

115 ANALYSIS OF THE TEMPORAL SEQUENCE OF LEFT VENTRICULAR SYSTOLE IN NORMAL CHILDREN BY ECHOCARDIOGRAPHY. L. George, A.N. DeMaria, T.A. Riemenschneider, L.C.

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Little data are available regarding measurements of the active state of left ventricular (LV) segmental contraction. Thus we performed echograms (E) in 40 normal school children, to establish and relate normal values for the period of LV systole, as assessed by a variety of E parameters. Duration of contraction of posterior LV wall (LVWSP) and Septum (SSP) was measured from the onset of movement to the point of maximal systolic anterior or posterior excursion respectively. Mitral valve coaptation (MSP) was computed as the duration between closure and opening of the mitral leaflets, as was aortic ejection period (ASP) from separation to reclosure of the aortic leaflets. Systolic periods measured in milliseconds were: (mean and standard error of mean) LVWSP 281.1 ± 2.8 , SSP 261.7 ± 2.6 , MSP 316.3 ± 4.4 and ASP 269.5 ± 3.2 . Further maximal excursion and systolic thickening of S and LVW were simultaneous. A marked difference between MSP and ASP (48.9 ± 3.5 , $p < 0.001$) represented isovolumic LV contraction and relaxation. Thus E may be utilized to analyze isovolumic LV systole. It appears that S systolic excursion may be completed and LVW systolic motion may continue after aortic ejection finishes. The difference between S and LVW systolic period suggests that the active state of contraction of LVW is greater than that of S, and is more important to LV contraction in normal children. (Sponsor: Eli Gold)

116 COMPARATIVE THICKENING FRACTION OF SEPTUM AND POSTERIOR LEFT VENTRICULAR WALL IN NORMAL CHILDREN ON ECHOGRAM. L. George, A.N. DeMaria, T.A. Riemenschneider, L.C. Weinert, A.L. Neumann and D.T. Mason. University of California, Davis, School of Medicine, Davis, California 95616

Although the ventricular septum (S) participates in left ventricular (LV) contraction (LVC) in normal subjects, no data are available regarding the relative contribution of S as compared to the LV posterior wall (LVW) to LVC in normal children. Thickening of S and LVW during systole, expressed as thickening fraction (TF) can be studied by echocardiography and thereby the relative contribution of these structures to LVC can be assessed. We therefore performed echograms upon a group of clinically normal school children to establish normal values for TF. Strip chart recordings of the LV at its midcavity sector containing mitral echoes were obtained by means of a 2.25 MHz transducer. The thickness of LVW and of S was measured at the onset of QRS complex of the EKG and at the point of maximum systolic excursion. The difference in these two measurements were expressed as a percentage to obtain TF for LVW and S ($TFS = S \text{ systole} - S \text{ diastole} \times 100 / S \text{ diastole}$), for several cardiac cycles and averaged. TF results were as follows: Mean and standard error of mean for S 51.51% (3.14) and for LVW 81.34% (3.64). The difference between these values was significant with $p < 0.001$. This data establishes normal TF values for S and LVW in children. In addition, these results suggest that LVW contributes more than S to LV contraction in normal children. (Sponsor: Eli Gold)

117 ECHOCARDIOGRAPHIC MEASUREMENT OF RIGHT VENTRICULAR OUTFLOW TRACT IN NORMAL CHILDREN. L. George, A.N. DeMaria, T.A. Riemenschneider, L.C. Weinert, A.L. Neumann, G.G. Janos, and D.T. Mason, University of California, Davis, School of Medicine, Davis, California 95616.

In order to enhance the echocardiographic assessment of the size and function of the right ventricle (RV), we evaluated the measurement of the right ventricular outflow tract (RVOT) on echogram, and compared it with that of the aortic root (AO). Thus ultrasound examinations were performed in a standard fashion in 40 clinically normal school children (5-6 years of age), and measurements were obtained at the onset of the QRS complex of the EKG during several cardiac cycles. The RVOT was measured as the distance from the endocardium of the anterior RV wall to the outer aspect of the anterior wall of the aorta, in an ultrasound sector containing the aortic valve leaflets. The aorta was measured as the distance between the inner aspect of the anterior and posterior walls in the same echo plane. The ratio of RVOT/AO was then computed. The results were as follows for the mean and standard error of mean: RVOT 2.06 cm (0.49), AO 1.65 cm (0.28) and RVOT/AO 1.258 (0.036). These results show that the RVOT can be measured in a reliable manner and that it bears a stable relationship to the AO diameter in normal children. Thus measurement of the RVOT and RVOT/AO ratio may provide additional criteria for the detection of abnormalities in RV size and function on echogram. (Sponsor: Eli Gold)

