Advance Publication

Circulation Journal
doi:10.1253/circj.CJ-24-0342

EDITORIAL

The Importance of Left Ventricular End-Systolic Diameter for Aortic Valve Replacement in Japanese Asymptomatic Patients With Chronic Severe Aortic Regurgitation

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Most patients with chronic aortic regurgitation (AR) experience slow disease progression, with the left ventricle (LV) compensating for volume overload by undergoing chamber hypertrophy and dilation, which often leads to prolonged asymptomatic periods. However, as the condition advances, irreversible dysfunction of the LV can occur. Therefore, current guidelines recommend prompt surgery, based on LV dysfunction and dilatation, for asymptomatic chronic severe AR.[1–3]

Despite slight differences among the guidelines, the LV end-systolic diameter (LVESD) serves as an essential indicator for surgery. An LVESD of 50 mm or 45 mm and an LVESD index (LVESDI) of 25 mL/m^2 are crucial metrics indicating dilatation and dysfunction.[1–3] As shown in **Figure A** and **Figure B**, the American College of Cardiology (ACC)/American Heart Association (AHA) and the European Society of Cardiology (ESC)/European Association for Cardio-Thoracic Surgery (EACTS) guidelines recommend LVESD >50 mm as Class IIa and Class I surgical indications, respectively.[1,2] The Japanese Circulation Society (JCS)/Japanese Society for Cardiovascular Surgery (JSCS)/Japanese Association for Thoracic Surgery (JATS)/Japanese Society for Vascular Surgery (JSVS) guidelines, taking into account body size differences with Western populations, recommend LVESD >45 mm as a Class IIa surgical indication (**Figure C**).[3] The importance of LVESD is well understood; however, the evidence supporting an LVESD of 45 mm in Japanese patients is limited, and new scientific data are eagerly awaited.

In this issue of the Journal, Hachiro et al[4] present the results of their single-center retrospective study on aortic valve replacement for asymptomatic or mildly symptomatic severe AR patients. They demonstrate the clinical importance of smaller LVESD criteria for surgery compared with previous studies. Enrolling 168 patients with a mean body surface area (BSA) of 1.64±0.21 m^2, they evaluated the incidence of major adverse cardiovascular and cerebrovascular events (MACCEs), including 5 factors, and examined LV reverse remodeling after surgery. Over a mean follow-up duration of 7.4±5.2 years, 35 MACCE cases (20.8%) were recorded. The cutoff value of preoperative LVESD for MACCE incidence was 42.8 mm (area under the curve: 0.616). A comparison between 2 groups (LVESD >42.8 mm vs. ≤42.8 mm) in the propensity score-matching cohort revealed that the smaller LVESD group had a significantly higher rate of freedom from MACCE at 10 years post-surgery (59.9% vs. 85.7%, P=0.004). Furthermore, a subanalysis of LV reverse remodeling at 5 years post-surgery showed a significant reduction in LV size and improvements in LV ejection fraction (LVEF) and LV mass index in the smaller LVESD group. These results suggest that performing surgery with LVESD values smaller than those recommended by current guidelines (i.e., performing surgery at an earlier stage) may lead to better postoperative outcomes, particularly regarding MACCE-free status. Therefore, this study, conducted using data from Japanese patients, is of high value, and the authors deserve commendation for their efforts.

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A close reading of the report reveals that the only difference observed in the causes of MACCE was in nonfatal heart failure. No significant difference was found in survival rates, and their LVESD cutoff value of 42.8 mm is interpreted as an indicator for preventing postoperative heart failure. In previous studies, Amano et al reported 47 mm as a preoperative LVESD cutoff value for all-cause death,[5] and Saisho et al reported 42 mm as a preoperative LVESD cutoff value for the recovery of postoperative LV function.[6] These 3 Japanese reports suggest that LVESD cutoff values may differ for survival, heart failure, or LV function recovery. Focusing on LV function, opting for surgery before the LVESD value reaches 45 mm may be preferable, especially in patients with small body size.

The authors also evaluated the rate of freedom from MACCE using cutoff values of LVEF 50% and LVESDI 25 mm/m^2, as indicated by the guidelines. The result showed no significant differences between groups: LVEF <50% vs. LVEF ≥50%, and LVESDI ≤25 mm/m^2 vs. LVESDI >25 mm/m^2. Moreover, LVEF <50% and LVESDI >25 mm/m^2 were not identified as risk factors for MACCE. They suggest that preoperative LVESD >42.8 mm may be more predictive than preoperative LVEF <50% or LVESDI

Received May 6, 2024; accepted May 7, 2024; J-STAGE Advance Publication released online May 31, 2024
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ISSN-1346-9843

