Similar Mortality and Morbidity of Orthotopic Heart Transplantation for Patients 70 Years of Age and Older Compared With Younger Patients

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ABSTRACT

Background. The upper age limit of heart transplantation remains controversial. The goal of the present study was to investigate the mortality and morbidity of orthotopic heart transplantation (HT) for recipients ≥70 compared with those <70 years of age.

Methods. Of 704 adults who underwent HT from December 1988 to June 2012 at our institution, 45 were ≥70 years old (older group) and 659 were <70 years old (younger group). Survival, intraoperative blood product usage, intensive care unit (ICU) and hospital stays, and frequency of reoperation for chest bleeding, dialysis, and >48 hours ventilation were examined after HT.

Results. The older group had 100% 30-day and 60-day survival compared with 96.8 ± 0.7% 30-day and 95.9 ± 0.8% 60-day survival rates in the younger group. The older and younger groups had similar 1-year (93.0 ± 3.9% vs 92.1 ± 1.1%; $P = .79$), 5-year (84.2 ± 6.0% vs 73.4 ± 1.9%; $P = .18$), and 10-year (51.2 ± 10.7% vs 50.2 ± 2.5%; $P = .43$) survival rates. Recipients in the older group had higher preoperative creatinine levels, frequency of coronary artery disease, and more United Network for Organ Sharing status 2 and fewer status 1 designations than recipients in the younger group ($P < .05$ for all). Pump time and intraoperative blood usage were similar between the 2 groups ($P =$ NS); however, donor-heart ischemia time was higher in the older group ($P = .002$). Older recipients had higher postoperative creatinine levels at peak ($P = .003$) and at discharge ($P = .007$). Frequency of postoperative complications, including reoperation for chest bleeding, dialysis, >48 hours ventilation, pneumonia, pneumothorax, sepsis, in-hospital and post-discharge infections, were similar between groups ($P =$ NS for all comparisons). ICU and hospital length of stays were similar between groups ($P = .35$ and $P = .87$, respectively). In Cox analysis, recipient age ≥70 years was not identified as a predictor of lower long-term survival after HT.

Conclusions. HT recipients ≥70 years old had similar 1, 5, and 10-year survival rates compared with younger recipients. Both patient groups had similar intra- and postoperative blood utilization and frequencies of many postoperative complications. Older and younger patients had similar morbidity and mortality rates following HT. Carefully selected older patients (≥70 years) can safely undergo HT and should not be excluded from HT consideration based solely on age.

ORTHOTOPIC heart transplantation (HT) remains the preferred treatment for selected patients with end-stage advanced heart failure refractory to medical therapy, with a median survival after transplantation of ~11 years [1].

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However, given the shortage of donor organs, the maximum acceptable age for HT recipients has been controversial. We previously noted that the maximum recipient age for HT was initially set at 55 years in the early years of heart transplantation [2]. In the late 1980s and early 1990s, controversy about age limit was centered on HT recipients aged 50–55 years [3–6]. Studies showed similar early and late mortality rates as well as similar 1- and 2-year actuarial survival rates between the older and younger recipients [3–5]. Therefore, by the early 1990s, performing HT in 50–55-year-old recipients became accepted in most transplant centers in the world.

In the middle and late 1990s, advances in recipient selection and donor matching, surgical techniques, immunosuppressive therapy, and recipient management led to better patient outcomes [7–11], thus encouraging many centers to expand HT to candidates 60–65 years old [8–15]. Early mortality was similar between recipients younger and older than 60 years [9,12,15]. In addition, survival rates at 1, 5, 8, and 10 years were similar between the 2 age groups in several studies [12–15]. However, other studies showed lower survival rates at 1, 5, and 6 years in the older age group [9,10].

