

Prosthetic Valve Endocarditis: Early Outcome following Medical or Surgical Treatment

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Abstract

Background: Prosthetic valve endocarditis (PVE) is an important cause of morbidity and mortality associated with heart valve replacement surgery. The aim of the present study was to describe the early outcome of treatment in patients with PVE in a single center.

Methods: The data of all the episodes of PVE registered at our institution between 2002 and 2007 were collected and analyzed retrospectively. The patients were assessed using clinical criteria defined by Durack and colleagues (Duke criteria). The analysis included a detailed study of hospital records. The continuous variables were expressed as mean±standard deviation, and the discrete variables were presented as percentages.

Results: Thirteen patients with PVE were diagnosed and treated at our center during the study period. In all the cases, mechanical prostheses were utilized. The patients' mean age was 46.9±12.8 years. Women made up 53.8% of all the cases. Early PVE was detected in 6 (46.2%) patients, and late PVE occurred in 7 (53.8%). Eleven (84.6%) patients were treated with intravenous antimicrobial therapy, and the other two (15.4%) required surgical removal and replacement of the infected prosthesis in addition to antibiotic therapy. Blood cultures became positive in 46.2% of the patients. Mortality rate was 15.4% (2 patients).

Conclusion: It seems that in selected cases with PVE, i.e. in those who remain clinically stable and respond well to antimicrobial therapy, a cure could be achieved by antimicrobial treatment alone with acceptable morbidity and mortality risk.

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Introduction

Prosthetic valve endocarditis (PVE) remains a serious complication of cardiac valve replacement despite improvements in prostheses types, surgical techniques, and infection control measures. PVE is an endovascular, microbial infection occurring on parts of the valve prosthesis

or on reconstructed native heart valves.¹ PVE occurs in 3% to 6% of recipients of substitute valves. Infection is generally categorized into early (usually less than 60 days postoperative) and late (greater than 60 days post-implantation).² The risk of infection of the prosthetic material shows a bimodal distribution pattern, with an early peak during the first 6 postoperative weeks and likelihood of approximately 3%

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during the first postoperative year. The incidence of late PVE ranges between 0.1 and 2.3 per 100 patient-years.³ Endocarditis developing on prosthetic valves accounts for 15 to 32% of all cases of infectious endocarditis.⁴ Advances in the management of PVE include a lesser incidence of early-onset infections, improvements in diagnosis by means of transesophageal echocardiography, and better outcome associated with combined medical/surgical treatment.⁴ The traditional approach to the management of this condition has been early surgery, and superior results have been demonstrated with surgical treatment compared with antibiotics alone.

However, while early surgery is indicated in patients with hemodynamic compromise, there is evidence that in selected cases treatment with antibiotics alone provides equivalent results.^{5,6} To describe the outcome of patients treated either with antibiotics alone or surgery, we conducted this retrospective study and reviewed all cases of PVE in our center between 2002 and 2007.

Methods

Thirteen patients who had undergone cardiac valve replacement and were admitted with a definite clinical diagnosis of PVE between February 2002 and March 2007 were included in this study. In one patient, PVE diagnosis was not supported by echocardiography and blood culture; he was, therefore, excluded from the study. All the thirteen cases fulfilled the Duke criteria⁷ for definite endocarditis. Clinical information was obtained using a detailed review of hospital clinical records.

and chronic renal failure), clinical signs and symptoms, microorganisms isolated from cultures, echocardiographic findings, medical or surgical treatment, and short-term or in-hospital outcome. Cases were considered early PVE when they occurred within 60 days after valve replacement and late PVE when occurring later.

This investigation was approved by the Ethics Committee of our institution. Because of the retrospective nature of the study, requirement for informed consent was waived. Data analysis was performed using SPSS version 13.0 package. The continuous variables were expressed as mean±standard deviation, and the discrete variables were presented as percentages.

Results

Thirteen cases fulfilled the Duke criteria for definite endocarditis. Overall, seventeen valves were replaced with mechanical prosthetic valves in these 13 patients.

Endocarditis occurred at an average of 12.5±32.5 months (range=0.13 to 120 months) after valve replacement. The patients' mean age was 46.9±12.8 years (range=28 to 67 years) at the time of PVE diagnosis. Women made up 53.8% of all the cases. Two (15.4%) patients had diabetes mellitus, and 5 (38.5%) had hypertension. The history of renal dysfunction and intravenous drug use was not positive in any patient. No other comorbidity was found in the study group.

The mitral valve was affected in 9 (69.2%) patients and the aortic valve in 4 (30.8%). There was no multiple value involvement. Positive echocardiographic findings for

Table 1. Patient's characteristics and antimicrobial regimen

No.	Age (y)	Sex	Involved valve type	Time of PVE after surgery (month)	Treatment type	Blood culture	Outcome
1	36	M	mitral	2.27	Medical	Staphylococcus Epidermidis	Survived
2	33	M	aortic	0.83	Medical	Staphylococcus Epidermidis	Survived
3	61	F	aortic	0.33	Medical	Negative	Expired
4	51	F	aortic	9.33	Medical	Kelebeciella Oxytoka	Survived
5	37	M	aortic	3.7	Surgical	Bacillus gram negative HACECK	Survived
6	60	M	mitral	0.33	Medical	Negative	Survived
7	52	F	mitral	0.43	Medical	Negative	Survived
8	63	M	mitral	1.03	Medical	Staphylococcus Aurous	Survived
9	28	F	mitral	0.13	Medical	Negative	Survived
10	38	F	mitral	3.47	Medical	Negative	Survived
11	67	F	mitral	17.03	Medical	Negative	Expired
12	41	F	mitral	120.0	Medical	Negative	Survived
13	43	M	mitral	4.0	Surgical	Pseudomonas Aeruginosa	Survived

No, Number; PVE, Prosthetic valve endocarditis; F, Female; M, Male

The following information was collected from the medical records: age, gender, coexisting comorbidities (diabetes mellitus, ischemic cardiomyopathy, malignancy,

infective endocarditis were found in the transesophageal echocardiograms of all the cases.

