

# Cardiac Surgery is Successful in Heart Transplant Recipients



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## Background

Improved survival of heart transplant (HTx) recipients and increased acceptance of higher risk donors allows development of late pathology. However, there are few data to guide surgical options. We evaluated short-term outcomes and mortality to guide pre-operative assessment, planning, and post-operative care.

## Methods

Single centre, retrospective review of 912 patients who underwent HTx from February 1984 - June 2012, identified 22 patients who underwent subsequent cardiac surgery. Data are presented as median (IQR).

## Results

Indications for surgery were coronary allograft vasculopathy (CAV) (n=10), valvular disease (n=6), infection (n=3), ascending aortic aneurysm (n=1), and constrictive pericarditis (n=2). There was one intraoperative death (myocardial infarction). Hospital stay was 10 (8-21) days. Four patients (18%) returned to theatre for complications. After cardiac surgery, survival at one, five and 10 years was 91±6%, 79±10% and 59±15% with a follow-up of 4.6 (1.7-10.2) years. High pre-operative creatinine was a univariate risk factor for mortality, HR=1.028, (95%CI 1.00-1.056;  $p=0.05$ ). A time dependent Cox proportional hazards model of the risk of cardiac surgery post-HTx showed no significant hazard; HR=0.87 (95%CI 0.37-2.00;  $p=0.74$ ).

## Conclusions

Our experience shows cardiac surgery post-HTx is associated with low mortality, and confirms that cardiac surgery is appropriate for selected HTx recipients.

## Keywords

Heart transplantation • Reoperation • Cardiac surgical procedures • Mortality • Treatment outcome.

## Introduction

Improved management of heart transplant (HTx) recipients and increased acceptance of higher risk donors and recipients has resulted in growth of this population and allows development of late complications such as coronary artery and valvular disease [1,2]. Non-retransplant cardiac surgery may be required to extend patient survival and improve graft function and quality of life.

There are few reports detailing outcomes of surgical intervention in this context. The available data suggest that

coronary artery bypass grafting (CABG) should be performed cautiously, has limited efficacy in the setting of diffuse cardiac allograft vasculopathy (CAV), but can be successful providing a suitable target vessel can be identified [3–7]. Tricuspid valve (TV) surgery appears to be safe and confers good clinical results, but further experience is required in order to define patient characteristics that predict successful outcomes [8–14]. Case reports detail outcomes after surgery on valves other than the tricuspid, suggesting that repair may improve and extend graft function [15–17]. Likewise, there are case reports and one series of three

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patients detailing aortic arch surgery for aortic dissection, where valve sparing and valve replacing techniques were used successfully [7,18–20].

The aforementioned studies are all retrospective and limited by relatively small patient numbers inadequate for regression analysis. Additionally they are restricted by short duration of follow-up. They do not include information concerning short-term post-operative parameters with little data on hospital stay logistics. Only one study by Reddy (2002) reports on length of hospital stay (LOS) [21].

We evaluated multiple parameters in order to further characterise the post operative course in this population and help inform patient selection and facilitate pre-operative planning and post operative care. In addition, this information should influence judgment regarding acceptability of donor organs in a context of high demand and limited supply.

## Methods

The study was approved by the Human Research Ethics Commission of New South Wales, and the St. Vincent's Hospital Research Ethics Board.

### Study Design

From February 1984 to June 2012, a total of 912 heart transplants were conducted at St Vincent's Hospital, Sydney. A medical records search identified 22 patients with a positive heart transplant status, who were subsequently placed on cardiopulmonary bypass, and who underwent other specific procedures.

Medical records were analysed retrospectively to extract pre-operative data (including age, sex, renal function, and clinical status), operative data (including bypass time and aortic clamp time), and post-operative outcomes including ventilator time, length of ICU stay (LOS-ICU), LOS and 30 day mortality. Long-term survival data were obtained from the St Vincent's Hospital database, which is continuously updated.

### Patient Population

The study evaluates the outcomes of cardiac surgery performed late after HTx. Only patients who underwent redo-surgery at an interval of greater than 30 days after HTx were included. One included patient underwent sternotomy, left radial artery harvest, and dissection of the mediastinum before it was deemed inappropriate to continue with bypass grafting due to severe adhesions. This patient was not placed on bypass before the decision to discontinue.

### Follow-up, Immunosuppression and Pre-Operative Assessment

The patients were followed up routinely with biopsies weekly for the first four weeks after transplantation, fortnightly up to three months, monthly to six months, and in month nine. Cardiac catheterisation with angiography is performed at one, five and ten years. There is no further intervention unless clinically indicated.

Patients were placed on a maintenance immunosuppression regime consisting of cyclosporine (trough target levels of 100-180 ug/L) and mycophenolate (trough target levels 2.5-4.5 ug/L). Azathioprine was used instead of mycophenolate before 2000.

Pre-operatively, echocardiography was used to assess left ventricular ejection fraction. Angiography was used to assess the coronary arteries, and renal function was checked using serum creatinine. All patients underwent a CT scan to assess the risk of re-sternotomy.

### Statistical Analysis

All data were analysed using the Statistical Program of Social Sciences (SPSS) Version 19. Continuous variables that were not normally distributed are presented as median (interquartile range). Cox regression was used to identify factors associated with decreased survival. A Kaplan Meier survival analysis is presented. Length of hospital stay was defined as the number of days spent in hospital after the operation. Creatinine clearance was estimated using the Cockcroft-Gault equation.

## Results

### Patient Population

Of 912 patients who underwent HTx, 22 (2.4%) received non-retransplant cardiac surgery. The mean age was  $49 \pm 10.9$  years. There were 19 (86%) males and three (14%) females. The median interval between HTx and subsequent surgery was 7.2 years (1.4-10.8). Median follow up was 4.6 (1.7-10.2) years with a cumulative follow up of 138 patient years.

Indications for redo surgery included CAV, valvular insufficiency and stenosis, infection, ascending aortic aneurysm and constrictive pericarditis. [Table 1](#) details the pre-operative characteristics of the patient population.

There was one intraoperative death from myocardial infarction. There were no other deaths in the post-operative period (30 days). Median LOS was 10.0 (8-20) days. Median length of ICU stay (LOS-ICU) was 45 (24-101) hours. Median ventilator time was 15.0 (5.5-29.3) hours. Four patients (18%) were returned to theatre. Re-intubation was required in two patients, as was a tracheostomy. There were two cases of sternal wound infections and one case of pneumonia. One patient required permanent and two patients required temporary dialysis post-operatively. There were no cerebrovascular complications. The post-operative outcomes are summarised in [Table 2](#).

### CABG Surgery

Nine transplant recipients underwent CABG surgery. All but one were elective. Median age was 48 (36-52) and the median interval between HTx and CABG was 7.1 (5.4-8.4) years. All patients were male, and all operations involved redo median sternotomy and were performed on bypass. The median aortic clamp time was 52 (44-68) minutes and median time on bypass was 95 (89-128) mins. The left internal mammary

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