The Heart Surgery Forum #2000-23079
3 (4):334–336, 2000

Online address: www.hsforum.com/vol3/issue4/2000-23079.html

# Left Sided Heartport Approach for Combined Mitral Valve and Coronary Bypass Surgery

(#2000-23079 … June 8, 2000)

**Imad Tabry, MD,** Eugene Costantini, MD, Elmore Reyes, MD

Department of Surgery, Section of Cardiac Surgery, Holy Cross Hospital, Fort Lauderdale, Florida

*Dr. Tabry*

## ABSTRACT

**Background:** To explore the possibility of achieving adequate exposure of the mitral valve (MV) and the entire coronary anatomy using a limited (Port-Access) left lateral thoracotomy incision.

**Methods:** Using this incision, four patients underwent a single bypass to the left anterior descending, combined with MV repair (1), MV replacement (2), and left atrial (LA) myxoma excision (1). This approach required single lung ventilation, femoral venous cannulation, and cannulation of the femoral artery or thoracic aorta. Exposure of the MV was achieved through a LA incision parallel to the atrio-ventricular groove, extending into the pulmonary vein or behind the pulmonary artery as necessary.

**Results:** Excellent exposure of the MV and coronary anatomy was achieved in all patients. There were no surgical complications and all were discharged home within one week.

**Conclusion:** Left-sided Port-Access is a valid technique particularly suitable for combined primary MV and coronary bypass surgery. It does not allow exposure of the tricuspid or aortic valve, however, and is not recommended in repeat MV surgery due to the fragility of the LA appendage in such cases.

## INTRODUCTION

In the past, the left anterior thoracotomy (LAT) incision was the incision of choice for closed mitral commissurotomy. When unsuccessful or complicated, cardiopulmonary bypass (CPB) was established and open repair of the mitral valve (MV)—or replacement—usually carried through the same incision [Scott 1958, Clowes 1962]. Subsequently and despite the original success of this exposure, there was a major shift to address the MV through a median sternotomy incision [Lillehei 1958, Merendino 1959] or a right anterolateral thoracotomy (RALT) in repeat MV surgery [Pezzella 1983, Balasundaram 1990, Frater 1998, Srivastava 1998]. Combined MV and coronary bypass (CB) was done in a similar fashion, through a sternotomy or sometimes even combining a "minimally invasive" LAT for left internal mammary (LIMA) harvesting and a RALT incision. The LAT approach was thus laid to rest until the recent advent of the Port-Access technology, which resurrected it and allowed total coronary revascularization using this incision. MV surgery using the Port-Access technique continued to be performed through a limited RALT.

After we became familiar with the Port-Access technique, it occurred to us that one should be able to combine MV and CB surgery using a single limited but more lateral left thoracotomy incision. To explore this theory we first applied it successfully to a patient with left atrial (LA) myxoma who also underwent single LIMA to left anterior descending (LAD) bypass. We will report here on our total experience with four patients and describe the surgical technique used.

## MATERIALS AND METHODS

A total of four patients underwent combined MV/LA tumor and CB surgery using a left-sided Heartport (Heartport, Inc., Redwood, CA) approach.

### *Patient Profile*

All patients were females, ranging in age between 68 and 78 years (mean 74). Two were insulin dependent dia-

*Presented at the Third Annual Meeting of the International Society for Minimally Invasive Cardiac Surgery, Atlanta, Georgia, June 8–10, 2000.*

*Address correspondence and reprint requests to: Imad Tabry, MD, 1625 SE, 3rd Ave., Suite #601, Fort Lauderdale, FL 33316, Phone: (954) 462-4413, Fax: (954) 462-5413, Email: itabry@worldnet.att.net*

betics, one had hypertension, and two atrial fibrillation and congestive heart failure. One had a left atrial myxoma, one severe mitral stenosis, and two severe calcific mitral regurgitation. All four had significant isolated proximal LAD lesions.

