
SURGICAL TREATMENT OF PROSTHETIC VALVE ENDOCARDITIS*

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Forty three (2.8%) cases of prosthetic valve endocarditis (PVE) were encountered in a period of 8 years and 30 (69.8%) of these were treated surgically. 19 (63.3%) had early, and 11 (22.79%) had late PVE. Staphylococcus was the most common microorganism isolated from the cultures. Progressive heart failure and uncontrollable sepsis were the main indications for surgery. Total hospital mortality was 30%, with a late mortality of 9.5%. The living patients were followed up mean 21±9 months, and in 4 patients recurrent endocarditis and periprosthetic leakage was seen. Prolonged cardiopulmonary bypass periods in the primary operation seemed to be an important factor in the establishment of PVE ($p < 0.01$). Reoperation should be performed in PVE before severe heart failure develops.

Keywords: Prosthetic valve endocarditis, sepsis.

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Prosthetic valve endocarditis (PVE) is a devastating complication seen in 2-4 % of all valve replacement operations, which is generally associated with high mortality rates. Increasing surgical experience, and high mortality with medical treatment have led to the widespread recommendation of early reoperations.

Material and Methods

Between February 1985-1993, a total of 5746 open heart operations were performed, and of these 59% (3393) were CABG procedures; 30.46% (1750) cardiac valve operations. 87.9% (1538) of the valve procedures were isolated or combined mitral and aortic valve replacements. In 43 (2.8%) of these cases PVE was encountered, and were treated either medically or surgically. 30 (69.8%) of these patients were treated surgically.

The diagnosis of PVE required at least two of the following criteria to be present:

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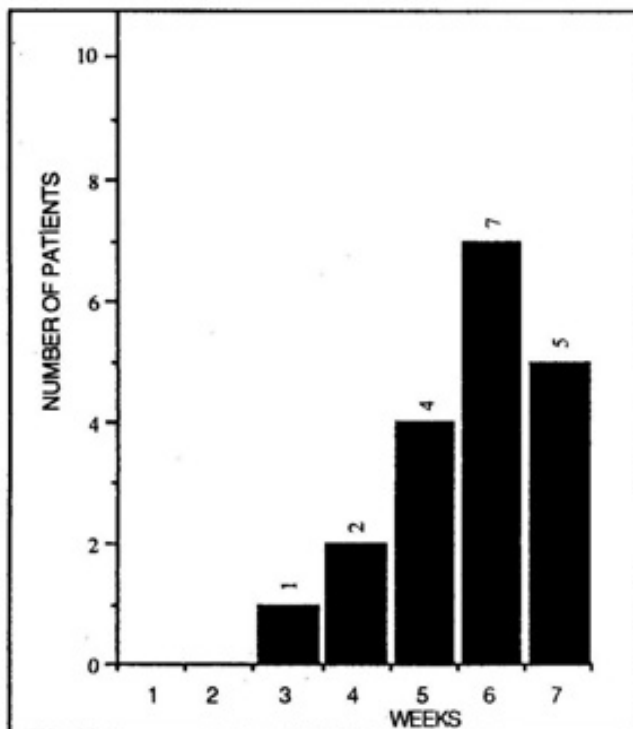


