Child Health Research Institute

University of Nebraska Medical Center

Children's Hospital & Medical Center

Semi-supine Exercise Stress Echocardiography in Normal Healthy Children- Project Pilot Updates

Ling Li, UNMC, Mary Craft, UNMC, 3. Michael Randone, CHMC, 4. Caleb Ross, CHMC, 5. Kelly Erickson, UNMC, 6. Christopher Erickson, UNMC, 7. Jason Christensen, UNMC

Stress echocardiography (SE), which is the merging of advancements in echocardiography and cardiovascular stress testing, is a well-established technique in adult cardiology. Within the last two decades, SE has been discussed in the literature as a viable stress imaging modality for children, but its use remains quite limited, and no specific guidelines or recommendations are available for its use in pediatric patients. The consequences of continued reliance on non-state-of-the-art technology and without reference standards in pediatric cardiology include misinterpreting cardiac pathophysiological conditions, failure to predict or prevent adverse events, and missing the optimal time for surgical or medical intervention. This project is to furnish cardiac physiology profiles reference data, thus unlocking the potential of technology that is poised to improve the clinical management of pediatric patients treated for cardiomyopathy, congenital heart disease, or repaired congenital heart disease. Our hypothesis is that standardized exercise SE study in normal healthy children can establish normative Doppler and two and three-dimensional echocardiographic data that correlate cardiac function changes with exercise stress. 120 healthy volunteers, aged 7 to 18 years, will be prospectively enrolled. Volunteers will be classified into 4 groups based on age. Group I is 7 to 9 years; Group II is 10 to 12 years; Group III is 13 to 15 years; Group IV is 16 to 18 years; each group includes 15 females and 15 males. All will exercise to exhaustion followed by a 5-min cool-down period. There will be five protocol points: 1). Baseline before exercise (rest), 2). A heart rate of 130 beats/min during exercise (mid), 3). A heart rate of 160 beats/min during exercise (peak), 4). 5 min after exercise in recovery, and 5) 10 min after exercise in recovery. The 2D and 3D echocardiographic images will be captured at each exercise point and analyzed offline. Three subjects were enrolled in Group I (Age 7.6±0.6 yrs). The 3D echocardiographic images were analyzed at rest, mid, peak, and recovery stages. The result is summarized in Table.

	HR (bpm)	EDV (ml)	ESV (ml)	SV (ml)	EF (%)	SDI (%)	GLS (%)	GCS (%)	Twist (°)	Torsion (°/mm)	LV length (mm)
Rest	77	73.3	27.2	46.1	62.8	4.27	-26	-31	5.0	0.67	73.1
Mid	141	60.8	20.35	40.4	66.8	6.83	-26.2	-36.73	8.9	1.33	68.1
Peak	180	51.7	14.1	37.7	72.8	13.6	-33.6	-37.23	14.8	2.2	37.9
Recovery	93	70.8	26.0	44.8	63.4	4.27	-24.7	-34.53	4.97	0.7	72.6

3D SE can detect left ventricular function adjustment during exercise in normal healthy children that correlates cardiac function changes with exercise stress.