

Catheter-based edge-to-edge mitral valve repair for pulmonary pressure reduction and to postpone heart transplantation in a teenaged patient

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Abstract

We report a case of catheter-based edge-to-edge mitral valve repair in a teenage male patient with non-ischaemic cardiomyopathy to improve pulmonary hypertension secondary to severe functional mitral regurgitation (FMR) to defer anticipated heart transplantation. A 19-year-old patient with previous history of fulminant myocarditis followed by markedly left ventricular dysfunction presented with severe mitral regurgitation 3 years after initial recovery. Slightly over time, deterioration of FMR was associated with gradual increase in pulmonary artery pressures despite optimal medical therapy. MitraClip implantation in this young patient was successfully performed with sustainable improvement of pulmonary hypertension.

Keywords Mitral valve regurgitation; Myocarditis; Pulmonary hypertension; MitraClip

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Case report

A 16-year-old Caucasian male patient initially presented with cardiogenic shock due to fulminant myocarditis following gastrointestinal infection. Listing for heart transplantation at high urgency was considered but finally abandoned because of clinical stabilization due to inotropic support followed by neurohormonal therapy.

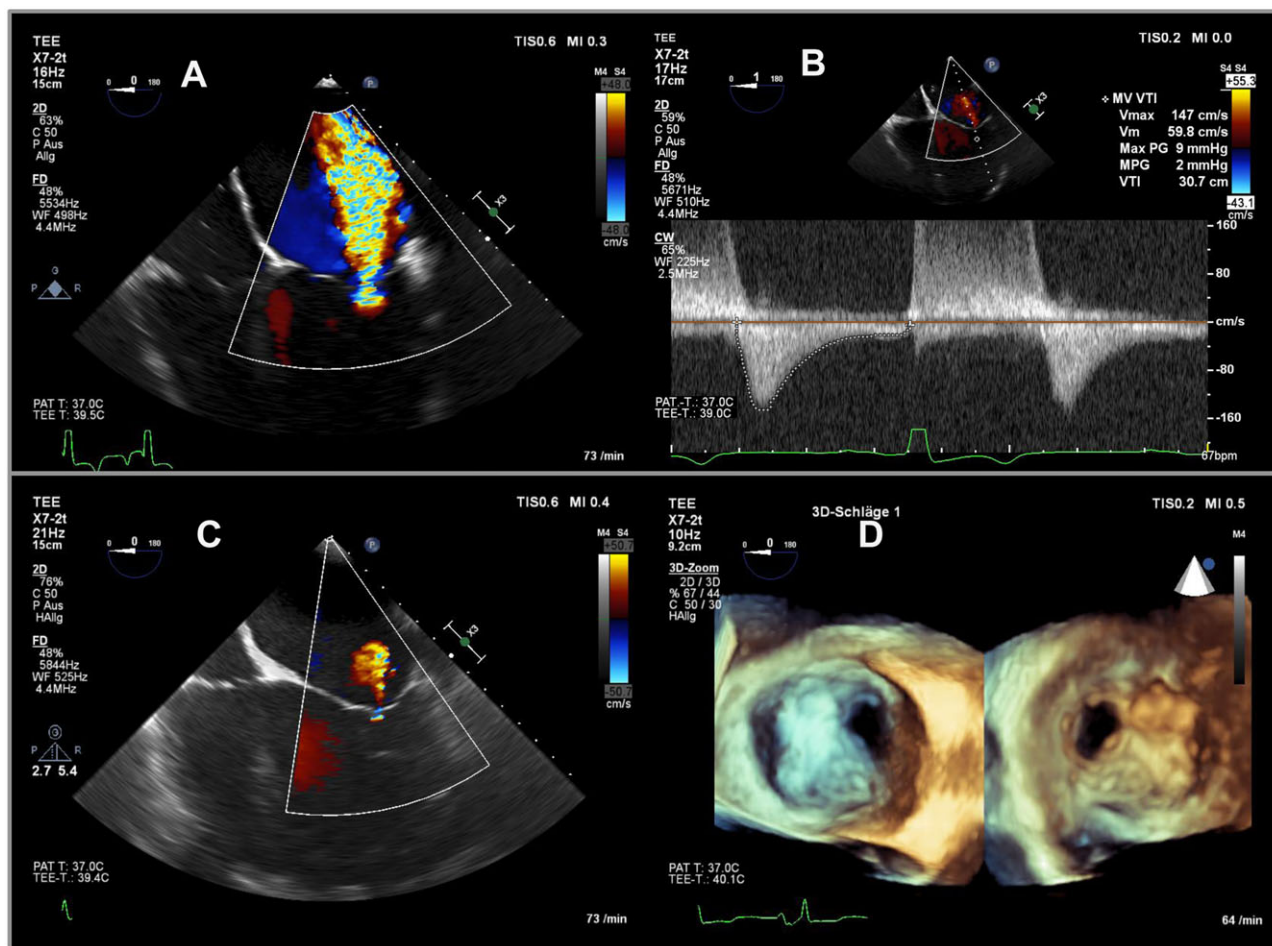
Three years later, at the age of 19, the patient was referred to our centre for deteriorating heart failure symptoms classified as New York Heart Association (NYHA) Class III. Physical examination revealed extension of jugular veins and a 4/6 loud systolic heart murmur at the apex. N-terminal pro-BNP was 5524 ng/L.

