Timing of Surgical Treatment for Active Native Valve Endocarditis

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The aim of the study was to assess the optimum timing of surgical treatment for the active phase of native valve endocarditis. A retrospective study was conducted of the records of patients who had undergone aortic and/or mitral valve replacement for active native valve endocarditis during 1979—94 at Kinki University Hospital. Thirty-three patients with active infective endocarditis of the native valves were treated surgically. Their mean age was 45.4 years (range 11—71). The infective organism was streptococcus in 9 cases, Staphylococcus aureus in 8, and enterococcus in 4 cases. Blood cultures were negative in 9 cases. Of the patients infected with Staphylococcus aureus, 3 died soon after the operation and 1 died later during hospitalization. These 4 patients had been treated medically more than 2 weeks before operation. Another patient who was also treated medically more than 2 weeks before surgery survived. In contrast, all 3 patients infected with Staphylococcus aureus who were operated on within 2 weeks after the onset survived. No early or in-hospital deaths were documented among patients infected with organisms other than Staphylococcus aureus. Among patients who had suffered preoperative embolic episodes, the time from the initial pyrexia to the embolic event was clearly shorter in those infected with Staphylococcus aureus than in those infected with other organisms. Among the former group, 5 out of 6 patients suffered an embolism within 2 weeks of the onset of pyrexia and the remaining 1 within 3 weeks. Thus, in patients presenting with active native valve endocarditis caused by Staphylococcus aureus, surgical treatment should be performed as soon as possible after the onset of pyrexia, preferably within 2 weeks or as soon as the infective organism is identified as Staphylococcus aureus.

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Key Words: Native valve endocarditis; Active phase; Valve replacement; Staphylococcus aureus

Early surgical treatment with cardiac valve replacement for active native valve endocarditis (NVE) has been advocated by several study groups based on the good results they have obtained. These results favor more aggressive surgical management of these patients; however, when and in which cases surgery should be performed in the active phase are controversial issues that need to be addressed.4 Moreover, the definitions of ‘early’ and ‘more aggressive’ differ from study to study.

In this retrospective study to assess the optimum timing of surgical treatment, we describe the results of surgical intervention performed during the active phase of endocarditis in relation to the time elapsed from the onset of pyrexia to surgery and to the type of infective organism.

Patients and Methods

The clinical records of 33 consecutive patients (21 men, 12 women) who underwent valve replacement between May 1979 and December 1994 at Kinki University Hospital because of infective endocarditis of the mitral and/or aortic valve in the active phase were retrospectively analyzed. Patients who had developed NVE after open heart surgery were excluded. The patients’ age at surgery ranged from 11 to 71 years, with a mean of 45.4. The infective organisms isolated are shown in Table 1. Staphylococcus aureus or streptococci were each isolated in approximately one-quarter of patients. The causative organism was undetectable in a quarter of the patients. Indications for surgery included congestive heart failure, systemic...
emboli, persistent sepsis, and/or echocardiographically demonstrated vegetation. The operative procedure is shown in Table 2. All patients underwent 1 or 2 mechanical valve replacements. Reconstruction of aortomitral continuity using Manouguian’s method was performed in the case of double valve replacement for severe annular infection. Associated cardiac procedures were performed in 10 patients, including 4 patients with a root abscess (Staphylococcus aureus in 2 cases, Gram-positive cocci in 1 case and an undetectable organism in 1 case). All abscesses were debrided; they were excluded by a pericardial patch in 3 cases and left open in one.

Results

Operative Mortality
Operative and in-hospital deaths are summarized in Table 1. The 4 patients who died early or in hospital after surgery had Staphylococcus aureus infection. One of these patients suffered multiple organ failure with multiple cerebral infarction on admission and electroencephalography was isoelectric after mitral valve replacement. This patient died 11 days after surgery. Another died the day after aortic valve replacement from low cardiac output syndrome complicated by hemorrhage. This patient had had an aortic root abscess and cerebral bleeding and exhibited severe deterioration in hemodynamics before surgery. The third died from uncontrollable bleeding 1 day after aortic valve replacement. This patient had developed disseminated intraluminal coagulopathy, which had remitted before surgery. Bleeding in these 2 patients was caused by intraoperative coagulopathy.

