# Cardiovascular Health in Patients with Congenital Heart Disease Requiring Surgical Intervention: a Longitudinal Study-One Year Report

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Background: Congenital heart patients have the same risk factor profile for developing acquired cardiovascular disease (CVD) as the general population and there is emerging data that they may have increased intrinsic risk based on their congenital anomaly. Cardiovascular biomechanical properties (biomarkers) can be measured noninvasively by assessing blood vessel structure (carotid intima–media thickness, cIMT), blood vessel function (pulse wave velocity, PWV), and myocardial function (myocardial strain, MS). These properties strongly predict premature CVD in children and adults in the general population. No previous studies have used these biomarkers to assess subclinical CVD in a longitudinal cohort of patients with surgical CHD.

Significance of the Problem: Patients with surgical CHD have epidemic levels of precursor conditions for developing CVD, including sedentary lifestyle, obesity, and type II diabetes. Thus, risk stratification will be critical to target these extremely high-risk patients for primordial prevention.

Hypothesis, Problem/Questions: We hypothesize that patients with congenital heart disease requiring cardiac surgical intervention will have altered arterial structure and function and altered cardiac function compared to age-matched controls. Our secondary hypothesis is that this altered cardiovascular structure and function will be more pronounced in a preterm birth cohort.

Experimental Design: A prospective longitudinal observational study design of 200 subjects (ages 1-60y) will be performed (100 study patients with congenital heart disease requiring surgical intervention, and 100 age/gender-matched controls). "Ideal cardiovascular health" score will be calculated to stratify CVD risk based on BMI and blood pressure measurements, blood work (fasting glucose, total cholesterol), and questionnaire report of 3 health behaviors (smoking, physical activity, diet). Biomarkers (cIMT, PWV, MS) will be measured pre- and post-op and then annually for three years. There will be four research visits for normal controls (as there is no post-op follow-up). The first visit will be used as a baseline assessment.

Results/Data: 36 subjects were recruited (24 study patients age 15.03±10.73 years, BSA 1.31±0.56 m2, BMI 20.53±5.48 kg/m2; 12 control patients, age 12.95±13.23 years, BSA 1.40±0.62 m2, BMI 21.73±9.47 kg/m2). The baseline Ideal CVH metrics, cIMT, PWV, and MS were collected. 20 patients had post-op visit for cIMT, PWV, and MS. The data is summarized in Table.

| Data summary in CHD and normal control groups | | | | | |
|---|---|---|---|---|---|
| Group/visit | | Ideal CVH Metrics Score | cIMT (mm) | PWV (m/s) | LV GLS (%) |
| CHD group (n=24) | Baseline visit | 9.93±1.82 | 0.468±0.062 | 4.85±0.99 | -22.94±3.64 |
| | Post-operation visit | _____ | 0.5±0.078 | 4.68±1.33 | -22.44±2.93 |
| Normal control group (n=12) | | 10.43±1.90 | 0.429±0.224 | 4.76±1.5 | -25.43±2.09 |
| LV indicates left ventricle; GLS indicates global longitudinal strain | | | | | |

Conclusions: All our proposed measurements are possible in patients >10kg (generally >1y of age). We anticipate that enrollment will require 2y (at an average of 4 patients per month).