Left Thoracotomy: An Ideal Approach for Mitral Valve Replacement in Patient With Severe Chest Wall Deformation

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We report a 65-year-old woman with chronic diastolic congestive heart failure, pulmonary hypertension, and severe mitral valve regurgitation. She was not a candidate for percutaneous mitral valve repair and was turned down for an open heart operation by 2 institutions based on her severe pectus excavatum deformity. A left posterior lateral thoracotomy approach provided excellent exposure for central cannulation and replacement of the mitral valve.


Pectus excavatum is a congenital deformity affecting the costal cartilage. The second through eighth cartilages develop in a concave position. Severe pectus excavatum deformity causes displacement of the mediastinum to the left and compression of the cardiac chambers. Such a shift in cardiac structures can make the exposure to the mitral valve difficult, if not impossible, through a median sternotomy or right thoracotomy [1].

The left thoracotomy approach for cardiac procedures has existed since 1910, when Alexis Carrel [2] proposed it for a coronary artery bypass from the thoracic aorta. Some of the earliest mitral valve interventions were also performed through a left thoracotomy; in the 1960s, mitral valvuloplasties were commonly approached from the left side [3, 4]. However, as median sternotomy became the standard approach for cardiac operations, the left thoracotomy fell out of favor [5–7]. More recently, with the advent of minimally invasive cardiac operations, a large number of mitral valve operations are performed through a limited right thoracotomy with peripheral cannulation; few surgeons still prefer a limited left thoracotomy.

This case report illustrates the useful approach of left thoracotomy for mitral valve replacement with central cannulation of the aorta and main pulmonary artery.

A 65-year-old woman presented with severe shortness of breath and fatigue of more than a year’s duration. On examination, the patient had severe pectus excavatum.

Her cardiac examination was remarkable for a blowing pan systolic murmur. She had a history of bilateral breast cancer 5 years earlier and was treated with bilateral mastectomy and chemotherapy. She had multiple repeated thoracentesis procedures for drainage of pleural effusions. An echocardiogram revealed severe mitral regurgitation with an ejection fraction of 65%. Pulmonary function test results indicated severe restrictive lung diseases with forced expiratory volume in the first second of respiration of 1.02 liters and diffusing capacity of lung for carbon monoxide of 21%. She had no coronary lesions on angiography. Computed tomography of the chest showed severe pectus excavatum with the heart displaced into the left side of the chest (Fig 1).

Given the unusual anatomy, a left thoracotomy approach was selected, with a double-lumen endotracheal tube for selective ventilation. The patient was placed in the right lateral decubitus position. The thorax was opened using a left posterolateral incision through the fourth intercostal space. After heparinization, the pericardium was opened 1 cm anterior to the phrenic nerve and retracted with retention sutures. The distal ascending aorta was cannulated with a 20F arterial cannula. The pulmonary artery was cannulated with a 36F venous cannula that was placed through the pulmonary valve and into the right ventricle. Cardiopulmonary bypass was instituted and the patient's temperature was allowed to drift down to 28°C. The aorta was cross-clamped, and antegrade cold blood cardioplegia was infused into the aortic root. The operative field was flooded with carbon dioxide. The atrial appendage was opened at its base, and the incision was extended into the dome of the left atrium. The valve was unsuitable for repair, and a 31-mm mechanical prosthesis was inserted using interrupted pledgeted sutures. After closure of the atrium, removal of air, and rewarming, the patient was weaned off bypass in normal sinus rhythm. The chest and pericardium were drained and closed. She had an uneventful recovery and was discharged on postoperative day 8.

Comment

We performed a mitral valve replacement through a posterolateral thoracotomy in a patient with extensive pectus excavatum causing severe displacement of mediastinal structures into the left side of the chest.

Although left thoracotomy was used in the past as an approach to access the mitral valve, there are very few reports using this approach in the current literature. One of these reports describes valve replacement in a patient who had previously undergone esophageal resection and reconstruction with a substernal gastric conduit [8]. Others describe left thoracotomy for pulmonary valve replacement and as access for minimally invasive mitral valve operations [7, 9]. LeMaire and colleagues [10] describe valvular reparations using a left thoracotomy in patients with pectus excavatum. Combined coronary artery bypass grafting and mitral valve procedures using a left-sided approach have been reported [11].

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There are a few disadvantages in using a left thoracotomy. There is poor access to the ascending aorta for direct cross-clamping, especially in the reoperative setting. Also, mitral valve orientation from this exposure is somewhat inverted compared with that achieved from the right side. Compared with median sternotomy, there is an increased tendency for patients to experience post-thoracotomy pain syndrome. There is limited access to the right atrium or right ventricle, especially in redo operations. Hence, use of retrograde cardioplegia is not feasible. In addition, there may be difficulty with defibrillation in reoperations [12].

Regarding anesthesia for the left thoracotomy approach, double-lumen endotracheal intubation allows the left lung to collapse and improves exposure. Placement of an epidural anesthesia catheter improves postoperative pain management, allowing early ambulation and improved pulmonary toilet, thereby decreasing the risk of postoperative pulmonary complications.

In conclusion, left thoracotomy for mitral valve operations is a largely forgotten, old approach. It can be a great option in a patient with distorted anatomy caused by severe pectus excavatum or for approaching cardiac operations when there are major obstacles for safe sternotomy.

References