Surgical management for active infective endocarditis: A single hospital 10 years experience

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Abstract

Objective: **Surgical treatment of active infective endocarditis (IE) requires not only homodynamic repair, but also, special emphasis on the eradiation of the infection to prevent recurrence. This study was undertaken to examine the outcome of surgery for active infective endocarditis.**

Methods: **One hundred sixty-four consecutive patients (pts) underwent valve surgery for active IE in Madani Heart Centre (Tabriz, Iran) from 1996 to 2006. Patients presenting with IE diagnosis (according to Duke Criteriaset) were eligible for study.**

Results: **The mean age of patients was 36.3±16 years overall: 34.6±17.5 years for native valve endocarditis and 38.6±15.2 years for prosthetic valve endocarditis (p=0.169). Ninety one (55.5%) of patients were men. The infected valve was native in 112 (68.3%) of patients and prosthetic in 52 (31.7%). In 61 (37%) patients, no predisposing heart disease was found. The aortic valve was infected in 78 (47.6%), the mitral valve in 69 (42.1%), and multiple valves in 17 (10.3%) of patients. Active culture-positive endocarditis was present in 81 (49.4%) whereas 83 (50.6%) patients had culture-negative endocarditis. Staphylococcus aureus was the most common isolated microorganism. Ninety patients (54.8%) were in NYHA classe III and IV. Mechanical valves were implanted in 69 patients (42.1%) and bioprostheses in 95 (57.9%), including homograft in 19 (11.5%). There were 16 (9%) operative deaths, but there was only 1 death in patients that underwent aortic homograft replacement. Reoperation was required in 18 (10.9%) of cases. On multivariate logistic regression analysis, Staphylococcus aureus infection (p=0.008), prosthetic valve endocarditis (p=0.01), paravalvular abscess (p=0.001) and left ventricular ejection fraction less than 40% (p=0.04) were independent predictors of in-hospital mortality.**

Conclusions: **Surgery for infective endocarditis continues to be challenging and associated with high operative mortality and morbidity. Prosthetic valve endocarditis, impaired ventricular function, paravalvular abscess and Staphylococcus aureus infection adversely affect in-hospital mortality. Also we found that aortic valve replacement with an aortic homograft can be performed with acceptable in hospital mortality and provides satisfactory results.** ***(Ind J Thorac Cardiovasc Surg 2008; 24: 120-123)***

Key words: Hemodynamics, Aortic value replacement, Surgery

Introduction

Despite advances in the diagnosis and antibiotic treatment of infective endocarditis, eradication of the septic focus and abolition of the accompanying systemic manifestations frequently require surgical intervention. Inspite of appropriate antibiotic treatment and improved surgical techniques, hospital mortality in patients with active endocarditis is higher than expected and the incidence of recurrence is still significant[1-3]. Since recurrent endocarditis is a dreadful complication and targeted postoperative antibiotic treatment for more than 4 weeks carries a better prognosis, according to recent reports[4,5], the determination of microorganisms could affect early and late outcomes after surgery. Because of the heterogeneity of the clinical and pathologic make up of patients undergoing surgical treatment for active endocarditis, operative mortality ranges widely between 3.8 and 22%[6-16] and many risk factors for hospital mortality were reported: age above

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Received - 09/12/07; Review Completed - 20/03/08; Accepted - 16/04/08.

60 years, delayed diagnosis, Staphylococcus infection, aortic valve endocarditis, large valvular vegetations, congestive heart failure, cerebral or coronary embolism, prosthetic valve infection, recurrent events, and failed antibiotic therapy. In this study, therefore, we reviewed our 10-year experience in the treatment of diagnosed active endocarditis and identified factors determining operative mortality, reoperation, and events, particularly focusing on the factor of culture negative endocarditis.

Methods

One hundred sixty-four consecutive patients underwent valve surgery for active IE in Madani heart Centre (Tabriz, Iran) from 1996 to 2006. We divided the patients into two subgroups: "native valve Infective Endocarditis" (NVE) (n=115) and "prosthetic valve Infective Endocarditis" (PVE) (n=52). Patients presenting with IE diagnosis (according to Duke Criteria) were eligible for study. All the patients underwent operation before completion of antibiotic treatment and all received at least 4 weeks of postoperative multidrug antibiotic treatment. Transthoracic echocardiography was performed in all cases, and also blood cultures and valve cultures were performed routinely for all patients with fever or active infection.

