Original Article

A Survey on Mechanical Prosthetic Pulmonary Valve Replacement in Rajaie Cardiovascular, Medical, and Research Center:7 Years' Experience

Mohammad Ali Sadr-Ameli[1], MD; Tahereh Zandi Kermanshahi[2], MD; Mohammad Mehdi Peyghambari[1], MD; Mandana Amir Sardari[3], MD; Hooman Bakhshandeh[3], MD; Maryam Shojaeifard[4], MD; Masoomeh Fooladi*[3], MD; Maryam Moradian[3], MD

ABSTRACT

Background: The present study aimed to assess the postoperative consequences and clinical course after mechanical prosthetic pulmonary valve replacement (PVR) in patients candidated for this procedure.

Methods: In a retrospective study, by referring and reviewing surgical reports at Rajaie Cardiovascular, Medical, and Research Center, between 2006 and 2013, patients' characteristics were assessed. Eligible patients were those who underwent PVR because of significant pulmonary insufficiency, and postoperative consequences and clinical courses were assessed retrospectively.

Results: In total, 415 patients underwent PVR. The most common underlying etiology was tetralogy of Fallot, with a prevalence of 88.9%, followed by concomitant pulmonary stenosis, with a prevalence of 11.1%. Only 1.5% of the patients had malfunction in their mechanical prostheses. During the follow-up, no death was reported. Regarding the clinical course of the disease after surgery, 3.1% of the patients suffered hemorrhagic events. None of the patients developed thromboembolic events. The 1-, 2-, and 3-year hemorrhagic-free survival rates were 98.9%, 98.4%, and 97.2%, respectively.

Conclusions: Regardless of the occurrence of postprocedural malfunction, PVR had an appropriate midterm outcome with rare mortality and morbidity among our study population. Our study showed that an appropriate anticoagulation support was able to confer a proper outcome *vis-à-vis* thromboembolic or hemorrhagic events. ***(Iranian Heart Journal 2017; 17(4): 26-29)***

Keywords: Prosthetic● Pulmonic valve● Mechanical

[1] Cardiovascular Intervention Research Center, Rajaie Cardiovascular, Medical, and Research Center, Iran University of Medical Sciences, Tehran, I.R. Iran.
[2] Department of Anesthesiology, Modares General Hospital, Shahid Beheshti University of Medical Sciences, Tehran, I.R. Iran.
[3] Rajaie Cardiovascular, Medical, and Research Center, Iran University of Medical Sciences, Tehran, I.R. Iran.
[4] Echocardiography Research Center, Rajaie Cardiovascular, Medical, and Research Center, Iran University of Medical Sciences, Tehran, I.R. Iran.

***Corresponding Author:** Masoomeh Fooladi, MD; Rajaie Cardiovascular, Medical, and Research Center, Iran University of Medical Sciences, Tehran, I.R. Iran.
E-mail: fooladimasoomeh@yahoo.com **Tel:** 09126223176

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Pulmonary valve regurgitation refers to a retrograde flow from the pulmonary artery into the right ventricle during diastole. Although mild physiological regurgitation in this valve may be detected in most healthy individuals, particularly in those with advanced age, pathologic conditions leading to the production of excessive and clinically significant regurgitation can result in the impairment of right ventricular function and eventual clinical manifestations of right-sided volume overload and heart failure. [1,2] The incompetence of the pulmonic valve can occur in consequence of some major pathological processes, including dilatation of the pulmonic valve ring, acquired alteration in the morphology of the pulmonic valve leaflet, and congenital absence or malformation of the valve. [3] These conditions frequently appear in some underlying etiologies such as primary and pulmonary hypertension, tetralogy of Fallot, infective endocarditis, rheumatic heart disease, carcinoid tumors, and some medications or complications related to the therapeutic balloon catheter dilatation of a stenotic pulmonic valve. [4]

Pulmonic regurgitation is seldom severe enough to warrant special treatment except only for controlling symptoms of heart failure or pulmonary hypertension. [5, 6] In this regard, the surgical reconstruction or replacement of the pulmonic valve, preferably with a bioprosthetic valve, is the appropriate option. [7] More recently, percutaneous intervention for dysfunctional right ventricular outflow tract conduits has become available. [8] The intermediate-term results have shown that percutaneous bioprosthetic valve implantation is a reasonable option for patients with dysfunctional right ventricular outflow tract conduits, especially those with a high surgical risk. [9] Freedom from valve dysfunction or reintervention following percutaneous bioprosthetic valve placement has been reported to be 93.5% at 1 year. [10] In this regard, periodic echocardiographic reassessments can provide a longitudinal comparison of the progression of both regurgitation and right ventricular size and function following pulmonary valve replacement (PVR). [11]

The present study aimed to assess the postoperative consequences and clinical courses after mechanical prosthetic PVR in patients candidated for this procedure.

