

# Immediate and Long-Term Outlook for Valve Replacement in Acute Bacterial Endocarditis

P. N. SYMBAS, S. E. VLASIS, L. ZACHAROPOULOS, C. R. HATCHER, JR., D. ARENSBERG

The clinical course of 22 patients with acute endocarditis treated surgically less than six weeks after the onset of antibiotic therapy was reviewed. The aortic valve was infected in the patients, the mitral in six, the tricuspid in two, and one patient had both aortic and mitral valve involvement. The indications for surgical intervention before the completion of adequate antibacterial therapy included uncontrollable congestive heart failure, persistent sepsis, systemic embolization, and multiple septic pulmonary embolizations. The annulus was involved by the infectious process in five of the 13 patients with aortic valve endocarditis, in one of the two patients with tricuspid valve infection, and in none of the patients with mitral valve endocarditis. There were two surgical deaths, for a mortality of 9.1%. During the follow-up period, four patients died three months, seven months, four years, and seven years after surgery. The remaining patients have been followed up for a period of five months to 10 years. One patient has a hemodynamically insignificant paravalvular leak, and another developed paravalvular regurgitation and a false aneurysm of the left sinus of Valsalva two weeks after the initial operation. She subsequently underwent successful valve replacement and repair of the aneurysm. This study confirms that valvular replacement should be done for acute endocarditis as soon as indicated, and that the incidence of reinfection and/or the development of valvular or paravalvular problems is small even in the patients with incomplete antimicrobial therapy, whether or not the annulus is involved by the infectious process.

**O**PERATIVE INTERVENTION for the treatment in some patients with acute endocarditis is well established but the surgical mortality still remains quite high. This communication reviews our last ten years experience with the management of acute bacterial endocarditis requiring surgical intervention before the completion of six weeks of antimicrobial therapy and the follow-up of these patients.

## Materials and Methods

Twenty-two patients underwent valve replacement for acute bacterial endocarditis during the ten-year pe-

*From the Joseph B. Whitehead Department of Surgery, Thoracic and Cardiovascular Surgery Division, and the Department of Medicine, Division of Cardiology, Emory University School of Medicine and Grady Memorial Hospital, Atlanta, Georgia.*

riod from 1971 to 1981 at Grady Memorial Hospital. The aortic valve was infected in 13 patients, the mitral valve in six, the tricuspid in two, and one patient had infection of both the aortic and mitral valves. The ages of the patients ranged from 4 to 62 years (mean 38), and the male-to-female ratio was 15:7. Five patients had a history of intravenous drug abuse, and seven patients had previously known heart disease: two had rheumatic fever, one had aortic regurgitation, three had previous valve replacements, and one had a bicuspid aortic valve. The time lapse from the onset of symptoms to the initiation of the medical treatment was one day to eight weeks (mean 14 days). The clinical manifestations of endocarditis upon admission included fever in 15 patients, congestive heart failure in 14 patients, pulmonary edema in six patients, multiple septic pulmonary embolization in two patients, and symptoms and signs of systemic embolizations in two patients and of meningitis in one patient. Thirteen patients had preoperative echocardiograms that showed vegetations on the aortic valve in five, on the tricuspid valve in two, and on the mitral valve in two patients.

Blood cultures were obtained before antibiotics were administered in all patients; they subsequently grew *Streptococcus* in 13, *Staphylococcus* in 5, *Neisseria gonorrhoea* in three, and *Moraxella* in one. After the cultures were drawn, intravenous antibiotics were begun and were later adjusted to cover the sensitivities of the offending organism.

All 22 patients were operated on before the completion of the six weeks of antibiotic treatment. The indication for surgical intervention before completion of adequate antibacterial therapy included uncontrollable congestive heart failure in 16 patients, systemic embolization with vegetations on the valve as demonstrated

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Reprint requests: Dr. P. N. Symbas, 69 Butler Street, S.E., Atlanta, GA 30335.