Cases of infective endocarditis were classified retrospectively according to the Duke Criteria. Endocarditis was labeled 'active' if the patient had fever and/or leukocytosis at the time of surgery or required surgical treatment before completion of a standard course of antibiotic treatment. Prosthetic valve endocarditis was defined as infection occurring on any type of tissue or mechanical valve device. 'Early' prosthetic valve endocarditis was present if recurrent or residual endocarditis occurred within 60 days after surgery, while prosthetic valve endocarditis occurring after 60 days was labeled 'late'. Culture-negative endocarditis was present when no microorganisms could be identified either in serial blood cultures or in cultures from the explanted valvular tissue in patients presenting with a clinical picture of active endocarditis, particularly in the presence of a new regurgitant murmur, congestive heart failure and/or vegetation on echocardiogram.

The collected data were entered into SPSS v.13.0 (SPSS Inc. Chicago.IL) statistical package. Continuous variables between the two study groups (native vs. prosthetic valve IE) compared by independent samples t-test categorical variables analysed by chi-square or Fisher's exact test as appropriate. All variables that have statistically significant differences ($p< 0.05$) in univariate analysis underwent multivariate logistic regression analysis for determining of independent risk factor of in-hospital mortality.

Results

The mean age of patients was 36.3±16 years overall: 34.6±17.5 years for native valve endocarditis and 38.6±15.2 years for prosthetic valve endocarditis ($p=0.169$). Ninety one (55.5%) of pts were men. The infected valve was native in 112 (68.3%) of patients and prosthetic in 52 (31.7%). In 61 (37%) patients, no predisposing heart disease was found. The aortic valve was infected in 78 (47.6%), the mitral valve in 69 (42.1%), and multiple valves in 17 (10.3%) of patients. Active culture-positive endocarditis was present in 81 (49.4%) whereas 83 (50.6%) patients had culture-negative endocarditis. The results of the blood cultures and valve cultures are shown in (Table 1).

Table 1. Infective microorganisms of flood or valve cultures.

Microorganism	NVE (n=112)	PVE (n=52)	total
Staphylococcus aureus	13 (16.1%)	24 (46.15)	37 (22.6%)
Staphylococcus epidermidis	2 (1.8%)	1 (1.9%)	3 (1.8%)
Streptococcus viridians	23 (20.5%)	-	23 (14.02)
Streptococcus other	2 (1.8%)	-	2 (1.2%)
Entrococcus	2 (1.8)	-	2 (1.2%)
Brocellosiss	5 (4.5%)	-	5 (3.04%)
Candida	5 (4.5%)	2 (3.8%)	7 (4.3%)
pseudomona	-	2 (3.8%)	2 (1.2%)
Culture-neqative	60 (54.4%)	23 (44.2%)	83 (50.6%)

NVE = Native value endocarditis, PVE = Prosthetic value endocarditis

Staphylococcus aureus was the most common isolated microorganism [37 (22.6%)]. Streptococcus species were the most common infecting microorganisms in NVE 25 (22.3%), while Staphylococcus species were the most common infecting microorganism in PVE 25 (48.1%). Culture-negative endocarditis was equally distributed between NVE 60 (54.4%) and PVE 23 (44.2%); $p=0.09$. New York Heart Association (NYHA) status was evaluated in all patients: 62 patients (37.8%) were in NYHA class III and 28 (16.6%) in NYHA class IV, while 74 patients (55.2%) did not complain of dyspnea, being in NYHA class I or II. LVEF <40% was present in 71(43.3%) of patients. Mechanical valves were implanted in 69 patients (42.1%) and bioprostheses in 95 (57.9%), including a homograft in 19 (11.5%). eighteen patients with NVE and 8 patients with PVE had embolic events, 14 with cerebral embolism, 4 with splenic embolism, 4 with peripheral

embolism, and 6 with renal embolism. Typical findings of infective endocarditis were recorded at echocardiography: significant valvular regurgitation was observed in 63 cases. There were 16 (9%) in-hospital deaths, but there was only 1 (5.3%) death in pts that underwent aortic homograft replacement. The infecting microorganisms in hospital deaths were Staphylococcus aureus in 6 patients, Staphylococcus epidermidis in one, Streptococcus viridians in 2 and the other 7 patients were culture-negative. Univariate analysis of variables influencing in-hospital mortality is shown in (Table 2).

Table 2. Univariate analysis of variables influencing in-hospital mortality.

Variables	Categories	No	Univariate In hospital mortality		P
Sex	Male	91	9	(9/9)	0/225
	female	73	7	(9/6)	
Age >70	Yes	8	1	(12/5)	0/793
	No	156	15	(9/6)	
NYHA III.IV	Yes	90	10	(11/11)	0/632
	No	74	6	(8/1)	
PVE	Yes	52	10	(19/2)	0/008
	No	112	6	(5/35)	
Aortic valve	Yes	84	8	(9/52)	0/93
	No	80	8	(10)	
Mitral.valve	Yes	81	7	(8/64)	0/86
	No	83	9	(10/84)	
`Multiple valve	Yes	17	2	(11/8)	0/81
	No	147	14	(9/52)	
Blood Culture	Neg	83	7	(8/43)	0/80
	Pos	81	9	(11/11)	
Staphylococcus aureus	Yes	37	5	(13/51)	0/03
	No	127	11	(8/66)	
Para valvular abcess	Yes	15	4	(26/6)	0/01
	No	149	12	(8)	
LVEF ≤ 40%	Yes	71	12	(16/9)	0/003
	No	93	4	(2/3	
Reoperation	Yes	18	1	(5/5)	0/046
	No	146	15	(10/2)	

