Hypertrophic cardiomyopathy (HCM) is a relatively frequent genetic disease that affects 1/500 human beings. Main problems with this disease are the development of symptoms in 10-20% of affected individuals, and the increased risk of sudden cardiac death (SCD) in a subset of patients with the disease. It is important to clarify the cause of symptoms and to assess the risk of sudden death in HCM because we do have therapies to relieve these problems.

Main causes of symptoms in HCM are related to either LV outflow tract or mid ventricular obstruction, LV diastolic dysfunction, and myocardial ischemia. Drug refractory heart failure symptoms due to LV obstruction may be successfully treated by septal myotomy–myectomy. Alcohol septal ablation or dual-chamber pacemaker are reserved as alternatives to surgery. Indeed, exercise may have a role in discerning the role of LV obstruction as a cause of symptoms in these patients. A comprehensive exercise echocardiography approach can discover a truly symptomatic status in minimally symptomatic or asymptomatic patients, as well as measure LV obstruction, mitral regurgitation (MR) and global and regional wall motion response to exercise (Figures 1 and 2).

Recent guidelines recognize exercise echocardiography as a safe and important adjunct in the management of HCM [1]. LV obstruction may develop only during exercise, and echocardiography as a safe and important adjunct in the management of HCM [1]. LV obstruction may develop only during exercise, and exercise echocardiography might also have a role for predicting outcome in patients with HCM. In a recent study of our institution we performed treadmill exercise echocardiography studies in 239 consecutive patients with HCM [5]. LV obstruction and MR were measured immediately after exercise, whereas LV function was assessed during peak exercise. LVOT obstruction at rest was seen in 60 patients (25%), and 43 (18%) developed exercise-induced LVOT obstruction. Mean resting LVEF was 69.9%. We found exercise-induced wall motion abnormalities (WMAs) in 19 patients (7.9%). During a follow-up of 4.1±2.6 years, 19 patients had hard events (cardiac death, cardiac transplantation, appropriate discharge of a defibrillator, stroke, myocardial infarction, or hospitalization due to heart failure) and 41 patients had composite endpoints of hard or soft events (including atrial fibrillation and syncope). Exercise WMAs were more frequent in patients with hard events than in those without (31.5% vs. 5.9%, p<0.001). After adjustment, LV wall thickness (hazard ratio [HR], 1.13; 95% confidence interval [CI], 1.05–1.21; P = .002), resting wall motion score index (HR, 21.59; 95% CI, 2.38–196.1, P = .006), and exercise workload in metabolic equivalents (HR, 0.74; 95% CI, 0.63–0.88; P = .001) remained independent predictors of hard events. Change in wall motion score index was also independently associated with hard events (HR, 52.30; 95% CI, 3.81–718.5; P = .003) and with the composite end point (HR, 39.51; 95% CI, 3.79–412.4; P = .002). Interestingly LV outflow tract obstruction was not associated with either endpoint. In another also recently published study in patients with HCM submitted to exercise echocardiography, predictors of outcome were achieved METs, heart rate recovery and presence of atrial fibrillation, but not LV outflow tract response [6].

The relationship between exercise-induced wall motion abnormalities and myocardial fibrosis by late gadolinium enhancement (LGE) by magnetic resonance and specific sarcomeric mutations are currently considered as potential SCD risk modifiers [1].
Figure 1: On the left, resting and peak exercise images in the 4- and 2-chamber apical views in a patient with HCM and dyspnea during physical effort, at diastole (D) and end-systole (S). Note the reduction of LV cavity with exercise in this patient. LV ejection fraction increased from 64 to 72%. On the right, color and continuous wave Doppler images at rest and at exercise. Note the exercise-induced LV outflow tract obstruction and accompanying mild-to-moderate mitral regurgitation, both due to systolic anterior motion of the mitral valve.

Figure 2: Pulsed Doppler LV inflow and tissue Doppler mitral annulus waves at rest and at exercise. Both resting and exercise E/e’ ratios were increased.
enhancement (LGE) in HCM was further explored by our group. We found that there is an association as exercise wall motion score index correlated with myocardial mass with LGE (r=0.20, p=0.02) and with perfusion defect area (r=0.40, p<0.001). An extensive LGE signal (≥15% of the LV myocardium) was observed more frequently in patients with exercise wall motion abnormalities than in those without (38% vs. 12% without, p=0.009) likely reflecting the lack of contractile reserve in fibrotic myocardium (unpublished data) [7].

Therefore, exercise echocardiography is a reliable and safe technique to measure important variables in HCM. The decision making process can vary should significant LV obstruction and/or MR regurgitation are found during exercise. Also, exercise derived variables such as maximal achieved exercise workload and exercise-induced wall motion abnormalities may influence prognosis.

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