A NEW NON-INVASIVE TECHNIQUE FOR THE LOCALIZATION OF THE SITE OF LEFT VENTRICULAR OUTFLOW TRACT OBSTRUCTION (LVOTO). David J. Sahn, and William F. Friedman, Division of Pediatric Cardiology, University of California, School of Medicine, San Diego, California.

A new multiple crystal echocardiographic instrument designed by Bom was utilized to obtain real time motion studies of sagittal cross-sectional anatomy of the LVOT and ascending aorta. Thirty patients with various forms of LVOTO were studied: valvar aortic stenosis (VAS) n = 15, supravalvular aortic stenosis (SVAS) n = 6, discrete subaortic stenosis (DSAS) n = 3, and IHSS n = 6. In the VAS group the method detected post stenotic aortic dilatation in fourteen, thickened aortic cusp tissue in nine, and increased superior-inferior cusp excursion with poor lateral mobility (doming) in six. In six patients with SVAS the localized constriction of the ascending aorta was identified easily. Localized thickening of the interventricular septum at its insertion into the anterior aortic wall was observed in all pts with DSAS as well as post stenotic aortic dilatation and aortic valve thickening. All pts with IHSS showed increased septal thickness, a septal bulge, decreased total mitral excursion and systolic anterior motion. Thus, even in pts with mild LVOTO this new non-invasive method allows anatomic definition similar to that obtained angiographically. Significant advantages exist with regard to accuracy and ease of interpretation when compared to single crystal ultrasound techniques.

ECHOCARDIOGRAPHY WITH PATENT DUCTUS ARTERIOSUS IN PREMATURE INFANTS. N.H. Silverman, A.B. Lewis, M.A. Heymann, A.M. Rudolph
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Premature infants with or without idiopathic respiratory distress syndrome (IRDS) have a high incidence of persistent patency of the ductus arteriosus (PDA). It is often difficult to assess whether worsening of the respiratory symptoms is due to cardiac failure related to PDA or the intrinsic lung disease. We used echocardiography to differentiate these conditions. 23 examinations were done on 14 infants weighing 700 -2160gm. We measured left atrial diameter (LAD) at the level of the aortic valve (Ao), as a guide to the magnitude of the PDA shunt. Because infant weight varied greatly we calculated LAD/Ao ratios. The ratio was 0.71 ± 0.11 in normal prematures and those with IRDS with or without PDA shunts. There was no significant difference between control infants and those with IRDS and small PDA. In 5 prematures with large PDA confirmed by cardiac catheterization and/or surgery the ratio was 1.23 ± 0.12. The difference between infants with large PDA and other infants with PDA and IRDS is highly significant ($p<0.01$). After surgery the ratio returned to normal. Serial study in one infant showed a progressive increase in the LAD/Ao ratio as the IRDS improved and as the PDA shunt increased prior to surgical ligation. Echocardiography is useful in assessing the size of PDA left to right shunt and in determining the role of PDA in producing respiratory distress.

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RIGHT-TO-LEFT SHUNT THROUGH THE DUCTUS ARTERIOSUS IN NEWBORN INFANTS. Mureen A. Schlueter and William H. Tooley, NHLI Spec. Ctr. of Res. Pulm. Dis., Cardiovas. Res. Inst. and Dept. of Ped., Univ. of Calif., San Francisco.

In newborn infants if there is a large right-to-left (R-L) shunt through the ductus arteriosus (DA), the oxygen tension (P_{O_2}) of umbilical artery (UA) blood could be substantially lower than that going to the head. To explore this, we cannulated a temporal artery (TA) and obtained blood simultaneously from TA and UA for measurement of P_{O_2} ($PTAO_2$ and $PUAO_2$) on 241 occasions in 110 infants (ages 2 hrs to 22 days, birth weights (BW) 510 to 4260 gms) who were breathing O_2 concentrations between room air and 100%. Their diagnoses included idiopathic respiratory distress syndrome (90), persistent pulmonary hypertension (4), meconium aspiration (5) and other conditions (11). They were breathing without assistance (WA), with continuous positive airway pressure (CPAP) or were being mechanically ventilated (MV). We calculated R-L shunt using $PUAO_2$ and $PTAO_2$ and estimated R-L through the DA which averaged 2.8% (SD 3.6). $PUAO_2$ was $\leq$80 mm Hg in 185 samples and average $PTAO_2$-$PUAO_2$ (T-U) was 3.7 mm Hg (SD 6.2); T-U was $\geq$20 mm Hg in 5 infants who were in profound shock. When $PUAO_2$ was $\leq$80 mm Hg, T-U was 4.3 mm Hg (SD 7.0) for infants $\leq$ 2000 gms and 2.6 mm Hg (SD 4.1) for those >2000 gms, T-U was 4.2 mm Hg (SD 6.3) for WA, 2.3 mm Hg (SD 3.3) for CPAP and 7.5 mm Hg (SD 10.2) for MV. Clinically important T-U differences are rare regardless of BW or ventilatory status except in severe shock. When $PUAO_2$ is $\leq$80 mm Hg, it can be used safely to approximate the P_{O_2} of blood going to the head.

