Clinical and Nutritional Factors Associated With Early Mortality After Heart Transplantation

L. Giglio Canelhas de Abreu[a,*], L. Proença Vieira[a], T. Teixeira Gomes[a], and F. Bacal[b]

[a]Dietic and Nutrition Department, Heart Institute (InCor), Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo, São Paulo, Brazil; and [b]Heart Transplant Unit, Heart Institute (InCor), Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo, São Paulo, Brazil

ABSTRACT

Objective. The aim of this work was to verify the association between clinical and nutritional factors and mortality in the 1st 30 days after heart transplantation.

Methods. This was a retrospective study of patients who underwent heart transplantation in a public hospital in Brazil from January 2013 to August 2015. The clinical and nutritional factors analyzed were: body mass index, body surface area, cachexia, infection, duration of orotracheal intubation, ejection fraction, mean pulmonary pressure, Interagency Registry for Mechanically Assisted Circulatory Support (INTERMACS) score, hemoglobin, and diabetes mellitus. The primary outcome was mortality in the 1st 30 days after heart transplantation, and secondary outcomes were infection, acute kidney insufficiency, and duration of orotracheal intubation. We performed chi-square test, unpaired t test, and logistic regression in the analyses. A P value of $< .05$ was considered to be significant.

Results. The sample had 103 patients, of which 16 patients (15.53%) died within 30 days after heart transplantation. We observed a relationship between death and orotracheal intubation duration ($P < .01$), postoperative creatinine ($P < .01$), acute kidney injury ($P < .01$), and INTERMACS score ($P = .01$) in the bivariate analysis but not in the multivariate model.

Conclusions. Clinical and nutritional factors had no impact on mortality up to 30 days after heart transplantation in this study, although orotracheal intubation duration, postoperative creatinine, acute kidney injury, and INTERMACS score were individually associated with early death.

HEART transplantation (HT) is the best choice for treatment of refractory heart failure (HF), despite the improvement of life expectancy with clinical treatment [1]. Patients with advanced HF, functional class III or IV, with severe symptoms without clinical treatment options, and with worse prognosis are candidates for HT [2].

HF is an important catabolic disease that influences the nutritional status of the patients. One of the main HF symptom is weight loss affecting muscle mass, adipose tissue, and the heart itself leading to a state known as cardiac cachexia which is related to worse prognosis and increased mortality [3,4].

Malnutrition results in changes in body composition and in homeostasis of several systems, with activation of inflammatory and endocrine systems, leading to lipolysis, muscle weakness, anorexia, and changes in intestinal perfusion, and can increase the complications and mortality in postoperative period [5,6].

On the other hand, patients with body mass index (BMI) $\geq$30 kg/m^2 or with weight percentage >140%, should lose weight, because elevated BMI is a factor of poor prognosis after transplantation [1].

In the medium and long term after HT, weight gain occurs, but data of the impact of the preoperative weight in the 1st month after surgery are still limited. [7].

*Address correspondence to Leilane Giglio Canelhas de Abreu, Heart Institute (InCor), Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo, Avenue Doutor Eneas de Carvalho Aguiar, 44, 05403-900 Sao Paulo, Brazil. E-mail: leilanegiglionutri@gmail.com

0041-1345/17
http://dx.doi.org/10.1016/j.transproceed.2017.01.045

OBJECTIVE

The aim of this work was to verify the association between clinical and nutritional factors and mortality in the 1st 30 days after HT.

METHODS

This was a retrospective study of patients who underwent HT in the Heart Institute (InCor) of the Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo, Brazil, from January 2013 to August 2015. The inclusion criteria was age ≥18 years, and the exclusion criteria were incomplete information of weight or height.

The clinical and nutritional factors studied were: preoperative body mass index (BMI) and body surface area (BSA), cachexia, infection, orotracheal intubation (OTI) duration, acute kidney injury (AKI), underlying heart disease, cardiac output (CO), ejection fraction (EF), mean pulmonary pressure (MPP), Interagency Registry for Mechanically Assisted Circulatory Support (INTERMACS) score, hemoglobin (Hb), and diabetes mellitus (DM).

All the information about sex, age, weight, height, laboratory tests (serum creatinine at the preoperative period and 48 hours after surgery and preoperative Hb) and other pre- and postoperative data were collected in the patient electronic record system.

