MRI Versus 3D Echocardiography in Postinterventional Patients With Hypertrophic Obstructive Cardiomyopathy

To the Editor:

The article by Schulz-Menger et al1 describes the value of MRI for evaluation of the left ventricular outflow tract (LVOT) after septal artery embolization in patients with hypertrophic obstructive cardiomyopathy (HOCM). The concept of using imaging techniques for follow-up after therapeutic intervention in HOCM patients is not new and has been investigated previously using 2D as well as 3D echocardiography.2,3 Because MRI for analysis of LVOT area changes differs substantially from echocardiography, we would like to add some further comments.

The method applied by Schulz-Menger et al is an indirect visualization of the residual LVOT area, measuring the smallest cross-sectional area of the turbulent flow (“vena contracta”) at only 1 preselected timepoint of the cardiac cycle. The vena contracta is known to underestimate the true anatomic orifice area because of flow constraints. Furthermore, the visualization of a turbulent jet with MRI is dependent on a variety of factors, including methodological parameters (echo time, flip angle, and alignment between imaging plane and flow direction) and hemodynamic parameters (pressure gradient, orifice size, and cardiac chamber size).2 Schulz-Menger et al do not say whether all imaging parameters were kept constant for individual patients during follow-up studies. After enlargement of the LVOT, when the turbulent portion of the jet has decreased, it will be more difficult to clearly delineate its borders. This inconsistent systematic error may cause inaccuracies in the determination of the true LVOT area before and after intervention, even in the same patient.

In contrast, 3D echocardiography allows assessment of the minimal LVOT area before and after intervention by direct visualization of the anatomic boundaries during each phase of the cardiac cycle. Thus, because it is less affected by technical and hemodynamic variables, 3D echocardiography may be a more reliable method for assessment of the LVOT area and its changes. This is also reflected by the significant interobserver variability (12%) observed for the determination of LVOT area by MRI in the study by Schulz-Menger et al,1 which clearly is not superior to that observed for 3D echocardiography (7% to 10%).1

Therefore, we feel that the role of 3D echocardiography may have been underestimated by Schulz-Menger et al and that it should be considered a valuable diagnostic alternative that directly assesses the morphological changes of the LVOT area in patients with HOCM.

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References


Response

Franke et al indicate that 3D echocardiographic imaging of the left ventricular outflow tract (LVOT) area is another suitable approach for assessing the hemodynamic relevance of hypertrophic obstructive cardiomyopathy (HOCM). As stated in our article, there are studies on the use of transesophageal 3D echocardiography for both diagnosis and follow-up after intervention, and we are pleased to observe that the results obtained by the authors are in the same range as those we report.

However, we do not concur with the other statements of Franke et al. The timepoint in our study was not preselected but rather was defined by flow physiology. As described in Methods, we determined the end-systolic phase by flow measurements using phase-contrast sequences. Thus, we individually verified the adequate timing of our sequence. Furthermore, we took great care to detect the narrowest part of the LVOT by analyzing images obtained at that time from a set of ≥3 slices.

We also would like to more precisely describe the area we measured. As can be seen in Figure 1 in our article, we measured the entire LVOT area, not only the turbulent vena contracta flow. The anatomic borders, including the anterior mitral valve leaflet, were readily detectable in all studies. We have subsequently obtained preliminary evidence that MRI-derived LVOT area measurements may even be helpful in differentiating asymptomatic HOCM from other diseases with similar left ventricular hypertrophy. There is variability in the measurements, and the sample size is still limited. Nevertheless, we believe that the excellent anatomic depiction offered by MRI provides great diagnostic power. This power is further increased by the outstanding ability of MRI to visualize pathology-related morphology and function before and after therapeutic interventions.

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