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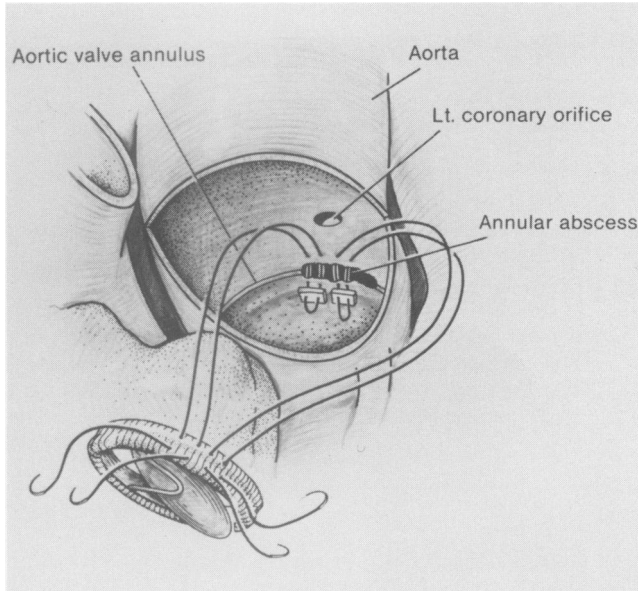


FIG. 1. Repair of small annular defect.

by echocardiography in two patients, multiple pulmonary septic emboli in two patients, and persistent sepsis in two patients. The valve replacement was done less than one week after the onset of the antibiotic therapy in four patients, less than two weeks in one, less than three weeks in three, less than four weeks in seven, and less than six weeks in five patients. Valvectomy was performed in the two patients with tricuspid infection in less than four and five weeks, respectively.

Annular involvement by the infectious process, resulting in a defect between the aorta and the left ventricle, was noted at the time of surgery in five patients with aortic valve infection. Annular involvement was also noted in one patient with tricuspid valve infection, whereas none of the patients with infected mitral valve had annular involvement.

Conventional aortic or mitral valve replacement with interrupted pledgetted sutures was performed in the patients with the infectious process resulting only in destruction of the valve leaflets or cusps. In the two patients with aortic endocarditis and small aortic-left ventricular discontinuity, the repair was done with horizontal pledgetted sutures placed first through the left ventricular myocardium, then through the aorta, and then through the prosthetic valve ring (Fig. 1). The remainder of the valve ring was then sutured to the native valve annulus. In another patient, in whom a larger defect and a cavity were found extending underneath the pulmonary artery, a similar repair was initially performed. Aortic regurgitation recurred two

weeks after the initial surgery, and a large mycotic left sinus of Valsalva aneurysm was demonstrated at cardiac catheterization. This defect was subsequently repaired with the use of a Dacron® graft in a manner similar to that used in the other two patients with large aortic-left ventricular discontinuity. A patch of Dacron graft of the appropriate size was sutured to normal left ventricular and aortic tissue. The ring of the valve prosthesis was then sutured to the remaining native aortic valve annulus and to the graft at the appropriate level (Fig. 2). A prosthetic valve was used for the valvular replacement in 13 patients and a bovine bioprosthesis in seven patients. Both patients with tricuspid endocarditis initially underwent only tricuspid valvectomy.

The cultures of the tissues removed at the time of surgery grew organisms similar to the preoperative organisms in eight patients; there was no growth in the cultures obtained from nine patients, and there was no available record of the cultures at the time of review in the remaining five patients.

Two of the 22 patients died, for a surgical mortality of 9.1%. One of the two surgical deaths was due to pulmonary insufficiency following a tricuspid valvectomy in a patient who had extensive preoperative pulmonary infection and multiple septic pulmonary emboli, and the other to sepsis and low cardiac output following mitral valve replacement of an infected valve prosthesis with evidence of preoperative systemic embolization.

The twenty patients who survived have been followed up for a period of five months to ten years. One of the living patients has a hemodynamically insignificant paravalvular leak, and another developed paravalvular regurgitation and a false aneurysm of the left sinus of Valsalva two weeks after the initial operation. She subsequently underwent successful valve replacement, repair of the aortic-left ventricular discontinuity, and repair of the left sinus of Valsalva false aneurysm.