Transthoracic echocardiography showed severely reduced function (left ventricular ejection fraction of 28%) of a markedly dilated left ventricle (left ventricular end-diastolic diameter of 75 mm) with severe mitral regurgitation (MR) and moderate to severe tricuspid regurgitation, whereas right ventricular function was still preserved.

Neurohormonal therapy and diuretics were optimized, and a transvenous defibrillator (implantable cardioverter defibrillator) was implanted for primary prophylaxis. Two months later, the patient was in NYHA Class II. Transoesophageal echocardiography confirmed severe functional MR (IIIb according to Carpentier's classification) based on mitral ring dilatation and restrictive posterior mitral leaflet motion. Effective regurgitant orifice area was 0.56 cm² (Figure 1A). Right-heart catheterization revealed enlarged V-wave (41 mmHg) in the mean pulmonary capillary wedge pressure (PCWP 29 mmHg) tracing and reduction of cardiac index (CI 1.46 L/min/m²). Symptom-limited treadmill exercise performed in supine position revealed worsening of secondary pulmonary hypertension (PH) [mean pulmonary artery pressure (mPAP) from 40 to 45 mmHg] due to an increase in PCWP from 29 to 34 mmHg, whereas CI decreased from 1.46 to 1.2 L/min/m² (Figure 2A).

Discussion in the heart team was based on anticipated clinical deterioration of the patient in the future associated with further increase of PH. In particular, fixation of PH and therefore with a potential contraindication for possible heart

Figure 1 Transoesophageal echocardiography shows reduction of functional mitral regurgitation from severe (A) to mild (B) with successful implantation of three MitraClips. Antegrade gradient across the mitral valve was 2 mmHg.



transplantation were suspected. Thus, MitraClip implantation was recommended to prevent the further increase of pulmonary pressures and to delay heart transplantation in this teenage patient.