Figure 1: Distribution of onset of early PVE in 19 patients

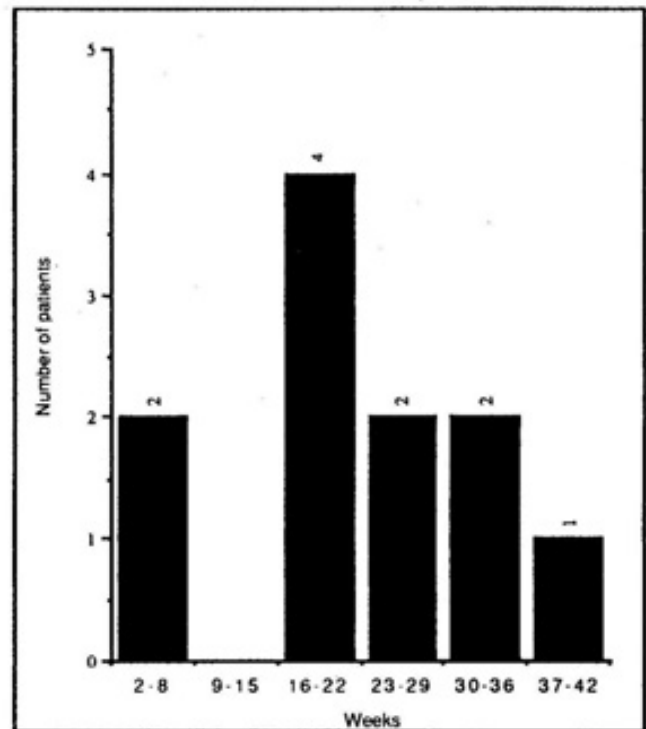


Figure 2: Distribution of onset of late PVE in 11 patients

- 1) At least two positive the blood cultures;
- 2) Clinical features of PVE; fever with leukocytosis in the presence of a new cardiac murmur, peripheral embolism, or splenomegaly;
- 3) The presence of vegetation or periprosthetic dehiscence with granulation tissue, noncalcific bioprosthetic leaflet destruction or annular abscess formation, as observed at the operation;
- 4) Histologic or bacteriologic evidence of infection in the excised prosthesis.

Early PVE was defined as onset of symptoms in the first 60 days following prosthetic valve replacement.

The youngest of the 30 patients was 16, and the oldest 68 years old, with a range of 42 ± 18

years. 20 (66.6%) of the patients were male, 19 (63.3%) patients had early PVE while the other 11 (27.7%) had late PVE. The distribution of onset of early and late PVE are shown in Figs 1 and 2. Early PVE was seen mostly in the 6th postoperative week. Late PVE had occurred between 3rd and 42nd postoperative months, with a mean of 21 ± 14 months.

Clinical features of 30 patients treated surgically are shown in Table I.

In 19 (69%) of the cases the PVE was seen at the mitral, while in 11 (27%) at the aortic valve. We have never encountered double valve endocarditis. The distribution of the valve types according to early and late PVE are shown in

Table I: Clinical manifestations of 30 patients treated surgically with PVE

	No	%
Fever over 37°C	30	100
Heart failure	19	63.3
A new cardiac murmur	11	36.6
Splenomegaly	6	20.0
Peripheral physical findings	6	20.0
Hematuria	5	16.6
Systemic embolism	3	10.0

Table II: Distribution of valve type in early and late PVE

	Early PVE	Late PVE
Valve Type		
Mechanical	16	6
Bioprosthesis	3	5
Valve Position		
AVR	8	3
MVR	11	8
Mechanical Valve		
St Jude Mechanical	7	3
Bjork Shiley	6	3
Sorin	3	—

Table II. The microorganisms which were isolated from blood cultures and infected prosthetic valves are shown in Table III. In 7 (23.3%) patients no microorganism was isolated. All of the patients were reoperated under standard cardiopulmonary techniques. Centrifugal pumps and membrane oxygenators were used in every case.

Results

Staphylococcus was the most common microorganism isolated in the cultures (43%). In 7 (23.3%) of the patients any microorganism could not be isolated. Small periprosthetic leakage and flail bioprosthetic valve leaflet were the causes of regurgitant murmur in patients, were as on after occasions the infected prosthesis were detached from the annulus by one to two thirds of the circumference. The myocardium was invaded by annular to subannular abscess formation in 10 patients and in 5 of them there

was complete loss of supporting tissue. Table IV shows macroscopic pathology of these patients.

In 19 (67%) occasions patients exhibited severe hemodynamic failure (Class IV and cardiogenic shock) while on medical management, and were operated upon within 8-72 hours of their hemodynamic deterioration. Six patients who presented heart failure (Class III), fever, and regurgitant murmur showed progressive deterioration; and were operated upon in the 1-5 week of their illness. Table V shows the relationship between functional class and operative mortality. Hospital mortality in the whole group was 30% and all of the patients were in the class IV and cardiogenic shock group. On the other hand, the rest of the 11 patients survived.