There was 1 late in-hospital death in a patient who had been placed on a ventilator before the double valve replacement operation because of congestive heart failure. This patient developed prosthetic valve endocarditis followed by cerebral hemorrhage and died 84 days after surgery.

In each of the 4 patients described above, the indication for surgery was congestive heart failure. In contrast, the indication for surgery among survivors in the staphylococcus group was vegetative growth.

All those who had non-Staphylococcus aureus NVE, except for 1 patient who died from colon cancer 19 months postoperatively, survived (1 year 8 months to 17 years 3 months, mean 7 years 8 months after surgery).

The relationship between the time from the onset of pyrexia to surgery and the surgical outcome is shown in Fig 1. In the 3 patients with Staphylococcus aureus infection who survived, surgery had been performed within 2 weeks of the onset of pyrexia. In contrast, 4 of the 5 patients who had been operated on 2 weeks or longer after pyrexia onset died. No patient with active NVE caused by an organism other than Staphylococcus aureus died early or in hospital, although the time elapsed between the onset of symptoms and operation ranged from 4 weeks to 6 months, and 13 patients developed congestive heart failure before surgery.

Of 4 patients who developed root abscesses, 1 with
Table 3 Complications Before Surgery

<table>
<thead>
<tr>
<th>Complication</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>embolism</td>
<td></td>
</tr>
<tr>
<td>cerebral</td>
<td>7</td>
</tr>
<tr>
<td>renal</td>
<td>3</td>
</tr>
<tr>
<td>peripheral</td>
<td>2</td>
</tr>
<tr>
<td>eye</td>
<td>1</td>
</tr>
<tr>
<td>coronary</td>
<td>1</td>
</tr>
<tr>
<td>DIC or preDIC</td>
<td>3</td>
</tr>
<tr>
<td>mycotic aneurysm</td>
<td>2</td>
</tr>
<tr>
<td>(rupture)</td>
<td>1</td>
</tr>
<tr>
<td>meningitis</td>
<td>1</td>
</tr>
</tbody>
</table>

DIC, disseminated intraluminal coagulopathy

Staphylococcus aureus infection died from uncontrollable bleeding despite resection of the abscess and leaving the residual space open.

Preoperative Complications

Preoperative complications are summarized in Table 3. Cerebral embolism was the most common complication among 14 patients who presented embolic episodes (n=7). One patient’s right leg was amputated after valve replacement because of worsening of peripheral embolism. Another patient who had embolism of the right ophthalmic artery developed visual disturbance. Either Staphylococcus aureus or streptococci were isolated from all patients who developed embolism. The 3 patients with coagulopathy had had Staphylococcus aureus infection and 1 died of uncontrollable bleeding 1 day after the operation. Splenectomy before valve replacement was required in a patient who suffered rupture of a mycotic aneurysm in the splenic artery owing to infection with Enterococcus faecium. The time between the onset of pyrexia and either embolic episodes or rupture of the mycotic aneurysm is shown in Fig 2. Among patients with Staphylococcus aureus infection, 5 embolic episodes occurred within 2 weeks of the onset of pyrexia, whereas only 1 episode occurred during the same period in those infected with other organisms.

Postoperative Complications in the Patients who Survived

Four of the 29 patients who survived presented complications requiring some kind of treatment. One patient who developed severe low-output syndrome survived with the aid of a left ventricular assist device for 11 days after surgery. One patient who developed paravalvular leakage underwent a further aortic valve replacement 2 years after the first operation. A mitral valve repair was performed for severe mitral regurgitation after removing the vegetation in the mitral valve and aortic valve replacement. A permanent pacemaker was implanted for the complete atrioventricular block.

