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The role of Semi-Supine Cycle Ergometry Stress Echocardiography in Decision Making for Surgery in Children with Aortic Insufficiency

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INTRODUCTION: The criteria for surgery for children with aortic insufficiency (AI) have not been empirically developed, although the response of left ventricular (LV) function to exercise is well documented in adults. Semi-supine cycle ergometry (SSCE) stress echocardiography can be used to assess exercise capacity and cardiac function during staged exercise. The aim of this study was to assess the responses to SSCE in children with AI. METHODS: We retrospectively reviewed stress echocardiograms performed in 15 children with AI (Patients) and compared them to a healthy control group (Controls) (n=29). Subjects exercised on a semi-recumbent cycle ergometer to volitional fatigue. Workload was progressively increased every three minutes by 20-40 Watts, depending on the size of the patient. Echocardiography, Doppler, heart rate (HR) systolic (SBP) and diastolic (DBP) blood pressures were taken at rest, 1.5 minutes into each stage, and post exercise. LVED, LVES, LVPWs, shortening fraction (SF), rate corrected mean velocity of circumferential fiber shortening (MVCFc), wall stress at peak systole (sPS), left ventricular stroke volume index (SVI), and left ventricular cardiac index (CI) were obtained. RESULTS: Aortic cross sectional area was higher in patients (p=0.02). At rest, HR and SBP were similar, DBP was lower (p<0.001), LVED and LVES were larger (p=0.003; p=0.009, respectively) and LVPWs was thicker (p=0.003) in patients. SF, MVCFc, and sPS were similar between groups. SVI and CI were higher (p<0.001) in patients. Cumulative work was similar between patients and controls. At peak exercise, LVED and LVES remained larger (p<0.001). Although the percent change in LVES, SF, sPS from rest to peak exercise was lower (p=0.004; p=0.03; p=0.002, respectively), SF and MVCFc were similar and sPS was higher in patients (p=0.001). SVI and CI remained higher at peak exercise (p=0.005; p=0.02, respectively). CONCLUSIONS: AI patients had normal exercise capacity, with appropriate rises in SBP and HR. The increase in SF and MVCFc indicates adequate recruitable myocardial reserve. SSCE may be helpful in decision-making for surgery in children with AI.