Mid-term results for mitral valve repair in congenital mitral regurgitation associated with ventricular septal defect

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Abstract

Introduction: Congenital mitral regurgitation (MR) associated with ventricular septal defect (VSD) is not uncommon. Surgical repair of significant mitral valve regurgitation at the time of the VSD closure is indicated specially if there is a structural problem. The aim of this study is to look at the outcome of concomitant mitral valve repair during surgical closure of the VSD.

Material and methods: Between January 2000 to December 2009, 53 patients underwent repair for congenital mitral valve regurgitation at the time of ventricular septal defect closure. The mean age was 5 years, median of 1.25 years, minimum of 4 months and maximum of 47 years. Twenty-two patients were infants. The predominant type of the VSD was peri-membraneous. Annuloplasty with a ring repair was performed in 49% of patients.

Results: One patient died in the hospital because of sepsis. One patient with large VSD and prolapsed anterior mitral valve leaflet, underwent redo mitral valve repair within the same admission because of residual moderate to severe MR. The mean follow up period was 4.5 years. Freedom from reoperation was 94%. There was one late mortality after one year due to non-cardiac cause. Overall survival at 10 years was 96%

Conclusion: Concomitant mitral valve repair is indicated in patients with moderate to severe mitral valve regurgitation associated with VSD. At mid-term follow up the durability of the mitral valve repair is excellent with relatively low reoperation rate.

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Introduction

The surgical repair of congenital mitral valve disease has significantly evolved and successful long-term results have been reported.[1,2,3] The association of congenital mitral regurgitation (MR) with or without normal mitral valve morphology and ventricular septal defect (VSD) has not been well documented and studied.

Significant mitral regurgitation with structural valve abnormality when associated with VSD, mitral valve repair should be considered at the time of VSD closure. The challenging part of repairing pediatric mitral valve is the presence of small annulus. Furthermore, development of fibrosis may jeopardize the valve function later on. It was observed that in our practice the number of patients with MR and VSD that needed mitral valve repair at the time of the VSD closure was increasing. This paper reports on the midterm outcome of the mitral valve repair in these patients.

Material and methods

From January 2000 to December 2009, 53 patients underwent VSD closure and mitral valve repair in our institute. The clinical and surgical records of these patients were traced after approval from the research committee. Patients with associated

cardiac anomalies apart from secondum atrial septal defect (ASD) and patent ductus arteriosus (PDA) were excluded. The mean age at the time of operation was 4.9 ± 1.3 years, median of 1.25 years, minimum of 4 months and maximum of 47 years (Figure 1). Three patients were in New York Heart association class IV, 15 in class III and 35 in class II preoperatively. Twenty-two patients (41.5%) had pulmonary hypertension at the time of operation. The VSD type was perimembraneous in 32 patients, doubly- committed subarterial in 15 patients, and outlet in four patients. The degree of MR was quantified into trivial, mild, moderate and severe MR. Thirty eight patients (71.7%) had moderate MR while 15 (28.3%) had severe MR. Thirteen patients with severe MR had a large VSD but the relationship between the size of the VSD and the degree of MR was not statistically significant *p=0.2*. Carpentier's functional classification for the mitral valve regurgitation was used and accordingly, 13 patients were Carpentier type I, 33 patients type II while seven patients were type III. The exact mitral valve lesion echocardiographic finding is summarized in Table 1.

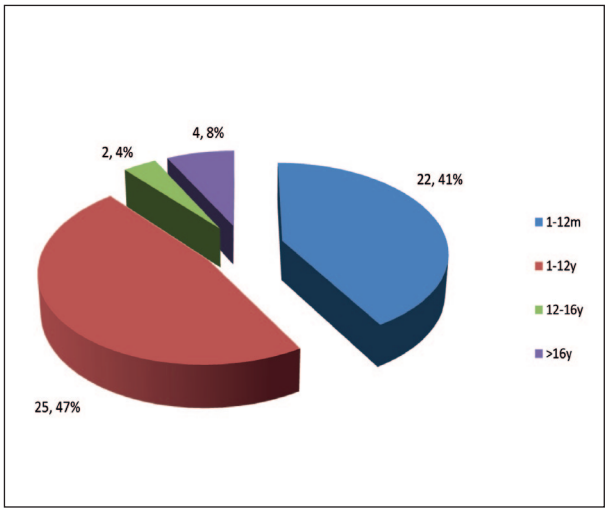

Figure 1: Age distribution

Table 1, Carpentier's classification

Carpentier type	Number of patients	Percentage
Type I	13	24.5
• Annular dilatation	9	
• Cleft mitral valve leaflet	4	
Type II	33	62.3
• Ruptured chordae	2	
• Elongated chordae	31	
Type III	7	13.2
• Short leaflet	5	
• Short chordae	2	
Total	**53**	**100%**

Median sternotomy and cardiopulmonary bypass was performed using cannulation of the ascending aorta and bicaval cannulation. A left ventricular vent was inserted through the right superior pulmonary vein. Cold blood cardioplegia was used for myocardial protection.