METHODS

In a retrospective study, by referring and reviewing surgical reports at Rajaie Cardiovascular, Medical, and Research Center, between 2006 and 2013, the patients' baseline characteristics, cardiovascular risk factors, preoperative and postoperative laboratory and echocardiography assessments, and preoperative medications were assessed. Eligible patients were those who underwent PVR because of significant pulmonary insufficiency. The results of the statistical analyses are presented as means ± SDs for the quantitative variables and summarized as absolute frequencies and percentages for the categorical variables. The normality of the data was analyzed using the Kolmogorov–Smirnoff test. The categorical variables were compared using the χ^2 test or the Fisher exact test when > 20% of cells with an expected count < 5 were observed. The quantitative variables were also compared via the ANOVA or the Wallis *H*-test. The complication-free survival rate was assessed using the Kaplan–Mayer survival analysis. For the statistical analyses, SPSS—version 16.0 for Windows (SPSS Inc., Chicago, IL)—was used. A P value ≤ 0.05 was considered statistically significant.

RESULTS

Baseline Characteristics

In total, 415 patients underwent PVR. The mean age of the patients was 27.65 ± 8.50 years. The most common underlying etiology for PVR was tetralogy of Fallot with a prevalence of 88.9%, followed by concomitant pulmonary stenosis, with a prevalence of 11.1%. With respect to the type

of the implanted valves, the most frequently applied valves were the St Jude (88%) and the CarboMedics (n= 19). In the last clinical visit, 28.6% of the subjects with valvular malfunction and 86.9% of those without malfunction remained asymptomatic ($P < 0.001$); however, cardiac arrhythmia occurred in 9%, chest pain in 2%, dyspnea in 36.5% , and endocarditis in 3.2%—indicating a significant discrepancy in the prevalence of dyspnea as the dominant clinical symptom ($P < 0.001$) (Fig. 1). Apropos the clinical course of the disease after surgery, 3.1% of the study population suffered hemorrhagic events. None of the patients experienced thromboembolic events. The 1-, 2-, and 3-year hemorrhagic-free survival rates were 98.9%, 98.4%, and 97.2%, respectively (Fig. 2).

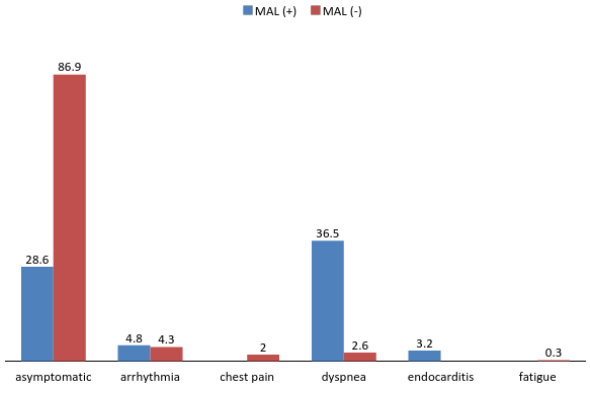

Figure 1. Prevalence of the symptoms in the study population in terms of valvular malfunction.

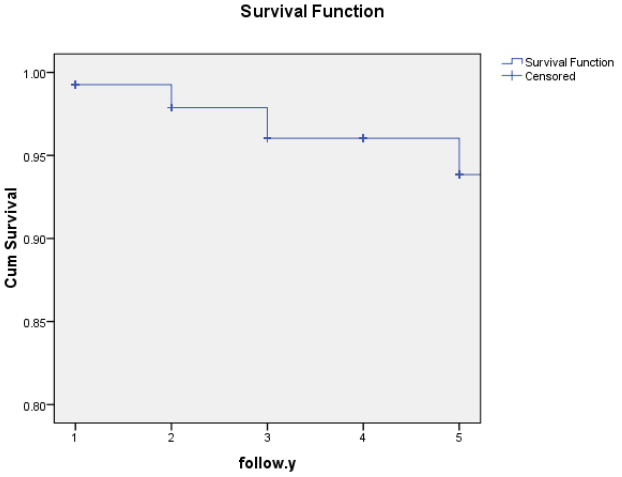

Figure 2. Kaplan–Meier plot shows the probability of hemorrhage-free survival in the patients.

DISCUSSION

The present study is the 1st study to compare the midterm outcome of the surgical management of pulmonary valve insufficiency between patients. First and foremost among our results is that an appropriate postoperative outcome in terms of survival as well as lack of complications such as thromboembolic or hemorrhagic events can be expected following mechanical PVR. Until now, the implantation of mechanical pulmonary valves has not been routinely recommended, except when there are some indications, because of the evidence of pulmonary thromboembolic events. [12] Our findings showed that there were no deaths or thromboembolic events at midterm follow-up. We also achieved a high hemorrhagic-free survival rate as well as no significant change in the international normalized ratio (INR) values within the follow-up period in the treated patients, indicating a proper anticoagulation management of the affected patients. In sum, surgical intervention as PVR can be the 1st and final choice for treating pulmonary insufficiency regardless of the type of the underlying etiology and the likelihood of postoperative valvular malfunction.

A review of the literature underscores similar findings with respect to a proper postoperative outcome. Deorsola et al [13] reported that all their patients remained asymptomatic during an 11-year follow-up period, with no arrhythmias and with good anticoagulation. In a study by Tjalling et al, [14] mechanical PVR had promising early midterm results.

In total, it seems that regardless of the occurrence of postprocedural malfunction, PVR has an appropriate midterm outcome, with rare mortality and morbidity. Our study showed that an appropriate anticoagulation support was able to confer a proper outcome with regard to thromboembolic or hemorrhagic events.

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