Magnetic resonance imaging versus echocardiography to ascertain the regression of left ventricular hypertrophy after bioprosthetic aortic valve replacement: Results of the REST study

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Objectives: To compare the decrease in left ventricular mass index (LVMI) by magnetic resonance imaging (MRI) versus transthoracic echocardiography (TTE) after aortic valve replacement (AVR) for severe aortic stenosis with Epic and Epic Supra stented porcine bioprostheses (St Jude Medical, Inc, St Paul, Minn).

Methods: This prospective multicenter study enrolled 149 patients who underwent AVR between January 2006 and February 2008. TTE and cardiac MRI measurements of LVMI were made at baseline and at 6 months of follow-up and were compared. Changes in mean pressure gradients were examined using TTE.

Results: TTE measurements of LVMI were 48% to 63% higher than the MRI measurements. A decrease in LVMI from 137 ± 32 to 95 ± 16 g/m² with the Epic and from 139 ± 29 to 104 ± 28 g/m² with the Epic Supra valves ($P < .0001$ for both comparisons) was measured by TTE. Cardiac MRI revealed decreases in LVMI from 84 ± 20 to 64 ± 12 g/m² and from 86 ± 27 to 64 ± 17 g/m² with the Epic and Epic Supra valves, respectively ($P < .0001$ for both comparisons). TTE revealed a significant regression of mean pressure gradients from 51.6 ± 15.3 to 15.5 ± 5.2 mm Hg with the Epic and from 46.7 ± 19.4 to 17.9 ± 12.8 mm Hg with the Epic supra ($P < .0001$ for both comparisons).

Conclusions: A significant decrease in LVMI was measured after AVR with all sizes of both bioprosthetic models. Because of the overestimation of the decrease in LVMI by the Devereux formula, as well as the higher accuracy and reproducibility of cardiac MRI measurements, the latter should be preferred to TTE. An ultimate validation of this thesis could only be done comparing each of these modalities with pathologic examination. (J Thorac Cardiovasc Surg 2012;144:640-5)

Supplemental material is available online.

Aortic valve replacement (AVR) remains the main treatment of severe aortic stenosis (AS).¹ Several studies have confirmed the benefit it confers on long-term survival, symptomatic relief, and quality of life,^{2,3} a benefit

attributable to a decrease in left ventricular (LV) pressure overload, allowing the decrease in LV mass and regression of hypertrophy.

LV mass is an independent predictor of cardiovascular morbidity and mortality.⁴ It is crucial in patients who have severe, symptomatic AS to lower the LV afterload and normalize the LV mass, a process that takes place mainly within the first 3 postoperative months. However, significant LV hypertrophy persists in a subset of patients.⁵ Systemic hypertension and a small prosthetic valve are 2 causes of persistent LV hypertrophy after surgical AVR,^{6,7} underscoring the importance of an optimal postoperative treatment plan to (1) achieve the greatest amount of decrease in LV mass and (2) most reliably ascertain its changes.

Most studies of LV mass and its decrease after AVR have used transthoracic echocardiography (TTE), a method that is readily available and that uses geometric assumptions that have been validated in normal hearts.⁸ However, in the presence of asymmetric LV hypertrophy, the LV mass may be overestimated.^{9,10} Moreover TTE is (1) dependent on the acoustic window and (2) subject to interobserver and intraobserver variability.¹¹ In contrast, cardiovascular magnetic resonance imaging (MRI) enables the acquisition of high-resolution images in any plane,

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Abbreviations and Acronyms

AS	= aortic stenosis
AVR	= aortic valve replacement
CABG	= coronary artery bypass graft
LV	= left ventricular
LVMI	= left ventricular mass index
MRI	= magnetic resonance imaging
REST	= Left Ventricular Regression European Study
TTE	= transthoracic echocardiography

unlimited by an acoustic window and without exposure to radiation, producing measurements that are accurate and highly reproducible.

The objective of this prospective multicenter study was to compare the decrease in LV mass measured by MRI versus that measured by TTE, 6 months after AVR, using the Epic and Epic Supra bioprostheses (St Jude Medical, Inc, St Paul, Minn).

STUDY POPULATION AND METHODS

The Left Ventricular Regression European Study (REST) was conducted at 8 European medical centers. The data were collected by study coordinators appointed at each participating center, analyzed by an independent core laboratory, and monitored by St Jude Medical, the study sponsor. The protocol was approved by the research ethics committee of each participating center, and all patients granted their written informed consent to participate in the study.