Reoperation was required in 18 (10.9%) of cases. On multivariate logistic regression analysis, Staphylococcus aureus infection (p= 0.008) Prosthetic valve endocarditis (p=0.01), paravalvular abscess (p=0.001) and left ventricular ejection fraction less than 40% (p=0.04) were independent predictors of in-hospital mortality (Table 3).

Table 3. Multivariate analysis of variables influencing in-hospital mortality.

Variable	OR (95% CI)	P
PVE	2.83 (1.44-6.76)	0.0114
Staphylococcus aureus	3.19 (1.09-10.6)	0.0471
Paravalvular abcess	1.93 (1.14-3.98)	0.0231
LVEF = 40%	4.61 (1.93-8.92)	0.0103
Reoperation	2.13 (0.13-11.7)	0.0938

LVEF = left ventricular ejection fraction, PVE = presthetic value endocarditis

Discussion

Surgical treatment of active infective endocarditis by valve replacement still remains a challenge to the surgeon, because it requires not only homodynamic repair, but also, special emphasis on the eradiation of the infection to prevent early postoperative colonization of the prosthesis by remaining microorganisms. This goal can be achieved by the combination of aggressive debridement of infective tissue and appropriate and adequate antibiotic treatment. In this retrospective study, Staphylococcus aureus infection, prosthetic valve endocarditis, paravalvular abscess and left ventricular ejection fraction less than 40% were independent predictors for in-hospital mortality.

In this study, the hospital mortality was (LVEF) 9%, including NVE in 9 (8%) and PVE in 7 (13.5%). In recent reports, the early mortality of patients with NVE was reduced to less than 10%, although operative mortality ranges widely between 3.8 and 22%[7-16] because of the heterogeneity of this disease. In contrast to NVE, the early mortality from PVE remains as high as 13 to 33%[6,8,9,14,17,18]. It has been demonstrated that Staphylococcus aureus and annular abscess may significantly increase the risk of early mortality [6,8,10,11,14]. In fact, significant risk factors of advanced age and preoperative heart failure have been reported by many authors. Although, improvements in diagnosis, surgical techniques, and postoperative care have reduced hospital mortality, the recurrence rate is still high[1-3]. Inevitably, reinfection or other mainly valve-related events such as periprosthetic leakage, will lead to a need for reintervention in some patients. The 10.9% reoperation rate in this series is within the reported ranges of 8.2–19.8%.[8–10,19]. Use of a homograft for aortic valve or root replacement has been shown to provide good results in terms of operative mortality and freedom from recurrence of infection[20,21] although the availability is limited. In contrast, however, others mentioned that the type of prosthesis used is not so important because early and late good results can be achieved by adequate debridement of the infected tissues, reconstruction of the resulting defects, and administration of appropriate postoperative antibiotics[9,11,22]. It has, nonetheless, a serious impact on the outcome, being a determinant of late cardiac death. The survival after surgical treatment for active endocarditis is known to be good, with reported 10-year rates ranging from 52.0 to 71.3%[6,8–10,12].

In this study, microorganisms were not detected in 50.6% of patients in blood or tissue cultures; although all tissue samples were cultured routinely. Controversial observations about the prognostic impact of positive blood and tissue cultures are still issued. Aranki et al.[6]

reported that long-term survival was not influenced by activity of infection nor by the type (native or prosthetic endocarditis), whereas Dehler et al.[4] reported a significantly worse prognosis in patients with positive intraoperative cultures than in patients with negative intraoperative cultures. Renzulli[13] reported a higher incidence of reoperation in patients with positive intraoperative cultures although no differences were found in short and long-term survivals. Lack of germ isolation and sensitivity test results precludes specific postoperative antibiotic therapy, and targeted postoperative antibiotic treatment for more than 4 weeks carries a better prognosis according to a recent report[4]. This would suggest that although surgical techniques and appropriate preoperative multidisciplinary management can avert an unfavorable earlyoutcome, there remains a continuous risk for recurrence and mortality.

Conclusions

Surgery for infective endocarditis continues to be challenging and associated with high operative mortality and morbidity. Prosthetic valve endocarditis, impaired ventricular function, paravalvular abscess and Staphylococcus aureus infection adversely affect in-hospital mortality. Also we found that aortic valve replacement with an aortic homograft can be performed with acceptable in-hospital mortality and provides satisfactory results.

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