLA Medical Center, Dept. Peds. Los Angeles, CA. 90024

This study investigates the developmental changes in myocardial mechanical function and the function of subcellular organelles utilizing the isolated, arterially perfused heart of the fetus (28th day of gestation), newborn (3-5 day old), and adult rabbit. Maximal force of contraction in the fetus was significantly less than in the newborn and both the fetus and newborn values were significantly less than in the adult. The myofibrillar content in the fetus and ATPase activity in the fetus and newborn were significantly less than in the adult. Both the amount of SR, and SR Ca^{2+} uptake per g muscle increased with age. Mitochondrial Ca^{2+} uptake was not observed at pCa more than 6 (physiological range) in all age groups. At pCa less than 6, mitochondrial Ca^{2+} uptake (per g muscle) in the newborn was significantly greater than in the fetus and adult. Ca^{2+} uptake by crude homogenate in the newborn was also greater than in the fetus and adult. These data suggest that the age-related change in myocardial contractility is due to the differences in intracellular Ca^{2+} concentration and myofibrillar content as well as ATPase activity. Intracellular Ca^{2+} concentration may vary with development depending upon the relative capability of Ca^{2+}-releasing system and Ca^{2+}-sequestering system.

●172 TWO DIMENSIONAL DOPPLER ECHOCARDIOGRAPHIC ANALYSIS OF FETAL CARDIAC ARRHYTHMIAS Charles S. Kleinman;Lilliam M. Valdes-Cruz;Ellen M. Weinstein;David J. Sahn. Department of Pediatrics and Diagnostic Imaging, Yale University School of Medicine, New Haven, CT, University of California Health Sciences Center, San Diego, California

We have evaluated the use of two-dimensional (2-D) pulsed Doppler echocardiography (DE) in conjunction with M-mode and 2-D imaging to assess the electromechanical status of fetuses with cardiac arrhythmias. Using duplex imaging systems we have evaluated DE flow velocity tracings in 20 human fetuses (gestational ages 18-38 weeks) with cardiac arrhythmias. Waveform analysis of atrioventricular valve (AVV) and great vessel flows have demonstrated the hemodynamic effects of isolated atrial ectopic beats in 18 of these patients. DE was more sensitive than M-mode in detecting ectopic atrial activity (18/18 cases versus 14/18 cases). In one patient with atrioventricular block DE showed the abnormal relationship between atrial and ventricular activity. DE analysis of great vessel flows has demonstrated the impact of arrhythmias on fetal cardiovascular function and has documented the presence of postextrasystolic potentiation in the human fetus. Disturbed flow patterns were found in an hydropic fetus with SVT with retrograde vena caval flow due to tricuspid insufficiency and decreased diastolic flow in both the ductus arteriosus and descending aorta. Flow patterns normalized after transplacental therapy. DE has added to the sensitivity and accuracy of the in utero evaluation of fetal arrhythmias and has increased our understanding of the flow disturbances that they cause.

170 HEMODYNAMIC CHANGES FOLLOWING ARTIFICIAL SURFACTANT THERAPY: A CONTROLLED STUDY. Eunice John, Rama Bhat, Haruo Maeta, Tonse Raju, Dharmapuri Vidyasagar. Department of Pediatrics, University of Illinois Hospital, Chicago.

Effects of exogenous surfactant (S-TA, Fujiwara) on hemodynamics and organ blood flow were studied in prematurely delivered baboons (76% term). Cardiac output (CO) and organ blood flow were measured before, 2 h and 7 h after surfactant using Sr^{85}, Cr^{51} and Ce^{141}, respectively. Colloid osmotic pressure (COP) was measured using osmometer (mm Hg). Diagnosis of PDA was confirmed by one shot angiography and at autopsy. Data from 3 control (A) and 2 S-TA treated (B) baboons are shown below.

	Age at Study (h)	MBP mm Hg	COP M S.E.	CO ml/kg/min	Lung	Kidney	Small Gut
A	2-3	39±2.3	12.3±0.5	289±42	4.65±6.5	0.53±0.36	0.35±0.1
	4-5	39±2.7	11.40±0.9	-	3.58±2.2	0.71±0.08	-
	9-10	39±3.7	10.1±0.28	237±29	-	1.31±0.3	0.51±.18
B	2-3	42	12.25	361±119	5.2±0.13	0.45±0.07	0.03±0.02
	4-5	46	11.5	-	18.05±2.11	0.88±0.16	0.86±0.11
	9-10	36	12.5	442±233	2.8±0.85	0.77±0.05	0.04±0.32

Organ blood is expressed as ml/min/gram (M±S.E). Ductal size was larger in surfactant treated baboons than in controls (3.5 mm vs 2.0 mm). This preliminary data suggest that (1) transient increase in lung blood flow seen after TA surfactant is secondary to large L to R shunt thru the PDA; (2) progressive increase in renal blood flow may be secondary to decrease in renal resistance; (3) colloid osmotic pressure increased in surfactant treated in comparision to control.

† 173 NON-INVASIVE DETECTION OF CARDIAC SPECIALIZED CONDUCTION SYSTEM POTENTIALS IN PEDIATRIC PATIENTS. Ehud Krongrad, M.D., Nan-Koong Wang, M.D., Yoram Lass, M.D., College of Physicians & Surgeons, Columbia University, N.Y.C., N.Y. and Sackler School of Medicine, Tel Aviv, Israel.