Sample Size Calculation

The sample size calculation was based on the main end point of the study, that is, change in LV mass index (LVMI) between baseline and 6 months. Baseline is defined as before intervention. According to Bech-Hanssen and associates,¹² it was assumed that the mean change of LVMI using echocardiography for all biological valves will be 18.35% with an estimated standard deviation of 17.35%.

For sample size calculations, it was assumed that the mean change of LVMI using MRI will be 25%, with the same standard deviation as the one for mean change of LVMI using echocardiography, that is, 17.35%. Moreover, several values were assumed for the correlation between the change in LVMI using MRI and using echocardiography. Assuming a very weak association of 0.2, a 2-sided paired *t* test will detect a significant difference (5% significance level and power at least 90%) in change of LVMI between echocardiography and MRI when 117 analyzable patients are recruited. If the correlation is 0.4, then 88 patients should be recruited. If the correlation is higher, the sample size required will decrease.

Study Eligibility

Patients of legal age in their host country, who underwent a first AVR for severe AS or for mixed aortic valve disease with predominant AS, were considered for study enrollment. In February 2007, an amendment to the protocol was introduced, which allowed the enrollment of patients undergoing AVR with concomitant coronary artery bypass graft (CABG) surgery. Patients were excluded from the study if they were pregnant or nursing, on hemodialysis, or had unstable angina, active endocarditis, acute aortic dissection, New York Heart Association heart failure functional class

IV, or prominent LV wall motion abnormality, chronic or persistent atrial fibrillation, or claustrophobia. Further exclusion criteria were the presence of a permanent pacemaker or implantable cardioverter defibrillator, aneurysmal clip, carotid artery stent, neurostimulator, cochlear or other ear implant, temporary or permanently implanted drug infusion device, bone growth or fusion stimulator, and ocular foreign body.

Study Design

This was an international, multicenter, prospective, observational study. Demographic and clinical characteristics, health history, concomitant medications, and baseline laboratory values were recorded in all patients. The patients were scheduled to return for ambulatory follow-up visits at 6-month (time frame from 180 to 270 days) intervals after their discharge from the hospital. TTE and MRI were performed at baseline and at 6 months of follow-up.

Implanted Valve Models

Epic and Epic Supra are stented porcine bioprostheses. The choice of Epic versus Epic Supra valve implanted in this study was left to the surgeon's discretion.

TTE

All TTEs were performed by expert sonographers at site, trained on study echocardiography protocol, and analyzed at an independent core laboratory (U.Z. Gasthuisberg, Department of Cardiology, Leuven, Belgium) by observers highly trained in qualitative, quantitative, and Doppler ultrasonography. Two-dimensional, M-mode, and Doppler images were obtained in standard apical, subcostal, suprasternal, and parasternal views. Measurements were performed according to the guidelines issued by the American Society of Echocardiography.¹³ LV mass was calculated using the Devereux formula.

Cardiac MRI

MRI was performed during continuous electrocardiographic monitoring using 5 different scans. The new, balanced, steady-state free precession cine MRI sequences were used for the measurements of LV volumes, mass, and function in scans 3, 4, and 5. For the cine MRIs in the short axis, an 8-mm thick continuous slice was used with a repetition time of 35 ms or less. LV end-diastolic volume, LV end-systolic volume, stroke volume, LV mass, and their associated indices, and LV ejection fraction were calculated by an independent MRI core laboratory (U.Z. Gasthuisberg, Department of Radiology, Leuven, Belgium) using a custom-made software (CardioViewer; Catholic University Leuven, Leuven, Belgium).¹⁴ The endocardial trabeculations and papillary muscles were included in the LV wall measurements.

Statistical Analysis

Continuous variables are presented as means $\pm$ standard deviation and were compared with the Student *t* test or Wilcoxon nonparametric test, as appropriate. Categorical data are presented as counts and percentages. The relationship between measurements of LV mass and LVMI by MRI versus echocardiography was examined using the Spearman rank correlation coefficients and associated *P* values. All statistical analyses were performed with SAS software, version 9.1 (SAS Institute Inc, Cary, NC).

RESULTS**Study Population**

A total of 149 patients were enrolled in the REST study between January 2006 and June 2008. Their mean age was 73.3 ± 8.6 years and 57% were women. The main baseline characteristics of the study population are shown in Table 1.

