Cardiac resynchronization therapy in low-flow low-gradient aortic stenosis

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A 74-year-old male with New York Heart Association (NYHA) Class IV heart failure, low-flow low-gradient (LFLG) aortic stenosis, and severe functional mitral regurgitation (MR) was referred for transcatheter aortic valve implantation. Medical history included permanent atrial fibrillation and complete heart block requiring dual-chamber pacemaker implantation. Coronary angiography showed no flow-limiting lesions. Transthoracic echocardiogram (TTE) showed a left ventricular ejection fraction (LVEF) of 27%, stroke volume index (SVI) of 26 cc/m², aortic valve area (AVA) of 0.77 cm², AV mean systolic gradient (MG) of 20 mmHg, and severe functional MR (Panel: Supplementary data online, Video S1). With dobutamine, SVI increased to 34 cc/m², AVA increased to 0.87 cm², and MG increased to 26 mmHg, diagnosed as ‘fixed LFLG severe aortic stenosis’. The patient was considered extremely high risk. Cardiac resynchronization-defibrillator therapy (CRT-D) was recommended as the next step for heart failure despite optimal medical therapy and ongoing need for continuous right ventricular pacing. After 1 month of biventricular pacing, the patient improved symptomatically to NYHA Class II, and TTE showed LVEF 33%, SVI 40 cc/m², AVA 1.1 cm², MG 25 mmHg, and mild–moderate MR (Panel: Supplementary data online, Video S2). At 9 months follow-up, the patient was NYHA Class I. TTE revealed LVEF 58%, SVI 48 cc/m², AVA 1.1 cm², MG 32 mmHg, and trivial MR (Panel: Supplementary data online, Video S3). CRT has been shown to improve MR and normalize LVEF, but in this singular instance also normalized forward stroke volume to allow determination of true severity of underlying aortic stenosis, which was moderate, obviating the need for aortic valve intervention.

At presentation, the patient was noted to have severe MR (A), low SVI of 26 cc/m² (B), AVA of 0.77 cm², and MG of 20 mmHg (C), suggestive of severe LFLG aortic stenosis. After 1 month of CRT-D upgrade and biventricular pacing, MR was mild–moderate (D), SVI improved to 40 cc/m² (E), AVA increased to 1.1 cm², and MG was 25 mmHg (F). At 9 months follow-up, only trivial MR was present (G), SVI increased to 48 cc/m² (H), AVA was 1.1 cm², and MG was 32 mmHg (I) consistent with moderate aortic stenosis.

Supplementary data are available at European Heart Journal—Cardiovascular Imaging online.

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