—Reports on Experiments and Clinical Cases—

Early experience of minimally invasive valve surgery

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Abstract

In this paper we report on our early results of minimally invasive cardiac valve surgery. A series of 6 consecutive patients with valvular disease underwent valve repair and valve replacement via a right parasternal incision; aortic valve replacement 3, mitral valve replacement 1, mitral valve repair 2. There were no intraoperative complications requiring median sternotomy. Five patients had no blood transfusion. There was only one postoperative event ; this patient had a sudden massive bleeding from the chest tube after extubation of the endotracheal tube, an immediate re-suture of the aortotomy was performed. The reoperative course was uneventful. Minimally invasive cardiac surgery for aortic and mital valves is an excellent option for most patients affected by isolated valvular disease. (J Nippon Med Sch 1998; 65: 413—415)

Key words: minimally invasive cardiac surgery, valvular disease, right parasternal incision

Introduction

Clinical outcomes for cardiac surgery have been dramatically improved in the last ten years due to the advances of cardiopulmonary bypass, myocardial protection and surgical techniques. Recently, the concepts of less invasive surgery have dramatically affected many surgeons and several reports have been published detailing less invasive techniques for coronary artery bypass grafting so-called minimally invasive direct coronary artery bypass grafting (MIDCAB), designed to limit surgical trauma while decreasing hospital stays[1,2]. The same concept as MIDCAB has been applied to valve surgery. Valve procedures have traditionally been performed via a median sternotomy with direct aortic and right atrial cannulations for cardiopulmonary bypass. Recently, an approach has been proposed to repair or replace the valve via a 10 cm right parasternal incision without jeopardizing surgical outcomes for patients[3]. In this paper, we report on our early results of using this procedure.

Materials and Methods

From June 18, 1997, through December 3, 1997, a series of six consecutive patients with valvular disease under went valve repair and valve replacement via a right parasternal incision (**Table 1**).

All patients were anesthetized in the supine position and intubated. Defibrillator pads were placed on the patient's back and anterior left chest. A transesophageal echo cardiogram was used for monitoring cardiac function during operation. A skin incision 8 cm long was made along the right sternal border, from the lower edge of the second costal cartilage to the lower edge of the firth costal cartilage (**Fig. 1**). The pectoral major muscle was divided, exposing the second, third and fourth intercostal space. The third and fourth costal cartilages were totally resected and the fifth costal cartilage

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Table 1 Operative data

	y/o	Ciagnosis	OP	ECC(min)	ACC(min)	Op. time(min)	Drainage(ml)
A. F	63	AR(III). MR(I)	AVR	138	79	290	74
K. T	34	MR(III)	AVR	74	55	312	96
S. S	72	AR(III)	AVR	160	89	318	233
S. H	58	ASR	AVR	219	107	398	321
M. T	29	MR(III)	MVR	333	224	570	254
M. N	48	MR(III)	MVR	175	92	353	330
	51±15			183±80	107±54	373±94	218±100

Abbreviation; AR: aortic regurgitation, MR: mitral regurgitation, ASR: aortic stenosis and regurgitation, AVR: aortic valve replacement, MVP: mitral valuvulo-plasty, MVR: mitral vaive replacement, OP: performed operation, ECC: extracorporeal circulation, ACC: aortic cross-clamping, Op. time: total operation time, Drainage: chest drainage loss during the first 24 hours after operation, y/o: years old, min: minute, I ~III : grade of regurgitation, mean±SD.

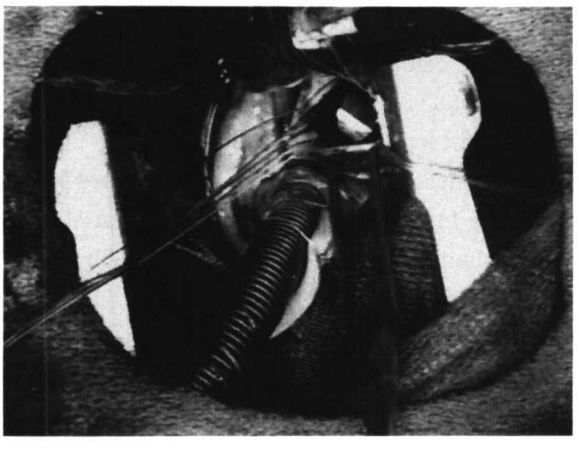

Fig. 1 Intraoperative view during aortic replacement. The artificial valve can be clearly seen through a transverse aortotomy.