Discussion

The results of this study imply that the outcome of surgical intervention for active NVE depends on the causative bacteria and on the time elapsed from the onset of pyrexia until surgery, especially in patients with Staphylococcus aureus infection.

The generally accepted operative indications for active NVE are severe heart failure, repeated episodes of embolism, the presence of vegetations large enough to be detected by echocardiography, and infection that is resistant to appropriate antibiotic therapy. Some surgeons advocate operating earlier than usual, especially in the presence of Staphylococcus aureus infection and our experience would support this. All patients with non-Staphylococcus aureus infection survived after surgery regardless of whether a long period had elapsed after the onset of pyrexia. On the other hand, 4 of the 5 patients with Staphylococcus aureus infection who were operated on more than 2 weeks after the onset of symptoms died. In contrast, the 3 patients who underwent surgery within 2 weeks after the onset of pyrexia survived. Staphylococcus aureus has long been regarded as a very virulent organism. Many studies have indicated that a patient who develops Staphylococcus aureus endocarditis will require surgical treatment because of the ability of the bacteria to destroy tissue. During long-term medical treatment, valvular infection may worsen and extend to the annulus. The presence of an aortic annular abscess and more severe forms of cardiac pathology is associated with an increased risk of complications and recurrence. As long as an early operation does not
seem to increase the reinfection rate or the risk of paraavalvular leakage; prompt surgical intervention may be recommended in patients with Staphylococcus aureus infection.

Regarding preoperative complications, the 3 patients who developed coagulopathy had Staphylococcus aureus endocarditis. On the other hand, half of the embolic episodes occurred in patients with streptococcal infection and mycotic aneurysms were detected in 1 patient with streptococcal infection and another with enterococcal infection. It should be noted that the time from the initial pyrexia to the embolic event was clearly shorter in the group with Staphylococcus aureus infection than in those with infections due to other organisms. In the former group, 5 out of 6 patients suffered embolism within 2 weeks of the onset of pyrexia and the remaining patient did so within 3 weeks. In contrast, in patients with streptococcal infection, 4 out of 5 embolic events occurred more than 9 weeks later. Thus, in patients with Staphylococcus aureus infection, early surgery may help to prevent embolic events.

Furthermore, 5 patients with Staphylococcus aureus infection had cerebral septic emboli before surgery. Three patients who had surgery 2–6 days after a cerebral embolic episode survived without any new neurologic complications. However, the general conditions of 2 patients whose operations were postponed for 10 or 11 days deteriorated postoperatively, and both patients died after surgery. When cerebral septic infarct is ischemic (not hemorrhagic), valve replacement can be performed with only slight risk of a perioperative stroke. Thus, in patients with Staphylococcus aureus infection, even those who have suffered a cerebral embolism, surgery for infective endocarditis should be performed as soon as possible, probably within 7 days.

Some authors have reported that the clinical course of aortic endocarditis is more progressive than that of mitral endocarditis and that mitral endocarditis is relatively tolerable. This may indicate that urgent surgery might not be necessary in patients with mitral endocarditis. In our study, however, early or in-hospital death was documented in 2 cases involving the aortic valve, 1 involving the mitral valve, and 1 patient in whom both valves were affected. When the infective organism is Staphylococcus aureus, medical treatment appears to be relatively ineffective regardless of the location of the infection.

In summary, our experience of surgery for active NVE suggests that prompt operation can decrease mortality and morbidity in patients with infective endocarditis caused by Staphylococcus aureus. Our series is too small to draw conclusions regarding therapeutic strategy for active NVE, although some authors reported fantastic results for active endocarditis complicated with annular abscess. However, our experience suggests that surgery should be performed within 2 weeks of the onset of pyrexia or as soon as possible if the infecting organism is Staphylococcus aureus.

References