Infective Endocarditis

— Analysis of 116 surgically and 26 medically treated patients —

KIYOSHI YOSHIDA, M.D., JUNICHI YOSHIKAWA, M.D., TAKASHI AKASAKA, M.D.
TAKESHI HOZUMI, M.D., KENJI MAEDA, M.D., FUKUMARU OKUMACHI, M.D.
KENICHI SHIRATORI, M.D., KATSUMI KOIZUMI, M.D., HIROSHI KATO, M.D.
YUKIKATSU OKADA, M.D.*, AND TOYO SHOMUURA, M.D.*

We have reviewed 116 cases of bacterial endocarditis treated surgically and 26 cases treated medically since 1973. There were 123 patients with native valve endocarditis and 19 patients with prosthetic valve endocarditis. Overall, the left-sided valves were infected most frequently. There were 10 cases with right-sided valves involved. Multiple valves were infected in 6 patients. There were 6 perioperative deaths in the surgical group. The most common cause of death was multi-organ failure associated with uncontrollable sepsis. The overall operative mortality for active endocarditis was 7.7% (4/55), and for healed endocarditis, 3.3% (2/61). For active native valve endocarditis, the mortality was 4.2% (2/48), for healed native valve endocarditis, 3.6% (2/55), for active prosthetic valve endocarditis, 28.6% (2/7), and for healed prosthetic valve endocarditis, 0%. There was no difference in the operative mortality between active native valve endocarditis and healed native valve endocarditis. The mortality of active prosthetic valve endocarditis was significantly higher than that of active native valve endocarditis ($p < 0.01$). Of the 26 patients treated medically, 7 died during the initial hospitalization. The major factor related to mortality in the medically treated patients was persistent sepsis (four patients), and congestive heart failure (three patients). The overall mortality of the medical group for active valve endocarditis was 15% (3/20), and for active prosthetic valve endocarditis, 67% (4/6). We conclude that patients with infective endocarditis with significant valve lesions who are unresponsive to medical therapy should be considered for urgent surgery.

DESPITE the availability of new and potent antibiotics, the management of patients with acute infective endocarditis remains a difficult therapeutic challenge! Since the initial report of successful cardiac valve replacement in the treatment of infective endocarditis², subsequent experience has indicated that further improved survival is possible with earlier valve surgery.³⁻¹⁴ Pub-

lished series reporting the results of valve replacement in infective endocarditis are, however, often difficult to interpret and compare because of imprecise definition of infective endocarditis, and failure to differentiate between active infection and healed valvular lesions^{8,10}. We have therefore, reviewed our medical and surgical experience of infective endocarditis at the Kobe General Hospital in Kobe, Japan.

Key words:

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Department of Cardiology and Cardiothoracic Surgery, Kobe General Hospital, Kobe, Japan*

Mailing address: Kiyoshi Yoshida, M.D., Department of Cardiology, Kobe General Hospital, Minatojima-nakamachi 4-6, Chuo-ku, Kobe 650, Japan

TABLE I PATIENTS WITH INFECTIVE ENDOCARDITIS

<i>Medical treatment</i>	
<i>Native valve endocarditis</i>	20
<i>Prosthetic valve endocarditis</i>	6
<i>Surgical treatment</i>	
<i>Native valve endocarditis</i>	103
<i>Prosthetic valve endocarditis</i>	13
<i>Total</i>	142

TABLE II VALVE INVOLVEMENT

<i>Aortic</i>	55
<i>Mitral</i>	52
<i>Mitral + Aortic</i>	7
<i>Tricuspid</i>	5
<i>Pulmonic</i>	4
<i>Aortic + Pulmonic</i>	1

TABLE III OPERATIVE DEATH

<i>Patient</i>	<i>Age</i>	<i>Sex</i>	<i>Timing</i>	<i>NVE/PVE</i>	<i>Procedure</i>	<i>Cause of death</i>
1	35	F	Active	PVE	MVR	Sepsis, Dehiscence
2	57	M	Inactive	PVE	AVR	MOF, Dehiscence
3	37	F	Active	NVE	MVR	DIC, Bleeding
4	42	M	Inactive	NVE	AVR	Rupture of cerebral AN
5	65	F	Active	NVE	CABG, AVR	MOF, Dehiscence
6	58	M	Inactive	NVE	AVR	Sudden death

PVE: prosthetic valve endocarditis, NVE: native valve endocarditis, AVR: aortic valve replacement, MVR: mitral valve replacement, CABG: coronary artery bypass graft

PATIENTS AND METHODS

All patient records coded with a discharge diagnosis of infective endocarditis between January 1973 and December 1989 from Kobe General Hospital were reviewed. One or more of the following criteria established the diagnosis of active infective endocarditis:

- 1) before the completion of a 4 week standard course of antibiotic treatment,
- 2) positive blood cultures within 48h preoperatively,
- 3) positive valve cultures at operation,
- 4) fever and new embolic event within 48h preoperatively.

Healed endocarditis was considered to be present when, at operation, there were macroscopic signs of endocarditis in the absence of positive tissue cultures and when blood cultures were negative within 4 weeks of surgery.

Indications for surgery were often multiple and included at least one of the followings; 1) moderate or severe congestive heart failure (New York Heart Association class III or IV) irrespective of the type and amount of

antifailure therapy; 2) active infection (positive blood cultures, typical clinical pictures as defined above, or both) persisting more than 3 weeks, despite adequate intravenous therapy with at least two well-selected bactericidal antibiotics; 3) persistent hypotension (defined as systolic blood pressure less than 90 mmHg, oliguria, poor peripheral pulses, and mental confusion) due to the severity of valvular disease and requiring inotropic agents; 4) new onset heart block suggesting a root abscess; and 5) suppurative pericarditis.

