Adequate open exposure of the mitral valve is necessary to accomplish reconstruction or replacement of the diseased mitral valve apparatus. The technique employed by most cardiac surgeons for mitral valve access involves median sternotomy and vertical left atriotomy posterior to the interatrial sulcus. However, certain conditions can sometimes make this approach very difficult. Different approaches are discussed with particular emphasis on our case in which the transaortic double valve replacement have been performed.

Key words: mitral valve replacement, transaortic approach

INTRODUCTION

Complete visualization of the mitral apparatus is a prerequisite for accurate repair or replacement of the mitral valve. In most situations exposure is satisfactory through an incision in the left atrium posterior and parallel to the interatrial sulcus (Sunder-gaard's groove). However, certain conditions, including: small left atrium, previous left atriotomy, severe ventricular hypertrophy, presence of a rigid aortic prosthesis, atrial calcifications and large organized thrombus, can sometimes make this approach very difficult. This report describes the transaortic double valve replacement, a technique that sometimes offers excellent exposure of the mitral apparatus and left ventricular cavity.

CASE REPORT

A 59-year-old man presented at our institution with progressively increasing dyspnea on exertion. Transesophageal echocardiography (TEE) showed severe mitral regurgitation with thickened both leaflets and small left atrium (39 mm in diameter). Aortic valve area was calculated to be 0.5 cm² with a peak gradient of 120 mm Hg. Aortic regurgitation was referred as mild one. End-diastolic diameter was 60 mm, end-systolic diameter 53 mm, and ejection fraction was calculated to be 0.20. There were significant atherosclerotic lesions on coronary arteries (stenoses >70% on the left anterior descending artery - LAD as well as on circumflex artery - Cx). The patient was scheduled for double valve replacement and tricuspid valve annuloplasty (due to severe tricuspid regurgitation), plus aortocoronary bypass (on LAD and Cx marginal branch). Risk factors for coronary artery disease included smoking history and hypertension. Patient had suffered cerebrovascular insult with transient left hemiparesis and disfagia two months ago (Doppler color ultrasonography revealed fibrocalcificated plaque, reducing diameter of right internal carotid artery up to 80%). Carotid artery endarterectomy was scheduled to follow cardiac surgery procedure.

A mid-sternotomy was performed with standard reciprocating saw. Cardiopulmonary bypass (CPB) was established using aortic and bicaval cannulation. Myocardial protection has been obtained using cold anterograde blood cardioplegia, topical ice slush and moderate hypothermia (28°C).

The distal anastomosis on marginal branch of Cx artery (vein graft) was accomplished first. Then, the aortic valve cusps (thick, retracted, with massive calcifications) were excised. The mitral valve with its subvalvular apparatus could be seen clearly through the aortotomy over the aortic annulus. Though we were faced with small left atrium we decided to perform transaortic mitral valve replacement (MVR). We excised the anterior mitral leaflet while the posterior one was preserved. Interrupted pledged mattress sutures were placed from the left ventricular side through the posterior mitral leaflet, then through mitral annulus and finally through outer half of the sewing ring of the valve (mechanical bileaflet mitral prosthesis - 27 mm). The valve was released from its holder, and seated

Transaortic double valve replacement in difficult mitral valve exposure

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into the mitral annulus by tying the posterior mitral leaflet sutures on the left atrial side. The anterior sutures were placed through the valve ring and tied down in such a way that the knots (with pledgets) were on left ventricular side (Fig. 1 B). Using this technique the mitral prosthesis was situated on left atrial side (Fig. 1 A), thus avoiding any obstruction of the left ventricular outflow tract. A 23-mm bileaflet prosthesis was implanted in the aortic position. There was no obstruction to the leaflets of the aortic prosthesis by the mitral prosthesis or by preserved posterior mitral leaflet and chordal apparatus. After finishing tricuspid valve annuloplasty (sec. De Vega) we have performed distal anastomosis (internal mammary artery) on LAD. Routine de-airing and rewarming was done. The patient was weaned from CPB without difficulty.

