Transthoracic echocardiographic reference ranges for left ventricular, left atrial and aortic root M-mode dimensions in preterm infants

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Objectives: To derive reference ranges for left ventricular, left atrial and aortic root M-mode measurements in preterm infants. M-mode measurement is routine in transthoracic echocardiography. Reference ranges are well defined in adults and children. Calculation of Z scores (number of standard deviations from the mean) in children permits recognition of normal or abnormal change with growth over time. Available data in preterm infants is limited to small numbers analysed in categories rather than as continuous variables.

Methods: Retrospective audit of echocardiograms performed in preterm infants for clinical indications. All echocardiographic studies performed in Monash Newborn, between January 2005 and December 2010 were identified. Offline measurement of M mode variables, i.e. left ventricular systolic and diastolic dimensions (LVEDD and LVESD), left atrial and aortic root, and the wall thickness was performed. Infants with congenital heart disease or greater than a small patent ductus arteriosus were excluded. Suboptimal studies were also excluded. Analysis was limited to infants with a birth or current weight ≤3.5kg and ≤45 completed weeks of corrected gestational age (cGA) at the time of echocardiography. Regression curves were modelled with respect to weight and cGA and reference curves for ±1 and ±2 standard deviations calculated using the method of Altman (Statistics in Medicine 1993). This method allows for standard deviations which vary with weight or cGA.

Results: Two hundred and eighty studies were identified, mean corrected gestational age at study 32.5 ± 3.7 weeks (range 24 – 45 weeks), mean weight of the study group was 1.63 ± 0.7 kg (range 0.5 – 3.5 kg). Regression curves with standard deviations were modelled. Quadratic equations yielded the best fit for all parameters. Left ventricular systolic and diastolic dimensions increased with weight and cGA. Standard deviation was variable with both increasing weight and cGA, with respect to all the parameters measured. Graphical representation for LVEDD is presented below.

Conclusions: These data will permit calculation of z scores for left ventricular, left atrial and aortic root dimensions in preterm infants facilitating easier recognition of abnormalities and better description of change over time.