

# Extended vertical transseptal approach in mitral valve reoperation with a small left atrium

*Acesso transeptal vertical ampliado em reoperações valvares mitrais com átrio esquerdo pequeno*

Walter Vosgrau FAGUNDES<sup>1</sup>, Bruno Botelho PINHEIRO<sup>1</sup>

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## Abstract

**Objective:** Evaluate the efficacy of the extended vertical transseptal approach in mitral valve reoperation with a small left atrium.

**Method:** From January 2001 to December 2002, 15 patients with previous mitral operation, small left atrium and atrial fibrillation underwent mitral valve surgery through an extended vertical transseptal incision. There were nine women and six men. Their ages ranged from 22 to 48 years. The main surgical indication was mitral prosthetic dysfunction in six patients, pure mitral regurgitation in five and mitral stenosis with regurgitation in four. Three patients had associated aortic regurgitation and one patient had associated tricuspid regurgitation. Nine patients (60%) were in congestive heart failure function class III (NYHA) and 6 patients (40%) in function class IV.

**Results:** In all patients this approach provided excellent exposure. The cardiopulmonary bypass time ranged from

65 to 150 minutes (mean = 95 min). The mitral valve was replaced in 15 patients, the aortic valve in three and the tricuspid valve in one. One patient died secondary to cardiogenic shock and multiple organ failure (hospital mortality 6.6%). Another patient had pneumonia in the postoperative period (morbidity 7.1%). Ten patients remained in atrial fibrillation, three regained sinus rhythm and one was in nodal rhythm. The mean hospital stay was 8.2 days. Twelve patients (85%) have been in NYHA functional class I and two patients (15%) in functional class II. Actuarial survival rate at 22 months is 92.5%.

**Conclusion:** The extended vertical transseptal approach provides excellent mitral valve exposure without inherent complications.

**Descriptors:** Mitral valve, surgery. Reoperation. Heart valve prosthesis implantation, methods. Heart valve prosthesis.

Work performed in the Clinicord Group - Hospital Santa Geneveva, Goiânia, Goiás and Hospital Evangélico Goiano, Anápolis, Goiás - Brazil.

1 - Cardiovascular Surgery Department of the Clinicord Group - Hospital Santa Geneveva - Goiânia, Goiás and Hospital Evangélico Goiano - Anápolis, Goiás

Correspondence address: Walter Vosgrau Fagundes. Rua Prof. Adolfo Batista nº 64, Jundiá - Anápolis, GO - Brazil. CEP 75110-590.  
E-mail: silvanafag@brturbo.com

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**Resumo**

**Objetivo:** Avaliar a abordagem transeptal vertical ampliada em reoperações da valva mitral com átrio esquerdo pequeno.

**Método:** De janeiro de 2001 a dezembro de 2002, 15 pacientes portadores de doença valvar mitral com indicação de reintervenção cirúrgica, átrio esquerdo pequeno (menor ou igual a 4,0 cm) e fibrilação atrial crônica, foram submetidos à abordagem transeptal vertical ampliada da valva mitral. Nove pacientes (pt) eram do sexo feminino. A idade variou de 22 a 48 anos. As indicações cirúrgicas foram: disfunção de prótese mitral (seis pt); insuficiência mitral (cinco pt) e dupla lesão mitral (quatro pt). Três pacientes apresentavam insuficiência aórtica associada e um pt, insuficiência tricúspide. Nove (60%) pacientes encontravam-se em ICC CF III da NYHA e seis (40%), em CF IV.

**Resultados:** A exposição do aparelho valvar mitral foi excelente. O tempo de circulação extracorpórea variou de 65

a 150 min (média = 95min). Foram implantadas próteses em todos os pacientes (15 mitrais, três aórticas e um tricúspide). A mortalidade hospitalar foi de 6,7%, com um óbito devido a baixo débito cardíaco e falência de múltiplos órgãos. Um (6,7%) paciente apresentou broncopneumonia na fase hospitalar. Dez pacientes permaneceram com fibrilação atrial, três pt reverteram para ritmo sinusal e um evoluiu com ritmo juncional. A permanência hospitalar média foi de 8,2 dias. Doze (85,7%) pacientes encontram-se em CF I e dois (14,3%) em CF II. A curva atuarial de sobrevida é de 92,5 % em 22 meses de seguimento.

**Conclusão:** A técnica cirúrgica empregada proporciona excelente visualização do aparelho valvar mitral, com baixo índice de complicações.

**Descritores:** Valva mitral, cirurgia. Reoperação. Implante de prótese de valva, métodos. Próteses das valvas cardíacas.

