

Case report

Endoventricular circular patch plasty for end-stage valvular cardiomyopathy

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Abstract

We present here a case of end-stage non-ischemic valvular dilated cardiomyopathy (DCM) associated with mitral regurgitation (MR). The patient underwent surgery where left ventricular volume reduction using endoventricular circular patch plasty (EVCPP) and mitral valve replacement (MVR) were performed. He has improved much after the operation and is now in New York Heart Association (NYHA) functional class II. © 2001 Elsevier Science B.V. All rights reserved.

Keywords: Dilated cardiomyopathy; Endoventricular circular patch plasty

1. Case report

A 66-year-old male patient was admitted to our hospital for treatment of NYHA class IV heart failure. He had had two previous cardiac valve operations. Initial valve surgery was an aortic valve replacement (AVR) with mechanical tilting disc valve for rheumatic aortic valve stenosis 13 years previously. The second operation included re-AVR with bileaflets prosthesis, mitral annuloplasty using artificial ring, and tricuspid annuloplasty 5 years ago. He had been in good general condition with NYHA class II until the age of 65 years old when he gradually developed NYHA class III–IV cardiac failure and was diagnosed with valvular cardiomyopathy. Although he received intensive medication including digoxin, diuretics, angiotensin converting enzyme inhibitor, and beta-blocker, he could not recover well and was finally burdened with NYHA class IV heart failure requiring mild inotropic support.

Echocardiography without inotropes showed left ventricular end diastolic volume index (LVEDVI) of 167 ml, left ventricular end systolic volume index (LVESVI) of 146 ml (Fig. 1), left ventricular ejection fraction (LVEF) of 12%, grade 2+ MR, and normal function of aortic bileaflet mechanical prosthesis. Dobutamine stress echocardiography revealed improvement of LVEF up to 31%, particularly lateral wall motion improvement with wall thickness, but the apical and anteroseptal wall stayed thin and akinetic.

Three-dimensional images of quantitative gated single photon emission computed tomography (QGS) demonstrated akinesis and very poor isotope uptake in the apical and anteroseptal wall. Cardiac catheterization showed cardiac index of 1.8 l/min/m², systolic pulmonary artery pressure of 50 mmHg, mean pulmonary capillary wedge pressure of 26 mmHg. Coronary angiography showed no abnormal lesion.

We scheduled left ventricular volume reduction surgery using EVCPP and MVR. On cardiopulmonary bypass with cold blood cardioplegia, MVR with preservation of posterior mitral leaflet using a bileaflet mechanical prosthesis after removal of the previously implanted artificial ring via a right-sided left atriotomy was performed first and then the left atrium was closed, the aortic clamp removed, and the left ventricle was opened through an antero-apical incision of 7 cm long. The line of endoventricular purse-string suture was decided by close observation and palpation of the left ventricle under beating heart. The purse-string suture of 2-0 monofilament was tightened, and then the remaining opening was closed with an equine pericardial patch with 3-0 monofilament sutures. Finally, the left ventricle was closed. The patient was weaned from cardiopulmonary bypass easily with moderate inotropic support.

An echocardiographic study 6 weeks after the operation revealed LVEDVI of 100 ml, LVESVI of 74 ml (Fig. 2), and LVEF of 26% without inotropic support. We did not perform the postoperative catheterization study. Presently, at 6 months follow-up, he is in NYHA class II.

We could not perform a histologic examination because

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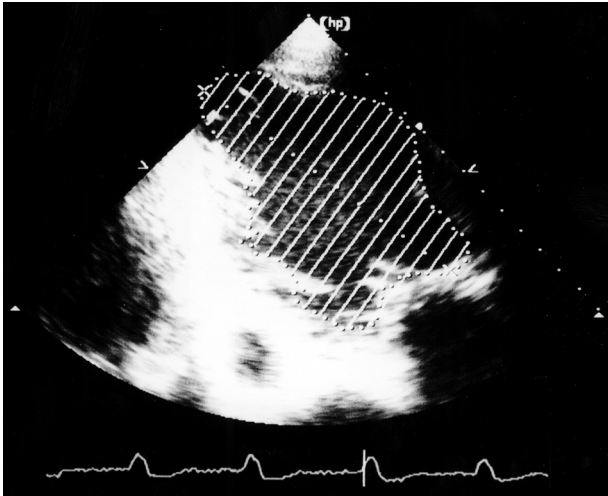


Fig. 1. Preoperative echocardiography showed left ventricular end diastolic volume index of 167 ml.

of the lack of myocardial specimen from the excluded left ventricular wall.

