Case Reports

A Patient with Giant Left Atrium Undergoes Orthotopic Heart Transplantation

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We present a novel technique for resolving the problem of radical size mismatch at the time of orthotopic transplantation. A 48-year-old man presented with chronic rheumatic heart disease and a giant left atrium. Twenty-three years before, he had undergone mitral valve replacement with a mechanical prosthesis. At the time of the repeated intervention, the volume of his left atrium was 350 mL.

Surgical features of the transplantation included approximation of the pulmonary vein ostia by gathering sutures intentionally, in order to decrease the area of the left atrial posterior wall and thereby enable appropriate coaptation with the donor left atrium. After the operation, left atrial volume had been reduced to 60 mL. ***(Tex Heart Inst J 2014;41(1):87-90)***

Orthotopic heart transplantation (OHT) remains the operation of choice in patients with end-stage chronic heart failure. Nowadays, up to 3,800 such operations are performed annually. Only 2.7% of patients undergo transplantation as a consequence of valvular cardiomyopathy.[1] In patients with rheumatic heart disease, the presence of giant left atrium (GLA) makes the technical aspects of transplantation more difficult because of substantial size mismatch between donor and recipient at the point of anastomosis. We present a rare case of OHT in a recipient with GLA.

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Case Report

In July 2011, a 48-year-old man presented with an enlarged heart caused by chronic rheumatic disease (Fig. 1). His height was 174 cm and his weight was 79 kg. Twenty-three years earlier, he had undergone mitral valve replacement with an EMIKS 27-mm disk graft (produced in the Union of Soviet Socialist Republics). Preoperative echocardiography showed a GLA (70 × 96 mm), with a calculated volume of 350 mL. Abdominal ultrasonic examination revealed ascites.

Upon reoperative median sternotomy, we encountered intensive adhesions. After exposing the ascending aorta and the superior vena cava, we instituted partial cardiopulmonary bypass (CPB). We continued to perform cardiolysis, exposing the inferior vena cava. We then switched to full CPB with bicaval cannulation. Cardiomegaly was found, chiefly in the left atrium (LA), right atrium, and left ventricle (LV). After cross-clamping the aorta, we explanted the heart (Fig. 2). After excising the right atrium, right ventricle, and LA, we found that the remaining wall of the LA presented a particular difficulty. The residual posterior wall was considerably enlarged (18 × 16 cm) and calcified, with immovable pulmonary veins (PVs) adjoined to the surrounding tissues. After freeing the PVs, we used 2 Prolene 4-0 monofilaments on 4 × 7-mm felt pads to approximate (via gathered sutures) the ostia of the PVs laterally along the posterior wall (Fig. 3A). Each horizontal suture was located between the upper and lower PVs. These were supplemented with Prolene 4-0 sutures on felt pads introduced vertically. Placing stitches only on the posterior left atrial wall (Fig. 3B), we implanted the LA of the donor heart. All told, posterior-wall reduction and donor left atrial implantation took 57 minutes. Other anastomoses were carried out uneventfully. Cardiopulmonary bypass time was 198 min. The donor heart was anoxic for 125 min, and the operation took 299 min in total. At the end of the procedure, up to 4 L of ascitic fluid was evacuated from the abdominal cavity through the diaphragm. The patient

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Fig. 1 *Chest radiograph before the procedure shows cardiomegaly, the result of rheumatic mitral valve disease of many years' duration.*

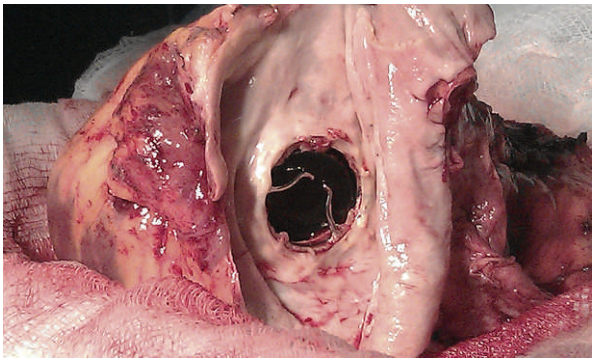

Fig. 2 *Photograph shows the patient's explanted heart.*

was discharged from the hospital on postoperative day 36 in a satisfactory condition, with a left atrial volume of 60 mL (Figs. 4 and 5).

Discussion

According to the medical literature, GLA (a volume of more than 300 mL) is found in union with mitral valve disease.[2] In recent years, OHT has usually been performed via a bicaval technique, with separate superior and inferior vena cava anastomoses. According to the United Network for Organ Sharing (UNOS), in 2005 the bicaval technique was used more often in the United States than was the biatrial technique (1,083 operations vs 806).[3]

The main problem in our case was the substantial mismatch between recipient and donor areas of the LA. Pulmonary hypertension and left atrial overload had resulted in a GLA in our patient. Hemodynamically, GLA compresses the heart chambers, vena cava, and trachea. Giant left atrium obstructs venous drainage from the vena cava by shifting the interatrial septum toward the right atrium. Moreover, it compresses the