TABLE 1. Baseline characteristics of the 149 study patients

Age, y	73.3 ± 8.6
Women	85 (57)
Height, cm	164.2 ± 9.7
Body	
Weight, kg	75.1 ± 14.1
Mass index, kg/m ²	27.9 ± 4.9
Surface area, m ²	1.8 ± 0.2
Log EuroSCORE	6.6 ± 4.0
New York Heart Association functional class	
I	21 (14%)
II	86 (58%)
III	42 (28%)

Values are means ± standard deviation or numbers (%) of observations.

Surgical and Intraoperative Observations

Fifty-four (36%) patients had pure AS and 95 (64%) had aortic insufficiency and predominant stenosis (Table 2). The peak and mean pressure gradients at baseline were 81 ± 28 and 49 ± 18 mm Hg, respectively, and mean effective orifice area was 0.80 ± 0.34 cm².

Of the 149 patients, 109 underwent isolated AVR, 26 underwent concomitant CABG, and 22 underwent other additional procedures (Table 2). The sizes of the 77 Epic and 72 Epic Supra bioprostheses implanted in this study are detailed in Table 2. The mean duration of cardiopulmonary bypass was 96 ± 34 minutes and mean duration of cross-clamping was 70 ± 24 minutes. Further intraoperative observations and measurements are shown in Table 2.

Postoperative Outcomes and Analyzable Data

The short- and long-term clinical outcomes and ultimate data availability are shown in Table E1.

Short-term outcome. The overall duration of ventilator support ranged from 5 to 53 hours, the mean stay in the intensive care unit ranged from 6 to 163 hours, and the duration of hospitalization ranged from 5 to 76 days. At 30 days after the operation, 3 (2.0%) of the 149 patients had died, including 1 patient on postoperative day 9 of ventricular fibrillation, 1 patient on day 11 of acute cardiac decompensation and pulmonary edema, and 1 patient on day 12 of unwitnessed sudden death. Major intrathoracic hemorrhages requiring reoperations occurred in 4 (2.7%) patients and hemorrhages treated with transfusions of blood products in 3 (2.0%) patients. Atrial fibrillation developed in 12 (8.1%) and complete heart block requiring permanent pacing in 8 (5.3%) patients. Other complications included a major hemorrhage on postoperative day 6 from a duodenal ulcer in 1 (0.7%) patient and large pericardial effusions in 3 (2.0%) patients, treated with diuretics, open drainage, and pericardiocentesis in 1 patient each.

Long-term outcome. Over a mean follow-up of 7.1 months and cumulative follow-up of 1052 months, 2 additional patients died, of renal failure and liver cirrhosis,

TABLE 2. Intraoperative observations

Valve sizes, mm	
Epic Supra	
19	10 (7)
21	38 (26)
23	24 (16)
Epic	
21	7 (5)
23	39 (26)
25	22 (15)
27	9 (6)
Aortic valve lesions	
Stenosis	54 (36)
Mixed stenosis and insufficiency	95 (64)
Calcifications	
Annular	97 (65)
Leaflet	134 (90)
Leaflet thickening	149 (100)
Commissural fusion	47 (32)
Concomitant procedures	
None	109 (73)
Coronary artery bypass graft	26 (17)
Aortoplasty	11 (7)
Replacement of ascending aorta	2 (1)
Other	9 (6)
Duration, min	
Cardiopulmonary bypass	96 ± 34
Crossclamp	70 ± 24

Values are means ± standard deviation or numbers (%) of observations.

respectively, for an overall mortality of 3.4%. Valve thrombosis treated with cleaning of the valve leaflets on postoperative day 102 and embolic stroke on postoperative day 116 occurred in 1 patient each. Furthermore, 7 patients withdrew from the study, 1 was lost to follow-up, 2 had pacemakers implanted, and 13 patients had incomplete or untimely collections of data (Table E1). At the end of follow-up, complete and paired echocardiographic and MRI data were available in 109 patients (complete MRI data in 111 patients and complete echocardiographic data in 118 patients).