Fig. 2 A small anterior right parasternal incision was performed to approach the aortic valve. This patient is shown one week postoperatively.

was cut close to the sterum. After the right internal thoracic artery was liganted and the pleura opened, the pericardium was incised longitudinally and suspended with sutures. The aortic root, right atrium and right pulmonary vein were exposed. After systemic heparinization, the right femoral artery was cannulated and a two-staged cannula was inserted via the right atrial appendage; In the case of mital valve procedure, separated venous canulations were used via superior vena cava and right femoral vein.

After cardiopulmonary bypass was established and the aorta was encircled with tape, the aorta was crossclamped. When isolated aortic stenosis or mital valve disease was present, blood cardioplegia was infused in the aortic root; in the presence of aortic regurgitation, cardioplegia is given directly into the coronary ostia after the aortotomy was performed. During mitral valve procedure, a transeptal approach was employed after the aortic cross-clamping (**Fig. 2**). After the valve replacement or valve repair were completed by conventional methods, the left ventricle was deaired both through the LA-LV vent catheter and through a continuously aspirating cannula of the cardioplegic line. When needed, the heart was defibrillated by means of disposable pads placed on the patient's back before the operation. After the patient was weaned from the cardiopulmonary bypass, the heart was decannulated and repaired. Atrial and ventricular pacing

wires were placed. Two chest tubes were inserted into the pericardial and chest cavities. The pericardium was closed with interrupted sutures, and rib cartilages were replaced in their original position and stabilized with sutures. The wound was closed in layers.

Results

There were no intraoperative complications requiring conversion to median sternotomy. Cardiopulmonary bypass time, aortic cross-clamp time, operation time, and the chest drainage during the first 24 hours are lised in **Table 1**. We had some difficulties in establishing, a point of operative area of the mitral valve procedures. A 29-year-old female patient who had a severe mitral regurgitation due to infectious endocarditis had mital valuvulo-plasty performed, but mitral regurgitation remained. So we decided to convert to mitral replacement. Although the operation time took so long to reoperate, there were no postoperative events. Slight inotropic support with dopamine was needed during a few hours after the operation in all patients. All patients were extubated in the ICU at an average of 12 hours (range, 3.7 to 16.6 hours). Five patients required no blood transfusion. The postoperative course was uneventful except for one patient who had a sudden massive bleeding from the chest tube after the extubation of endotracheal tube and the immediate re-suture of the aortotomy was performed. His reoperative course was uneventful.

Discussion

Recent efforts in all surgical fields have focused on less invasive surgical techniques. Early follow-up of MIDCAB demonstrated the effectiveness of this operation in accelerating patient recovery and decreasing hospital length of stay. These benefits encouraged the application of minimally invasive techniques for valve procedures[4,5]. The smaller incision has a number of potential advantages; it is cosmetically more acceptalbe to patients and the patient had no complainrs of severe wound pain related to the retraction and stress placed on ribs by a median sternotomy. A small wound reduces the potential for wound infection and blood loss from the incision. Reoperation through a medain sternotomy should be less difficult because the pericardium below the sternum remains intact, protecting the heart during recentry. Practically, it will be of benefit at the second operation for the patient in this series, who had performed a mitral valve replacement with bioprosthesis.

In our patients, although aortic valve procedure was performed smoothly, it was somewhat difficult to obtain optimal visualization for the mitral valve procedure. In these cases, it was helpful to make the overinflation of the left lung and collapse the right lung during the phase of valve procedure. The usefulness of the application of video-assisted endscopy for mitral repair has been reported and many of the currently available instruments for these procedures have been manufactured[6]. In the near future, new operative techniques employing these instruments will be developed. Although we have little experience in this field, we conclude that minimally invasive cardiac surgery for aortic and mitral valves is an excellent option for most patients affected by isolated valvular disease. Of course, further experience and careful management of this field are needed.

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