PRO: Proximal Isovelocity Surface Area Should Be Routinely Measured in Evaluating Mitral Regurgitation

Proximal isovelocity surface area (PISA) should be part of every transesophageal echocardiography evaluation of mitral regurgitation (MR) (1). Although most of us think of formulae and calculations when we hear the term PISA, it is most useful as a qualitative indicator of the presence and severity of MR. Just as we use color flow Doppler (CFD) to see the regurgitant jet in the left atrium, we can use it to look for flow converging on the ventricular side of the valve as well. That is the PISA. And there is evidence to suggest that the size of the flow convergence is more directly related to the severity of MR than the size of the regurgitant jet, especially if the jet is eccentric and constrained by the wall of the left atrium (2,3). I often see beginning echocardiographers place the lower edge of the CFD sector at the level of the valve leaflets, focusing on the regurgitant jet in the atrium. But the sector should be placed well into the left ventricle below the leaflets to see any flow convergence and how big it is. Using PISA to judge severity of MR is as simple as that. If you see a big flow convergence (>1 cm) and the aliasing velocity is high (>40 cm/s), you have diagnosed severe MR.

As far as quantification of MR with PISA is concerned, it should be used in cases where there is a question of whether to repair or replace the mitral valve, usually those with moderate to moderately severe functional MR, where the structure of the valve leaflets is normal and the MR is caused by mitral annular dilation and/or papillary muscle displacement. The PISA quantification assumptions, a circular regurgitant orifice and a hemispherical flow convergence, break down with pathology involving the valve leaflets (4). And quantification of MR is usually not needed in patients having a mitral valve repair for a flail P2 leaflet, where severe MR can be diagnosed without even turning on CFD from 2-dimensional images showing a huge regurgitant orifice. Quantification is also not important for patients with a normal mitral valve and trace-to-mild MR. At the extremes, the decision about what to do is easy. It is cases in the gray zone (2 to 3+ MR) that are difficult, and where quantification of MR severity with PISA can most help. The technique is quick and easy once it has been done few times, especially using the simplified or “PISA for Pinheads” method (5). Check that the systolic blood pressure is in the 110 to 130 mm Hg range, turn on the CFD with the sector extending below the valve into the ventricle, set the aliasing velocity close to 40 cm/s, freeze the image, scroll through systole to the biggest flow convergence, and measure its radius. If it is more than 8 or 9 mm, the MR is likely significant. If the PISA radius is 7 mm or less, the MR is probably not severe. Quantification of MR with PISA will not eliminate the gray zone, but can make it smaller. The important thing is to ALWAYS look for a flow convergence with CFD when evaluating MR. And if you see one and there is a question about whether or not to operate on the valve—measure it!

REFERENCES


