

Reasonable and Effective Volume Reduction of a Giant Left Atrium Associated with Mitral Valve Disease

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Severe left atrial enlargement associated with mitral valve disease has been known to carry a poor prognosis in patients undergoing mitral valve repair or replacement. There are several reasons why left atrial size can have a significantly negative impact on prognosis. A giant left atrium (LA) can cause postoperative respiratory dysfunction by bronchial and pulmonary compression and hemodynamic disturbance subsequent to compression of the posterobasal portion of the left ventricle (LV). Moreover, the presence of a giant LA can increase thromboembolic risk despite anticoagulant therapy after operation. We report a case of a 62-year-old female who had a markedly enlarged LA associated with mitral valve stenosis and regurgitation. The patient, who had severely restrictive and obstructive respiratory dysfunction, underwent mitral valve replacement and left atrial volume reduction with postoperative improvement in hemodynamic and respiratory function. We believe that volume reduction of an enlarged LA, in addition to mitral valve surgery, is important not only because it leads to improvement in heart failure but also because it will relieve compression of the adjacent organs. (*Ann Thorac Cardiovasc Surg* 2008; 14: 252–255)

Key words: giant left atrium, volume reduction, mitral valve disease, restrictive and obstructive respiratory dysfunction, low-output syndrome

Introduction

A giant left atrium (LA) associated with mitral valve disease can cause postoperative respiratory dysfunction by compression of the left main bronchus and/or the right middle and lower lobes and hemodynamic disturbance produced by impingement on the posterobasal portion of the left ventricle (LV). Moreover, the presence of a giant LA can increase thromboembolic risk despite postoperative anticoagulant therapy.^{1,2)}

Some authors have reported that left atrial volume reduction resulted in a significant decrease in the incidence of postoperative low-cardiac output syndrome

and respiratory dysfunction, and possibly also a reduction in mortality.^{2–6)} We believe that surgical correction of this anatomical abnormality secondary to mitral valve disease should be considered for patients who preoperatively have obstructive and/or restrictive respiratory disorder and low-output syndrome brought about by a giant LA to reduce postoperative morbidity and mortality.

Case Report

A 62-year-old female was referred to our hospital with severe heart failure resulting from mitral valve stenosis and regurgitation and a 15-year history of atrial fibrillation. On chest X-ray, the cardiothoracic ratio was 100%, the left main bronchus appeared compressed leftward and upward by the enlarged LA, and the carinal angle was more than 130°. As a likely consequence of the left main bronchial compression, forced expiratory volume/second (FEV₁) was only 0.76 L. Also, vital capacity (VC) was decreased to 1.52 L resulting from a compres-

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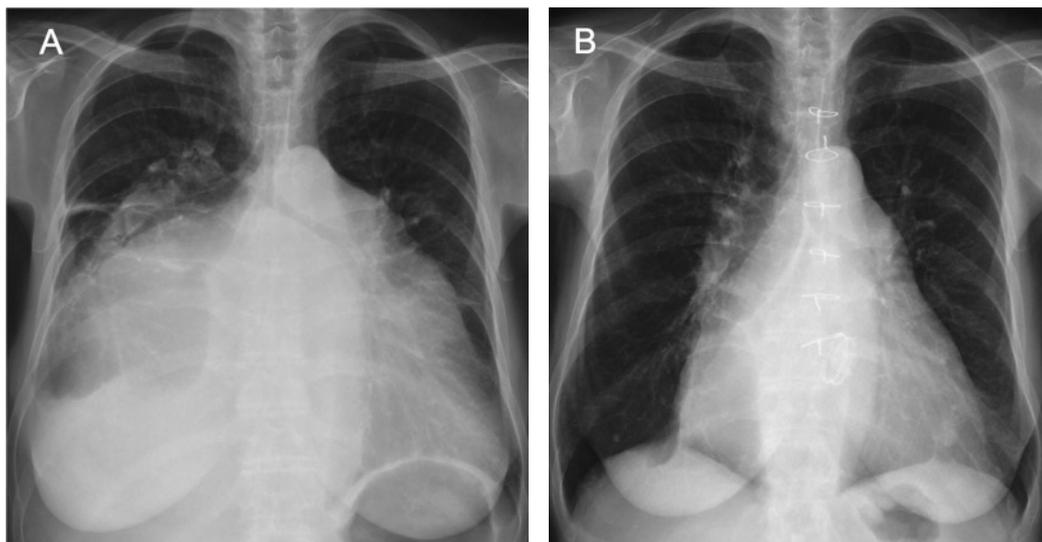


Fig. 1.

- A:** Preoperative chest X-ray demonstrating cardiac enlargement with a cardiothoracic ratio of 100%, and compression of the left main bronchus by the enlarged left atrium (LA).
- B:** The postoperative cardiothoracic ratio is markedly reduced, and compression of the left main bronchus appears improved.

sion of the right middle and lower lobes. Transthoracic echocardiography showed good left ventricular function with an ejection fraction of 55% in the setting of severe mitral valve stenosis and regurgitation. The LA was severely enlarged with a maximum diameter of 94 mm. The posterobasal wall of the LV was compressed toward the interventricular septum with paradoxical motion. There were no endocavitary thrombi.