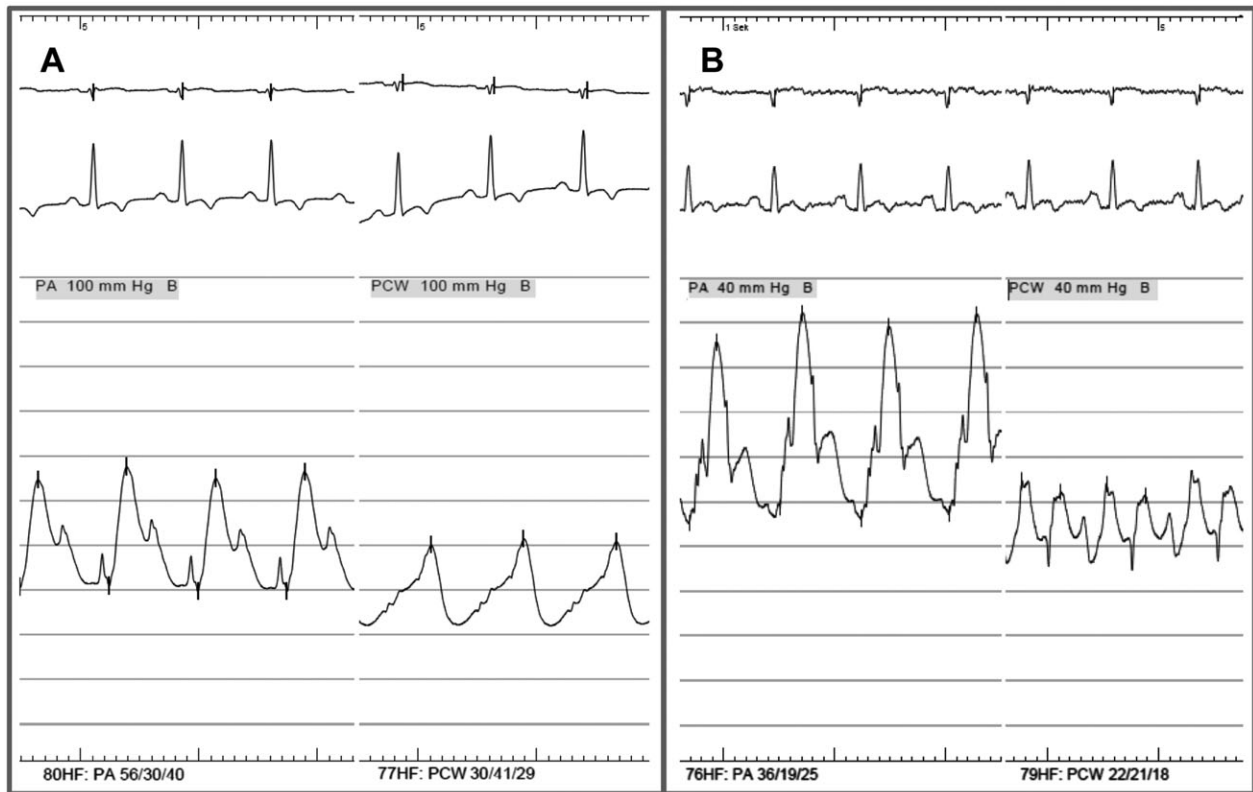
Finally, three clips were successfully implanted (Figure 1D), resulting in a reduction of MR from severe to mild with a diastolic mean pressure gradient across the mitral valve of 2 mmHg (Figure 1B). Improvement of MR was associated with a significant reduction in mPAP (31 mmHg) and decrease of tricuspid regurgitation (TR), whereas cardiac output increased from 2.8 to 3.56 L/min, CI from 1.46 to 1.86 L/min/m², and tricuspid annular plane systolic excursion (TAPSE) from 17 to 22 mm and pulmonary vascular resistance improved from 3.93 to 2.27 Woods units.

At 3 month follow-up, the patient was in NYHA Classes I and II. Transoesophageal echocardiography showed only mild

MR (Figure 1C) and systolic pulmonary artery pressure calculated by Doppler echocardiography was 35 mmHg. Despite an intermittent episode of ventricular fibrillation, which was terminated by implantable cardioverter defibrillator shock, excellent short-term results were maintained after 1 year. Currently, the patient is working again as a salesperson, MR is still mild on transthoracic echocardiography, and invasive haemodynamics (mPAP 25 mmHg, PCWP 18 mmHg) are acceptable (Figure 2B).

Based on this case report and on previous publications that have addressed the impact of MitraClip implantation on PH,^{1,2} MitraClip implantation can be considered in selected patients with severe cardiomyopathy and functional MR as a means to maintain pulmonary artery pressures in a range that is acceptable for possible heart transplantation.

Figure 2 Pre-interventional resting haemodynamics, pulmonary artery (PA) pressure and pulmonary capillary wedge (PCW) pressure (A) significantly improved after MitraClip implantation with sustained effects at 1 year follow-up (B). In parallel, cardiac output increased from 2.8 to 3.6 L/min.



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