ECHOCARDIOGRAPHIC MEASUREMENTS IN NORMAL WELL CHILDREN
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Echocardiography is a valuable tool for the diagnosis and management of cardiac problems in children. This technique permits accurate and reproducible measurements of the various cavity sizes, great vessel dimensions, wall thicknesses, septal thickness, and valve motion.

Little information has been published concerning normal values for children. This is a particularly important problem since these values and ranges of values change with each increment in physical size.

We performed echocardiograms on 120 well children of varying sizes. These data were combined with similar measurements done at the University of Indiana, and growth curves were constructed for the various measurements which were compared to body surface area. The resulting curves permit rapid comparative analysis of echocardiograms of children with cardiac disease. Additionally, the rate of growth of various portions of the heart is further established.

REDUCED LEFT VOLTAGE IN THE VECTORCARDIOGRAM AS AN INDICATOR OF COR PULMONALE IN CYSTIC FIBROSIS.
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Recognition of right ventricular hypertrophy in cystic fibrosis has been difficult. 74 cases of cystic fibrosis were studied with arterialized finger prick blood for pO_2, a series of static and dynamic pulmonary function tests and vectorcardiograms (Frank lead) and orthogonal X,Y,Z all done the same day. Group I: normal pO_2 for age (N=31). Group II: pO_2 less than two standard deviations for age (N=43). There was no significant correlation between the S wave in the X lead or the maximum voltage to the right in frontal or horizontal loops (signs of right ventricular hypertrophy) and the pO_2 or selected respiratory function tests in either group. We were surprised to find that there was a significant positive correlation in group II of (1) R in lead X(Rx) with pO_2 (r=.38), $FEV_{1.0}$ (r=.44) MBC (r=.39), (2) frontal plane maximum left voltage (FMLV) with pO_2 (r=.40) $FEV_{1.0}$ (r=.37) MBC (r=.36), (3) T in the X lead (Tx) with pO_2 (r=.37) and MBC (r=.47).
Conclusions: As the respiratory function tests worsen or the pO_2 lessens the voltage over the left ventricle gets less. These simple hand measurements of left voltage (Rx, FMLV, and Tx) can be used to follow patients with cystic fibrosis to detect the development of cor pulmonale.

CHANGES IN THE QT INDEX WITH SLEEP IN YOUNG MAMMALS.
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Sudden death has been reported in syndromes with prolongation of the QT index (QTc). Sudden death syndrome in infancy (SIDS) occurs most frequently during sleep. Two unreported observations by Talner and Campbell of "near-miss" SIDS showed prolongation of the sleeping QTc. This study was designed to determine variations of QTc with sleep and its relationship with age in young mammals.

Forty experiments were performed in healthy young piglets ranging between 1 to 77 days of age. ECG recordings were obtained during awake and artificially induced sleep with pentobarbital. QTc was calculated from measurements of QT intervals corrected for heart rate. Results showed sleeping QTc of 335 $\pm$ 27 msec as compared with waking QTc of 303 $\pm$ 26 msec. Average increase in QTc during sleep of 32 msec ($p < 0.001$) persisted for the first five weeks of age for this species.

Sleeping and waking ECG were also obtained in 21 babies ranging between 1 to 12 months of age. Sleeping QTc of 404 $\pm$ 23 msec were obtained as compared with waking QTc of 388 $\pm$ 17 msec (Average increase of 16 msec, $p < 0.005$).

Prolongation of the QTc during sleep seems to be a normal electrophysiologic phenomenon in infants of this age. Whether prolongation of the QTc, by increasing the vulnerability of the ventricles to potentially lethal arrhythmias, may predispose to SIDS remains speculative.

THE EFFECT OF HEPARIN ON POST CATHETERIZATION ARTERIAL THROMBOSIS IN CHILDREN. Michael D. Freed, Amnon Rosenthal, and John F. Keane, Harvard Med. Sch., Children's Hosp. Med. Ctr., Dept. of Card., Boston, Mass.