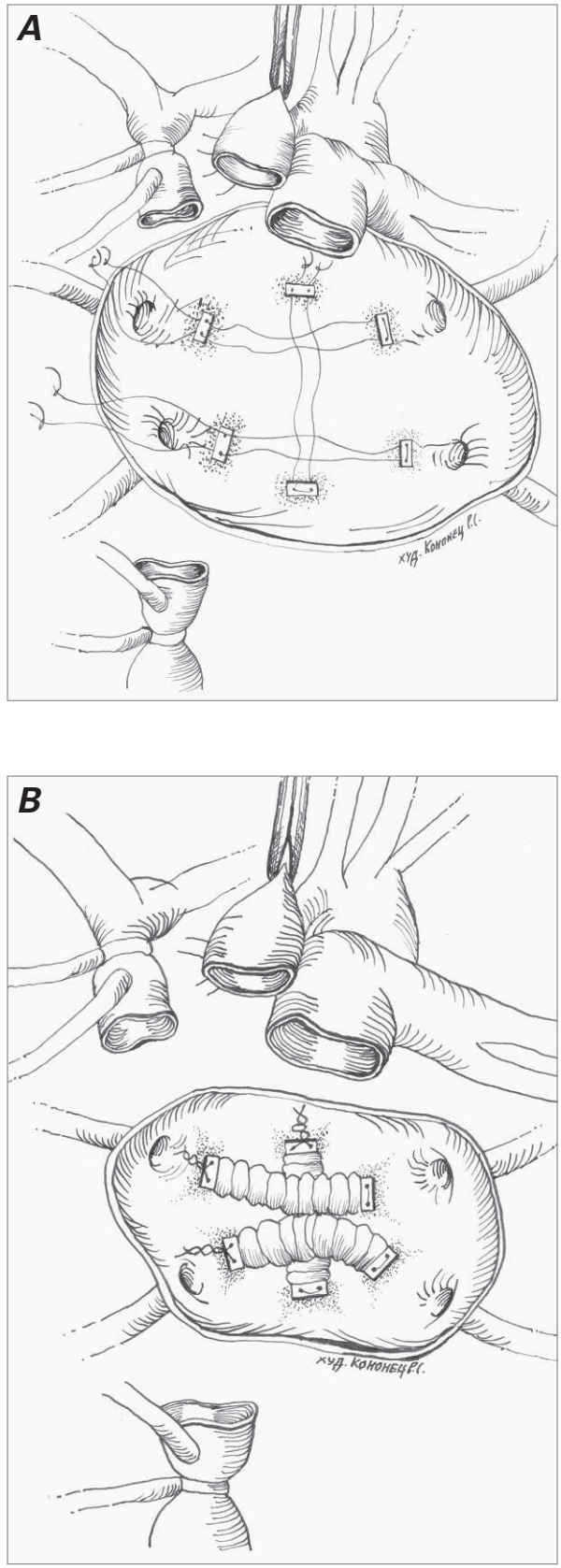

Fig. 3 *Diagrams show **A**) the approximated ostia (with gathered sutures) of the pulmonary veins as they appear laterally along the posterior wall, and **B**) a final view of the left atrial posterior wall.*

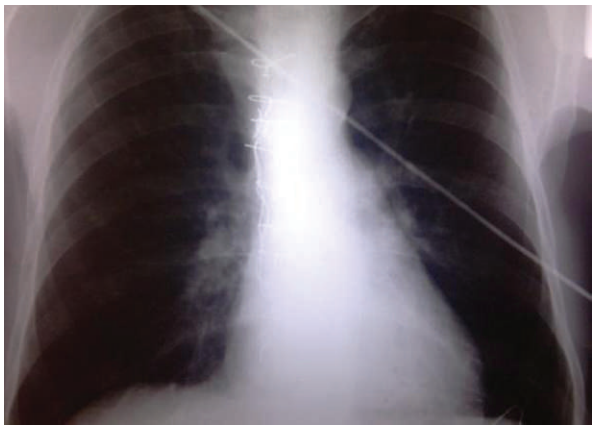

Fig. 4 *Chest radiograph after the procedure shows the left atrium to be greatly reduced in size.*

Fig. 5 *Computed tomogram 5 months postoperatively shows the left atrial posterior wall, reduced to 30 × 45 mm (arrow).*

LV walls by displacing the left atrial inferior wall downward. In addition, the PVs and GLA enlarge the pericardial cavity, thereby relocating the aorta, pulmonary artery, vena cava, and PVs.[4,5]

Conventionally, the treatment of GLA ranges from simple surgical methods to cardiac autotransplantation. In the English-language literature, we have found only 3 articles that refer to patients with GLA who became OHT recipients. The first report was that of Duncan and colleagues, in 1987.[6] They decreased atrial circumference and volume by plicating the excess tissue of the remaining atrium during biatrial OHT. The 2nd article, by Bishay and Smedira,[4] was published in 2000. It describes left atrial resection during biatrial OHT. The authors excised the LA and retained only left atrial cuffs around the ostia of the right and left PVs. Implantation of the PVs into the donor's LA was done in accordance with the technique of Dreyfus and co-authors (1991).[7] In addition to reduction, right atrial tissue was plicated by a technique similar to that of Duncan and colleagues. The 3rd paper describes a surgical stage of artificial LV implantation in preparation for further OHT in a patient who presented with a left atrial volume of 1,200 mL.[5] The authors explain that LV assist device implantation decreases the development of complications in patients who are to undergo OHT despite GLA.

On the other hand, we have not read anything about single-stage giant left atrial reduction during bicaval OHT. We consider our case to be the first such surgical intervention. In our patient, we performed heart transplantation by using the modification of Sievers and co-authors,[8] in order to avoid possible vena cava narrowing and occlusion. In addition, we avoided incisions on the right atrium, which, as it happened, was thin and fragile. As for the LA, we thought it possible to perform reduction by reefing the posterior wall and PVs, which we had carefully mobilized. In our situation, the donor heart was not harvested at a remote distance, so we were not limited by myocardial ischemia time. We also avoided incising the posterior wall of the LA, to prevent further bleeding and the attendant possibility of difficulty with hemostasis. Key moments in our operation came during the careful and massive mobilization of the PVs and the posterior wall, and during the exclusion of excess tissue by gathering the posterior wall. We restored normal left atrial size and reduced the discrepancy—between donor and recipient—of left atrial anatomic configuration and geometric shape.

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