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Original Article

Emergency operation of redo second and third mitral valve regurgitation in a patient with a history of the mitral valve prosthesis, coronary artery bypass graft surgery, and moderate aortic regurgitation: a case presentation

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Abstract

Redo cardiac surgery is usually more complex than initial surgery and has a higher risk of mortality due to the risks associated with sternotomy.

Thoracotomy is a procedure through which easy access to the heart and valves is possible, taking less time. There is no need to release the adhesions of the previous operation. In addition, there is no possibility of heart rupture and unstable hemodynamics in the second CABG operation.

Safe peripheral Cardiopulmonary bypass (CPB) access and right thoracotomy are preferred in patients with unstable hemodynamics with a history of CABG and mitral valve replacement (MVR) surgery.

A 60 -year old man with a history of prosthetic MVR, CABG, and right-hand paresis due to cerebrovascular accident (CVA) was referred to Madani Hospital in Tabriz, Iran (2020). Transthoracic echocardiography (TTE) revealed signs of severe dysfunction of the prosthetic mitral valve (PMV). Whereas, on anticoagulation, a left ventricular ejection fraction (LVEF) was about 40%, and the patient had mild to moderate aortic regurgitation (AI). The patient underwent an emergency redo MVR operation using the thoracotomy techniques and coronary intervention (hybrid procedure). After two weeks, TTE showed a decreased mobility of one PMV leaflet, and the patient did not respond to full anticoagulation. Therefore, the third surgery was performed.

Keywords: Thoracotomy; Coronary artery bypass; Prosthetic valve malfunction; Reoperation

Introduction

The redo operation of the heart has higher risks, mortality, and morbidity than the first operation (1). In patients with a history of coronary artery bypass grafting (CABG), heart valve malfunction (HVM) or coronary artery occlusion can lead to heart redo-surgery. Bleeding, graft injury, cardiac rupture, dense adhesions, difficulty with valve exposure, and other complications are likely reasons for choosing a thoracotomy over a sternotomy (2- 4).

Cardiac diseases such as aortic, mitral, or tricuspid valve disease, congenital heart defects (atrial septal defects), specific sites of coronary artery disease (CAD), heart tumors, and pericardial disease may be treated by thoracotomy. Many heart diseases treated with thoracotomy can be accessed with a middle sternum, but alternative methods are used when the sternotomy is too difficult for the patient. (5,6).

Here, we report a case of second and third redo mitral valve replacement (MVR) in a patient with a history of the mitral valve prosthesis, CABG, and moderate aortic regurgitation (AR).

Case presentation

A 60- year- old- man with a history of prosthetic MVR, CABG, and right-hand paresis affected by cerebrovascular accident (CVA) was referred to Madani Hospital in Tabriz, Iran (2020) due to pulmonary edema (PE) and severe hypotension.

This study has fully observed all aspects of the Helsinki Declaration and the Code of Ethics of the National Committee for Medical Ethic Tabriz University of Medical Sciences, Tabriz, Iran. The information was recorded confidentially. The patient incurred no additional costs.

The patient was lethargic, and peripheral pulses were not detectable. He received intravenous drips of inotropic agents and mechanical ventilation. Transthoracic echocardiography (TTE) showed signs of severe malfunction of the prosthetic mitral valve (PMV). However, on anticoagulation, left ventricular ejection fraction (LVEF) was about 40%. The patient had mild to moderate aortic regurgitation (AI), restricted left movement, extensive valve thrombosis, and peak gradient of about 20 mm Hg (Figure 1, 2). The transesophageal echocardiography (TEE) and fluoroscopy were not performed due to the hemodynamic instability. Coronary angiography conducted before surgery, illustrated a patent left internal mammary graft (LIMA) to the left anterior descending coronary artery (LAD) and saphenous vein graft to OM, and a diagonal and occluded PDA graft. The posterior descending coronary artery (PDA) had 70% stenosis with relatively good runoff. The patient was scheduled for an emergency reoperation of MVR followed by the coronary intervention (hybrid procedure).

The informed consent was obtained from the patient.