***Surgery Performed***

One patient underwent excision of LA myxoma and LIMA to LAD bypass. One underwent mitral valvuloplasty involving commissurotomy, extensive decalcification of leaflets, resection of secondary thickened chordae and fenestration of marginal chordae to relieve restricted leaflet motion, along with a LIMA to LAD graft. Two patients underwent MV replacement using porcine bioprostheses and bypass to the LAD using LIMA in one and saphenous vein graft in the other (with prior chest wall radiation post mastectomy).

***Surgical Technique***

Transesophageal echocardiogram (TEE) was used in all patients to guide with placement of the EndoCPB system (Heartport, Inc., Redwood, CA), visualize the intracardiac anatomy, assess adequacy of surgical repair and confirm thorough de-airing of the cardiac chambers before completion of the surgery.

Single-lung ventilation with double lumen endotracheal tube was used to allow collapse of the left lung and full thoracoscopic mobilization of the LIMA.

Endocoronary sinus and endopulmonary vent catheters were inserted by the anesthesiologist prior to positioning of the patients. Patients were then placed in the strict right lateral decubitus position with the left arm over the head and the left groin exposed for cannulation, then prepped and draped. A 6-8 cm limited left lateral incision was made and the chest entered through the fifth intercostal space.

LIMA harvesting was done using a single thoracoport positioned at the level of the fourth intercostal space along the anterior axillary line with the video camera introduced through the thoracotomy incision. The operating table was temporarily tilted to the semioblique position to allow the heart to drop away from the chest wall. The LIMA thus exposed was dissected its entire length as a skeletonized vessel using standard low current electrocauthery and fine clips. CPB was then established after full heparinization using an endovenous cannula placed through the left common femoral vein. Arterial cannulation was established using the endoarterial cannula placed in the left common femoral artery in two patients, and the endodirect arterial cannula placed in the distal ascending aorta in two patients.

The operating table was returned to the full lateral position and the pericardium was then vertically incised anterior to the phrenic nerve. The endoaortic clamp was inflated in the correct position and cardioplegia administered to achieve cardiac arrest.

The LA was now incised from the base of the appendage, 1–1.5 cm cephalad to the atrio-ventricular (AV) groove, and across the origin of the left inferior pulmonary vein. When necessary, the incision was extended behind the pulmonary artery and aorta, always leaving a 1–1.5 cm rim of good tissue inferiorly for safe repair of the atriotomy. Silk sutures applied to the edges of the incision allowed satisfactory exposure of the entire LA and MV apparatus. MV repair or replacement and excision of myxoma were then accomplished in a standard fashion. A Foley catheter (CR Bard Inc., Covington, GA) was then placed across the MV and the atriotomy closed around it. The distal anastomosis between the LIMA and the LAD was then constructed. The patient was placed in the Trendelenburg position and de-airing was accomplished by using a left ventricular apical needle, endoaortic vent and the Foley catheter. The endoaortic clamp was deflated only after satisfactory de-airing was confirmed by TEE. The proximal venous anastomosis to the aorta was then completed in a single patient.

## RESULTS

Total CPB time varied between 84 and 133 minutes, mean 117 minutes. Endoaortic clamping time varied between 60 and 103 minutes, mean 88 minutes. Exposure of the LA, MV apparatus and entire coronary anatomy (though unnecessary in our patients) was excellent, as was exposure of the apex of the left ventricle, entire thoracic aorta and even right atrial appendage. All four patients were successfully weaned off CPB. They were extubated within eight hours of their surgery, were neurologically intact and were discharged home within one week.

## DISCUSSION

It is not infrequent that patients in need of MV surgery are also found to have significant coronary artery disease at coronary angiography. Such patients usually require either a separate angioplasty procedure or the coronary artery disease is addressed during their valve surgery. When electing the latter approach, such patients were traditionally operated on through a median sternotomy. With the advent of "minimally invasive" surgical techniques aimed mostly at avoiding sternotomy complications, there has been a resurgence of interest in the right thoracotomy approach. Although this incision provides excellent exposure of the MV, and possibly of the right coronary artery (RCA), it fails to expose adequately the remainder of the coronary anatomy. Furthermore, harvesting the LIMA for combined MV and CB requires a separate small LAT.

