Late gadolinium enhancement cardiac magnetic resonance in aortic stenosis: Where do we stand today?

Theodoros D Karamitsos[1], Christos A Papanastasiou[1, 2]

[1]1st Department of Cardiology, School of Medicine, Aristotle University of Thessaloniki, Thessaloniki, Greece
[2]Department of Cardiology, 424 Military Hospital, Thessaloniki, Greece

Related article
by Orłowska-Baranowska et al.

Correspondence to:
Prof. Theodoros D Karamitsos MD, PhD,
1st Department of Cardiology, School of Medicine, Aristotle University of Thessaloniki, Greece,
phone: +30 231 099 48 30,
e-mail: tkaramitsos@auth.gr

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Aortic stenosis (AS) is the most frequent valvular heart disease and its prevalence is expected to triple over the next years due to population aging [1]. In the early adaptive phase, left ventricular (LV) systolic pressure increases in response to the narrowing of the aortic valve to compensate for the increased afterload and maintain an adequate cardiac performance and functional status [2]. However, as AS progresses, the LV enters a decompensation phase and the disease takes on a malignant course with a dramatic increase in mortality, especially when symptoms and/or LV dysfunction develop [3]. This transition from the adaptive to maladaptive/symptomatic phase is mainly driven by severe structural alterations in the myocardium, such as LV hypertrophy and intramyocardial fibrosis [4].

The fact that myocardial scarring is an advanced stage in LV remodeling in the setting of AS has been recently confirmed in large-scale studies and meta-analyses. They have shown that focal fibrosis, as evidenced by late gadolinium enhancement (LGE) cardiac magnetic resonance (CMR), is present in more than half of patients referred for aortic valve replacement (AVR) and its presence is associated with increased mortality [5–7]. Interestingly, Thornton et al. [7] demonstrated that both infract and non-infract LGE patterns on CMR were powerful independent predictors of mortality (all-cause and cardiovascular) in symptomatic patients with severe AS, regardless of the type of valve intervention. Although this is an intriguing finding that underscores the importance of LGE evaluation for better risk stratification of patients with severe AS, it does not answer "the one million dollar" question: Can CMR with LGE guide management of AS patients?

Orłowska-Baranowska et al. [8] tried to shed light on this important topic by conducting an observational study of 91 asymptomatic patients with severe AS, whose results were published in the *Polish Heart Journal*. All 91 patients underwent CMR with LGE, and 68 of them (75%) finally underwent AVR due to clinical progression of AS. The authors evaluated several early post-AVR complications (hospitalization time after AVR, length of hospitalization in the intensive care unit after AVR, need for extracorporeal membrane oxygenation or continuous renal replacement therapy, a new episode of atrial fibrillation or post-pericardiotomy syndrome) and echocardiographic outcomes (change in wall thickness and LVEF at 12 and 24 months after the procedure). They found that LGE-positive patients developed symptoms earlier than LGE-negative patients (median time of symptoms onset: 18 vs. 28 months, $P = 0.01$). However, when the analysis was restricted to the subgroup of patients who underwent AVR, no difference was observed with regard to the post-intervention echocardiographic and clinical outcomes compared to the LGE status from the baseline evaluation.

This work by Orłowska-Baranowska et al. [8] further confirms the emerging role of CMR in risk stratification of AS patients, showing that LGE is a potential predictor of

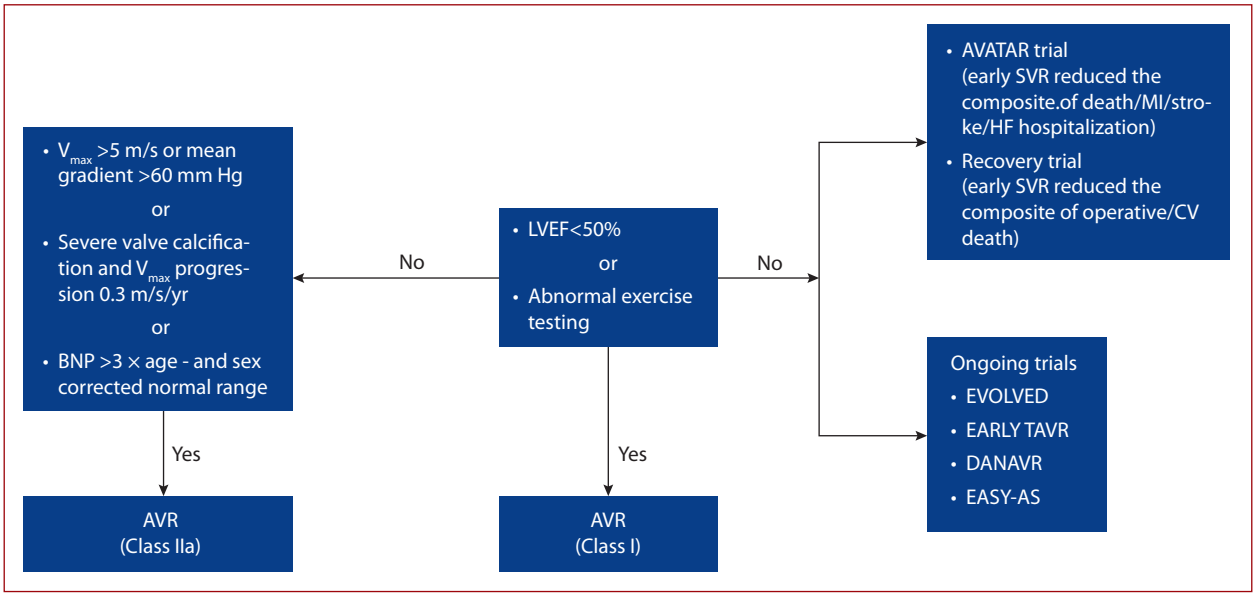

Figure 1. Current management and ongoing trials in asymptomatic aortic stenosis

Abbreviations: AS, aortic stenosis; AVR, aortic valve replacement; BNP, B-type natriuretic peptide; CV, cardiovascular; HF, heart failure; LVEF, left ventricular ejection fraction; MI, myocardial infarction; SVR, surgical valve replacement; Vmax, maximum velocity

early symptoms development in asymptomatic patients with severe stenoses. However, the post-AVR findings of the study should be interpreted with caution and in the context of some methodological shortcomings in the study design. First and foremost, the median time interval between the CMR examination and the AVR procedure was 2 years. During that period, the researchers did not perform a follow-up CMR to update LGE status in patients who initially had LGE-negative scan, and thus a kind of cross-over bias may have skewed the post-intervention findings. In addition, only a small number of patients (68 patients) were included in the analysis of the post-intervention outcomes, which gives the findings of limited or even dubious clinical significance.

There is no doubt that CMR can effectively risk-stratify symptomatic patients with severe AS and, as shown by Orłowska-Baranowska et al. [8], CMR's prognostic utility extends to asymptomatic patients as well. However, whether CMR can be used to optimize the timing of intervention in AS remains an open question. Currently, this hypothesis is being tested in the randomized EVOLVED trial (Early Valve Replacement Guided by Biomarkers of Left Ventricular Decompensation in Asymptomatic Patients with Severe Aortic Stenosis; NCT03094143), which compares early AVR with standard of care (i.e., wait for symptoms development) in patients with LGE on CMR and asymptomatic severe AS. This trial together with others investigating the role of early intervention in the clinical context of asymptomatic severe AS, is anticipated to provide strong recommendations on the optimal timing of intervention in this patient population (Figure 1). Until the recommendations of these trials become available, an individualized therapeutic approach should be followed, taking into consideration the patient's risk profile and his/her preferences.

Article information

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