85 CATECHOLAMINE EFFECT ON THE FORCE-INTERVAL RELATIONSHIP. Page A.W. Anderson, Andres Manring, and Edward A. Johnson. Duke University School of Medicine, Duke University Medical Center, Department of Pediatrics, Durham, North Carolina.

Catecholamines (isoproterenol, norepinephrine, methoxamine) have an effect on the force-interval relationship (FIR) (the way the force of contraction depends on the rate and pattern of stimulation) which is unique among inotropic agents. Although the effect on the FIR of a low dose of isoproterenol (10^{-8}M) is similar to that of other agents (e.g. elevation of calcium concentration), intermediate doses (10^{-7}, 10^{-6}M) cause the curves that characterize the FIR (monophasic for the control and the low dose) to become biphasic; large doses (10^{-5}M) strikingly accentuate this effect turning post-extrasystolic potentiation into post-extrasystolic depression. Propranolol (10^{-7}M) and practolol (10^{-6}M) blocked these effects competitively whereas phentolamine (5×10^{-6}M) and isopropylmethoxamine (5×10^{-6}M) did not. Thus, the effect of changing the FIR from a monophasic to a biphasic function can be deemed a β_1 action, unrelated to α or β_2 sites. Norepinephrine (10^{-7}, 10^{-6}, and 10^{-5}M) produced the same results. Methoxamine (10^{-3}, 10^{-4}M), not usually considered a β agonist, also produced this same effect on the FIR. These results demonstrate the potential usefulness of the FIR as a means of identifying and classifying inotropic agents as well as providing a method of analysis for testing hypotheses concerning the mode of action of β_1 agonists.

86 PROPRANOLOL IN THE TREATMENT OF HYPERTENSION IN THE YOUNG: LACK OF EFFECT ON MYOCARDIAL FUNCTION. Robert C. Boerth, Robert J. Boucek, Jr., and Thomas P. Graham, Jr. Vanderbilt University Medical Center, Departments of Pediatrics and Pharmacology, Nashville, Tennessee

Propranolol (P) can produce myocardial depression, and such an effect would be undesirable and potentially dangerous if it occurred when P is used to treat sustained hypertension in children. This study reports the effects on myocardial function evaluated by echocardiography in 8 hypertensive children (6 to 16 years) treated with P. Six of the pats had essential hypertension, 1 had renovascular hypertension and 1 had renal parenchymal disease. None of the children had clinical evidence of heart failure. P (1.8 to 11 mg/Kg/day) was effective in treating the hypertension in these pats producing significant ($p<0.02$) reductions in systolic BP (147±5 to 127±4mmHg, $\bar{X}$±SEM), diastolic BP (97±3 to 82±3mmHg) and heart rate (96±7 to 70±6 bpm). The changes in heart rate and BP produced by P did not alter left ventricular (LV) pre-load since LV end-diastolic dimension remained the same (41±2mm; $\bar{X}$±SEM). These same doses of P produced no significant alteration of LV function as described by LV shortening fraction (0.40±0.02 vs. 0.38±0.03; pretreatment vs. treatment), LV velocity of shortening (1.54±0.08 vs. 1.48±0.15 muscle lengths/sec) or LV pre-ejection period divided by LV ejection time (0.36±0.02 vs. 0.39±0.04). It is concluded that doses of P which are in the therapeutic range for treating hypertension in children without preexisting heart failure do not produce detectable alteration of left ventricular function.

87 CONDUCTION DEFECTS FOLLOWING VENTRICULAR SEPTAL DEFECT CLOSURE WITH AND WITHOUT A RIGHT VENTRICULOTOMY. Robert Boxer, Ehud Krongrad, Frederick O. Bowman Jr, James R. Malm, Welton M. Gersony. Coll. P&S, Columbia University, Department Pediatrics, New York City 10032.

It has been reported from our institution that almost all patients (pts) with tetralogy of Fallot develop a right bundle branch block pattern (RBBBP) postop and in addition 8.7% develop a left anterior hemiblock pattern (LAHP). To evaluate the occurrence of postop ventricular conduction defects the surgical procedures and pre and postop electrocardiograms of 70 pts with isolated ventricular septal defect (VSD) in whom the repair was carried out via a right ventriculotomy and 52 pts with VSD repaired via the atrium were reviewed. Of the 70 pts who had a right ventriculotomy 57 (81%) developed an RBBBP and 13 (19%) had no conduction abnormalities. No pt developed LAHP. Among the 52 pts repaired without a right ventriculotomy 13 (25%) developed an RBBBP and in addition 3 of the 13 had LAHP. The other 39 (75%) pts had no conduction defects after surgery. VSD size, location and use of suture vs. patch closure for VSD repair were similar for both groups. Our results indicate that 1) the incidence of RBBBP following VSD closure via the atrium is less frequent than previously reported; 2) RBBBP is more frequent when VSD is repaired via a right ventriculotomy suggesting that most lesions following ventriculotomy are due to peripheral injury of the right bundle branch; 3) when RBBBP and LAHP develop following VSD repair via the atrium, the lesion must be considered central in origin.