Table VI shows the relationship between cardiopulmonary bypass and aortic cross clamp times of the PVE groups during the primary operation, compared with randomized elective cases. It was found out that there was a significant difference among both the aortic and mitral groups ($p < 0.01$). Prolonged CPB and

Table III: Microorganisms isolated from blood cultures or infected prosthetic valves

	Early	Late	%
Staphylococcus aureus	12	1	43.3
Staphylococcus epidermidis	2	4	20
Streptococcus viridans	—	1	3.3
Enterobacter	2	—	6.6
Candida albicans	1	—	3.3

	Mitral	Aortic	%
Vegetation+thrombus	6	2	26.6
Periprosthetic leak age	2	7	30.0
Paraannular abscess	2	8	33.0
Leaflet destruction and perforation (bioprosthesis)	5		16.6

	No	Mortality	%
Class I	1	—	—
Class II	4	—	—
Class III	6	—	—
Class IV	8	2	25
Cardiogenic shock	11	7	63.6

cross-clamp periods seems to be a risk factor in the establishment of PVE.

Table VII shows causes of early and late mortality. Early mortality was 30%, while late mortality 9.5% period.

The follow-up period in the 19 surviving patients was 4 to 37 months (mean 21 ± 9 months). Recurrent endocarditis was seen in 2 and periprosthetic leakage in another 2 patients.

Discussion

The continuing high and unacceptable mortality of PVE, despite improvement in antimicrobial therapy, myocardial preservation techniques, still is a major problem in cardiac valve surgery.

Operative mortality for patients in having severe heart failure because of PVE remains high and has been reported as 35-84%¹⁻⁴ in recent publications. Various risk factors such as early presentation, presence of non-streptococcal organisms, new or increased regurgitant murmur, myocardial invasion, severe hemodynamic failure, aortic valve replacement have been identified, and urgent surgical intervention has been proposed for patients in whom these risk factors are detectable⁵⁻⁷.

At Koşuyolu Heart and Research Hospital the current consensus in emergency valve rereplacements with suspected PVE, is progressive hemodynamic deterioration developing in the presence of a new regurgitant murmur. In such patients it is believed that it is

	No	Cross-clamp	CPB Time
PVE (Aortic)	11	75 ± 16	120 ± 31
Control group	20	59 ± 13	91 ± 26
			$p < 0.01$
PVE (Mitral)	19	63 ± 11	104 ± 24
Control group	20	41 ± 9	74 ± 18
			$p < 0.01$

Table VII: Causes of early and late mortality

EARLY MORTALITY:	9 patients (30%)	LATE MORTALITY :	2 patients (9.5%)
Low cardiac output	5	Cerebral embolism	1
Multiorgan failure	3	Heart failure	1
Cerebrovascular accident	1		

not even necessary to wait for the blood culture results. The high operative mortality of 25% of Class IV, and 63.6% of the cardiogenic shock group shows us how important it is to gain time before progressive severe heart failure develops. NYHA functional classification of this group patients seems to be the most important predictor of mortality and morbidity. Another interesting observation was the significant prolonged periods of these patients' cross clamp periods, and total perfusion periods during their primary operations.

Isolation of nonstreptococcal organisms especially in the presence of early PVE pushes us to be more careful in the operating room and intensive care unit. The type of prosthetic valve used in the primary operation seems to be unimportant.

Recently, potential technical problems concerning a reoperation prevented most patients from undergoing reoperation. However, increasing surgical experience, and the higher mortality of patients with medical management has led to an enthusiasm in emergency or semielective reoperations in PVE^{2,5,8}. The indications for these procedures may be summarized as: congestive heart failure, moderate to severe heart failure due to valve dysfunction, refractory sepsis despite optimal antibiotic coverage, valve obstruction or unstable prosthesis detachment without severe heart failure, new onset of heart block.

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