To calculate BMI (kg/m^2) we used the equation weight/height^2 and the nutritional status classified according to age, using the classification proposed by the World Health Organization in 1998 for adults [8] and, for the elderly (≥60 years of age), the classification proposed by Organização Pan-Americana de Saúde in 2001 [9]. For BSA (m^2) we used the equation weight [0.5378] × height [0.3964] × 0.024265 [10].

The diagnostic criteria for cachexia were: nonintentional weight loss ≥5% in ≤12 months or BMI <20 kg/m^2, plus 3 of 5 clinical or laboratory criteria: decreased muscle strength, fatigue, anorexia, low fat-free mass index, and abnormal biochemistry with signs of systemic inflammation, anemia, or low serum albumin [11].

To diagnose AKI we used the Acute Kidney Injury Network (AKIN) criteria [12].

To rank the preoperative HT status we used the INTERMACS [13] score, which varies from 1 to 7 and gives a classification from most serious to least serious.

The primary outcome was mortality in the 1st 30 days after HT.

To analyze the variables we performed the chi-square test to check the association between mortality and independent variables. The numeric variables were tested for normality with the use of the Shapiro-Wilk test. In case of normal distribution we performed the unpaired Student *t* test, otherwise we performed the Mann-Whitney test. A *P* value of < .05 was considered to be significant.

Logistic regression was used to perform multivariate analysis and to verify the crude and adjusted odds ratios (ORs) between variables and mortality. A *P* value of <.10 in the bivariate analysis was considered to enter variables in the model. The 1st quartile of Hb cutoff points and the medians of postoperative creatinine and OTI were used as reference.

RESULTS

The study sample consisted of 106 patients aged ≥18 years who underwent HT from January 2013 to August 2015. Of these 106 patients, 3 were excluded from the analysis because of missing data of weight and/or height, for a remaining total of 103 patients. Table 1 presents the descriptive characteristics of the sample.

Among the total sample, 16 patients (15.53%) died within 30 days after HT. An association was observed between death and OTI duration, postoperative creatinine, AKI, and INTERMACS score (Table 2). We did not observe association between death and underlying heart disease ($P = .27$) nor with other variables, as presented in Table 2.

As presented in Table 3, postoperative creatinine was the factor, individually, with the highest-magnitude effect on early mortality (OR, 9.46; 95% confidence interval [CI], 2.03–44.18), but it lost the strength after adjustment (OR, 3.90; 95% CI, 0.67–22.7).

DISCUSSION

It is difficult to compare results owing to limited data in the literature. In this study there was a higher prevalence of chagasic cardiomyopathy, which is the most common in

Table 1. Clinical and Nutritional Characteristics of the Sample, São Paulo, 2016 (n = 103)

Characteristic	Value
Age (y)	45 ± 12.47
Sex male	65 (63.11)
Underlying heart disease	
Chagasic	39 (37.9)
Ischemic	17 (16.5)
Idiopatic	13 (12.6)
Other (peripartum, hypertensive, valvular, alcoholic)	34 (33.0)
INTERMACS score	
1	4 (3.9)
2	45 (43.7)
3	40 (38.8)
4	10 (9.7)
5	4 (3.9)
BMI (kg/m^2)	21.62 ± 3.82
Nutritional status by BMI	
Underweight	27 (26.2)
Normal	57 (55.3)
Overweight	15 (14.6)
Obesity	4 (3.9)
BSA (m^2)	1.64 ± 0.21
Ejection fraction (%)	23 ± 10.65
Cardiac output (L/min)	4.4 ± 1.56
Mean pulmonary pressure (mm Hg)	36.98 ± 14.52
Postoperative creatinine (mg/dL)	1.82 ± 0.86
OTI duration (h)	48.3 ± 109.12
Hemoglobin (g/dL)	10.21 ± 1.87
Infection	54 (52.43)
Diabetes mellitus type 2	12 (11.65)
Cardiac cachexia	65 (63.1)
AKI	50 (48.54)

Note. Results are presented as *n* (%) or mean ± SD.
Abbreviations: INTERMACS, Interagency Registry for Mechanically Assisted Circulatory Support; BMI, body mass index; BSA, body surface area; OTI, orotracheal intubation; AKI, acute kidney injury.