EDITORIAL COMMENT

Ventricular Function in Aortic Stenosis: How Low Can You Go?*

Blase A. Carabello, MD
Houston, Texas

In 1980, we reported that patients with aortic stenosis (AS) who had a low mean gradient (<30 mm Hg) and low ejection fraction (<0.30) fared poorly following aortic valve replacement (AVR) (1). We also demonstrated that while ejection fraction may be reduced in AS either because of afterload mismatch or contractile dysfunction, in patients with low transvalvular gradient, afterload mismatch is rarely the explanation for reduced ejection performance. Rather these patients suffer from severe muscle dysfunction in turn explaining their poor outcome. In our small sample, all patients with a low gradient did poorly but only four such patients were included. Subsequent reports confirm a worse prognosis for such patients (2–4), but these larger series have universally demonstrated that some patients with low gradient/low ejection fraction gain substantial benefit by improvement in symptoms following AVR. Benefit occurs despite only a modest improvement in the ejection performance (4). The failure of ejection performance to improve very much is consistent with contractile dysfunction rather than afterload mismatch as the major cause of reduced preoperative performance. Indeed when afterload mismatch is the major culprit, ejection performance improves dramatically. Persistent left ventricular dysfunction in turn no doubt explains why both early and midterm postoperative mortality is substantially greater than is seen in patients with aortic stenosis with preserved ventricular function.

While previous reports demonstrated that patients with low gradient/low ejection fraction aortic stenosis could be operated on successfully, it remained unclear whether they did better and lived longer with surgery than with medical therapy until now. The authors of the article published in this month’s Journal (5), in my view, conclusively demonstrate that there is not only symptomatic benefit but also a mortality benefit to AVR in this group of patients. While theirs was not a randomized controlled trial (and none is likely to be performed in this group of patients), an excellent attempt was made to compare apples with apples between the patients who did and did not receive an aortic valve replacement. While no doubt some biases still exist, the preoperative data in the two groups suggest that the groups were comparable and while some differences were probably present but not accounted for, it is highly unlikely that any explanation other than the success of AVR would explain the obvious benefit to those patients who received a valve. While clearly it is ill-advised for patients to get to this far-advanced stage in their disease (and surely no physician would allow it to occur on purpose), these data are persuasive that we should recommend AVR for most patients in this category.

While the study by Pereira et al. (5) is a clear advance, in my view, at least one major question remains unresolved and awaits further study. This question is whether patients with low gradient/low ejection fraction with what I have referred to as aortic pseudostenosis would fare as well as patients with true AS following AVR (6). Aortic pseudostenosis is a condition in which the valve area in the low gradient/low output state is calculated to be small but when increased flow is introduced into the valve, there is only a small or even no increase in gradient resulting in a large increase (≥0.3 cm²) in valve area when area is recalculated using the new higher flow data (7–9). It seems logical that in such cases where it is not true AS but rather a weakened ventricle incapable of opening an only mildly diseased valve, that AVR would not benefit such patients. This should differ from the situation in which increased flow causes a large increase in gradient with little change in valve area, a condition in which presumed truly severe AS has led to ventricular dysfunction and, therefore, AVR might be expected to improve the condition. In the current study, it is not clear how often these techniques were used preoperatively to separate patients although in some cases they were. However the question remains: Were there patients in the pseudostenosis category who benefited from AVR or is the practice of using increased flow to ferret out this situation still justified? Previous studies suggest that patients with pseudostenosis do not benefit, but the number of patients was small (7,8).

Huge strides have been made in the preoperative assessment of the patient with AS in the last decade. Otto et al. (10) have demonstrated that patients with a transaortic jet velocity of >4 m/s are likely to become symptomatic and, thus, need an AVR within a few years. This knowledge helps focus on a high risk group in whom early intervention should help to prevent the small but definite risk of sudden death that exists in asymptomatic patients. Das et al. (11) have helped to further stratify this group by finding that exercise testing reveals patients who denied symptoms or have treadmill-induced symptoms which in my view should be an indication for surgery. We have known for some time that patients with congestive heart failure and reduced ejection performance fare quite well at surgery provided they have a high transvalvular gradient. Now for the first time we have evidence that patients with reduced ejection performance and low gradient fare better following surgery than similar unoperated-on patients.

*Editorials published in the Journal of the American College of Cardiology reflect the views of the authors and do not necessarily represent the views of JACC or the American College of Cardiology.

From the Veterans Affairs Medical Center, Houston, Texas.
Putting these data together, it seems prudent for the asymptomatic patient with severe AS and aortic flow velocity of >4 m/s to undergo frequent close questioning regarding symptomatic status and that almost all such patients should also undergo exercise testing which I believe (but cannot prove) would reduce the risk of sudden death from 2% to a much lower figure. At the other end of the spectrum, until data are developed to the contrary, I believe that the patient with low gradient/low ejection fraction should undergo preoperative hemodynamic manipulation to increase cardiac output. Those with truly severe AS who have increased gradient as output increases should undergo AVR.

For now, I believe that patients with aortic pseudostenosis should be treated medically unless and until new data demonstrate that they also benefit from AVR.

Reprint requests and correspondence: Dr. Blase A. Carabello, Medical Service (111), Veterans Affairs Medical Center, 2002 Holcombe Boulevard, Houston, Texas 77030. E-mail: blaseanthony.carabello@med.va.gov.

REFERENCES


