Partial cardiac autotransplantation with a concomitant mitral valve, aortic valve replacement and tricuspid plasty

Jun Pan\textsuperscript{a}, Qing-Guo Li\textsuperscript{b}, Jie Li\textsuperscript{a} and Dong-Jin Wang\textsuperscript{a,*}

\textsuperscript{a} Department of Cardiothoracic Surgery, The Affiliated Drum Tower Hospital of Nanjing University Medical School, Nanjing, Jiangsu Province, China
\textsuperscript{b} Department of Cardiology, The Affiliated Drum Tower Hospital of Nanjing University Medical School, Nanjing, Jiangsu Province, China
\textsuperscript{*} Corresponding author. No.321, East Zhong Shan Road, Nanjing, Jiangsu Province 210008, China. Tel: +86-2583304616; fax: +86-2583105117; e-mail: djwgl@hotmail.com (D.-J. Wang).

Received 8 March 2013; received in revised form 8 May 2013; accepted 28 May 2013

Abstract

We describe a case with left atrial volume reduction of a giant left atrium, treated successfully by partial cardiac autotransplantation, concomitant mitral and aortic valve replacement, and tricuspid valve plasty. We obtained good results at the 1-year follow-up.

Keywords: Cardiac autotransplantation • Mitral valve • Aortic valve • Surgery

INTRODUCTION

A giant left atrium (GLA) can cause severe oppression of its surrounding tissues and organs such as the trachea, bronchus, lung and left ventricle. Because GLA can increase the risk of sudden death, its existence merits careful evaluation and surgical intervention when needed \cite{1, 2}. Cardiac autotransplantation has been recommended to achieve left atrium volume reduction and relief of compressive symptoms after surgery \cite{3, 4}. We describe here a patient with a GLA who had successful surgical correction by partial heart autotransplantation. The mitral and aortic valves were replaced by mechanical prostheses, and a tricuspid valve annuloplasty was also performed.

CASE REPORT

The patient was a 46-year old female with a 20-year history of dyspnoea, worsening chest discomfort and a history of more than 15 years of persistent atrial fibrillation. Preoperative transthoracic echocardiography revealed severe mitral and aortic valve stenosis, severe tricuspid valve regurgitation, an ejection fraction of 42%, left atrium dimensions of $10.7 \times 8.3$ cm and an atrial volume of 789 ml. The left ventricular diastolic diameter was 6.4 cm and systolic diameter was 5.1 cm. The patient was classified as New York Heart Association Class IV. Computed tomography showed midoesophageal and bilateral pulmonary compression from the left atrium. Preoperative coronary angiography showed no coronary artery stenosis.

Standard midline sternotomy with aortic and bicaval cannulation was used. The superior vena cava (SVC) was cannulated 3 cm above the junction between the right atrium and the SVC using an L-shaped cannula. Retrograde cold blood cardioplegia was administered every 20 min for myocardial protection. After aortic cross-clamping, the SVC, aorta and pulmonary artery were transected in the same way as in heart transplantation. The inferior vena cava was left intact. The left atrium was resected except for its base, conserving the left and right pulmonary vein orifices. The lateral wall, atrial appendage, atrial roof and the region between the pulmonary veins and the mitral annulus were resected, leaving enough area for suturing. The mitral and aortic valves were replaced with St. Jude mechanical valves (St. Jude Medical, Inc., St. Paul, MN, USA). Then, the left atrium was closed using running 5-0 polypropylene sutures (Fig. 1) \cite{3}. Finally, through a vertical right atriotomy, a tricuspid annuloplasty was performed with an Edwards MC\textsuperscript{3} tricuspid annuloplasty ring (Edwards Lifesciences, Irvine, CA, USA). Cardiopulmonary bypass and cross-clamp time were 320 and 250 min, respectively.

The patient was discharged 15 days after surgery. The 1-year follow-up echocardiography revealed a well-functioning prosthetic mitral and aortic valve, trace tricuspid insufficiency, an ejection fraction of 55% and a left atrial volume of 116 ml. The left ventricular diastolic diameter was 4.86 cm and systolic diameter was 3.65 cm (Fig. 2A and B).

DISCUSSION

Currently, there is no consensus regarding the management of GLA during mitral valve surgery \cite{5}. Risk of excessive bleeding, increased cardiopulmonary times and unclear surgical efficacies raise many questions about the optimal approach to GLA reduction. The conventional technique is partial plication. The classic plication technique involves occluding the left atrial appendage and plicating just the inferior wall of the left atrium. This technique results in a modest left atrial volume reduction and may leave a potentially thrombogenic surface within the left atrium. Lessana et al. \cite{4} presented a case in which GLA was...
reduced by means of partial autotransplantation, with excellent results. In the present case, we successfully used this technique to reduce the volume of GLA that was associated with mitral and aortic valve operations.

The biggest advantage of this technique was an extensive reduction of the left atrial volume. The intended benefits of reducing a GLA included alleviating the pressure effects to the left ventricle, bronchus and lung parenchyma and reducing the early postoperative complications related to low cardiac output syndrome and respiratory complications [2]. Also, this technique may have benefits in chronic atrial fibrillation in the context of mitral valve disease as left atrium size is an important factor in the successful treatment of chronic atrial fibrillation. However, a potential disadvantage of this technique is a risk of bleeding along the extensive suture lines and increased surgical time.

Conflict of interest: none declared.

REFERENCES


eComment. Mini-partial heart autotransplantation for atrial fibrillation and mitral valve surgery

Author: Ovidio A. Garcia-Villarreal
Department of Cardiac Surgery, Hospital of Cardiovascular Disease No. 34, IMSS, Monterrey, Mexico
doi: 10.1093/icvts/ivt377
© The Author 2013. Published by Oxford University Press on behalf of the European Association for Cardio-Thoracic Surgery. All rights reserved.

It is very exciting to discuss this beautiful article by Pan et al. [1]. There is considerable documentation in the literature about the use of partial heart autotransplantation for a variety of purposes. My teacher, Arrigo Lessana in Aubervilliers, France, had begun to use partial cardiac autotransplantation in the spring of 1998 [2] for adequate visualization to reduce the size of the left atrium (LA). Later, when I came back to Mexico, I operated on three cases of mitral valve disease and chronic atrial fibrillation (AF) with giant LA from 2000 to 2001 [3]. All three cases had a spectacular outcome. After this very nice experience, I promptly realized that by sectioning only the superior vena cava (SVC) one can get an effective access to the whole LA. So I performed about 100 cases of surgical isolation of the pulmonary veins to treat AF in mitral valve disease [4]. But it is clear that this was not a left-sided maze, and the sinus rhythm conversion rate was lower than those reported by Cox et al. [5]. With all this

Figure 1: Drawings of the technique of partial cardiac autotransplantation: (A) sectioning of the aorta, pulmonary artery and SVC, (B) the view after left atrial resection and (C) the left atrium was closed using running 5-0 polypropylene sutures.

Figure 2: (A) Preoperative transthoracic echocardiogram showing a GLA with a volume of 789 ml. (B) Postoperative transthoracic echocardiogram demonstrating significant reduction in left atrium and the volume is 116 ml.