During the follow-up period, four patients died: one during the immediate postoperative period following the insertion of a valve prosthesis seven months after the initial tricuspid valvectomy, another from pneumonitis and mediastinitis three months following aortic valve replacement, and the two other patients died four and seven years, respectively, after surgery from unknown causes. Among the deceased patients, three were intravenous drug abusers, and the remaining two drug addicts are alive and have not taken the drugs for one and three years after surgery, respectively.

### Discussion

Before the introduction of the antibacterial treatment, acute endocarditis was almost always fatal. Dur-

ing the preantibiotic era, most of the patients died from the septic complications of the infectious process before hemodynamically significant valvular lesions developed. Since the introduction of penicillin and other potent bactericidal antimicrobials, however, the cure rate for these patients has risen to 80% or higher.<sup>1</sup> Most of the deaths of the remaining patients were due to intractable congestive heart failure. With the introduction of the combined antimicrobial and surgical treatment<sup>2,3</sup> to correct the intracardiac complications of bacterial endocarditis and to protect the newly implanted valve from reinfection, the survival in patients with acute endocarditis has further increased. The reported surgical mortality, however, during the past 15 years has varied, ranging from none to 30%.<sup>4-7</sup> The most important determinant for the operative and postoperative mortality has been the patient's hemodynamic status at the time of cardiac surgery.<sup>4,5,7-9</sup> Recurrent endocarditis due to the organism from the original infection has been a rare complication of valve replacement surgery in the treatment of active endocarditis.<sup>7,9</sup> Therefore, the duration of antibiotic therapy has been considered to be of secondary importance. Major systemic embolization has been considered an indication for urgent valve replacement.<sup>8</sup> Early reports suggested that echocardiographically demonstrable valvular vegetations could identify patients likely to have complications, but subsequent experience has indicated that this is not in itself an indication for operation.<sup>10</sup> Identification of prosthetic valve dehiscence<sup>7</sup> or the development of sinus of Valsalva aneurysm with fistulous tract to cardiac chamber or great vessel, or of ventricular septal defect and of other cardiac structural abnormalities should prompt consideration for immediate surgery.<sup>11</sup> Uncontrollable infection, even with the best available antibiotic regimen, has been felt to be best managed with surgical debridement and replacement of the valve after other sources for persistent infection are excluded.

It appears, therefore, that in order to provide optimal care for the patients with acute endocarditis, it is essential to recognize those patients for whom surgery is indicated and to select the appropriate time for the surgical intervention.

Since surgical mortality at this institution, 9.1%, and the mortality of other investigators<sup>6,12</sup> have been acceptable and the late postoperative course of previously reported cases<sup>7</sup> and of patients at this institution has been relatively satisfactory, *i.e.*, only one of the patients required reoperation, it appears that when valvular dysfunction as a result of endocarditis results in significant hemodynamic derangement, valve replacement should be undertaken without delay. It is advisable, however, before surgery, whenever possible, to maintain appro-

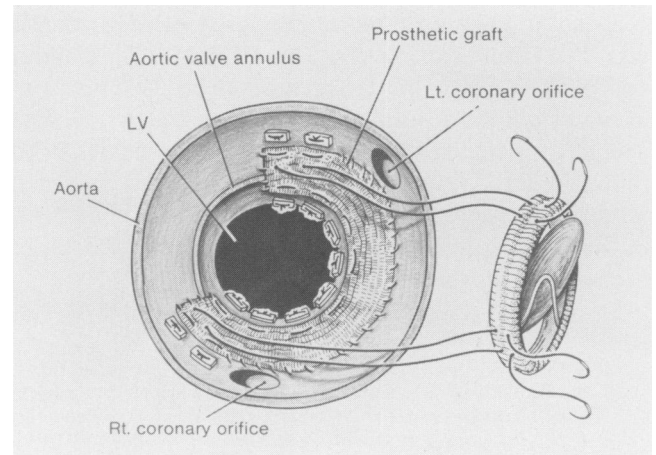


FIG. 2. Repair of a large aortic-left ventricular discontinuity involving three quarters of the aortic annulus.

