First experience of cardiac autotransplantation for giant left atrium treatment

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Abstract

Giant left atrium is a pathology that causes a lot of different complications, therefore it is very important to perform volume reduction. In some cases left atrium volume reaches a huge size. There are a lot of different methods for left atrium reduction: from wall plication, multicomponent resection followed by restoration integrity of wall to autotransplantation. In spite of the relative simplicity of plications and resection, these methods do not always allow to reduce left atrium to the desired volume. Cardiac autotransplantation is the most radical approach to the correction of giant left atrium which allows reducing left atrium including interatrial septum. The successful result of giant left atrium surgical treatment (volume of left atrium is 2200 ml according to the data of computerized tomography) by the method of autotransplantation is presented in the article.

Keywords: Giant left atrium; Reduction; Mitral valve

1. Introduction

Although we do not have a precise definition for the giant left atrium (GLA), the majority of authors refer to the description offered by Kawazoe et al. [1, 2]. We have treated more than 70 patients performing various types of plication and left atrium resections. Nevertheless, left atrium (LA) volume may reach enormous sizes, and we are forced to apply a more radical method – heart autotransplantation (HA). We describe our first experience of heart autotransplantation (HA) for GLA in a patient with mitral valve disease.

In September 2006, a 50-year-old female patient was admitted to our clinic with GLA, mitral valve disease of rheumatic etiology (stenosis and insufficiency), in end-stage disease with high-level pulmonary hypertension, and tricuspid valve insufficiency. The volume of LA was approximately 2200 ml (134×196 mm). Permanent atrial fibrillation has been observed for more than 10 years. The patient had a body mass index $\geq$ 30. We observed mitral valve disease and compression of the adjacent organs (trachea) caused by a giant atrium. Clinical data, results of chest X-ray, ECG, and CT-scans were very useful in confirming the diagnosis. Coronary angiography excluded presence of coronary arteries (Fig. 1).

2. Operative technique

We performed a standard median sternotomy, bicaval cannulation, cross-clamping of the aorta, and applied ante-grade and retrograde cardioplegia (Custodiol 3000 ml). LV drainage was maintained through the right superior pulmonary vein. Aorta and pulmonary artery trunk were sectioned as well as caval veins, leaving a strip of intra-ventricular septum between the superior vena cava and inferior vena cava, LA with preservation of a LA platform with pulmonary veins (six right ostia and four left ostia). Tissue redundancy of the LA posterior wall in the area of pulmonary veins was excised, then we performed a cross-shaped plasty of the posterior wall forming a platform for LA anastomosis. Ex situ tricuspid annuloplasty was done according to the method described by De Vega, and the mitral valve was replaced with a Medeng-2-31 prosthesis, preserving the posterior leaflet. Tissues of LA and inter-atrial septum were incised, and right atrium reduction was done. The heart was shifted to the thoracic cavity, and staged repair of LA, right atrium, pulmonary artery and aorta was performed with a 4-0 Prolene suture. Cross-clamp aorta time was 186 min, cardiopulmonary bypass time was 262 min.

The postoperative period was not uneventful as we observed respiratory insufficiency, which required mechanical ventilation for 48 h, inotrope support included adrenalin with a dose of 0.1 $\mu$g/kg/min, and dopamine 5 $\mu$g/kg/min with further tapering.
The patient was discharged 30 days postoperatively with significant health improvement. The volume of LA was reduced to 227 cm$^3$ (69×78 mm). After 15 months follow-up, LA volume was 98 cm$^3$ (68×68 mm) (Fig. 2).

3. Comments

GLA is a risk factor for pre- and postoperative complications (thrombosis, arrhythmia, compression of adjacent organs), so its presence necessitates volume reduction [1, 5].

Historically, the possibility to perform heart autotransplantation was offered by V.P. Demikhov, a Russian scientist [10]. In clinical practice this surgery was carried out in 1967 [1].

Variants of LA plication are manifold: from LA wall plication to complex resections with further repair of LA walls and heart autotransplantation. Despite relative simplicity of plications and resections, these methods do not sufficiently advantage for LA volume reduction. Meanwhile, heart autotransplantation is the most radical technique for GLA remodeling which allows maximally reducing all parts including interatrial septum [4, 8, 9]. Not only mitral valve disease causes LA dilatation but it may be linked to primary disorders of the atrial wall [1, 6]. In the present case, considering LA volume of 2 l, it was decided to perform HA.

Up to 79% of patients with enlarged LA have a history of stable atrial fibrillation [8], which is reliant on LA volume [7]. Precisely LA size is a major predictive factor of death; and thus, its reduction could reduce patients’ mortality risk [1–9]. A great majority of authors emphasize the necessity of sinus rhythm restoration in such patients, as it improves pumping ability, diminishes risks of arrhythmia and thromboembolism, and it may be attained in accordance with Maze III procedure and/or ablation [1, 7, 8].

Heart autotransplantation for atrial fibrillation was described by R.J. Batista [8]. He reported that heart autotransplantation, despite its relative complexity, offers an optimal access to LA, reducing time for mitral valve replacement. According to this fact, patients having a stable atrial fibrillation for more than 12 months, should be referred to surgical ablation in addition to mitral valve repair.

Cardiac autotransplantation is a technically demanding procedure and is recommended only in cases with extreme
range of LA enlargement. So, ‘spiral resection’ is an effective method for left atrium reduction [5], as it provides excellent exposure to LA without transection of aorta and pulmonary artery trunk.

While repairing mitral valve, and, accordingly, reducing LA overload, this heart chamber is contracted gradually, therefore the question of its possible reduction is under debate.

Heart autotransplantation is a proper technique for GLA remodeling in cases with mitral valve disease [1, 7–9], and survival rate is comparable with rates following the surgery with LA plication and/or resections [4].

References