The advent of Port-Access techniques and instrumentation for total coronary revascularization through a limited LAT, coupled with our prior satisfaction with MV exposure provided by that same incision in the days of closed mitral commissurotomy, led us to believe that combined MV and CB could be done simultaneously using a similar, but more lateral "minimally invasive" approach. We have thus applied this procedure successfully in four patients who required combined LAD bypass and primary MV

repair/replacement or excision of LA tumor. All operations were done without encountering technical difficulties or incidents. Although only a single coronary bypass was done in each case, any number of grafts could have been done based on the consistently excellent exposure of the entire coronary anatomy provided by this approach.

This study demonstrates that a modified left-sided Heartport approach (Heartport, Inc., Redwood, CA) for combined MV and CB surgery—as described above—presents several advantages over a sternotomy or RALT incision:

1. It avoids all sternotomy complications (pain, limitation of activities, infection).
2. It combines two major procedures through one small incision.
3. It allows excellent exposure of LA, MV apparatus, all coronary vessels and entire thoracic aorta.
4. It allows knot tying in the customary way, without instruments, due to the proximity of the MV annulus to the left-sided chest wall.
5. It allows complete de-airing through the apex of the left ventricle.

This approach also has some limitations:

1. It does not allow repair of associated tricuspid regurgitation.
2. It is contraindicated when there is significant aortic insufficiency.
3. It is dangerous — and thus contraindicated — in repeat MV surgery due to the fragility of the left atrial appendage in such cases.

## CONCLUSION

In conclusion, a limited access left lateral thoracotomy incision using the Heartport technology (Heartport, Inc., Redwood, CA) or an equivalent is a valid approach especially attractive for combined primary MV and CB surgery. Although tested in only four patients, it seems efficacious and can be performed expeditiously with minimum risks and post-operative complications. We do not recommend it, however, in case of repeat MV surgery and consider it contraindicated when there is associated significant aortic or tricuspid regurgitation.

## REFERENCES

1. Balasundaram SG, Duran C. Surgical Approaches to the Mitral Valve. J Card Surg 5 (3):163–9, 1990.
2. Clowes GH Jr, Neville WE, Sancetta SM, Traks E, Lim K, Barwinsky J, DelGuercio LRM. Results of open surgical correction of mitral valvular insufficiency and description of technique for approach from the left side. Surgery 51 (1):138–54, 1962.
3. Frater RWM, An Analysis of Alternative Exposures of the Mitral Valve. J Heart Valve Dis 7 (4):362–6, 1998.
4. Lillehei CW, Gott VL, DeWall RA, Varco RL. The surgical treatment of stenotic or regurgitant lesions of the mitral and aortic valves by direct vision utilizing a pump oxygenator. J Thorac Surg 35:154–90, 1958.
5. Merendino KA, Thomas GI, Jesseph JE, Herron PW, Wintersheid LC, Vetto RR. The open correction of rheumatic mitral regurgitation and or stenosis with special reference to regurgitation treated by posteromedial annuloplasty utilizing a pump oxygenator. Ann Surg 550:5–22, 1959.
6. Pezzella AT, Effler DB, Levy IE. Operative Approaches to the Left Atrium and Mitral Valve Apparatus. TX Heart Inst J 10 (2):119–23, 1983.
7. Scott HW Jr, Daniel RA Jr, Adams JE, Schull LG. Surgical Correction of Mitral Insufficiency under Direct Vision: Report of Clinical Cases. Ann Surg 147 (5):625–35, 1958.
8. Srivastava AK, Garg SK, Ganjoo AK. Approach for Primary Mitral Valve Surgery: Right Anterolateral Thoracotomy or Median Sternotomy. J Heart Valve Dis 7 (4):370–5, 1998.