High-Risk Surgery as an Alternative to Transplantation

Between April 1992 and April 1994, 185 patients were waiting for a cardiac transplant at our institution. Transplantation was performed in 118 of these patients. Twenty-six patients (14%) died while awaiting a donor heart: 13 of these were in the intensive care unit on multiple inotropic medications, mechanical support, or both; another 13 were either in the hospital on a single inotropic medication or at home with or without inotropic support. The remaining 41 patients were still awaiting transplantation at the end of the study period.

During the same interval, 20 comparably ill patients who were referred to our institution for transplantation were considered for high-risk conventional surgical procedures. These patients underwent clinical evaluation to determine whether they had viable muscle that was salvageable and electrophysiologic status that was alterable. On this basis, these 20 patients underwent a variety of combined high-risk procedures. Two patients died; the operative mortality was 5% and the cumulative mortality was 10%. We conclude that these initial results support our original impression that mortality rates are higher in patients waiting for cardiac donation than in patients undergoing high-risk surgical procedures. Therefore, we will continue to investigate high-risk conventional surgery as an alternative to cardiac transplantation. (Texas Heart Institute Journal 1994; 21:302-4)

The current medical climate, which includes ever-increasing scrutiny of operative mortality, outcome analysis, and surgical statistics in general, may have caused many surgeons, consciously or not, to decrease their level of risk-taking in planning treatment strategies. These factors, coupled with the option of cardiac transplantation, with its excellent short- and intermediate-term results, may have encouraged over-reliance on transplantation. We report our experience in redirecting appropriate patients to high-risk conventional procedures. This redirection was prompted by the impression that we were experiencing increasing mortality in patients awaiting transplantation.

Patients and Results

Between April 1992 and April 1994, 185 patients were awaiting a donor heart in the transplant program at our institution. Of these, 118 patients underwent transplantation: 72 as Status I* and 46 as Status II or III.* Twenty-six died while waiting for a cardiac donor: 13 as Status I and 13 as Status II or III, for an overall mortality of 14% in patients awaiting transplantation. The remaining 41 patients were still waiting for a heart transplant at the end of the study period.

During this same interval, another group of patients was offered high-risk conventional surgery as an alternative to transplantation. This study population comprised 20 patients, ranging in age from 50 to 72 years, with an average age of 60. Only 2 of the 20 patients had experienced any recent angina. At presentation, all the patients were in congestive heart failure, New York Heart Association functional class III or IV. At the time of evaluation, 5 required an intra-aortic balloon pump, 9 required inotropic support, and 6 had a history of recurrent ventricular tachycardia or of sudden death. Ejection fractions ranged from 12% to 35% with an average of 21%. In 5 patients, severe mitral insufficiency was present. These

*Status I indicates that the patient is in the intensive care unit on multiple inotropic medications and/or mechanical support. Status II indicates single inotropic medication at home or in the hospital. Status III indicates at home.
same patients represented the higher ejection fractions, and thereby may have falsely elevated the values.

In the 20 study patients, preoperative evaluation to determine myocardial viability included thallium perfusion studies, dobutamine stress echocardiography, and technetium-99m-sestamibi studies. Five patients underwent preoperative electrophysiologic studies.

Of the 20 patients studied, 9 underwent coronary artery bypass alone. Table I presents the procedures performed in the other 11 patients, either alone or in combination, including bypass, valve replacement, cardioverter-defibrillator implantation, aneurysm resection, and endocardial resection.

The operative mortality was 5%, and the cumulative mortality was 10%. The 1 operative death occurred 3 months after surgery. The patient, who had undergone mitral valve replacement and coronary artery bypass surgery, died of multisystem failure after prolonged treatment for nonoliguric renal failure. A 2nd patient also died at 3 months, following a ventricular tachycardiac storm. This patient had undergone coronary artery bypass and placement of an automatic internal cardioverter-defibrillator; the device, on follow-up investigation, appeared to be functioning normally.

Morbidity in the study population was minimal. One patient required a brief period of reintubation in the early postoperative period, and another patient underwent several days of aggressive treatment for congestive heart failure after an episode of atrial fibrillation that resulted in deterioration of his condition.