118 EVALUATION OF LEFT VENTRICULAR PREEJECTION SYSTOLE IN NORMAL CHILDREN BY ECHOCARDIOGRAPHY. L. George, A.N. DeMaria, T.A. Riemenschneider, L.C. Weinert, A.L. Neumann and D.T. Mason, University of California, Davis, School of Medicine, Davis, California 95616. (Spon: Eli Gold)

The period of systole prior to left ventricular (LV) ejection (PES) can be assessed from echograms (E), by measuring the interval from the onset of the electrical Q wave to: coaptation of the mitral valve (Q-M) or opening of the aortic valve (Q-AO), and to the onset of systolic excursions of the ventricular septum (Q-S) or posterior left ventricular wall (Q-LVW). Thus we studied a group of clinically normal school children to establish standards for these different PES, and to examine the interrelationships between these normal events. Strip chart E were obtained from a LV sector containing mitral echoes, and from a plane of the aortic root in which valve motion was well recorded, using a 2.25 MHz transducer. PES intervals were measured in milliseconds and mean and standard error of mean values were: Q-M 49.4 ± 1.6 , Q-AO 74.0 ± 2.4 , Q-S 78.2 ± 2.2 and Q-LVW 109.0 ± 2.4 . The differences between Q-M and Q-AO (25.1) was highly significant ($p < 0.001$) and represents LV isovolumic contraction time. The shorter duration of Q-S than Q-LVW (31.0) with $p < 0.001$ reflects the conduction time along the left branch from S to LVW. Thus this study demonstrates that PES can be analyzed from a variety of reference points recorded by E. In addition E analysis of PES may be utilized to evaluate isovolumic systole and conduction velocity along the left bundle branch. These results also indicate that the aortic valve opening is not dependent on the systolic inward excursion of S and LVW.

119 RELATIONSHIP BETWEEN LEFT VENTRICULAR AND LEFT ATRIAL ECHOCARDIOGRAPHIC DIAMETERS IN NORMAL CHILDREN. L. George, A.N. DeMaria, T.A. Riemenschneider, L.C. Weinert, A.L. Neumann, G.G. Janos and D.T. Mason, University of California, Davis, School of Medicine, Davis, California 95616.

Since the entire stroke volume traverses each cardiac chamber in normal subjects, a study was undertaken to investigate the relationship of left atrial (LA) to left ventricular (LV) size. Thus, echocardiograms were performed in the standard fashion in 40 school children (ages 5-6 years) without evidence of heart disease. LV diastolic dimension (LVD) was measured at the onset of the QRS complex of the EKG in a sector of the LV containing the mitral valve echoes. LA dimension (LAD) on echo was obtained at the period of maximal anterior excursion of the aortic root in an ultrasound plane containing the aortic leaflets. All measurements were computed for several cardiac cycles. Results were as follows: LVD 3.49 cm (0.406), LAD 2.15 cm (0.35) and LVD/LAD 1.635 (0.029). These results show that there is a narrow range in normal values for LVD and LAD and there is a stable ratio between these two chamber diameters. Alterations in the ratio from the normal range on echogram may suggest pathology, even though the individual chamber diameters are within their own normal values. (Sponsor: Eli Gold)

120 THE RATIO OF SYSTOLIC TIME INTERVALS OF LEFT VENTRICLE IN NORMAL CHILDREN-ECHOCARDIOGRAPHIC STUDY. L. George, A.N. DeMaria, T.A. Riemenschneider, L.C. Weinert, A.L. Neumann and D.T. Mason. University of California, Davis, School of Medicine, Davis, California 95616

Current techniques utilize data derived from the aortic valve (AV) to determine the ratio between the pre-ejection (PEP) and ejection period (EP) of left ventricle (LV) in children. Mitral valve (MV), septum (S) and posterior LV wall (LVW) motion, can also be obtained and may be of value in the measurement of systolic time intervals (STI) by echograms (E). Thus, we studied a group of 40 normal school children by E to establish normal standards for PEP/EP for 4 reference points at MV, AV, S and LVW. PEP was measured from the onset of Q wave of the EKG to: 1-coaptation of MV (MPEP), 2-to the opening point of AV (APEP), 3-to the onset of systolic posterior excursion of S (SPEP) and 4-to the onset of anterior systolic motion of LVW (LVWPEP). EP was measured for: 1-total coaptation time of MV (MEP), 2-separated interval of AV (AEP), 3-from the onset to the point of maximum systolic posterior excursion of S (SEP) and 4-similar to S for LVW anterior motion (LVWEP). PEP/EP ratios were computed for several cardiac cycles and averaged. Results of mean and standard error of mean were: MPEP/MEP 0.154 ± 0.005 , APEP/AEP 0.275 ± 0.012 , SPEP/SEP 0.304 ± 0.009 and LVWPEP/LVWEP 0.390 ± 0.011 . Our study establishes normal standards for ratios of STI of 4 different reference points of LV in children which do not appear to be interchangeable as they reflect different intracardiac events. (Sponsor: Eli Gold)