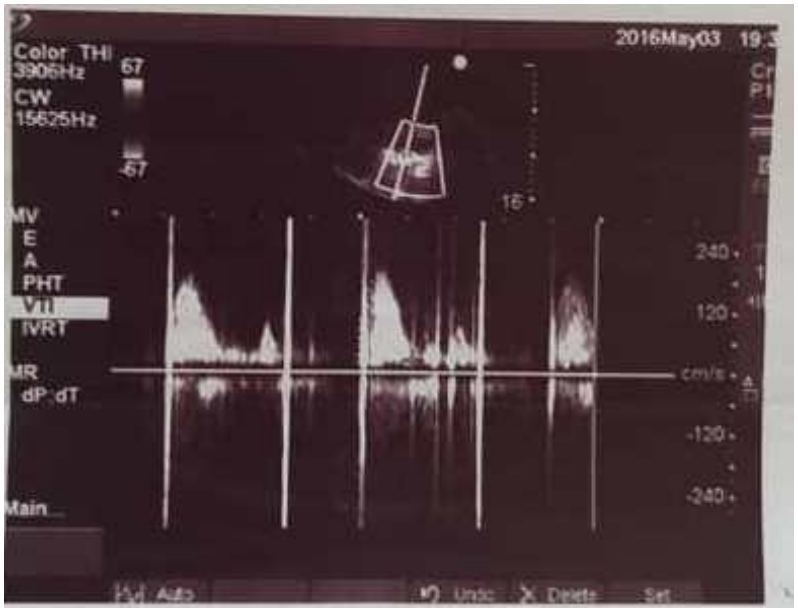


Figure 1. Transthoracic echocardiography before second surgery.
Limitation of t restricted leaflet movement and extensive valve thrombosis

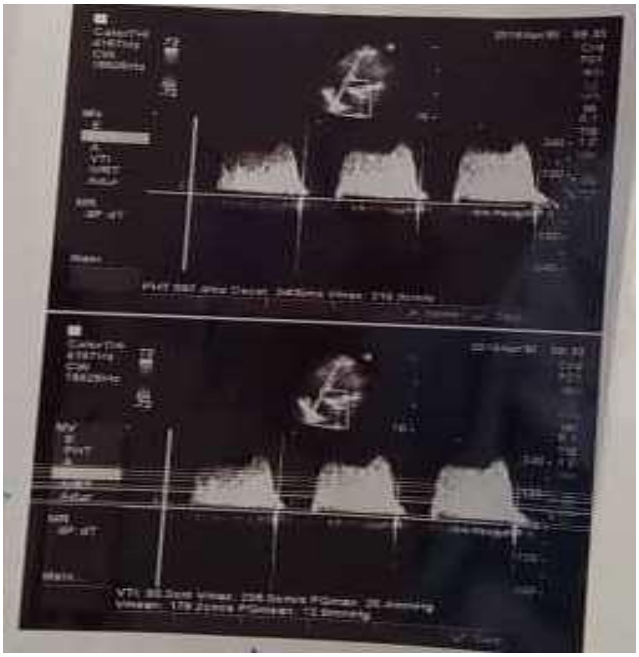


Figure 2. Transthoracic echocardiography before third surgery
Limitation of t restricted leaflet movement and extensive valve thrombosis

Surgery method

With supine and 30 degrees right lateral position, percutaneous cannulation was performed using the left femoral artery and right femoral vein. Cardiopulmonary bypass (CPB) was then established. In this way, Hypothermia induced. An inframammary groove skin incision with a length of 8 – 10 cm was performed, and the right fifth intercostal space was opened. After entering the thoracic area, the pericardium over the right atrium was incised. The patient's body cooled to20° C. Due to aortic insufficiency, we used deep hypothermia circulatory arrest (DHCA).. We protected the brain through retrograde cerebral perfusion (RCP).

We also performed a thoracotomy at the same time as cooling with CPB, and when the patient's heart tended to fibril, we opened the left atrium simultaneously and prevented the left ventricle from dilating.

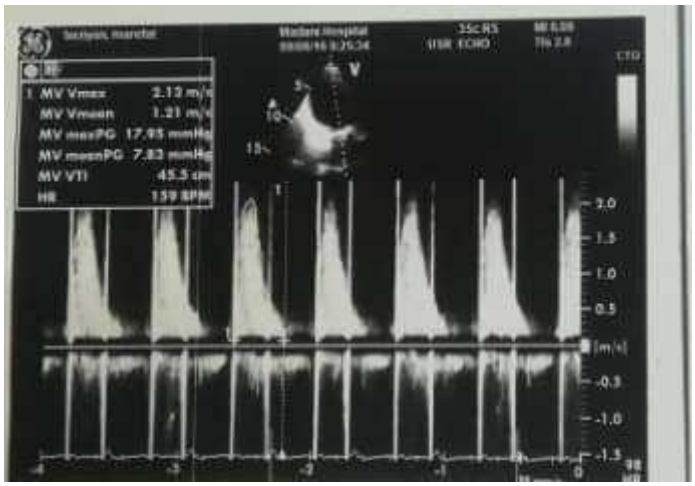
We opened the left atrium. There were massive collections of thrombus in the previous prosthetic valve, which were evacuated and cleaned. We checked prosthetic valve mobility and closed the left atrium. The DHCA time was 40 minutes. Adequacy of brain oxygen saturation during DHCA was confirmed using cerebral oximetry.Tracheotomy fails to use the usual methods for left ventricular ventilation. When the patient is in the elevated right- anterior position (35-40 degrees), and the left atrium is not entirely closed, with positive blood flow, the left atrium comes out ultimately with ventilation and heartbeat, and there is no need for conventional de-airing methods (7).The presence of previous operation scar, and the possibility of vascular damage made us perform this method to expose the opposite femoral side.The cannula was inserted into the superior vena cava vein (SVC), and X was injected into the brain as retrograde blood in the retrograde technique. A roller pump was used, and the atrium was emptied with pressure due to gravity.