All the VSDs were approached through the right atrium and were closed by Gortex 0.4 patch. The mitral valve was approached through the interatrial septum in most of the cases and through the left atrium in nine patients. In 26 patients the mitral valve was repaired using a ring of which 59.3% were Kalangos biodegradable ring (Bioring SA, Lonay, Switzerland) [4]. Fifteen patients underwent different types of mitral valve annuloplasty with or without a strip of autologous pericardium or poly-tetra-floro-ethylene patch. The mean cardiopulmonary bypass time was 120 minutes and the mean aortic cross clamp time was 81 minutes. Transesophageal echocardiography was used intraoperatively for all patients to assess the VSD and the mitral valve.

Results:

The mean intensive care unit stay (ICU) was 3.4 ± 3 days and the mean hospital stay was 8.7± 4.6 days. One patient (1,9%) died two weeks after the operation due to sepsis (Early hospital mortality), another patient died after one and a half years due to non-cardiac cause. One patient (1.9%) who had a significant residual VSD underwent redo VSD closure within the same admission. Four patients (7.5%) developed pericardial effusion, which needed open drainage. One patient (1.9%) had the chest reopened for hemostasis. One patient (1.9%) developed complete heart block that needed permanent pacemaker insertion. One patient (1.9%) underwent a redo mitral valve repair within the same admission.

Upon discharge from hospital, all patients underwent transthoracic echocardiography. Of the 52 survivors, eight had no MR, 10 trivial MR, 28 mild MR and six (11.5%) moderate MR. All patients with residual moderate MR were from the large VSD group. Three patients (5.8%) had redo-operations for the mitral valve regurgitation; all of them had moderate MR upon discharge from hospital that became worse. One of them underwent redo mitral valve repair after 4 years. The other two patients underwent redo mitral valve replacement with mechanical valve 5 years, and 8 years after the initial operation respectively. The MR regressed to trivial in the remaining three patients with moderate MR during the time of follow up and no intervention was needed. There was no statistical significance between the repair type (ring-annuloplasty) and the degree of postoperative MR $p=0.5$ or the re-operation rate $p=0.8$. No patient developed mitral stenosis (MS) during the period of follow up.

The overall survival rate during the 10-year follow up time was 96%, and the overall rate of the freedom from re-operation was 94%.

Discussion

The association between mitral valve disease and ventricular septal defect was addressed by Arthur Hollman in 1965[5]. Most of his cases were mitral stenosis associated with other complex heart disease. Kouichi Hisatomi and colleagues from Japan[6] published their outcome of mitral repair associated with VSD in 1996. They used conservative unilateral or bilateral mitral valve annuloplasty technique to repair the valve but their cases were few, only 25 patients. Their actual survival rate was 92% in 10 years, which is less than our result (96%). The other issue was that they had four patients out of the 25 who developed significant MS with a transvalvular gradient more than 10 mmHg while in the present series no one developed significant MS during the time of follow up. Our freedom from re-operation was 94% at 10 years while that of Hisatomi was 91.3%.

There was a strong relationship between the size of the VSD and the degree of the MR but it was not statistically significant $p=0.2$. Furthermore the degree of the MR upon discharge from hospital was significantly related to the latest echocardiography finding during the follow up period $p=0.02$ and was related to the reoperation rate $p=0.001$.

Limitation

Detailed echocardiographic tape record was missing in most of our patients. Patient's file record, which was not always complete, was the main source of information, and because of that, more than 20 patients were excluded. Some of the patients were discharged from follow up after 2 years to other centers and their status is unknown.

Conclusions

The association of mitral valve regurgitation and ventricular septal defect is not uncommon. The size of the VSD may aggravate the severity of the MR. Repair of the mitral valve at the time of the VSD closure has an excellent mid-term outcome. Moderate residual MR is the main reason for reoperation. The use of suitable ring and suiTable annuloplasty technique is not associated with the development of significant mitral stenosis at least at mid-term follow up.

Further detailed study of this association involving a large number of patients and for a longer period of follow up is needed.

Acknowledgement

The authors would like to thank the staff of the patient's records and clinical research departments for their unlimited help and support.

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