

Trans-septal Approach To The Mitral Valve

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The right atrial trans-septal approach is one approach to the mitral valve. We used this approach in 25 patients from October 1990 to May 1993. Fourteen patients were in NYHA class II, 10 in class III and 1 in class IV. All had gross cardiomegaly with a left atrial dimension of 58 ± 14 mm. The majority had advanced rheumatic heart disease involving more than 1 valve and therefore needed double or triple valve repair or replacement. A total of 49 operative procedures were performed, that is, about 2 per patient. The procedures for the mitral valve included open mitral valvotomy in 3 patients, valve repair in 12 patients and valve replacement in 10 patients. The average cross-clamp time was 84 ± 14 min. No patient died while in hospital. Each heart maintained its preoperative rhythm (sinus in 13 cases and atrial fibrillation in 12 cases). None developed iatrogenic arrhythmia or conduction defect. There was no residual atrial septal defect. This approach is useful, safe and convenient. (*Asia Pacific J Thorac Cardiovasc Surg* 1996;5(1):25-27)

Introduction

Proper exposure is a prerequisite for surgery of the mitral valve. Its importance is increased in cases of mitral valve repair where the post-repair evaluation greatly depends upon the position of the heart. Due to difficulty in gaining access, various surgical approaches have been devised, including the right atrial trans-septal approach. This paper is based on the study of 25 patients in whom this approach was used. We believe this approach is superior to other approaches in certain situations. We did not find any untoward change in the cardiac rhythm of the patients.

Patients and Methods

From October 1990 to May 1993, about 340 patients had mitral valve surgery in our unit. The trans-septal approach to the mitral valve was used in 25 patients (13 males and 12 females; mean age, 23 ± 7 years).

Most were in New York Heart Association (NYHA) class II to III (Table 1). The main symptoms were severe breathlessness and palpitations. One patient was in class IV and needed inotropic support in the preoperative

period. The preoperative blood counts were within normal range. Four of those suffering from severe tricuspid regurgitation had an enlarged liver and mildly increased liver enzymes.

All patients had gross cardiomegaly on chest X-ray examination. The average preoperative left atrial dimension was 58 ± 14 mm. The hearts of 13 patients were in sinus rhythm, and 12 had atrial fibrillation.

Indications for the trans-septal approach

In 17 patients, the indication for the trans-septal approach was concurrent tricuspid valve disease. However, on peroperative assessment 2 of these 17 tricuspid valves were found to be satisfactory, and only 15 needed surgery. Five patients had atrial septal defects in addition to mitral valve disease. Three patients had dense pericardial adhesions, and exposure of the interatrial groove would have been cumbersome. Therefore, we used the trans-septal approach.

Operative procedures

A total of 49 procedures were performed, an average about 2 procedures per patient (Table 2). In all patients

Table 1. Preoperative and postoperative New York Heart Association class.

No. patients	Preoperative	New York Heart Association Class		
		Postoperative		
		6 weeks	12 weeks	24 weeks
13	II	I	I	I
6	III	I	I	I
4	III	I	I	I
1	IV	Died	--	--
1	II	I	Died	--

Table 2. Types and numbers of operative procedures.

Procedure	No. of patients
MV replacement	3
MV repair+TV repair	3
MV repair+ASD closure	3
MV replacement+TV repair	5
MV repair	2
OMV	1
OMV+TV repair	1
OMV+ASD closure	1
MV repair+TV repair+ASD closure	1
MV repair+TV repair+AV replacement	1
MV replacement+TV replacement	1
MV repair+ TV repair +AV repair	2
MV replacement + TV replacement + AV replacement	1
Total	25

Abbreviations: MV, mitral valve; TV, tricuspid valve; ASD, atrial septal defect; OMV, open mitral valvotomy; AV, aortic valve; TV, tricuspid valve.

the heart was approached through a median sternotomy and, after heparinisation, cardiopulmonary bypass was established with the help of aortic and indirect bicaval cannulation. Anterograde cold St Thomas' cardioplegia was used.

The systemic temperature was lowered to 28°C, and the flow rate was kept at 2.2 L/min/m². Caval tapes were secured, and right atriotomy was performed anterior to the interatrial groove. The left atrium was opened through the interatrial septum. The septal incision was made in the posterior part of the fossa ovalis and, when needed, was extended cautiously in the superior and inferior directions (Fig. 1).

Before making such an extension, we assessed the available safe area of septum on its left side, either with digital palpation or with curved artery forceps. We attempted to remain as far away as possible from the

thick anterior limbus and the atrioventricular node. With this technique we never experienced an injury to the roof or the floor of the atria.

Stay sutures were placed on the edge of the fossa ovalis, and 2 small retractors were used, very gently, for retraction. After attending to the mitral valve, the septal incision was closed with 2/0 Ethibond sutures. The tricuspid valve was then attended to, and the right atrium was closed with 3/0 prolene sutures.

Caval tapes were released, and the patients were rewarmed. After the routine de-airing procedure, the aortic cross clamp was removed, and the patient was weaned from bypass. The pericardium was left open, and the chest was closed. Two pericardial drains were connected to a controlled suction system.

Results

The exposure in all cases was good. Minimal retraction was needed. No deaths occurred during surgery. The average cross clamp time was 83.8±13.6 min. The average stay in the intensive care unit and hospital bed was 26 hours and 6 days, respectively.

