MINIMALLY INVASIVE MITRAL VALVE SURGERY

Robert K. W. Tam, FRACS, Chris Ho, MBBS, and Aubrey A. Almeida, MBBS, *Brisbane, Australia*

Navia and Cosgrove¹ have described a minimally invasive approach to mitral valve surgery. This has the disadvantages of sacrificing the internal thoracic artery, resecting two costal cartilages leaving a flail segment, and requiring femoral artery cannulation to establish cardiopulmonary bypass. Others approach the aortic and mitral valves via upper partial sternotomy with either a partial or complete horizontal transection of the sternum. This causes more disruption to the sternum and risks injuring the internal thoracic artery. The sternum is potentially unstable despite wiring. Konertz and colleagues² have described a paramedian sternotomy.

Using an upper hemisternotomy and a modified Guiraudon vertical transatrial septal approach,³ we describe an approach to mitral valve surgery in which standard equipment is used.

Technique. External defibrillator pads are placed on the left side of the chest wall and posteriorly. An incision is made below the sternal notch to the fourth intercostal space. The upper part of the sternum is divided to the fourth intercostal space. The sternum is not transected. A small sternal retractor is used. Traction on pericardial sutures exposes the ascending aorta and right atrium.

Partial cardiopulmonary bypass is established after aortic and superior vena cava cannulation. The right atrium collapses and the inferior vena cava is cannulated posterolaterally in the right atrium. The ascending aorta is encircled with a tape and crossclamped. Antegrade cardioplegia is administered. The superior and inferior venae

cavae are snared (Fig. 1). An incision is made starting from the medial aspect of the right atrial appendage and extending cephalad onto the dome of the left atrium. A

Fig. 1. Operative approach with cannulas in situ. The aorta (A) and right atrial appendage (R) are seen, with cannulas in the aorta and the superior and inferior venae cavae.

From the Department of Cardiac Surgery, The Prince Charles Hospital, Brisbane, Australia.

Address for reprints: Robert Tam, FRACS, Department of Cardiac Surgery, The Prince Charles Hospital, Rode Rd., Chermside, Brisbane, Australia, Q 4032.

Received for publication July 14, 1997; accepted for publication August 18, 1997.

J Thorac Cardiovasc Surg 1998;115:246-7

Copyright © 1998 by Mosby, Inc.

0022-5223/98 \$5.00 + 0 12/54/85533

Fig. 2. Site of the atrial incision (*dotted line*), retracted aorta (*A*), and right atrium (*RA*) as seen by the surgeon.

caudal extension of the right atrial incision toward the inferior vena cava is not necessary. The left atrial incision is extended behind the aorta. The sinoatrial nodal artery is avoided, if possible, by incising parallel to it (Fig. 2). A vertical septal incision is made extending to the foramen ovale.

The retrograde cannula is inserted directly. The aorta is retracted to the left and stay sutures retract the right atrium and the interatrial septum to expose the mitral valve. Excellent exposure of the mitral valve is obtained by placing retractors in the superior and inferior aspects of the left atrial incision. The mitral valve is repaired or replaced in the standard fashion.

The left atrium is closed starting from the dome to the interatrial septum, with care taken to avoid the sinoatrial artery. Starting caudally, a second suture closes the interatrial septum and the right atrium. With the use of transesophageal echocardiographic monitoring, air is evacuated through the aortic root.

Results. Ten patients had surgery with this approach. Four patients had mitral valve repair, five had valve replacement, and one had combined mitral and aortic valve replacement. The median age was 56 years (range 45 to 77 years). The median aortic crossclamp time was 59 minutes (range 39 to 155 minutes), with a bypass time of 81 minutes (range 61 to 194 minutes). Patients were extubated at a median of 7 hours (range 2 to 14 hours). Stay in the intensive care unit was a median of 2 days

(range 1 to 5 days), with a hospital stay of 6 days median (range 4 to 21 days).

One patient died, a 54-year-old woman who 20 years previously had a mitral valvotomy via a left thoracotomy. She had recurrent mitral stenosis with severe pulmonary hypertension. A thrombus was removed from the left atrium. At the end of the procedure she was noted to have severe right ventricular dysfunction, probably resulting from embolism to the right coronary artery. A full sternotomy was performed and a right ventricular assist device was inserted. Despite this she was unable to be weaned from bypass.

One patient had a delayed pericardial effusion that was drained percutaneously. Four patients had junctional rhythm in the postoperative period, but this did not persist. Two patients had atrial fibrillation. No strokes or wound infections occurred.

Comment. Our experience in minimally invasive mitral valve surgery demonstrates that it can be performed safely and effectively. The reduced trauma has potential benefits of less pain, shorter recovery time, and shorter hospital stay. Concern regarding the incidence of junctional arrhythmia has been raised.⁴ This can be minimized by avoiding division of the sinoatrial artery. The sinus node artery does not seem necessary to sustain normal sinus node function,⁵ as seen in cardiac transplantation.

Hemisternotomy without transection of the sternum gives excellent access to the mitral valve, allowing the full range of mitral valve surgery with the benefits of a smaller incision. The sternum is inherently stable. Our approach is easily converted to full sternotomy if the need arises, without the sternum being in multiple segments. Patients are pleased with the small wound and may well drive the application of this technique.

REFERENCES

1. Navia JJ, Cosgrove DM. Minimally invasive mitral valve operations. *Ann Thorac Surg* 1996;62:1542-4.
2. Konertz W, Waldenberger F, Schmautzler M, Ritter J, Liao J. Minimal access valve surgery through superior partial sternotomy: a preliminary study. *J Heart Valve Dis* 1996;5:638-40.
3. Guiraudon GM, Ofiesh JG, Kaushik R. Extended vertical transatrial septal approach to the mitral valve. *Ann Thorac Surg* 1991;52:1058-62.
4. Kumar N, Saad E, Prabhakar G, De Vol E, Duran C M. Extended transeptal versus conventional left atriotomy: early postoperative study. *Ann Thorac Surg* 1995;60:426-30.
5. Sealy WC, Bache RJ, Seaber AV, Bhattacharya SK. The atrial pacemaking site after surgical exclusion of the sinoatrial node. *J Thorac Cardiovasc Surg* 1973;65:841-50.