Recently, several techniques have been developed in order to record non-invasively specialized conduction system (SCS) potentials in human. The current study was undertaken to assess a new type of high resolution electrocardiography (HRC) using the averaged signal of 128 successive cardiac beats (AC) and an averaged electrocardiogram using 64 successive cardiac beats (DC). 45 patients (pts) (ages 2 mo - 20 years median 6 years 2 mo) were studied using different lead positions and also with and without an external electrical shield. SCS potentials could be detected in 27 of 45 pts (60%) using different lead positions. The SCS potential amplitude ranged from 0.5 - 7.0 μv (mean 1.2 μv). The highest detection rate of SCS potentials with a single lead was 46.7%; with two leads the detection rate improved to 58.1%. The detection rate of SCS potentials with an electrical shield was 89% (8 of 9 pts) as compared with 53% (19/36 pts) without an electrical shield. Our results indicated that 1. SCS potentials in pediatric pts can be detected with a HRC using only 128 successive cardiac cycles. 2. Multiple lead system and electrical shielding will improve further the non-invasive detection of SCS potentials in pediatric patients.

171 ANGIOGRAPHIC ASSESSMENT OF THE IMPACT OF PULMONARY INSUFFICIENCY AFTER TETRALOGY OF FALLOT REPAIR. Rae-Ellen Kavey,Bernard Schneider,Henry M. Sondheimer, Craig Byrum,Marie Blackman. SUNY-Upstate Medical Center,Syracuse. Spon. by Frank Oski.

Pulmonary insufficiency(PI) has been implicated in the etiology of ventricular arrhythmias(VA) and biventricular dysfunction after Tetralogy of Fallot repair. To assess this, 30 consecutive postoperative TF pts with clinical PI have undergone branch pulmonary(PA) injections at follow-up catheterization. Group I consisted of 13 pts who cleared contrast normally from the right heart, within 2 beats of injection; Group II consisted of 17 pts who required 3-11 beats ($\bar{x}$=6) to clear the right heart. The groups did not differ significantly in age at surgery or evaluation, RV hypertension or RV outflow tract gradient. Five of 13 pts in Group I and 12/17 in Group II had obligatory surgical PI. The groups were compared for RV size by M-mode echocardiography expressed as RV/LV ratio diastolic dimension, RV and LV ejection fractions by radionuclide ventriculography, and grade of VPCs detected on treadmill exercise and ambulatory ECG. Findings are summarized below:

	GROUP I		GROUP II		p
RV/LV	0.67	(0.5-0.89)	0.91	(0.60-1.50)	< .005
RVEF	39%	(18-61)	27%	(12-44)	< .01
LVEF	61%	(50-78)	46%	(7-64)	<.005
VPCs ≥ Grade 2	2/13	(15%)			

In this study, prolonged opacification of the right heart after branch PA injection correlated with significant right ventricular dilatation, biventricular dysfunction, and ventricular ectopy After TF repair, branch PA injections provide a useful method for assessing the variable impact of pulmonary insufficiency.

●174 LEUKOTRIENE(LT)BLOCKERS AND THE PULMONARY CIRCULATION Thomas J. Kulik, Robyn K. Schutjer, Donna F. Howland, James E. Lock.Dept. of Pediatrics, Univ. Minn., Mnpls

LT's have been implicated in mediating hypoxic pulmonary vasoconstriction.We studied the LT blocker FPL 57231(FPL)in the pulmonary and systemic circulation in awake lambs. Flow probes were placed around the pulmonary arteries(PA)of six,3-7 day old lambs; a left atrial(LA) line was also placed. Catheters were placed in the aorta(Ao)and PA 7-14 days later. With the lambs awake, PA,Ao, and LA pressures(P;mmHg)and cardiac output(CO;ml/min) were measured in normoxia(N)and after 10 min. of hypoxia(H;fiO_2=.11). A continuous infusion of FPL(2 mg/kg/min.)was begun during H, and hemodynamics recorded for 15 min. The FPL was then stopped, H maintained for 45 min., and hemodynamic measurements continued.

Condition	PAP	AoP	CO	PAR†(units)	SVR††(units)
N	22±5.3	76±7.9	1272±430	16.9±8.3	64.6±17.6
H	30±6.9°	71±7.1	1372±281	21.3±7.9	54.3±14.3
H+FPLx15 min.	15±2.3°°	55±12.2°°	1686±574	8.7±5.0°°	38.9±22.8°°
H after FPL off	26±5.8	69±7.3	1684±526	15.5±7.4	45.6±20.6

†pulmonary arteriolar resistance,††systemic vascular resistance
°p<.05 compared to N,°°p<.05 compared to H, Student's t-test

By 15 min. after the start of the FPL,PAP returned to N level,and it fell further with continued FPL.AoP also fell,but less: after 15 min. of FPL, PAP fell 50%,AoP fell 23%.After FPL was stopped, PAP and AoP returned to nearly pre-FPL levels within 45 min.Propranolol(n=4;1 mg/kg)did not block the fall in PAP with FPL.

These data support the notion that LT's contribute to hypoxic pulmonary vasoconstriction, and suggest that LT blockers may be useful in the treatment of pulmonary hypertension.