No untoward or unexpected arrhythmias were encountered in any patient. The hearts of 13 patients maintained a sinus rhythm, as in the preoperative period. Eight patients who had atrial fibrillation in the preoperative period had sinus rhythm following bypass but soon reverted back to atrial fibrillation.

Four patients who had atrial fibrillation preoperatively developed various new arrhythmias in the immediate postoperative period but settled into atrial fibrillation within 24 hours. Thus, preoperative rhythm was preserved in all patients.

Two patients needed DC cardioversion during rewarming and weaning from cardiopulmonary bypass. Three patients received isoprenaline for a short period due to transient heart block or bradycardia. However, the heart block did not persist, and none needed a permanent

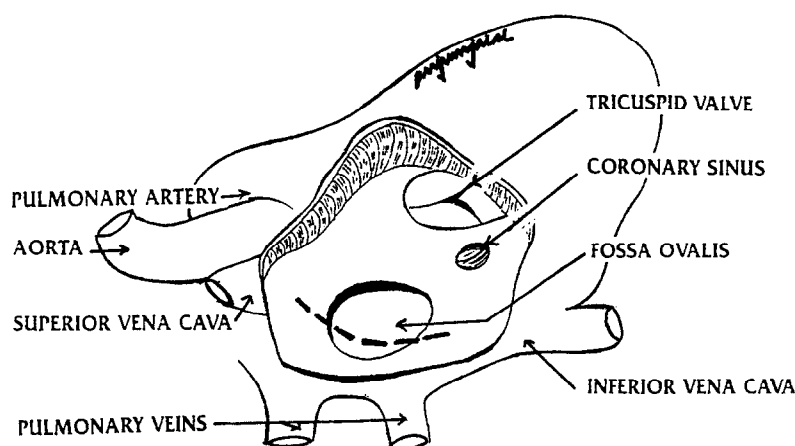


Fig. 1. Trans-septal approach to the mitral valve. The dotted line shows the location of the septal incision.

pacemaker. Three patients required minimal inotropic support (dobutamine, less than 5 µg/kg/min) for less than 24 hours due to low cardiac output.

Postoperative NYHA Class

Postoperative NYHA class was significantly improved. At 24 weeks after operation, 23 (92%) patients were in class I (Table 1). Two patients died in the first 3 months after operation: one of endocarditis, and the other from thrombosis of the prosthetic valve.

Discussion

Due to the comparatively difficult anatomical position of the mitral valve, various surgical approaches have been used to expose it. The commonly used approaches are left atrial, right atrial trans-septal, and septal superior. Some authors have reported unconventional approaches such as through the aortic root¹, through the left ventricular apex² and through the left ventricular aneurysm.³

The most commonly used approach is the standard left atrial approach, where a vertical incision is made posterior to the interatrial groove and anterior to the pulmonary veins. Although it provides good exposure in the majority of patients, it has limitations in certain difficult situations, as in the presence of a small left atrium, dense adhesions and a previous aortic or mitral valve prosthesis.

Carpentier has acknowledged such difficulty and has described a biatrial approach where the incision is made from the right atrial appendage to the right superior pulmonary vein, and the septum is incised by extending the same incision forwards toward the tricuspid valve.⁴ Other surgeons have developed their own techniques for better exposure in such difficult situations.

Craig R. Smith⁵ has reported the septal superior approach to the mitral valve. This approach has been adapted from transplant cardiectomy and is quite extensive. This approach is unsafe for patients critically dependent on normal sinus rhythm as it involves damage to the sinus nodal artery and conduction pathways.

Rene S. Hartz et al⁶ have described oblique trans-septal left atriotomy for mitral valve exposure in which an oblique incision is made in the right atrium between the venous cannulae and is extended in the right superior pulmonary vein. This approach is actually a modification of the Dubost⁷ incision which is extended anteriorly to the right atrioventricular groove. They have found that the sinus rhythm can be preserved by leaving at least 2.5 cm of the right atrial wall anteriorly and being cautious not to manipulate the sinoatrial or atrioventricular nodes. McGrath et al⁸ have reported impressive results with a similar right atrial trans-septal approach. They have used this approach routinely in patients who required combined mitral and tricuspid valve surgery.

The right atrial and septal incision which we have described in this study is different from that of McGrath (Fig. 1). Although there is a suspicion of increased incidence of arrhythmia in the trans-septal approach, we believe that arrhythmia can be safely avoided by carefully placing the septal incision and giving due importance to the normal anatomy of the septum, especially regarding the position of the preferential conduction pathways.⁹ It has been described by Chang¹⁰ that during sinus rhythm there is more rapid conduction through the thicker muscle bundles of the anterior limbus compared to slow conduction through the fossa ovalis. We recommend making the septal incision in the fossa ovalis and protecting the thick muscular part of the anterior limbus.

Conclusion

While taking precautionary measures based on knowledge of the anatomy of the conduction system, we have found that the trans-septal approach to the mitral valve is an excellent approach. It provides superior exposure and is technically easier for the operating surgeon and the assistant.

It is especially expeditious where there is concomitant tricuspid valve disease or an atrial septal defect and is more convenient in the aforementioned difficult situations. On the basis of our experience we conclude, with McGrath⁸, that the trans-septal approach is safe and can be used routinely in cases of combined mitral and tricuspid valve surgery.

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