**INTRODUCTION**

Good visualization of the mitral valve apparatus is a critical factor in the success of mitral valve plasties or replacements. In the majority of cases, satisfactory access is achieved by an incision in the left atrium, parallel to but behind the interatrial groove [1,2]. However, this approach can be difficult in the presence of some circumstances such as: (1) small left atria; (2) dense adherents from previous heart surgeries; (3) rigid aortic prostheses; (4) congenital heart and thoracic anomalies; (5) atrial calcifications and (6) organized large thrombi.

Varying techniques have been employed to deal with complex cases, mainly in related to the presence of small left atria and reoperations of the mitral valve [3-9].

The aim of this work is to evaluate the extended vertical transeptal approach in reoperations of the mitral valve with a small left atrium.

**METHOD**

In the period from January 2001 to December 2002, 15 patients suffering from mitral valve disease with indications for surgical intervention were submitted to the extended vertical transeptal approach to replace the mitral valve. All had small left atria (less than or equal to 4.0 cm in diameter as evidenced by transthoracic echocardiography) and chronic atrial fibrillation. Nine patients (60%) were female and six (40%) male. The ages ranged from 22 to 48 years with a mean of 36.7 years.

Indications for surgery included mitral prosthesis dysfunction (six patients), mitral insufficiency (five patients) and double mitral valve lesions (four patients). Three patients presented with associated aortic insufficiency and 1 patient tricuspid insufficiency. Nine patients (60%) were in functional class III heart insufficiency according to the New York Heart Association (NYHA) classification and six patients (40%) in functional class IV. Pulmonary vascular hypertension was present in five patients (30%) (Table 1).

Table 1. Preoperative data of the patients

Patient	Diagnosis	NYHA	EF (%)	PASP (mmHg)
1	MPD	III		29
2	MI	III	58	30
3	MPD + AoI	IV	60	65
4	MI	III	72	25
5	MDL	IV	66	47
6	MPD	IV	59	45
7	MI + AoI	IV	60	53
8	MI	III	68	30
9	MPD	III	65	27
10	MPD	IV	70	29
11	MI	III	59	29
12	MDL	III	64	30
13	MDL	III	67	24
14	MDL	III	75	28
15	MPD + AoI + TriI	IV	55	77

New York Heart Association (NYHA); Ejection fraction (EF); Pulmonary artery systolic pressure (PASP); Mitral prosthesis dysfunction (MPD); Mitral valve double lesion (MDL); Mitral valve insufficiency (MI); Aortic valve insufficiency (AoI); Tricuspid valve insufficiency (TriI).

All the patients were informed of the technical option that would be employed and written consent was obtained prior to the procedure.

**Surgical technique**

The access approach used was conventional median sternotomy. After dissection of the adherents and exposure of the heart, anticoagulation was achieved by the administration of heparin sodium (Liquemine®) at a dose of 5 mg/kg. Cardiopulmonary bypass (CPB) was installed with cannulation to the ascending aorta and directly to the superior and inferior vena cava.

During CPB with moderate hypothermia (28 °C), after the administration of the hypothermic antegrade sanguineous cardioplegia, a longitudinal incision was performed in the right atrial wall 1 cm above the terminal groove. This incision was partially extended around the base of the right atrial appendix to the superior portion of the interatrial septum. The interatrial septum was opened with a vertical incision to the terminal cephalic portion of the right atrial opening. The incision was then extended for 3 to 5 cm to the roof of the left atrium, thereby separating the aortic root. This allowed visualization of the mitral and tricuspid valves.

In patients in which concomitant manipulation of the aortic valve was necessary, a transverse aortotomy was performed.

The atrial incisions were closed with a double line of 4-0 polypropylene sutures (Ethicon, São Paulo, Brazil), as were the aortotomies.

**RESULTS**

In all the patients, access to the mitral valve apparatus was excellent (Figure 1).



Fig. 1 – Extended access to the left atrium and the mitral valve apparatus by extended vertical transseptal incision

The time of CPB varied from 65 to 150 minutes with a mean of 95 minutes. The time of aortic clamping varied from 45 to 120 minutes (Mean of 72.5 minutes).

A total of 15 mitral prostheses were implanted (10 bioprostheses and five metallic), three aortic prostheses (two bioprostheses and one metallic) and one metallic tricuspid prosthesis (Table 2).