appropriate antibiotic therapy for at least 48 to 72 hours. Although certain organisms causing endocarditis have themselves been considered as an indication for surgical intervention,<sup>7,13</sup> the decision for early surgery has not been made on this basis, but rather on the hemodynamic status and the overall clinical picture of the patients. In two of the patients with right-sided endocarditis from drug-resistant organisms with persistent sepsis and repeat septic pulmonary emboli, resection of the tricuspid valve was performed as has been advocated by others.<sup>14,15</sup>

At the time of surgery, the infectious process may be found to be limited to the valve cusps or leaflets alone, or may extend into the annulus and adjacent septum and myocardium, usually in aortic endocarditis causing partial aortic-left ventricular discontinuity,<sup>16</sup> ventricular septal defect,<sup>17</sup> mycotic aneurysm,<sup>18,19</sup> conduction defects,<sup>19</sup> *etc.* In none of our patients with mitral endocarditis was there extension of the infectious process beyond the valve leaflets. Extension into the annulus was observed in one of our patients with tricuspid endocarditis and in five of 13 with aortic valve endocarditis. When the infectious process in the mitral or aortic valve is limited to the valve leaflets or cusps, conventional valve replacement is satisfactory. In cases with partial aortic-left ventricular discontinuity, a variety of techniques have been utilized.<sup>15-23</sup> In our two cases with a small defect between the aorta and the left ventricle, the repair was done as has been previously reported<sup>18</sup> with horizontal pledgetted sutures passed first through the ventricular myocardium and then through the aorta and the prosthetic valve ring (Fig. 1). In the three cases with a large defect between the

aorta and the left ventricle, the defect was closed with Dacron graft patch, which was sutured to normal left ventricular and aortic tissue. The aortic valve prosthesis was then sutured to the remaining aortic valve annulus and the rest of its ring to the graft (Fig. 2). This form of repair allows closure of the defect between the aorta and left ventricle under no tension and provides good foundation for suturing the aortic valve at its normal level. In addition, the operative procedure is completed in the shortest possible time, and the coronary arteries are left undisturbed.

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### DISCUSSION

DR. ARTHUR C. BEALL, JR. (Houston, Texas): We recently reported our experience with a similar group of patients and these data would be very similar to what Dr. Symbas has said. Although we prefer to have six weeks of antibiotics, and hopefully sterilize the valve area before prosthetic replacement, once these patients begin to deteriorate, they will not live long enough without operation to sterilize the valve.

So two things have become apparent: We should operate on these patients as soon as they start to deteriorate, regardless of the length of antibiotic therapy, and even under these circumstances only a small percentage will infect their prosthesis.

DR. GEORGE C. KAISER (St. Louis, Missouri): Dr. Symbas review indicates the effectiveness of surgical intervention in the treatment of these severely ill patients. Our experience supports this.

It would be inappropriate to have this topic on this program without

mentioning the fact that two pioneers in the use of aortic valve replacement in acute bacterial endocarditis are members of this society. Drs. Robert Ellison and Glenn Young and their associates, more than 15 years ago, championed the use of valve replacement in acute bacterial endocarditis.

Initially, there was some concern about placing prosthetic material in an infected area that was only partially treated with antibiotics. This fear was unfounded. Their results were excellent. This depended upon two principles. The first is that these organisms are sensitive to the antibiotic that is employed. Second is that the antibiotic has been administered for at least a few days prior to operation.

Two other important features of bacterial endocarditis, when one considers operating upon these patients, were illustrated by Dr. Symbas today. One is that the aortic valve is clearly the most common valve involved by a factor of more than two times over the other valves combined. Second, involvement not only of the leaflets but also of the annulus and the surrounding structures is common in the aortic valve. Another involvement is relatively uncommon in the other valves. These two features can cause substantial difficulty at the origin of the aorta.