All 18 surviving study patients were in New York Heart Association functional class I or II at an average follow-up period of 12.3 months. Long-term follow-up on 12 of these patients (67%) revealed ejection fractions of 35% to 40%.

**Discussion**

In this study, we compared the mortality rates of patients awaiting cardiac transplantation with the mortality rates of comparably ill patients who underwent high-risk conventional surgery. Of the 185 patients awaiting a donor heart, 118 received a transplant during the study period and 67 did not. Of those 67, 41 were still waiting for a donor heart at the end of the study period, and 26 had died. Those deaths represented 14% of the original group awaiting transplant. In the group of 20 patients undergoing high-risk conventional surgery, 2 patients died, for a mortality rate of 10%.

Several factors are currently challenging cardiac transplantation. The recipient population is growing due to increased acceptance of the efficacy of transplantation by the public and medical professionals alike. In addition, refinement of the transplant procedure and of postoperative care has expanded the recipient criteria, which in turn has dramatically increased the number of eligible recipients. Unfortunately, the number of donor hearts is still limited, despite all efforts by medical professionals and organ procurement organizations to increase consent rates. Moreover, the progress, development, and approval of mechanical assist devices and total artificial hearts have been relatively slow.

All these factors lead to a dilemma for potential transplant recipients and their physicians: as the waiting time increases, the mortality of those on the waiting list increases as well. There are a number of strategies for managing the growing recipient population (Table II). Expansion of the number of potential cardiac donors by broadening the acceptance criteria is one possibility.2-8 Surgical alternatives to transplantation, such as cardiomyoplasty in the formation of skeletal muscle ventricles, continue to be developed and tested through clinical trials. Three programs—at the Texas Heart Institute, the Cleveland Clinic Foundation, and the Hershey Medical Center—have been funded to continue work on the total artificial heart. And finally, high-risk conventional procedures are being reconsidered in the proposed transplant patient population.

This last approach prompted us to ask whether patients referred for transplantation could undergo

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**TABLE I. Procedures Performed Alone or in Combination in the High-Risk Surgical Group (n=20)**

<table>
<thead>
<tr>
<th>Number of Patients</th>
<th>Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Coronary artery bypass graft</td>
</tr>
<tr>
<td>3</td>
<td>Combined: Mitral valve replacement; Coronary artery bypass graft</td>
</tr>
<tr>
<td>2</td>
<td>Combined: Coronary artery bypass graft; Automatic internal cardioverter-defibrillator</td>
</tr>
<tr>
<td>1</td>
<td>Combined: Mitral valve replacement; Coronary artery bypass graft; Automatic internal cardioverter-defibrillator</td>
</tr>
<tr>
<td>1</td>
<td>Redo aortic valve replacement</td>
</tr>
<tr>
<td>1</td>
<td>Redo mitral valve replacement</td>
</tr>
<tr>
<td>1</td>
<td>Combined: Aneurysm resection; Coronary artery bypass graft</td>
</tr>
<tr>
<td>1</td>
<td>Combined: Aneurysm resection and cryoablation; Coronary artery bypass graft; Automatic internal cardioverter-defibrillator</td>
</tr>
<tr>
<td>1</td>
<td>Combined: Aneurysm resection; Endocardial resection; Automatic internal cardioverter-defibrillator</td>
</tr>
</tbody>
</table>
TABLE II. Strategies to Manage a Growing Transplant Recipient Population

- Expansion of donor pool by expanded acceptance criteria
- Surgical alternatives to transplantation (cardiomyoplasty: skeletal muscle ventricles)
- Development of long-term assist devices, such as the total artificial heart
- Reconsideration of high-risk conventional procedures in the proposed transplant recipient population

high-risk surgical procedures with an acceptable operative mortality and postoperative clinical functional status. From our clinical results and impressions, we conclude that efforts should be made in severely ill cardiac patients to perform high-risk conventional surgery when evaluation suggests the presence of salvageable muscle and alterable electrophysiologic status.

References