88 DIAGNOSTIC EVALUATION OF CREATINE KINASE ISOENZYMES IN CHILDREN. Carmelita V. Britton, Antonio Hernandez, Jr., and Robert Roberts. Washington University, St. Louis Children's Hospital, Dept. of Peds. and Medicine, St. Louis, Mo.

In adults, plasma elevations of creatine kinase isoenzymes are highly specific for myocardial necrosis, however, the diagnostic sensitivity and specificity of MB CK in children have not been determined. Accordingly, we analyzed the CK isoenzymes by a kinetic fluorometric method in serial plasma samples from 89 patients, aged 1 day - 17 yrs, mean 3.9 yrs, and 34 controls, 1 mo - 18 yrs, 5.1 yrs. 57 pts. had cardiac catheterization (cath) and angiography. Cyanotic group included tetrology (2), transposition (3), atrioventricular canal (3), truncus (1), total anomalous pulmonary venous return (2), and combinations (9); acyanotic group included septal defects (13), valvular lesions (10), patent ductus arteriosus (6), idiopathic hypertrophic subaortic stenosis (2), endocardial fibroelastosis (1), pericarditis (1), and combinations (4). 31 pts. had cardiac surgery for congenital defects. Blood samples were collected prior to cath or surgery and q6H X 2 thereafter. CK isoenzymes were assayed with and without creatine phosphate, the specific CK substrate, and results compared to controls. MB CK was normal in control, pre cath and pre surgery samples (<.005 IU/ml). After cath, despite total CK elevations in 91%, with up to 12-fold increase, MB remained normal in 88%. However, after cardiac surgery, total and MB CK were elevated in all pts. Thus, elevated plasma MB CK in the pediatric population appears to be a sensitive and specific indicator of acute myocardial damage.

89 ELEVATED CREATININE PHOSPHOKINASE-MYOCARDIAL BOUND FRACTION (CPK-MB) AND PAPILLARY MUSCLE INFARCTION IN STRESSED NEWBORNS SHOWING MYOCARDIAL DYSFUNCTION WITH TRANSIENT TRICUSPID INSUFFIENCY (MD with TTI). R. Bucciarelli, R. Nelson, E. Egan, D. Eitzman, and I. Gessner. Dept. of Pediatrics, Univ. of Florida, College of Medicine, Gainesville.

We have reported (Bucciarelli *et al.*, Pediatrics, in press) 14 newborns stressed by acute birth hypoxia (and/or hypoglycemia) who developed congestive heart failure, tricuspid insufficiency, and electrocardiographic evidence of myocardial ischemia. Two infants died, each showing tricuspid papillary muscle infarction at autopsy. Subsequently, 13 more stressed newborns, clinically suggesting MD with TTI, have had determinations made of total CPK. Ten had a final clinical diagnosis of MD with TTI. In 9, total CPK was elevated (mean 874 IU/1), in 6 of whom the CPK-MB fraction was elevated to a degree consistent with acute myocardial infarction (mean 185 IU/1). Four of the 10 having MD with TTI died; 2 of these had elevated CPK-MB and papillary muscle infarction; 2 had normal CPK-MB and no infarction at autopsy. Three of the 13 studied had other final diagnosis; (1 with persistent fetal circulation, 2 with congenital heart disease). All had lower mean CPK (107 IU/1) and all had CPK-MB fractions <10 IU/1. We propose that myocardial infarction, particularly of papillary muscle, is part of MD with TTI and is associated with elevation of CPK-MB, and that this enzyme determination may aid differentiation from other cardiopulmonary disease states in the newborn.

90 RIGHT VENTRICULAR MYOCARDIAL BIOPSIES IN TETRALOGY OF FALLOT. Ramon V. Canent., The Children's Mercy Hospital, Kansas City, Missouri

Full thickness RV myocardial biopsies were taken during surgery in 21 patients with Tetralogy. Specimens stained with Trichrome and Verhoff VonGieson were analyzed. Grade I: Endocardial fibroelastosis with perivascular fibrous and collagen invasion. Grade II: Subendocardial collagen and fibroblast invasion with myocardial hypertrophy. Grade III: Myocardial cell disruption plus intimal thickening of intramural coronary arteries. Quantitative angiographic RV function was correlated with RV myocardial histology.

Grade III changes were found in older age group which showed markedly depressed RV ejection fraction. Grade I and II changes characterized the myocardium of patients below 2 yrs. Between 2 and 4 yrs. some patients showed Grade I and II changes with moderately depressed RV functions. Of 10 patients with mild changes, 6 showed RV ejection fraction in the low normal range; 3 had ejection fraction below 0.55 and only 1 had RV ejection below 0.50. 11 patients over 2 yrs. showed Grade III changes and markedly depressed RV ejection, 7 below 0.50.

Summary: RV myocardial changes correlated with the degree of RV function depression as well as the pts. age. Grade III myocardial changes accompanied severe RV function depression in Tetralogy pts. over 4 years of age; between 2 and 4 yrs. some pts. with marked RV depression showed only Grade I and II changes and pts. below 2 yrs. showed only Grade I and II changes with milder RV function depression. This study lends support to early corrective surgery for Tetralogy before marked myocardial changes accompanies deterioration of right heart function.