

Surgical correction and postoperative period management of a patient with the giant left atrium: case report

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Abstract

This case report describes the history of a 62-year-old man with symptoms of severe heart failure caused by critical mitral valve (MV) stenosis with extremely enlarged left atrium (LA) and chronic rheumatic heart disease. The patient has had MV replacement, aortic valve (AoV) replacement, tricuspid valve (TV) plastic surgery, left atrial thrombectomy, reduction, and resection of the LA.

The operation was performed by median sternotomy, in condition of artificial blood circulation with aortic cannulation, separate cannulation of Cava veins and hypothermia up to 29 C. Selective antegrade cold blood cardioplegia was used for the myocardium protection.

Revision of the MV was performed via the right atrium. Findings: the valves deformed by severe fibrosis, thickened subvalvular structures. Also, there was a massive thrombosis of the LA cavity. A thrombectomy was performed, total amount of evacuated thrombotic masses - 350 ml. Considering the circumstances of atriomegalia, was decided to provide reduction of the LA. MV replacement with mechanical prosthesis SJM MastersSeries # 31, aortic valve replacement with prosthesis SJM MastersSeries #25, and Suture commissuroannuloplasty were performed.

We believe that our surgical tactics has effectively reduced the size of the LA, together with the correction of valvular malformation, can significantly improve the patient's life quality.

Key words: mitral valve replacement, aortic valve replacement, thrombectomy, valvular malformation, resection of the left atrium

Introduction

Surgery of mitral valve defects is still an urgent problem of modern cardiac surgery [1-3]. Changes in the mitral valve because of the rheumatic process, infectious endocarditis, leads to the development of mitral malformation as a result, impairment of intracardiac hemodynamics. Narrowing of the left atrioventricular opening makes difficulties to blood passing from the left atrium to the left ventricle, causing tonogenic overload of the left atrium. Pathological changes subsequently lead to an increase sizes atrial cavity. Surgical treatment of mitral valve defects with giant left atrium is associated with a high mortality rate from 8 to 32% [4]. In patients operated for atriomegaly according to summary data is variable from 7.8 to 19 % [5,6]. Atriomegaly can lead to compression of Vena

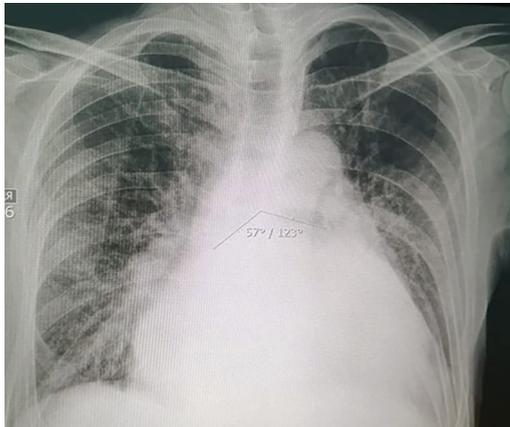
cava, right chambers of the heart, reduction of venous return, compression wall of the left ventricle, and also cause compression of extracardiac organs and tissues – such as bronchial tree (an increasement of the Carina angle more than 120 degrees), basal segments of the lung's, esophagus, descending part of the aorta with corresponding symptoms [7-9]. In this regard, in case of extreme atriomegaly with mitral valve defects, atrial reduction should be considered as an addition to valve surgery.

Case presentation

A 62-year-old man was admitted to the National research cardiac surgery center with symptoms of severe heart failure caused by critical mitral valve stenosis

with extremely enlarged left atrium (LA) and chronic rheumatic heart disease. Past history: more than 40 years ago diagnosed rheumatic disease, atrial fibrillation (date is unknown), officially registered more than 4 years ago. On the X-ray examination picture of severe dilatation of the left atrium, a shift of the Carina angle to 123 degrees (Figure 1).

Figure 1 - Chest X - ray. Shift of the Carina angle to 123 degrees



The aorta and the trunk of the pulmonary artery were cut off transversely in order to mobilization of the LA. The dilated LA wall was excised while preserving the physiological anatomy

Figure 2 - Echo. Perioperative period.



According to echocardiography (EchoCG) data at the moment of surgery, the size of the LA was 9.8cm x 7.3 cm, the volume of the LA about 600 ml, and the area was 96 cm² (Figure 2).

Patient also had a moderate degree of aortic and mitral valve insufficiency. Signs of thrombosis in the left atrial cavity were detected. According to EchoCG data the pulmonary artery systolic pressure (PASP) was 70 mmHg. Coronary angiography had shown intact coronary artery.

Surgical treatment was performed to patient. The operation was performed by median sternotomy, in condition of cardiopulmonary bypass (CPB) with aortic cannulation, separate cannulation of Cava veins and hypothermia up to 29 C. Selective antegrade cold blood cardioplegia was used for the myocardium protection.

Revision of the mitral valve was performed via the right atrium and interatrial septum access. Findings: the valves deformed by severe fibrosis, thickened subvalvular structures. Also, there was a massive thrombosis of the LA cavity. A thrombectomy was performed, total amount of evacuated thrombotic masses - 350 ml. Considering the circumstances of atriomegalia, was decided to provide reduction of the LA.

of the atrium in relation to the heart structures, followed by atrioplasty and reduction of the left atrium cavity. Enlarged wall of the left atrium was resected in a band 2-3 cm wide from the upper border of the LA, laterally, then to the posterior wall, the incision was sutured along the section line. Mitral valve replacement with mechanical prosthesis SJM MastersSeries # 31, aortic valve replacement with prosthesis SJM MastersSeries #25, and Suture commissuroannuloplasty were performed. In the early postoperative period bleeding (total amount of blood loss about 1600 ml) caused by coagulopathy and initially impaired liver function, due to active viral hepatitis C.