Arterial thrombosis is a common and serious complication of percutaneous cardiac catheterization (cath) in children. A double blind study was therefore designed to test the value of heparin administered during cath in reducing this complication. One hundred and sixty-one unselected children > 1 year of age were studied. Prior to cath the pulse amplitude was measured in both legs using a pulse volume recorder, a quantitative oscillometer, (Surgery 72:873, 1972). Immediately after arterial canulation heparin (H) 1mg/kg or a placebo (P) were administered. On the morning following cath the pulse amplitude in both legs was remeasured and a pulse volume index (PVI) calculated using the non-cath leg as a control. Patients in whom the cath leg was cold with poor capillary filling and absent arterial pulses 4 hours after cath were begun on systemic Heparinization (SH). If no improvement occurred within 48 hours embolectomy (E) was performed.

Only 2/78 children in the H group had a PVI of < 50% compared to 10/83 in the P group ($p<0.05$). SH was required in 15/83 children in the P group and 3/78 in the H group ($p<0.01$). Embolectomy was performed in 7/83 children in the P group and none of 78 in the H group ($p<0.03$).

We conclude that H administered during percutaneous cath is effective in preventing arterial thrombosis in children.

ALTERED VENTRICULAR FUNCTION DURING SEPTAL AND RIGHT VENTRICULAR ISCHEMIA IN ANESTHETIZED DOGS. David E. Fixler, George A. Monroe and Mickey Wheeler. Intro. by Gladys Fashena. Dept. of Pediatrics, University of Texas Health Science Center at Dallas, Dallas, Texas 75235

The purpose of this study was to determine the effect of right and septal coronary arterial ligation on ventricular function. Regional myocardial flow was measured using 9 micron radioactive microspheres. Following septal coronary ligation septal flow decreased 45.6% from control; following right coronary arterial ligation right ventricular free wall flow fell 41.2% indicating nearly equivalent degrees of ischemia were produced. Although ventricular systolic pressures and stroke volumes remained stable during septal and right coronary arterial ligations, right ventricular function was significantly depressed as evidenced by a fall in right ventricular peak dP/dt by 19% and 14% respectively, and a significant ($P < 0.05$) shift in the Frank-Starling function curve to the right. Septal coronary arterial ligation did not cause a significant shift in the left ventricular function curves. Following selective ligation, elevation of aortic pressure significantly increased coronary flow to the septum but failed to increase flow to the right or left ventricular free walls. The fact that left coronary arterial flow failed to increase with greater left ventricular pressure loads indicates loss of coronary autoregulation. This suggests that acute ischemia in one region may result in significant coronary vasoconstriction in a nonischemic region. The acute changes in right ventricular function demonstrate that contraction of the ventricular septum contributes more to right ventricular than left ventricular performance.

Preferential Shunting of Venous Return From Normally Connected Left Pulmonary Veins in Secundum Atrial Septal Defect. R.M. Freedom, R.E. Hawker, L.J. Krovetz, The Johns Hopkins Hospital, Department of Pediatrics, Baltimore.

Distinctive patterns of left-to-right shunting of pulmonary venous return (PVR) have previously been demonstrated by indicator dilution techniques in secundum (ASD 2), primum ASD, sinus venosus defects and in partial anomalous pulmonary venous connection. We intend to document a most unusual and paradoxical hemodynamic finding in ASD 2: Preferential shunting of venous return from normally connected left pulmonary veins. 80 patients with ASD 2 underwent cardiac catheterization from 1971 to 1973. In 32 of these, dye curves were recorded following injection of indocyanine green through an end-hole catheter into both distal right and left pulmonary arteries, with sampling in a peripheral artery. In 21 of these 32 (65%) there was the usual predominant shunting of the right PVR; in five (16%) shunting from both sides was equal; in six (19%) predominant shunting from the left PVR was shown. In these six, the pulmonary to systemic flow ratio was between 1.7 and 2.4 and the defects at surgery ranged from 1.5 to 2.5 cm in diameter. Pulmonary arteriograms and intra-operative visualization confirmed normal pulmonary venous connections in these six. Although this pattern of shunting is strongly suggestive of an associated anomalously connected left pulmonary vein, paradoxically this phenomenon is also consistent with an uncomplicated ASD 2. A precise hemodynamic explanation is not readily apparent.