We published our initial experience with older recipients in 1996 comparing patients older and younger than 65 years [16]. Both groups had similar 30-day operative mortality rates and actuarial survival rates at 1, 2, and 3 years after HT. We also showed that age ≥65 years was not a predictor of patient survival [16]. We noted that a small group of 6 HT recipients who were ≥70 years old had improved quality of life after HT [17]. In 2001, we compared 15 recipients ≥70 years old with 98 younger recipients, and showed that both groups had similar operative mortality and actuarial survival rates within the first 4 years after HT [18]. Other studies, comparing recipients younger and older than 60 or 65 years, showed similar early (30-day) mortality rates and similar actuarial survival rates at 1, 3, 5, and 10 years after HT [19–22]. A study of recipients older and younger than 70 years in 2004 showed similar overall long-term survival between the two groups [23]. In a comparison of 3 age groups (<60, 60–69, and ≥70 years) at our center in 2011 [24], there was no significant difference in the survival rates among the older and younger recipients at 30 days and 1, 5, and 10 years after HT.

The upper age limit for potential recipients is currently controversial and is usually defined by the practicing center. In the present report, we further extended our experience and compared the outcome of HT recipients under age 70 with those 70 years of age and older.

METHODS

Patients

From December 1988 to June 2012, 704 consecutive adult HT procedures were performed at Cedars-Sinai Medical Center, excluding multiple-organ and redo transplantations. There were 45 recipients ≥70 years of age (older group; 6.4%) and 659 recipients <70 years of age (younger group; 93.6%).

Surgical Technique, Immunosuppression, Postoperative Care, and Cytomegalovirus Prophylaxis

Orthotopic heart transplantation was performed with the use of a median sternotomy, cardiopulmonary bypass, and a biatrial or bicaval surgical technique with incorporation of the azygos vein stump into the superior vena cava anastomosis [25–29]. The frequency of endomyocardial biopsies, rejection grading, immunosuppressive therapy, and postoperative follow-up were performed as previously described [24,30–33]. The cytomegalovirus prophylaxis regimens were as reviewed in earlier publications [34–36].

Data Collection

We collected preoperative data on the recipients, as well as donor variables and recipient intraoperative and postoperative variables and complications. We assessed survival in both groups at 1 and 2 months as well as 1, 5, and 10 years after HT. Patients were considered to have had a preoperative intra-aortic balloon pump (IABP) if they had a balloon pump within 4 months before HT. The postoperative data records for dialysis, prolonged (>48 h) ventilation, pneumonia, pneumothorax, abdominal surgery for mesenteric ischemia, sepsis, pacemaker placement, and post-discharge infection were collected for up to 1 year after HT. Statistical analyses were performed on the de-identified data records. Of the 704 HT recipients included in the study, 14 patients required a 2nd HT after the currently analyzed HT procedure. The study was approved by the Institutional Review Board.

Statistical Analysis

Continuous variables were summarized by mean ± SD or median (interquartile range). Normally distributed continuous variables were compared across the 2 groups with the use of the independent samples *t* test. Nonnormally distributed numerical variables were compared across the 2 groups with the use of the Wilcoxon rank sum test. Categoric variables were summarized by frequency and percentage and were compared across groups with the use of the Fisher exact test. Survival was estimated with the use of the Kaplan-Meier method, and survival was compared across groups with the use of the log-rank test. Hazard ratios and their 95% confidence intervals were calculated with the use of Cox proportional hazards regression. Factors associated with survival were assessed with the use of multivariable Cox proportional hazards models. The proportional hazards assumption was checked with the use of the supremum test. A 2-sided 0.05 significance level was used throughout. SAS version 9.2 (SAS Institute, Cary, North Carolina) was used for statistical analysis.

RESULTS

Preoperative Recipient and Donor Variables

Table 1 presents the preoperative recipient and donor variables in the older (≥70 years old) and younger (<70 year old) recipient groups. There was no significant difference between the height, weight, and body mass index (BMI) between the older and younger patients. There was no significant difference in the percentage of patients with previous sternotomies in the 2 groups ($P = .13$). With minor missing data points, preoperative creatinine levels were higher in the older group ($P = .025$). However, the percentage of patients with creatinine levels >1.5 mg/dL did not significantly differ between the groups ($P = .28$).

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