

Post-Prandial Upright Exercise Echocardiography in Hypertrophic Cardiomyopathy

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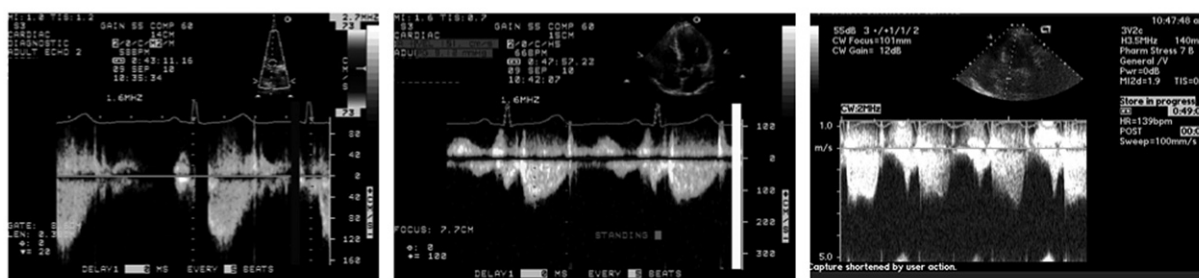
To the Editor: Approximately one-third of patients with hypertrophic cardiomyopathy (HCM) experience symptom exacerbation after a meal, and the post-prandial (PP) state has been associated with an increase in left ventricular outflow tract (LVOT) gradients (1). Also, LVOT gradients are higher when measured in the upright posture (2). We evaluated standing post-exercise PP (SPEPP) echocardiography for detection of latent obstruction in symptomatic patients who were not obstructed after conventional provocations and after exercise echocardiography.

For clinical indications, selected symptomatic patients with HCM without previous detection of LVOT obstruction at rest, standing, or after Valsalva first performed fasting symptom-limited maximal exercise stress test using the Bruce protocol with gradient acquired supine within 30 to 60 s of terminating exercise. Selected patients were chosen for SPEPP on the same day because the HCM clinician suspected they might have LVOT obstruction

(described below), despite gradients <45 mm Hg demonstrated after routine stress. Meal size was not standardized; patients were instructed to eat a “moderate-sized lunch.” On the same day 1 hour after lunch, within 3 h of the first test, they underwent exercise testing with the post-exercise gradient acquired standing, SPEPP, after the same symptom-limited protocol.

In 13 of 20 patients, gradients due to new mitral-septal contact were much higher after SPEPP than after the fasting supine exercise test, with a median 83 mm Hg versus 34 mm Hg (Fig. 1). The remaining 7 patients were nonobstructed with an SPEPP median gradient of 18 mm Hg. The percent target heart rate achieved did not differ between the 2 groups, 83% versus 79%. In the whole group of 20 patients, post-exercise gradients were higher after a meal, with a median 61 mm Hg (interquartile range [IQR]: 20 to 85 mm Hg) versus 25 mm Hg (IQR: 17 to 37 mm Hg) ($p = 0.03$). Heart rate when gradients were measured did not differ

Fasting LVOT gradients

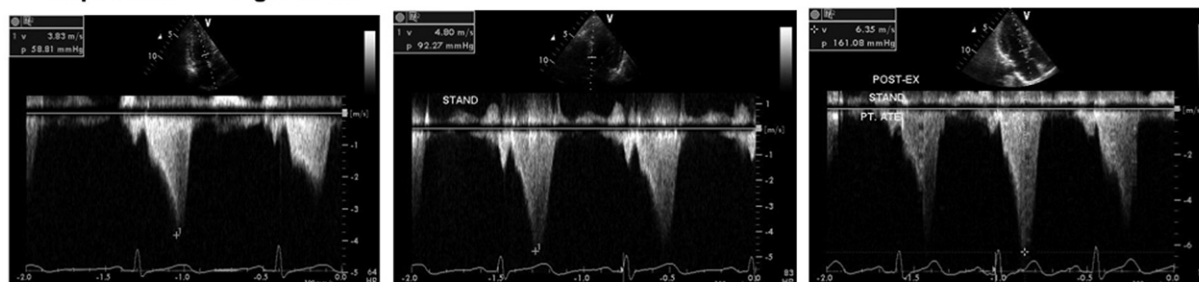


Fasting rest supine

Standing

Post-exercise supine

Postprandial LVOT gradients



Postprandial rest supine

Standing

Post-exercise SPEPP

Figure 1 Gradients Revealed by SPEPP

(Upper) In fasting state, no outflow gradients were shown supine, standing, and post-exercise. (Lower) Post-prandial resting gradient was 58 mm Hg, standing 92 mm Hg, and standing post-exercise post-prandial (SPEPP) 161 mm Hg. The patient had surgical relief of obstruction with improvement in symptoms. LVOT = left ventricular outflow tract.

between the 2 tests: 122 ± 15 beats/min versus 121 ± 16 beats/min.