Variables were compared using the chi-square test; p values less than 0.05 were considered to be significant. Actuarial survival was calculated using Kaplan-Meier technique with probabilities being expressed as $\pm$ one standard error of the mean. Operative survivors have been followed up by letter questionnaire and/or by telephone contact.

RESULTS

During the 16 year study period, 142 patients met the criteria of infective endocardi-

TABLE IV OPERATIVE MORTALITY

Operative procedure	NVE		PVE		Total
	Active	Inactive	Active	Inactive	
AVR	1/17	1/19	1/2	0/4	3/42 (7.1%)
MVR	1/15	0/15	1/3	0/0	2/33 (6.1%)
AVR+MVR	0/6	0/7	0/2	0/2	0/17 (0.0%)
MVR+TVR	0/0	0/1	0/0	0/0	0/1 (0.0%)
Congenital	0/10	1/10	0/0	0/0	1/20 (5.0%)
MV Repair	0/0	0/2	0/0	0/0	0/2 (0.0%)
Total	2/48	2/55	2/7	0/6	6/116 (5.2%)

PVE: prosthetic valve endocarditis, NVE: native valve endocarditis, AVR: aortic valve replacement, MVR: mitral valve replacement, TVR: tricuspid valve replacement

Fig. 1. Survival rate in medically and surgically treated patients with infective endocarditis.

tis. One hundred and sixteen patients underwent operation and 26 patients were treated medically (Table I). There were 123 patients with native valve endocarditis and 19 patients with prosthetic valve endocarditis. Overall, the left-sided valves were infected most frequently (Table II). There were 10 cases with right-sided valves involved. Multiple valves were infected in 8 patients.

Hospital mortality

Surgical group: There were 6 perioperative deaths (Table III) in the surgical group.

The most common cause of death was multi-organ failure associated with uncontrollable sepsis. One patient died of rupture of cerebral mycotic aneurysm. One patient died suddenly 28 days after aortic valve replacement. The overall operative mortality (Table IV) for active endocarditis was 7.7% (4/55), and for healed endocarditis, 3.3% (2/61). For active native valve endocarditis, the mortality was 4.2% (2/48), for healed native endocarditis, 3.6% (2/55), for active prosthetic valve endocarditis, 28.6% (2/7), and for healed prosthetic valve en-

Fig.2. Survival rate in patients with active and inactive infective endocarditis.

docarditis, 0%. There was no difference in the operative mortality between active native valve endocarditis and healed native valve endocarditis. The mortality of active prosthetic valve endocarditis was significantly higher than that of active native valve endocarditis ($p < 0.01$).

Medical group: Of the 26 patients treated medically, seven died during the initial hospitalization. The major factor related to mortality in the medically treated patients was persistent sepsis (4 patients), and congestive heart failure (3 patients). The overall mortality of medical group for active native valve endocarditis was 15% (3/20), and for active prosthetic valve endocarditis, 67% (4/6).

Late results

The follow-up of patients was performed by yearly clinic examinations. None of the 19 patients in the medical group died. Seven patients in the surgical group died. Actuarial survival curves for late survival of the two groups are presented in Fig. 1. Actuarial survival curves for late survival of active and inactive infective endocarditis are presented in Fig. 2.

DISCUSSION

Despite the availability of new and potent antibiotics, the management of patients with acute infective endocarditis remains a difficult therapeutic challenge. The precise in-

dications and the optimal time for operation require further definition, as does the incidence of postoperative complications compared to medically treated patients. Our present investigation was carried out to evaluate our experiences with medical and surgical intervention in a large patient population with infective endocarditis. Our data showed that there were no differences in operative mortality between active and inactive native valve endocarditis. In the present study, the mortality is lower than in many previous reports and suggests that early operation should be more widely employed, especially when signs of sepsis remain after a week of appropriate antibiotic therapy. Therefore early operation should be performed for native valve endocarditis before complications such as embolization and congestive heart failure occur. Progressive congestive heart failure or embolization from valve lesions in the absence of infection indicate the need for prompt valve replacement. The presence of infection, however, makes one hesitant to insert a foreign body, a valve prosthesis, into a potentially infected area. This has led to the traditional approach of treating patients for 4 weeks prior to valve replacement in an attempt to eradicate the infectious process before operation. If the infection is clinically controlled, this approach is satisfactory. Our experience and that of others^{15,16} however, has clearly demonstrated that 4 weeks of therapy does not cure patients who have clinically uncontrolled infective endocarditis; instead, the delay allows the condition to deteriorate to such an extent that the chance of surgical cure is almost nonexistent.

If endocarditis can be controlled clinically, operation can be safely delayed for 4 to 6 weeks, at which time valve replacement can be done if necessary. However, if the endocarditis is not clinically controlled by antimicrobial therapy, prompt surgical intervention is indicated before local or distant spread of the infection occurs. Embolization or progressive congestive heart failure developing at any time indicates the need for valve replacement.

The pathological process in infective endocarditis generally begins on a diseased valve leaflet and remains isolated to that valve leaflet for a period of time.^{17,18} It ex-

tends to the annulus or perivalvular structures only when the organism is particularly virulent or a prolonged course of ineffective antibiotic therapy has been conducted. Theoretically, it would thus seem that if the infection were localized to the valve tissue, excision of the valve would cure the infection. This hypothesis has been shown to be true clinically. Wallace et al² first cured a patient with active endocarditis by excision of the infected valve and replacement with a valve prosthesis.

In conclusion, technical advances in cardiac surgical procedures have considerably improved the outcome of patients with infective endocarditis. Therefore, we recommend urgent surgical intervention for patients with significant valve lesions and who are unresponsive to medical treatment to prevent embolization and deterioration of the heart.

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