Echocardiographic Observations at Baseline Versus 6 Months of Follow-up

The changes in echocardiographic measurements associated with each valve model and each valve size between baseline and 6 months of follow-up are summarized in Tables 3 and 4. LV mass and LVMI both decreased significantly with each model and each valve size (Table 3 and Table 4). Likewise, LV end-diastolic diameter, LV end-diastolic posterior wall and septal thickness, and LV end-diastolic volume decreased significantly. LV end-systolic volume, however, decreased significantly in the Epic group only. Mean LV ejection fraction was normal at baseline in both valve model groups and increased

TABLE 3. Echocardiographic and MRI observations at baseline versus 6 months of follow-up

Measurements	Valve model	Echocardiography			MRI		
		Baseline	6 mo	P	Baseline	6 mo	P
Left ventricular							
Mass, g	Epic	258 ± 65	178 ± 37	<.0001	160 ± 41	120 ± 28	<.0001
	Epic supra	243 ± 51	180 ± 47	<.0001	151 ± 47	110 ± 30	<.0001
Mass index, g/m ²	Epic	137 ± 32	95 ± 16	<.0001	84 ± 20	64 ± 12	<.0001
	Epic supra	139 ± 29	104 ± 28	<.0001	86 ± 27	64 ± 17	<.0001
End-diastolic, mm							
Diameter	Epic	45.9 ± 5.2	43.0 ± 4.0	<.0001			
	Epic supra	44.3 ± 5.5	40.7 ± 5.7	<.0001			
Thickness							
Posterior wall	Epic	12.9 ± 1.3	10.9 ± 1.0	<.0001			
	Epic supra	12.9 ± 1.4	11.4 ± 1.3	<.0001			
Septum	Epic	14.8 ± 2.0	12.3 ± 1.6	<.0001			
	Epic supra	14.8 ± 1.8	13.1 ± 2.1	<.0001			
Volume, cm ³ (TTE)							
Volume, mL (MRI)							
End-diastolic	Epic	110 ± 29	98 ± 17	<.0001	131 ± 36	117 ± 23	.01
	Epic supra	104 ± 36	92 ± 23	.026	125 ± 47	110 ± 28	.002
End-systolic	Epic	35 ± 16	31 ± 10	.0032	45 ± 29	44 ± 31	<.0001
	Epic supra	32 ± 18	28 ± 10	.066	30 ± 13	29 ± 20	<.0001
Ejection fraction, %	Epic	68.8 ± 6.3	68.7 ± 6.8	.19	67.7 ± 12.5	74.4 ± 8.1	<.0001
	Epic supra	68.2 ± 8.8	70.6 ± 5.1	.002	68.9 ± 14.6	74.9 ± 10.4	<.0001
Transvalvular pressure gradient, mm Hg							
Peak	Epic	85.2 ± 25.2	28.5 ± 10.7	<.0001			
	Epic supra	77.3 ± 30.0	31.9 ± 18.3	<.0001			
Mean	Epic	51.6 ± 15.3	15.5 ± 5.2	<.0001			
	Epic supra	46.7 ± 19.4	17.9 ± 12.8	<.0001			
Effective orifice area, cm ³	Epic	0.8 ± 0.3	1.4 ± 0.3	<.0001			
	Epic supra	0.8 ± 0.4	1.3 ± 0.3	<.0001			
Effective orifice area index, cm ³ /m ²	Epic	0.4 ± 0.1	0.8 ± 0.2	<.0001			
	Epic supra	0.5 ± 0.2	0.7 ± 0.2	<.0001			
Cardiac output, L/min	Epic	5.3 ± 1.6	4.5 ± 1.2	<.0001	5.9 ± 1.4	5.6 ± 1.3	.62
	Epic supra	5.3 ± 1.2	4.5 ± 1.2	.0039	5.3 ± 1.4	5.3 ± 1.2	.67
Cardiac index, L · min ⁻¹ · m ⁻²	Epic	2.8 ± 0.8	2.4 ± 0.6	<.0001	3.2 ± 0.8	3.0 ± 0.7	.72
	Epic supra	3.0 ± 0.7	2.6 ± 0.7	.0079	3.0 ± 0.8	3.1 ± 0.6	.76

Values are means ± standard deviation. Paired transthoracic echocardiographic (TTE) observations were available in 58 recipients of Epic and 60 recipients of Epic Supra bioprostheses. Paired magnetic resonance imaging (MRI) observations were available in 53 recipients of Epic and 58 recipients of Epic Supra bioprostheses.

significantly from 68.2% ± 8.8% to 70.6% ± 5.1% ($P = .002$) in the Epic Supra group only (Table 3).