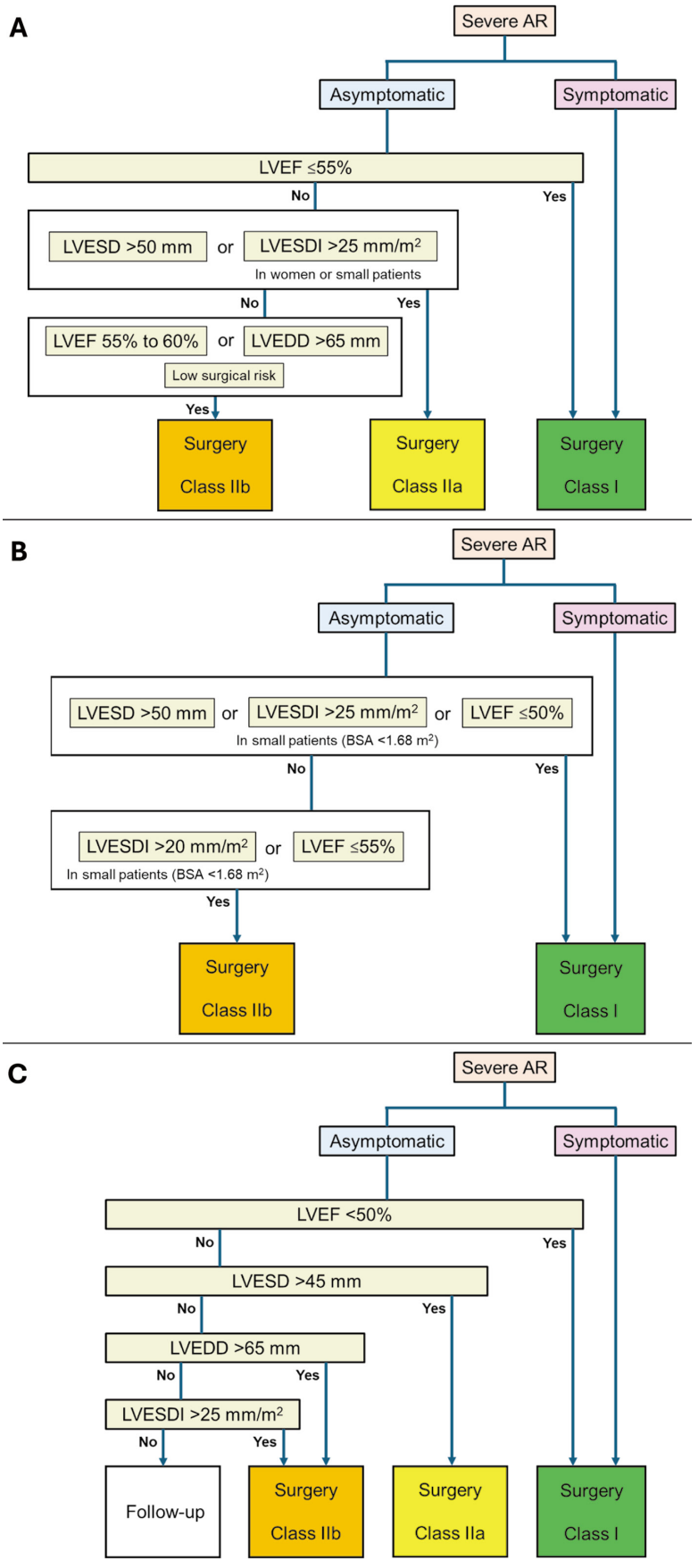

Figure. Surgical indications for severe AR. (**A**) Flowchart created based on the guidelines from ACC/AHA. (**B**) Flowchart created based on the guidelines from ESC/EACTS. (**C**) Flowchart based on the guidelines from JCS/JSCS/JATS/JSVS. ACC, American College of Cardiology; AHA, American Heart Association; AR, aortic regurgitation; BSA, body surface area; EACTS, European Association for Cardio-Thoracic Surgery ESC, European Society of Cardiology; JATS, Japanese Association for Thoracic Surgery; JCS, Japanese Circulation Society; JSCS, Japanese Society for Cardiovascular Surgery; JSVS, Japanese Society for Vascular Surgery; LVEDD, left ventricular (LV) end-diastolic diameter; LVEF, LV ejection fraction; LVESD, LV end-systolic diameter; LVESDI, LVESD index.

>25 mm/m^2 in Japanese patients. The reasoning is well described in the Discussion section regarding the LVEF calculation method and the study's design, such as the number of patients with small body size. It has been previously reported that once LV dysfunction occurs due to AR, surgical intervention at that time point yields better postoperative outcomes than waiting for the onset of symptoms or the progression of LV dilatation.[7,8] At this point, it is essential to focus on the 3 indicators of LVEF, LVESD, and LVESDI to determine the timing of surgery, and further research is needed to understand their implications.

In Western countries, LVESD and LVESDI are considered equally important, and their use is endorsed based on body size and sex. The ACC/AHA guidelines recommend the use of LVESDI in patients with small body size or female patients. The ESC/EACTS guidelines recommend the use of LVESDI in patients with a BSA <1.68 m^2, based on findings by Sambola et al.[9] LVESDI >25 mm/m^2 is considered a Class IIa surgical indication in the ACC/AHA guidelines and a Class I surgical indication in the ESC/EACTS guidelines. In Japan, however, the priority of LVESDI is lower than that of LVESD, with LVESDI >25 mm/m^2 classified as a Class IIb surgical indication due to the lack of sufficient scientific data in Japanese patients. In recent years, earlier surgery with LVESDI ≤25 mm/m^2 has also been advocated in Western countries,[10–12] and the ESC/EACTS guidelines recommend LVESDI >20 mm/m^2 as a Class IIb surgical indication in patients with a BSA <1.68 m^2. Further research is needed to determine the priority of LVESD and LVESDI, the use of LVESD and LVESDI based on body size and sex, and the respective cutoff values in Japanese asymptomatic patients with chronic severe AR.

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