Six (46.2%) patients presented with early PVE, while late



PVE occurred in 7 (53.8 %) cases. Eleven (84.6%) patients were treated with antimicrobial therapy alone for 6 weeks, and two (15.4%) patients required the surgical removal and replacement of the infected prosthesis in addition to antibiotic therapy (Table 1). The blood cultures were positive in 6 (46.2 %) patients: (in 2 cases of early and 4 cases of late endocarditis). All the cultures fulfilled the Duck criteria. The results of the blood cultures were as follows: staphylococcus epidermidis in 2 (one in early and one in late PVE), staphylococcus aureus in 1 (early PVE), gram-negative bacilli HACECK in 1 (late PVE), klebsiella-oxytoca in one (late PVE), and pseudomonas aeruginosa in another (late PVE).

For all the patients in the medically treated group (11 patients), treatment was commenced on admission and continued intravenously for six weeks. The initial choice of antibiotics was according to the existing guidelines⁸ for PVE treatment. For those with positive blood cultures, treatment was modified by consulting with an infectious disease specialist. In those who underwent surgery (2 patients), antibiotics were also initially commenced on admission. An inappropriate response to medical therapy (persisting fever or heart failure due to severe prosthetic valve dysfunction) led to surgical treatment. Aortic homograft in combination with antibiotics was utilized just in one case who had heart failure and continuing sepsis with a blood culture positive for gram-negative microorganism (klebsiella-oxytoca) in addition to severe aortic valve insufficiency and paravalvular leakage.

Two (15.4%) patients (one in early and one in late PVE) who were managed by antibiotics alone died during hospitalization due to multiorgan failure.

Discussion

Prosthetic heart valves, utilized for the management of valvular heart disease, have been in use since the mid-1960s. Today, more than 2 million individuals have received a cardiovascular prosthetic device in the United States and worldwide, and more than a quarter of a million prosthetic heart valves are implanted annually.⁹ In the emerging years of heart valve replacement surgery, the incidence of bacterial endocarditis after cardiac operations was as high as 10%.³ PVE is now a rare condition with a frequency ranging from 1% to 3% within the first postoperative year,¹⁰ it is associated with high morbidity and mortality rates of between 10 and 59%⁶ and with a 10-year survival rate of 50%.¹¹

In our study, 11/13 (84.6%) of the PVE cases occurred within the first year after surgery. The mortality rate was 15.4% in the patients with antimicrobial treatment due to multiorgan failure. According to Dominguez et al.,¹² the early mortality of PVE was 20%. Akowuah et al.⁵

reported 29% mortality among their antibiotic group.

The most appropriate treatment approach to PVE, either medical or surgical, is still under discussion. Whereas surgery is the treatment of choice for PVE according to some authors, others think that antibiotics may be sufficient for some patients.¹³

The superiority of surgical treatment over antibiotic treatment alone was shown in the Wang et al. study.¹⁴ However, antibiotics play a major role in the treatment of PVE. Some studies have confirmed that selected patients with PVE who remain clinically stable or show improvement on antibiotic treatment can be treated successfully with antibiotics alone.^{5,6,15}

Indications for valve replacement in early PVE include the presence of mild heart failure with evidence of valve obstruction caused by vegetations or a regurgitant murmur and staphylococcal endocarditis with any degree of heart failure. In late PVE (more than 2 months after the initial operation), advanced degree of heart failure, emboli, continuing sepsis, and staphylococcal organism are indications for valve surgery.¹⁶ Multidrug-resistant gram-negative bacilli infection is another PVE surgical indication.¹⁰

Staphylococci are more prevalent in both early and late PVE compared with endocarditis of the native valves.⁶ Although the blood cultures became positive in less than half of our cases, 50% of them were caused by staphylococci in both early and late PVE. PVE caused by staphylococcal organism is one of the indications for surgery; be that as it may, in all of our three cases conservative treatment with antimicrobial agents was successful and there was no requirement for surgery.

Vancomycin was utilized in 11/13 (84.6%) of our cases, and there was no resistance against it in patients with a positive blood culture or in culture-negative ones. The retrospective methodology of the present study along with the small number of patients with PVE was our notable limitation. Another limitation was the short duration of follow-up, which was confined to the duration of admission in contrast to other studies with long-term follow-up periods.

Conclusion

In conclusion, according our study with this sample size, it seems that patients with prosthetic valve endocarditis without left heart failure and echocardiographic evidence of the presence of large abscesses could be managed by antimicrobial treatment alone with acceptable morbidity and mortality risks. In this study, we reported cases of PVE (some with early PVE) in which medical therapy without surgical intervention was able to control the infection. This result raises the question about the necessity of surgery in

all cases of PVE. It seems that in selected cases, i.e. those who remain clinically stable and show a good response to antimicrobial therapy, a cure by medical treatment can be achieved. Nevertheless, it is advisable that more experiments with more cases and long-term follow-up be conducted for a better management of these patients.

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This study has been approved by Institutional Review Board and Ethics Committee of Tehran Heart Center, Tehran University of Medical Sciences.

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