Management in postoperative period in cardiac intensive care unit (CICU).

The patient was delivered to the CICU from the operating theatre at 3:05 p.m. on 18.10.2020. The patient has had mitral valve replacement, aortic valve replacement, tricuspid valve plastic surgery, left atrial thrombectomy, reduction, and resection of the LA 18.10.20. The duration of cardiopulmonary bypass was 279 minutes.

Clump cross time - 224 minutes. Circulatory arrest time - 1 minute.

Respiratory therapy: The duration of artificial lung ventilation 23 hours 55 minutes. Tracheal extubation was performed on 19.10.2020 2:40 p.m. From 19.10.2020 to 20.10.2020 non-invasive ventilation (NIV) was performed in the CPAP mode. NIV without positive effect. During NIV there was limitation of mobility of the patient, difficulties with enteral feeding. Respiratory therapy changed to high-flow nasal oxygen therapy (HFNOT) on 21.10.2020, with parameters: flow 50 l/min, FiO₂-50%. Activation of the patient (vertical position, sitting in the chair, walking around the ward) was started at time of HFNOT.

Figure 3 - Chest X-Ray in dynamics (24 hours after surgery)

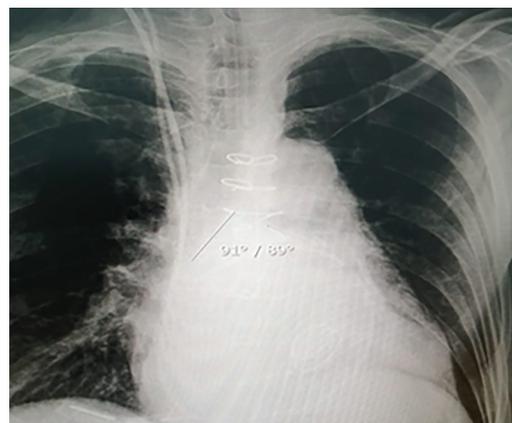


Figure 4 - Echo (24 hours after surgery).



In dynamics, the chest X-ray had shown a decrease of the Carina angle to 89 degrees (Figure 3).

EchoCG confirmed a reduction of the size of the LA: the volume of the LA 475 ml, the surface area 74.8 cm² (Figure 4).

During postoperative period in ICU, severe prolonged respiratory failure. Dynamics of respiratory status represented on the Table 1.

Table 1 Respiratory status

	PaO ₂ /FiO ₂	pCO ₂	pH
Before operation	393	37,8	7,42
After operation	302	43,1	7,35
Before extubation	572	50,5	7,43
After extubation	532	48,8	7,34
CPAP	470	52,9	7,34
CPAP	400	57,8	7,43
CPAP	276	64,2	7,39
HighFlow	276	58,6	7,44
HighFlow	440	50,5	7,49
		47	7,36

Discussion

A significant enlargement of LA has a poor prognostic effect for patients who are undergoing valve repair or replacement with a prosthesis due to mitral valve damage [10]. Measurement of the left atrium on two-dimensional EchoCG is one of the most important factors determining the outcome after mitral valve replacement. There are several distinctive pathophysiological changes associated with giant LA [11]. One of them is respiratory diseases due to compression of the left main bronchus and / or the right middle and lower lobes of lung by dilated LA [12].

We believe what the cause of respiratory failure in our case was regarded as the expansion of long-term atelectasis of the lower lobe of the left lung caused by compression of the giant left atrium. In the preoperative period, compensation for the condition was caused by a decreasing in ventilation of the lung section with atelectasis. Also, was parallel decreasing in its

perfusion, which did not cause gas exchange disorders. In the postoperative period, after the reduction of the LA, the lower lobe of the left lung was released from compression, as a result, atelectasis was straightened with the restoration of ventilation and perfusion functions. Subsequently, in this area was started intensive production of sputum, this led to a impairment of the ventilation of the lung section, with preserved perfusion, in consequence was formed pulmonary venous-arterial bypass (mixing of venous blood with arterial blood, which increases the degree of hypoxemia and hypercapnia).

Another is an infringement of hemodynamics due to compression of the posterior basal part of the LV due to the expansion of the LA downwards [13].

In addition, the presence of significantly increased blood pressure (BP) may increase the risk of thromboembolism, regardless of antithrombotic and antiaggregant therapy [14,15]. Volume reduction can be achieved by forming a fold in the LA wall, but resection can do more extensive volume reduction.

We believe that our surgical tactics has effectively reduced the size of the LA, together with the correction of valvular malformation, can significantly improve the patient's life quality. We believe that surgical correction of the dilated LA is compulsory in patients with mitral valve damage and giant LA, especially in the presence of atrial thrombosis, displacement of the left bronchus and impaired respiratory function. The postoperative period is not standard. It has many unforeseen complications. In early postoperative period in CICU department intensivist should be prepared for a long-time collision with respiratory failure, which was absent or slightly presented before surgical operation. Intensivists must detect symptoms of complications on the early stage and have a way to solve them.

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