2. Comment

Left ventricular volume reduction surgery, such as partial left ventriculectomy (PVL) [1] and EVCPP [2], has become increasingly interesting as a surgical treatment for end-stage DCM because of a donor shortage for heart transplantation. EVCPP has been developed as a surgical treatment for patients with severe left ventricular dysfunction due to anterior myocardial infarction with large akinetic or dyskinetic left ventricular aneurysm to improve hemodynamic function and clinical status [2,3]. However, we think that EVCPP would also be a useful procedure for non-ischemic valvular DCM with severe myocardial dysfunction if a large akinetic

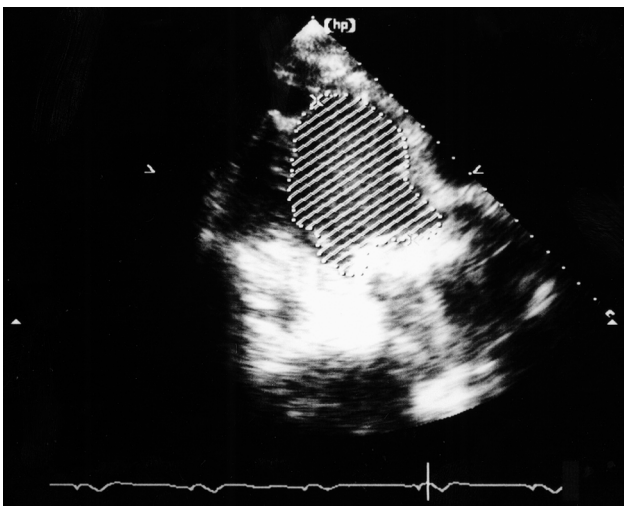


Fig. 2. Postoperative echocardiography showed left ventricular end diastolic volume index of 100 ml.

muscle is detected in the anterior, antero-apical, or antero-septal wall of the left ventricle.

There is a controversy regarding whether isolated mitral valve surgery is sufficient to obtain favorable postoperative left ventricular remodeling and clinical improvement in patients with DCM, mitral regurgitation and poor myocardial function. Bolling and associates [3] demonstrated very acceptable early and intermediate-term results of isolated mitral valve repair by means of annuloplasty in patients with severe secondary mitral regurgitation due to ischemic or idiopathic DCM with severe left ventricular dysfunction. Bishay and colleagues [4] also reported that isolated mitral valve surgery offers symptomatic improvement and survival benefit for patients with severe left ventricular dysfunction and primary or secondary severe MR. However, our patient was different from their patients in terms of the severity of MR. Our patient had only moderate MR (grade 2+), but all 48 patients reported by Bolling and associates [4] had severe grade 4+ MR, and 73% and 27% of the patients reported by Bishay and colleagues [5] showed severe (grade 4+) and moderate-severe MR (grade 3+), respectively. Thus, isolated mitral valve surgery would work for patients with cardiomyopathy where mitral valve regurgitation is one of the main causes of ventricular dilatation and dysfunction. Although the amount of MR in our patient was not severe, he needed hospitalization with inotropic support for NYHA class IV heart failure with severely deteriorated myocardial function. Therefore, we thought that mitral valve surgery alone could not improve the heart failure in our patient with only grade 2+ MR. We believe that the EVCPP associated with MVR played an important role in the significant clinical and hemodynamic improvement observed in our patient.

The moderate MR (grade 2+) in this patient was due to the degenerated fragile mitral leaflets and loss of adequate leaflets coaptation by the left ventricular dilatation with displacement of papillary muscles and tension on the chordae. However, because the prosthetic ring was previously implanted, there was no mitral annular dilatation. We judged that the mitral valve was inappropriate to be repaired by valve preservation procedure to obtain a complete competence with no residual MR. In this particular patient, complete control of the mitral regurgitation is necessary and even a mild (grade 1+) residual MR would exert a bad influence on left ventricular function. Therefore we decided to perform MVR.

We are aware that careful patient selection is important in applying EVCPP to end-stage non-ischemic DCM. Preoperative examinations including rest and stress echocardiography and QGS are necessary to decide the application of this procedure. Because it is difficult to find the border between the akinetic and kinetic area of non-ischemic DCM with severe left ventricular dysfunction, intraoperative close observation and palpation of the opened left ventricle under beating heart in addition to the data obtained by preoperative studies are important to determine the line

of purse-string suture in the left ventricle. In our patient, scarred endocardium and thin myocardium were recognized in the apical and anteroseptal wall of the left ventricle. Large prospective randomized studies including isolated mitral valve surgery versus combined mitral valve surgery and EVCPP are necessary to find an ideal candidate.

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