Postoperative TEE showed normal functioning of the mitral and aortic prostheses, and ejection fraction was calculated to be 25%. No left ventricular outflow tract obstruction or gradient were registered. The patient’s postoperative recovery was uneventful, and he was discharged to home on the 14th postoperative day.

DISCUSSION

Adequate open exposure of the mitral valve is necessary to accomplish reconstruction or replacement of the diseased mitral valve apparatus. Though excellent exposure of the mitral valve can’t always be obtained through conventional incision posterior to the interatrial groove, there were several alternative approaches described in the literature.

More than 40 years have elapsed since the idea of approaching the mitral valve via the right atrium and the interatrial septum was applied. In 1966, Dubost and colleagues described a new technique, the essence of which is an incision from the right superior pulmonary vein toward the right atrial wall and through the interatrial septum. This technique can be applied in any case of mitral valve surgery as well as first-time mitral valve surgery, if associated with a small atrium.

In 1980, Brawley reported a cardiac incision that incorporated elements of both: the standard approach to mitral valve and the incision suggested by Dubost and colleagues. In addition to the standard incision in left atrium the vertical incision is made into the right atrium between the two caval cannulas. Then, the interatrial septum is divided and the incision is continued anteriorly and obliquely toward the tricuspid annulus, but away from the atrioventricular node. These approaches allowed surgeons to reach the mitral valve almost without any traction on the atrial wall and yet achieve optimum exposure. Complications, including atrial arrhythmias are very rare.

In 1992, Smith reported modification of technique used for transplant recipient cardiectomy to improve exposure of the mitral valve in difficult patients’ anatomy, including small left atrium. Right atrial and septal incisions were joined at the superior end of the interatrial septum and extended across the dome (“septal-superior exposure”) of the left atrium. This approach provides excellent exposure

FIGURE 1
MITRAL PROSTHESIS SITUATED ON LEFT ATRIAL SIDE, THUS AVOIDING ANY OBSTRUCTION OF THE LEFT VENTRICULAR OUTFLOW TRACT (1A). THE TECHNIQUE HOW THE SUTURES (POSTERIOR AND ANTERIOR) WERE PLACED DURING TRANSAORTIC MITRAL VALVE REPLACEMENT (1B)

(LA-left atrium, LV- left ventricle, PML-posterior mitral leaflet, Asc Ao- ascending aorta)

but surgeon should be concerned of possibility of postoperative rhythm disturbances (up to 60% of patients).

The observed postoperative arrhythmias of the sinus node were proven to be caused by the damage of the sinus node artery during surgical procedure.

Combined replacement of the aortic and mitral valve is a relatively common operation. Occasionally it is feasible to replace the mitral valve through the aortic root. Aortic and mitral valve replacement through an aortotomy was reported in 1983. by Carmichael and Cooley. Very few cases, using this technique, have been reported since then. Some authors have preserved posterior mitral leaflet chordal apparatus, while the others have performed transaortic MVR with total chordal preservation. Advantages of transaortic mitral valve replacement are as listed:
a) elimination of need for an atrial incision, b) avoiding of extensive dissections (especially in reoperations) thus minimizing trauma and postoperative bleeding and c) reduction of myocardial ischemic time.

In presented case we were faced with a small left atrium and thus we decided to perform transaortic mitral valve replacement. The exposure during surgery was excellent. We strongly believe that in patients (scheduled for double valve replacement) with large aortic annulus, the transaortic approach provides excellent access for safe and expeditious MVR.

REZIME

Optimalna vizualizacija mitralnog aparata neophodna je za uspešnu zamenu ili rekonstrukciju mitralne valvule. Klasičan pristup upotrebljava medijalnu sternotomiju i vertikaln rez na levom atriju iza interatrialne brazde. Ponekad nam takav pristup ne omogućava optimalne uslove za izvodjenje hirurške procedure. Navedene su mane i prednosti alternativnih pristupa sa posebnim osvrtom na transaortnu tehniku zamene mitralne valvule koju smo primenili prilikom implantacije aortne i mitralne valvule kod našeg bolesnika.

Ključne reči: zamena mitralne valvule, transaortni pristup

BIBLIOGRAPHY