Patients with SPEPP+ latent obstruction more frequently reported PP symptoms: 92% versus 29% ($p = 0.007$). At rest, they had longer posterior mitral leaflets: 1.7 ± 0.3 cm versus 1.2 ± 0.3 cm ($p = 0.002$). Initial post-exercise gradients were mildly higher in patients who ultimately were SPEPP+: median 34 mm Hg versus 16 mm Hg ($p = 0.008$). Overall, in 9 of 13 SPEPP+ patients, there was a change in therapy to relieve obstruction. Patients with SPEPP+ latent obstruction were more frequently treated with beta-blockade: 100% versus 43%; 5 patients received disopyramide and 3 underwent septal myectomy. In patients with gradient-lowering therapy because of SPEPP+, Minnesota quality of life decreased from 29 ± 19 to 12 ± 19 ($p < 0.02$), but there was no change in SPEPP– patients.

We selected patients with HCM whom we suspected had LVOT obstruction as the cause of their symptoms, despite no significant obstruction with standard provocations and after symptom-limited conventional stress exercise. In these patients, 13 of 20 (65%) were found to have substantial LVOT gradients after SPEPP, which led to an alteration in treatment for 9 of 13 patients.

Treatment choices for relief of limiting symptoms in HCM depend heavily on the presence of LVOT obstruction. Patients' severe symptoms and outflow obstruction may be treated successfully by addition of medications or septal reduction. In contrast, there are limited options for patients who are nonobstructed. Exercise echocardiography is an excellent modality for provocation in patients who might otherwise be categorized as nonobstructed (2).

However, even after a stress exercise echocardiogram that does not provoke gradient, the clinician may still suspect obstruction in certain patients. It is our current clinical practice to employ SPEPP after conventional stress echocardiography for patients with putative nonobstructive HCM who have: 1) New York Heart Association 3 symptoms, especially PP worsening, who otherwise would have limited treatment options; 2) long leaflets or mild systolic anterior motion but no demonstrable gradients; and 3) syncope but where arrhythmias cannot be detected, even after prolonged monitoring.

Valsalva and standing increase gradient due to a reduction in venous return, a decrease in LV volume, and an increase in the overlap between LV inflow and outflow (2). Consequent decrease in stroke volume increases sympathetic activity, augmenting obstruction. In healthy individuals after a meal, peripheral vascular resistance decreases because of mesenteric vasodilation, with a secondary increase in stroke volume. In HCM, deleterious hemodynamic effects of a meal include limited rise of stroke volume, greater elevation in right heart pressures, and provocation of LVOT gradients (1). During exercise alone, augmented contractility increases obstruction. We have shown that selected patients who have no obstruction after conventional stress echocardiography performed fasting and imaged supine may develop large gradients (median 83 mm Hg) when exercised after eating and when the gradient is acquired upright. We posit that SPEPP more profoundly alters load and contractility than conventional stress echocardiography.

The diagnosis of latent obstruction altered therapy in 9 of 13 (69%) of our patients. Five received disopyramide and 3 had surgical septal myectomy. Patients who received new therapy because of SPEPP+ latent obstruction experienced a dramatic reduction in symptoms. A limitation of the study is that LVOT

gradients after stress were not interpreted blindly. Because study patients were selected by clinical suspicion, detection rates may not be generalizable.

Not infrequently, findings in a symptomatic patient with HCM will raise the clinical suspicion that the patient is suffering from LVOT obstruction, even if routine stress echocardiography is negative. Performing stress echocardiography in the PP state with gradient acquired in the upright posture (SPEPP) correctly diagnoses latent obstruction and thus focuses management on gradient reduction.

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Letters to the Editor

Do Work Accidents Play Any Role in the Increased Risk of Death Observed in 25- to 44-Year-Old Patients After Syncope?

We read with great interest the paper by Ruwald et al. (1) dealing with the prognosis of healthy individuals discharged from the emergency department or hospital after a syncope episode.

Surprisingly, fainters 25 to 44 years of age had a risk of death higher than that of subjects older than 75 years of age, differing from what was previously reported (2). Moreover, in individuals 25 to 44 years of age with syncope, the long-term all-cause mortality