Cardiac MRI Observations at Baseline Versus 6 Months of Follow-up

At 6 months of follow-up, LV mass and LVMI ($P < .0001$), LV end-diastolic volume ($P < .0001$) and LV end-systolic volume ($P = .003$) had decreased and LV ejection fraction had increased ($P < .0001$) significantly with both valve models and each valve size (Tables 3 and 4). Cardiac output and cardiac index remained unchanged with both valve models (Table 3).

Decrease in LV Mass on TTE Versus Cardiac MRI

Despite moderate correlations observed at baseline ($r = 0.54$) and at 6 months of follow-up ($r = 0.62$)

between the LVMI measured by TTE versus MRI, the measurements made by TTE were systematically and significantly higher ($P < .0001$) than the measurements made by MRI (Table 3).

Effects of Concomitant CABG Surgery

In February 2007, a protocol amendment was introduced allowing the enrolment in REST of patients undergoing AVR and concomitant CABG who had severe AS and no major LV wall motion abnormality. A comparison of the demographic characteristics of 26 patients who underwent concomitant CABG, versus 123 patients who did not, revealed no significant difference (Table E2). Likewise, no differences were observed between the 2 groups in (1) TTE-measured baseline LV ejection fraction, (2) TTE-measured LV mass at 6 months and at follow-up, and (3)

TABLE 4. Regression of LV mass and LVMI by valve type and size

Measurements	Valve type and size in mm						
	Epic 21	Epic 23	Epic 25	Epic 27	Epic Supra 19	Epic Supra 21	Epic Supra 23
LV mass, g							
MRI							
Baseline	128 ± 19	155 ± 43	170 ± 35	178 ± 45	163 ± 72	148 ± 41	150 ± 46
6 mo	101 ± 0.4	114 ± 28	125 ± 29	131 ± 25	111 ± 46	111 ± 26	111 ± 28
TTE							
Baseline	207 ± 48	253 ± 68	264 ± 63	290 ± 55	240 ± 68	242 ± 50	246 ± 46
6 mo	159 ± 15	168 ± 38	182 ± 34	207 ± 32	183 ± 65	180 ± 38	179 ± 53
LVMI, g/m ²							
MRI							
Baseline	72 ± 10	83 ± 21	89 ± 18	92 ± 24	97 ± 46	86 ± 25	82 ± 20
6 mo	56 ± 3	63 ± 13	65 ± 12	67 ± 14	65 ± 28	64 ± 16	62 ± 11
TTE							
Baseline	121 ± 31	136 ± 31	139 ± 34	149 ± 28	141 ± 41	140 ± 31	137 ± 20
6 mo	88 ± 13	94 ± 15	94 ± 17	106 ± 18	107 ± 37	105 ± 26	100 ± 29

Values are means ± standard deviation. For the different valve types and the valve sizes there is a significant regression of left ventricular (LV) mass and left ventricular mass index (LVMI) comparing baseline to 6 months' follow-up ($P = .02$ for 19-mm and 27-mm valves, $P < .0001$ for all other valve sizes). *MRI*, Magnetic resonance imaging; *TTE*, trans-thoracic echocardiography.

TTE- and MRI-measured changes in LVMI between baseline and 6 months of follow-up.

DISCUSSION

AS causes LV pressure overload and a marked hypertrophic response of the myocardium as an adaptive response to the increased wall stress.⁶ This, in turn, causes an increase in LV mass, which is strongly correlated with an increased cardiac mortality and morbidity.⁴ Therefore, it is crucial in patients with severe, symptomatic AS to decrease the LV mass to normal levels. It has been previously observed that LV mass may not return to normal after AVR for AS because of other factors, such as poorly controlled hypertension or patient–prosthesis mismatch.^{6,7} In this study, an approximately 25% regression of LV mass and LVMI was observed with all sizes of both bioprosthetic models at 6 months after AVR, an observation concordant with the 15% to 38% decrease reported by previous studies.^{15–17} The impact of the various valve models and sizes implanted on the regression of LV mass remains controversial. Some investigators found a lesser decrease in LV mass with small than large valves,^{12,18} whereas others observed no correlation between valve size and regression of LV hypertrophy.¹⁹ In the meta-analysis by Kunadian and associates,²⁰ the decrease in LV mass was similar among different valve types. In another study, Christakis and associates¹⁹ reported a similar regression of LV hypertrophy with 3 different valve sizes. In this study, a statistically significant decrease in LV mass and LVMI were observed with the 2 valve types and all valve sizes.

