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Commentary: No strain, no gain

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Hypertrophic cardiomyopathy (HCM) commonly causes heart failure symptoms due to obstruction of the left ventricular outflow tract (LVOT) despite normal or increased left ventricular ejection fraction (EF). The gold standard of surgical treatment for obstructive HCM is septal myectomy because this provides both symptom relief and improvement in longevity.¹ In most cardiac conditions, depressed EF is a marker for the severity of dysfunction and a predictor of surgical outcomes. This is not true in HCM, where EF does not predict postmyectomy survival.² Echocardiography now includes many analytic tools to interpret cardiac function, including strain measurements to evaluate ventricular systolic function. Cui and colleagues³ present a retrospective study of LV longitudinal strain prospectively measured in 857 patients who underwent septal myectomy for obstructive HCM from 2007 to 2016. All patients had preoperative echocardiographic measurement of LV strain. The authors observed that global longitudinal strain (GLS) had low correlation with preoperative EF, resting LVOT gradient, or age. However, patients with worse preoperative GLS were found to have worse survival. The study identified nonuniformity of regional longitudinal strain patterns in patients with HCM, as well as a gender difference, with women having better GLS overall. Median GLS did not change following myectomy, but regional strain changed to more uniform and even distribution after surgery.

Measurement of ventricular function is essential to the evaluation and management of cardiac disease. The volume-based measurement of LVEF differs fundamentally from direct measurement of myocardial motion

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CENTRAL MESSAGE

In hypertrophic cardiomyopathy, global longitudinal strain is abnormal and may predict mortality following myectomy.

by tissue Doppler, yet both can provide complementary information. LVEF may be normal despite LV dysfunction in the presence of LV hypertrophy and small LV cavity size. These conditions are present in HCM, where normal EF may mask an abnormally small stroke volume.

Although cardiac surgeons view echocardiographic studies nearly every day, some are unfamiliar with the intricacies of echocardiographic measurements. This is often the case with GLS imaging. Strain is a parameter that describes deformation of an object under stress. It is defined as the fractional change in length and thus is a dimensionless index. In the case of the heart, it may be measured using tissue Doppler in longitudinal, radial, and circumferential directions and the accuracy of the technique is well documented.⁴ It currently is being studied and employed in the management of several cardiac conditions. GLS has been shown to predict mortality independent of EF in patients with heart failure and reduced EF, and in patients with acute myocardial infarction.^{5,6} It is employed to assess asymptomatic LV dysfunction in patients with cardiotoxicity from chemotherapy and it is being investigated in cardiometabolic disease such as hypertensive and diabetic cardiomyopathy. In aortic stenosis, perhaps the clinical entity most analogous to HCM because of the associated LV hypertrophy and often normal EF, impaired LV longitudinal function correlates with myocardial fibrosis and it is associated with worse outcomes following surgery for severe aortic stenosis.⁷

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Disclosures: The author reported no conflicts of interest.

The *Journal* policy requires editors and reviewers to disclose conflicts of interest and to decline handling or reviewing manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

Received for publication Oct 18, 2021; revisions received Oct 18, 2021; accepted for publication Oct 18, 2021.

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J Thorac Cardiovasc Surg 2021; ■:1-2

0022-5223/\$36.00

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<https://doi.org/10.1016/j.jtcvs.2021.10.023>

HCM should now be added to the list of cardiac conditions where GLS measurement provides an enhancement over EF to predict survival. Understanding strain and its influence on outcome provides a significant gain in the management of HCM.

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