It has long been understood that left ventricular ejection fraction (LVEF) is a poor measure of LV systolic function because of load dependence, measurement error, and observer variability. In addition, LVEF, which is calculated from end-diastolic and end-systolic chamber volumes, is really a measure of chamber function not myocardial function. These issues are particularly problematic in mitral regurgitation (MR), where favorable loading conditions can preserve LVEF even when cardiomyocytes demonstrate loss of contractile elements and abnormal mitochondria.1 More sophisticated measures of LV systolic function, such as end-systolic elastance2 and arterial-elastance coupling,3 are of value in MR but are complicated and time-consuming and have not been adopted into clinical practice. Despite its flaws, LVEF remains important in MR because it is widely available and easy to measure. Both the American4 and European5 guidelines indicate that asymptomatic patients should be considered for mitral valve surgery before LVEF falls <60%, particularly when the anatomy is suitable for mitral valve repair. In addition, guidelines suggest that once LVEF falls <30%, the risks of mitral valve surgery might outweigh its benefits. These guidelines are based on expert opinion (Level of Evidence C) because there are limited data to support specific LVEF cutoff values in MR.

In this issue of Circulation: Cardiovascular Imaging, Tribouilloy et al6 report the relation of LVEF to outcomes in a large series of 1875 patients with MR because of flail leaflet in the Mitral Regurgitation International Database (MIDA) registry. Flail leaflet is a common manifestation of degenerative MR, is a known predictor of outcome,7 and usually is associated with severe MR.8 Only patients in sinus rhythm at the time of index echocardiography were included because measurement of LVEF is confounded by atrial fibrillation. Mean age was 65 years; 72% were men. Despite having a flail mitral leaflet, only 25% had New York Heart Association (NYHA) Class III-IV symptoms and 45% were asymptomatic (NYHA Class I). Coronary artery disease (CAD) was present in 10%, and 8% had infective endocarditis. In 85.5% of patients, isolated posterior leaflet flail was present. Details are not provided regarding the prevalence of Barlow’s disease versus fibroelastic deficiency or extensive mitral annular calcification. The decision to refer to mitral valve surgery was left to the discretion of the physicians managing the patient; patients in MIDA are not systematically under the care of a multidisciplinary valve team. Of the 1875 patients, 432 (23%) were treated medically and 1443 (77%) underwent mitral valve surgery at varying time points after the index echocardiogram. Of those, 85% underwent mitral valve repair.

A substantial majority (74%) of patients with flail leaflet had LVEF≥60%; 23% had LVEF 45% to 60%, and only 3% had LVEF<45%. LVEF<30% was rare (0.3%). These findings are consistent with augmentation of LVEF by the favorable loading conditions of pure MR. Patients with LVEF<45% tended to be older and with a higher comorbidity index, more CAD, and larger LV dimensions. By cubic spine analysis adjusted for differences in sex, comorbidity index, symptoms, and CAD, mortality during medical management was stable when LVEF>60% but increased linearly and sharply as LVEF fell <60%. After adjustment, the elevated risk of mortality was statistically significant in those with LVEF<60% compared with LVEF>60%. In those with LVEF<45%, the risk of death adjusted for covariates was 2.5 times higher than in those with LVEF>60%.

In the patients treated surgically, operative mortality was 1.7% with LVEF<60% and 1.1% with LVEF>60%. The 8-year mortality after surgery was 20% in those with LVEF>60%, 28% with LVEF 45% to 60%, and 62% with LVEF<45% (P=0.0001). This difference remained statistically significant after adjustment for covariates. Despite the higher long-term mortality after surgery in the lower LVEF subgroups, surgery reduced mortality compared with medical therapy by ≈50%. Moreover, the benefit of surgery extended to all LVEF subgroups. Despite this encouraging finding, a limitation of the present study is that patients who were denied surgery may have had factors not captured in the comorbidity index (ie, frailty, cancer, severe dementia, etc) that may have precluded surgery and rendered their survival under medical therapy worse than expected. On the contrary, these findings are consistent with previous studies showing that mitral valve repair restores normal longevity.9,10 Recently, David et al10 reported the long-term results of mitral valve repair in 840 patients with degenerative MR. LVEF was ≥60% in 60% of patients, and lower LVEF was an independent predictor of all-cause mortality. Mitral valve repair was found to restore long-term survival to normal except when NYHA Class IV symptoms or LV dysfunction were present.10

The findings of the present study confirm the guideline recommendations that surgery should be considered for asymptomatic patients before LVEF falls <60%. Of course, it is impossible to predict exactly when that is going to happen;
LVEF in MR Because of Flail Leaflet

Grayburn and Smith

Disclosures

Dr Grayburn is a consultant for Abbott Vascular and receives grant support from Abbott Vascular, Medtronic, and Edwards. He directs the echocardiography core laboratory for Guided Delivery Systems and ValTech Cardio. Dr Smith has no relevant disclosures.

References


Key Words: Editorials ■ cardiac surgery ■ echocardiography ■ left ventricular systolic function ■ mitral regurgitation
Left Ventricular Ejection Fraction in Mitral Regurgitation Because of Flail Leaflet
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doi: 10.1161/CIRCIMAGING.114.001675

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