The primary objective of this study was to compare TTE with cardiac MRI in the assessment of decrease in LV mass and LVMI. Current clinical practices rely mostly on TTE for measurements of LV mass because it is readily available

and correlates with contrast left ventriculography.¹¹ However, although 2-dimensional echocardiography reliably measures LV wall thickness and LV diameter at the base of the heart, its calculation of the LV mass depends on the Devereux formula, which has limitations in diseased states because of the geometric assumptions it makes.⁹ Moreover, TTE is acoustic window–dependent and subject to considerable interobserver and intraobserver variability.¹³ In contrast, cardiac MRI yields precise and highly reproducible measurements. Several studies have confirmed the accuracy of cardiac MRI in the assessment of the hypertrophied left ventricle.^{10,21–23} Bottini and colleagues²¹ found MRI to more precisely and reliably measure LV mass than TTE and to be more suitable to evaluate hypertensive patients. Allison and coworkers²² made similar observations in patients with hypertrophic cardiomyopathy, although in our study it seems that TTE grossly overestimated LV mass and LVMI, as observed in other studies.²⁴

Another advantage of cardiac MRI is the volumetric quantification in the assessment of LV ejection fraction. TTE, which is based on geometric assumptions, detected a significant difference in LV ejection fraction between baseline and 6 months limited to the Epic Supra group. MRI recorded decreases in LV end-diastolic and end-systolic volume, thus no change in stroke volume, and statistically significant increases in LV ejection fraction between baseline and 6 months with both valve models, confirming its superiority versus echocardiography in the measurements of volumes. The decrease in follow-up cardiac output may be attributed to the slower heart rate, explained by the consumption of beta-adrenergic blockers in 50.3% of patients at 6 months versus 29.5% preoperatively.

Because of an approximately 10-fold higher cost of MRI compared with TTE, its routine use for estimating LV mass

regression is still impracticable, especially as the absolute precision in its estimation is rarely needed. Despite this fact, MRI is a good alternative in patients in whom TTE is not possible or its quality is insufficient.

In conclusion, AVR using the Epic and Epic Supra bioprostheses results in a statistically significant decrease in mean LVMI at 6 months after the operation. On the basis of the results of this study and a review of the literature, it seems that MRI is more accurate in measuring the dimensions of the LV. An ultimate validation of this thesis could only be done comparing each of these modalities with pathologic examination.

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TABLE E1. Incidence of clinical outcomes in 149 recipients of aortic Epic and Epic Supra bioprostheses at 30 days and 6 months of follow-up

Clinical events	Epic (n = 77)	Epic Supra (n = 72)	All patients (n = 149)
0-30 days			
Death	2 (2.6)	1 (1.4)	3 (2.0)
Intrathoracic hemorrhage requiring reoperation	2 (2.6)	2 (2.8)	4 (2.7)
Atrial fibrillation	10 (13)	2 (2.8)	12 (8.1)
Complete heart block requiring permanent pacing	5 (6.5)	3 (4.2)	8 (5.4)
Pericardial effusion	3 (3.9)	0 (0)	3 (2.0)
Bleeding ulcer	0 (0)	1 (1.4)	1 (0.7)
1-6 months			
Death	1 (1.3)	1 (1.4)	2 (1.4)
Valve thrombosis	0 (0)	1 (1.4)	1 (0.7)
Embolic stroke	0 (0)	1 (1.4)	1 (0.7)
Withdrawal from the study	6 (7.8)	1 (1.4)	7 (4.7)
Miscellaneous causes of missing data	8 (10.4)	6 (8.3)	14 (9.4)
Available data at 6 months	60 (77.9)	61 (84.7)	121 (81.2)

Values are numbers (%) of observations.

TABLE E2. Comparison of patients who did versus did not undergo concomitant CABG surgery

Measurement	Patient group	
	CABG (n = 26)	No CABG (n = 123)
Age, y	73.3	73.3
Body mass index, kg/m ²	28.4	27.8
Body surface area, m ²	1.81	1.82
LV echocardiographic		
Ejection fraction at baseline, %	68.9	68.4
Mass, g		
At baseline	240	253
At follow-up	178	180
Δ LVMI, g/m ²		
On echocardiogram	35.8	38.8
On MRI	22.4	22.0

Values are means. Between-groups differences are all statistically nonsignificant. CABG, Coronary artery bypass graft; LV, left ventricular; LVMI, left ventricular mass index; MRI, magnetic resonance imaging.