Table 2. Types of prostheses utilized

Patient	Diagnosis	Mitral	Aortic	Tricuspid
1	MPD	BP 27		
2	MI	BP 31		
3	MPD + AoI	BP 27	BP 25	
4	MI	MP 29		
5	MDL	BP 29		
6	MPD	BP 27		
7	MI + AoI	BP 31	BP 25	
8	MI	BP 31		
9	MPD	MP 27		
10	MPD	MP 25		
11	MI	BP 29		
12	MDL	BP 27		
13	MDL	MP 29		
14	MDL	BP 25		
15	MPD + AoI + TriI	MP 27	MP 23	MP 31

Mitral prosthesis dysfunction (MPD); Mitral valve double lesion (MDL); Mitral valve insufficiency (MI); Aortic valve insufficiency (AoI); Tricuspid valve insufficiency (TriI); Porcine biological prosthesis SJM Biocor (PB); Double leaflet mechanical prosthesis St. Jude Medical (MP). The numbers represent the diameter in millimeters of each prosthesis.

Mean postoperative bleeding was 655 mL ± 230 mL. The stay in the intensive care unit was from 36 to 120 hours (mean of 48 hours).

One patient (mitral-aortic-tricuspid) died in hospital, owing to low cardiac outflow and multiple organ failure, giving a hospital mortality rate of 6.6%. One patient presented with bronchopneumonia in hospital giving a hospital morbidity rate of 7.1%. Mean hospital stay was 8.2 days.

In relation to heart rhythm of the 14 surviving patients, 10 (72%) remained with atrial fibrillation, three (21%) reverted to sinus rhythm and one (7%) developed bradycardic junctional rhythm requiring implantation of a definitive pacemaker in the postoperative period.

In the postoperative period 12 patients (85%) presented in functional class I (NYHA) and two (15%) in functional class II. The actuarial survival curve is 92.5% at 22 months of follow up (Figure 2).

**COMMENTS**

Several techniques have been employed to improve access to the mitral valve apparatus in patients with small

left atria or reoperations [3-9]. The transeptal approach via the right atrium is the oldest approach to the mitral valve [10,11]. GUIRADON et al. [6] proposed extended vertical transeptal approach to the mitral valve, with theoretical advantages of an excellent visualization and absence of distortions of the mitral valve apparatus.

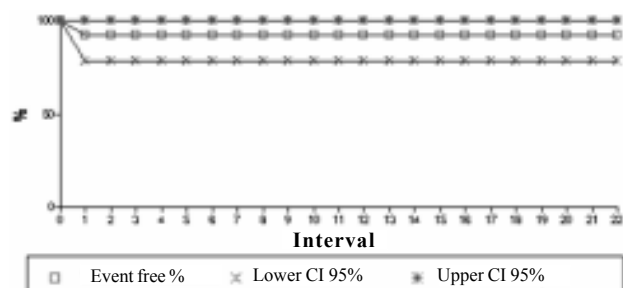


Fig. 2 – Actuarial Survival curve of the patients at 22 postoperative months

Exposure of the mitral valve was excellent in all our patients in which the extended vertical transeptal approach was employed. ALFIERI et al. [7] recommended a wide utilization of this technique for any mitral valve surgery.

Postoperative mortality in mitral valve reoperations has varied from 6.2% to 12% [12,13]. In our series, one patient after the second intervention with replacement of the mitral, aortic and tricuspid valves, died owing to low cardiac outflow and multiple organ failure. Hence, our hospital mortality rate of 6.6% is not directly related to the employed technique. Several authors have demonstrated mortality rates ranging from 5.5% to 12.6% when the extended vertical transeptal approach is utilized [14-16].

Postoperative morbidity of 7.1%, related to a bronchopneumonia event, can not be directly correlated to this technique either. The mean postoperative bleeding remained within the normal range for mitral valve reoperations. There were no cases of dehiscence of the interatrial septal sutures or left-right shunt in the postoperative phase. Although this has been reported as a rare condition (0.9%) in some published series [7].

Adverse effects to the postoperative heart rhythm have been reported, mainly owing to the division of important interatrial conduction tracts and lesions of the sinoatrial node artery [8]. However, some authors demonstrated that the sectioning of the sinus node artery does not necessarily result in loss of the sinus rhythm in the postoperative period [6,7]. This was also observed in experimental studies isolating the sinoatrial node [17], in heart transplantations in which the recipient remains in sinus rhythm [18], dissection of the right coronary groove in Wolff-Parkinson-White syndrome [19] and the superior approach of the mitral valve [20].

All the patients in our series presented with preoperative atrial arrhythmia (chronic atrial fibrillation) and in 21% of cases there was a return to sinus rhythm in the postoperative period. One patient (7%) presented with bradycardic junctional rhythm requiring the implantation of a DDDR endocavitary pacemaker.

### CONCLUSION

The employed surgical technique provided excellent visibility of the mitral valve apparatus in patients with small left atria and gave a low rate of complications in the postoperative period. The effects on atrial conduction and sinus rhythm require further investigation.

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