Surgical intervention was carried out through a median sternotomy; cardiopulmonary bypass was established with ascending aortic perfusion and bicaval drainage. With the heart beating, the adhesion of the downward-expanding LA to the posterobasal wall of the LV was dissected to facilitate the later volume reduction of the LA. Intermittent antegrade and retrograde infusion of cold blood cardioplegia was used for myocardial protection. Exposure of the mitral valve was achieved through a superior-transseptal approach. Mitral valve replacement was performed with a 27/29 mm ON-X valve (Medical Carbon Research Institute, Austin, TX). Then, according to “spiral resection” technique described by Sugiki and colleagues,⁵⁾ the markedly enlarged left atrial wall was resected with a strip 3 to 4 cm wide from the interatrial septum to the right lateral wall of the LA through the roof, lateral, posterior, and inferior walls, then sutured along the re-

section line. We also performed a plication of the posterior wall between the right and left pulmonary veins. Lastly, tricuspid annuloplasty was performed with a 32 mm Cosgrove-Edwards annuloplasty band (Edwards Lifesciences, Irvine, CA). The patient was easily weaned from a cardiopulmonary bypass.

Postoperative recovery was uneventful with no sign of low-output state or respiratory failure. In spite of preoperative low FEV₁, the patient was extubated without difficulty. On chest X-ray, the cardiothoracic ratio was markedly reduced to 64%, the diameter of the left main bronchus was widened, and the carinal angle was decreased to 60°, from 130° (Fig. 1). As a result of the relief from compression of the left main bronchus, FEV₁ improved to 2.39 L. Also, percent VC (%VC) increased to 98%, resulting from the relief from compression of the right middle and lower lobes. Echocardiography confirmed a reduction of the left atrial diameter from to 58 mm, from 94. Chest computed tomography clearly demonstrated the reduced postoperative volume of the LA (Fig. 2).

Discussion

Severe enlargement of the LA has been known to have a poor prognostic impact on patients with mitral valve

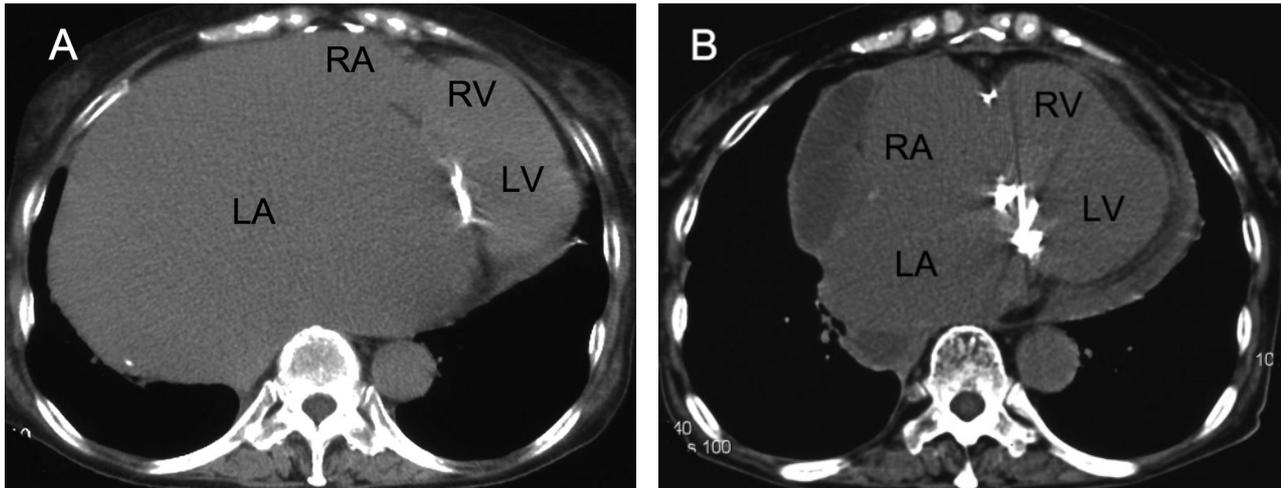


Fig. 2. Computed tomography of the chest, showing left atrial volume reduction.
A: Preoperative.
B: Postoperative.
 LA, left atrium; LV, left ventricle; RA, right atrium; RV, right ventricle.

disease undergoing either repair or replacement. Reed and colleagues¹⁾ reported that left atrial dimension on two-dimensional echocardiography is one of the most important determinants of outcome after mitral valve replacement. Kawazoe and colleagues²⁾ pointed out two distinctive pathophysiological changes associated with a giant LA. One is respiratory disorder because of the compression of the left main bronchus and/or the right middle and lower lobes by leftward, upward, and rightward expansions, respectively, of the LA. The other is hemodynamic disorder because of the compression of the posterobasal portion of the LV by downward expansion of the LA, which was reported echocardiographically in detail by Beppu and colleagues.⁷⁾ Furthermore, the presence of a significantly enlarged LA can increase the thromboembolic risk regardless of anticoagulation therapy.

To avert these problems, various operations have been considered. Volume reduction may be attainable by simple wall plication, but resection and primary suture can achieve a more secure and extensive volume reduction. Because our patient had the preoperative findings pointed out by Kawazoe and colleagues,²⁾ we adopted the “spiral resection” technique, as reported by Sugiki and colleagues,⁵⁾ to attain thorough volume reduction of the LA. This results in a postoperative improvement of respiratory function and cardiac performance. The active atrial wall resection begins at the in-

teratrial septum and extends to the right lateral wall of the LA through the roof and the lateral, posterior, and inferior walls. We added plication of the posterior wall between the right and left pulmonary veins to achieve maximal volume reduction. We believe that these interventions reasonably and effectively relieved compression of the left ventricular wall, left main bronchus, and right middle and lower lobes by the enlarged LA. The abnormal preoperative findings of the left main bronchus, right middle and lower lobes, and the posterobasal portion of the LV almost disappeared, and the patient’s quality of life remarkably improved postoperatively.

We believe that surgical correction of left atrial enlargement is imperative in patients with mitral valve disease and a giant LA, especially when left bronchial displacement and respiratory impairment are evident preoperatively.

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