At the end of the surgery, TEE was performed intraoperatively, and the result showed normal PM function. After rewarming, we performed cardioversion. When the sinus rhythm achieved the normal rate, we terminated CPB. The CPB time was 90 minutes. The incision was closed after the placement of the right hemithorax chest tube. The patient was extubated after one day of intensive care unit stay and listed as a case of successful percutaneous coronary intervention (PCI).

Follow up

During this two-week hospitalization, the patient was on full anticoagulation with unfractionated heparin, warfarin, Plavix, and aspirin. TEE showed a decreased mobility of one of the PMV

leaflets. Unfractionated heparin started again, but malfunction progressed, and the patient's situation became more critical. The third surgery was planned and was performed with the same method as the second surgery with some differences. The hypothermic fibrillary arrest was used. Right femoral artery cannulation and bicaval cannulation with the tracheal tube were done. For total CPB, the cuff of the tracheal tube was inflated (8), the right atrium was opened, and the interatrial septum was incised. Because of aorta insufficiency and bloody field, the replacement of PMV was done by total circulatory arrest. The brain was protected by retrograde cerebral perfusion (RCP). Postoperative Doppler echocardiography showed a normal function of PMV (Figure 3). Surgery and follow-up were terminated without any complication, and the patient was discharged alive. The echocardiographic study two years following the third surgery showed a normal function of PMV.



Figuer 3. Postoperative Doppler echocardiography
Postoperative Doppler echocardiography with a gradient of 12 according to the patient's tachycardia

Discussion

Thoracotomy is recommended for many challenging surgical interventions.

We reported a case of a reoperation to redo MVR with a history of prosthetic MVR, CABG, and right-hand paresis due to CVA. There was the possibility of irregular anticoagulant dose adjustment and lack of regular control of Pt. Access to the mitral valve by thoracotomy will be a reasonable option in patients with a history of CABG and MVR admitted for malfunction. The mitral valve and the major bypassed vessels, especially the LIMA vessel are patent as the mid-sternotomy and redo operation can be a critical threat for the grafted vessels (9).It is easier to enter through the right atrium and transept due to the adhesion of the previous operation. This technique is associated with long-term survival, freedom from recurrent MR as well as freedom from reoperation. Moreover, this This technique reduced postoperative pain, improved cosmesis, less blood loss with fewer blood transfusions, fewer infections, shorter stays, no more sternotomy mortality, faster recovery, improved quality of life, reduced health care costs, and a rapid return to activity (8, 11). Studies have reported an over 85% repair rate for minimally invasive mitral valve repair (12).

Thirty-day mortality for prosthetic valve reoperations is estimated to be 5% to 15% (13). Some studies do not recommend thoracotomy for redo MVR operation in the presence of aortic regurgitation. Because in a bloody field MVR is troublesome (14). We treated the problem with deep hypothermia, low pump flow, and total circulatory arrest (TCA). For better protection of our patient's brain, we used RCP and fortunately, we did not face a new complication in his brain.

Conclusion

To sum up, in patients with past sternotomy, thoracotomy with hypothermic fibrillatory arrest could be a reliable option for redo MVR without serious complications.

In this method, cardioplegia is not injected, and cardiac surgery is performed without aortic

clamping arrest fibrillation. This operation is used for deep hypothermia and ventricular fibrillation (Fabricatory arrest).We assume that a native or a grafted vessel with a lesion cannot be an obstacle for redo MVR operation through thoracotomy. It is worthy to note that, in our patient, after the mitral valve surgery, the culprit lesion, and the RCA, were revascularized by percutaneous old balloon angioplasty and PCI (hybrid procedure). The presence of aortic insufficiency could not be contraindicated.

We used low pump flow, deep hypothermia dilatory (DHF), and total circulatory arrest (TCA) to prevent complications caused by aortic insufficiency.

Conflicts of Interest

None

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