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Poster presentation

The effect of regurgitant volume on left ventricular volumes and dimensions in patients with isolated aortic or mitral regurgitation

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Introduction

The treatment of patients with aortic regurgitation (AR) or mitral regurgitation (MR) relies on the accurate assessment of the severity of the regurgitation and its effect on left ventricular (LV) size and function. CMR is an excellent tool for quantifying regurgitant volumes and LV size and function. The 2006 AHA/ACC management guidelines for the therapy of patients with AR or MR describe LV size in terms of linear dimensions (i.e. end-diastolic and end-systolic dimension). LV volumes that correspond to these linear dimensions have not been published in the peer-reviewed literature.

Purpose

To determine the effect of regurgitant volume on LV volumes and chamber dimensions in patients with isolated AR or MR and preserved LV function.

Methods

This study comprises 62 consecutive CMR exams in 57 patients with isolated AR or MR. LV volumes were determined from short and long-axis 1.5 T FIESTA images using a semiautomated algorithm (ReportCard 4.0). Flow in the proximal aorta and pulmonary artery was assessed with phase-contrast imaging. Baseline correction was performed using a stationary phantom. AR volume was determined by integrating aortic blood flow throughout diastole. MR volume was determined as the difference between LV stroke volume and pulmonary artery flow. To determine the reproducibility of AR and MR regurgitant volume, a second blinded analysis was made according to the same method.

Results

There is a strong, linear relationship between regurgitant volume and LV end-diastolic volume index (AR $r^2 = 0.8$, MR $r^2 = 0.8$) (figure). Bland Altman analysis of regurgitant volume shows little interobserver variation (AR: 0.6 + 4 ml; MR: 4 + 6 ml). The correlation is much poorer between regurgitant volume and commonly used clinical linear measures such as end-systolic dimension (MR $r^2 = 0.2$, AR $r^2 = 0.5$). Linear regression is used to determine the LV volumes that correspond to the linear dimensions currently recommended in the 2006 AHA/ACC management guidelines (Figure 1, Table 1).

Conclusion

MRI is a robust technique for quantification of regurgitant volume in patients with AR or MR and preserved LV function. Ventricular volumes show a stronger correlation with regurgitant volume than linear dimensions, suggesting LV volumes better reflect ventricular remodeling in patients with isolated mitral or aortic regurgitation. For a given regurgitant volume, AR results in greater LV enlargement than patients with MR, likely due to the fact that MR is a pure volume lesion whereas AR is both a pressure and a volume lesion. Ventricular volumes that correspond to published recommended linear dimensions are determined to guide the timing of surgical intervention.

Table	LV Volume Index (ml/m^2)	LV Volume (ml)
Mitral Regurgitation		
ESD = 40mm	ESVI: 29	ESV: 58
Aortic Regurgitation		
ESD = 55mm	ESVI: 51	ESV: 100
EDD = 75mm	EDVI: 129	EDV: 260

Figure 1

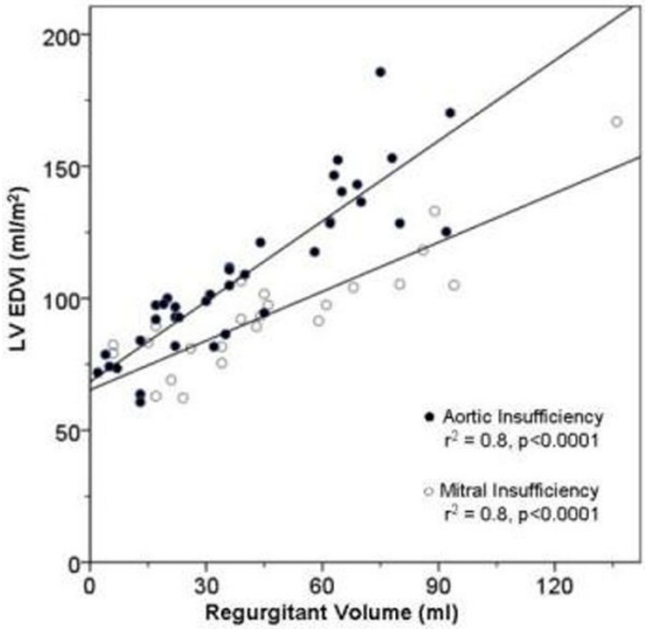

Figure 2