CHILDREN WITH CONGENITAL HEART DISEASE (CHD) DO EAT AND GROW WELL. Alice Strangway, Rodney Fowler, Kathrine Cunningham and Richard Hamilton. Res. Inst., Hosp. for Sick Children, Dept. of Ped., Univ. of Toronto, Toronto, Canada.

We studied the effect of nutrient intake (7 day food record) and cardiac status on growth in unselected ambulatory infants (183) and children (400) with CHD, without other chronic disease. For the total group decreased body weight and length were prevalent only in infants (less than 2 years); mean weight and height velocities were normal at all ages. Birth weight, 3.03 ± 0.72 Kg (m ± sd) for infants was appropriate for gestational age. Infants with cyanosis (41) grew less well ($p < .01$) than remaining infants; selected subgroups with large hearts, history of congestive failure or on digitalis grew normally. Means for nutrient intake (total Kcal, protein, CHO, fat) were normal at all ages and did not differ significantly in subgroups with severe heart disease. Although nutrient intake correlated positively with body weight and height there was a marked lack of correlation with weight or height velocity, expressing data in absolute terms or correcting for age and sex - in the total group, specific age groups or severely affected patients. Social and cultural factors did not seem to bias interpretations of our data. We conclude that when they occur in CHD, impaired growth and gain are primarily in early months, that cyanosis increases likelihood of growth failure but nutrient intake is not a crucial determinant. We suspect that mothers take particular care in feeding their children with CHD.

CARDIORESPIRATORY EVALUATION OF INFANTS OF DIABETIC MOTHERS (IDM). Maria Serratto, Talat Cantez, Vivian Harris, Tsu Yeh, and Rosita Pildes. Cook County Children's Hosp. and the Hektoen Inst. for Med. Research, Depts. of Pediatric Cardiology and Neonatology, Radiology, Chicago.

This prospective study was done in 42 infants. The mean gestational age was 38.02±0.62 weeks and the mean birth weight 3676.57±62.43gm. Apgar scores were < 5 in 7. Tachypnea (RR>60) was present in 12; 7 of these also had retractions. Tachycardia (HR>150) was detected in 7 infants. Hypoglycemia (BS<30mg%) was seen in 17 and hypocalcemia (Ca<7.5 mg%) in 9; these were associated with respiratory distress in 3 and 4 babies, respectively. Four patients had clinical heart failure. Cardiorespiratory symptoms abated within a few days. Two had congenital heart disease: a small atrial septal defect and patent ductus arteriosus in one and a small ventricular septal defect and patent ductus arteriosus in the other. Electrocardiograms (EKGs) were obtained throughout the first week and later as required in 32 infants; 15 were abnormal. Long-term followup EKGs were available in 5 cases. Conversion to normal occurred in 4 between 2 and 19 months. Chest x-rays were done throughout the first week in 35 patients; 10 showed "wet lung" pattern, 11 increased bronchovascular markings or infiltrates and 14 were normal. Lung changes cleared within a few days. Enlarged cardiac-thymic shadow was present in 17, and persisted several weeks to months. It is apparent that IDMs may have persistent cardiac abnormalities as indicated by EKGs and x-ray findings in spite of rapid improvement of their clinical symptoms.

PATENT DUCTUS ARTERIOSUS (PDA) IN INFANTS LESS THAN 30 WEEKS GESTATION: INDICATIONS FOR SURGERY. D. Thibeault, G.C. Emmanouilides, R.J. Nelson, R. Rosengart, W. Oh and R. Lachman. Depts. of Ped., Surg. and Rad., Harbor Gen. Hosp., UCLA Sch. Med., Torrance, Calif.

As intensive respiratory care is provided to more preterm infants with respiratory distress syndrome (RDS), heart failure from an associated PDA is being increasingly recognized. However, indications for surgery are not clearly defined.

The clinical courses of 21 infants $\leq$ 30 wks. gestation with RDS and a PDA diagnosed by either single film aortography or surgery were analyzed. Two clinical patterns were identified. One, involving infants with severe RDS (8 cases) requiring high respirator pressures and the other with mild or moderate RDS (13 cases). Those infants with severe RDS showed some improvement by 3 days, but relapsed again requiring continuation of respiratory assistance. Four infants with massive cardiomegaly and pulmonary edema underwent ligation of PDA between 5-9 days. Aortography demonstrated massive left-to-right ductal shunt as early as 3 days. Therefore it is suggested that ligation of PDA should be performed at the time of relapse or a short time later. Those infants with mild or moderate RDS recovered from their disease within a few days. They subsequently developed persistent apnea associated with PDA and heart failure. Ten infants could not be weaned from the respirator and underwent ligation of PDA between 8-32 days. It is suggested that in this group of infants surgery should be performed at the time when respirator therapy is needed to control the heart failure.