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Original Article

Outcome of Heart Transplantation at Rajaie Cardiovascular Medical and Research Center, Tehran, Iran

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ABSTRACT

Background: Heart transplantation is the last therapeutic choice in patients with severe heart failure who are symptomatic despite medical treatments and are estimated to have less than a year to live. Given the dearth of information on the initial years and outcomes of heart transplantation, we conducted the present study to determine the results of this procedure at Rajaie Cardiovascular Medical and Research Center, Tehran, Iran, since the first transplantation.

Methods: The current observational study, performed as a retrospective cohort, recruited 50 consecutive children who underwent heart transplantation between March 2014 and April 2017 in a census manner and determined their outcomes.

Results: Renal failure before transplantation was reported in 3 patients (6%), of whom 2 patients (4%) required dialysis. After transplantation, 11 subjects required dialysis. Eight patients (16%) developed hepatic failure before transplantation. Infectious complications were seen in 14 patients (28%) after transplantation. Nine patients (18%) had 1 rejection time. The mortality rate was 6%.

Conclusions: It seems that despite similar indications for heart transplantation in different centers, our study revealed better results than previous studies. However, the technical and skill differences between physicians in various settings should be considered possible explanations. ***(Iranian Heart Journal 2022; 23(3): 64-68)***

KEYWORDS: Heart transplantation, Iran, Outcome

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Heart transplantation is the last therapeutic choice in patients with severe heart failure who are symptomatic despite medical treatments and are estimated to have less than a year to live.[1,2] This treatment is selected when the other medical or surgical treatments have been utilized without therapeutic response and symptom alleviation.[3,4] Indications for heart transplantation include dilated cardiomyopathy with heart-pumping less than 25%, ischemic cardiomyopathy with heart-pumping less than 25%, and complex congenital heart diseases without appropriate medical or surgical therapeutic options.[5-7] Heart transplantation in children is responsible for 14% of all the cases of heart transplantation and could result in improvements in the quality of life in patients and their caregivers, although it could sometimes lead to complications.[8,9] Among the post-transplantation complications, pulmonary hypertension, infections, and rejection may be mentioned.[10-12]

Considering the paucity of data on the initial years and outcomes of heart transplantation, we performed the present study to determine the results of this procedure at Rajaie Cardiovascular Medical and Research Center, Tehran, Iran, since the first transplantation.

METHODS

The current observational study, performed as a retrospective cohort, recruited 50 consecutive children who underwent heart transplantation between March 2014 and April 2017 in a census manner. The patients were minimally followed up until 6 months after the transplantation procedure. The exclusion criteria consisted of incomplete data and the impossibility of follow-up.

The patients' medical documents were evaluated, and the required data including age, sex, weight, height, symptom duration, the type of heart disease leading to transplantation, family history of heart disease, the length of stay in the intensive care unit (ICU), the length of stay in the hospital, peritoneal dialysis, renal failure before/after transplantation, immunosuppressive therapy, ischemia duration, the pump time, total protein and albumin levels before transplantation, last serum sodium levels, liver enzymes before transplantation, the need for extracorporeal membrane oxygenation (ECMO), the duration of ECMO use, post-transplantation infectious complications, first pulmonary artery pressure after transplantation, donor-recipient weight mismatch, and rejection times.

Data analysis was done using the SPSS software, version 24.0. The utilized tests were χ^2, Fisher, independent-samples *t*, and logistic regression. A *P* value of less than 0.05 was considered significant.

RESULTS

Among the children recruited, 29 patients (58%) were male. The mean age of the patients was 9.7±4.7 years, ranging from 15 months to 16 years. The mean age was similar in both sexes (*P*>0.05).

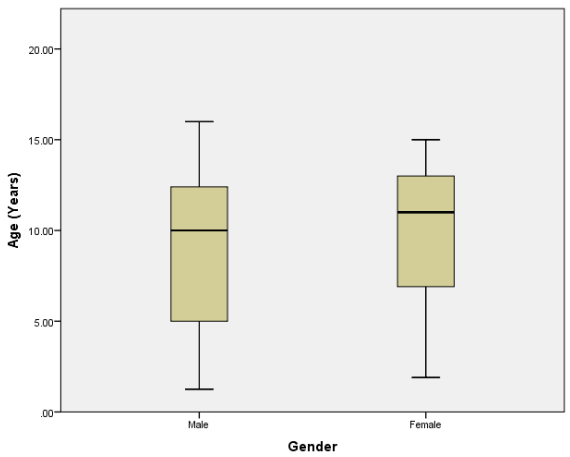

Figure 1: The image depicts the frequency distribution of age by sex.

The mean weight of the study population was 30.5±16.5 kg, ranging from 7.2 kg to 69 kg. Additionally, the mean weight was 134.2±29.3 cm, ranging from 70 cm to 177 cm. The mean duration of monitoring was 19.2±11.8 months, ranging from 6 months to 66 months. The mean length of stay in the ICU before transplantation was 9.9±14.1 days, ranging from 0 days to 61 days. The mean ICU length of stay after transplantation was 11.3±6.6 days, ranging from 3 days to 27 days. The mean pump time was 130.6±40.6 minutes, ranging from 80 minutes to 300 minutes. The mean ischemia duration was 175.2±42.7 minutes, ranging from 115 minutes to 350 minutes.

The reasons for the transplantation procedures are presented in Figure 2. Dilated cardiomyopathy, restrictive cardiomyopathy, hypertrophic cardiomyopathy, and mixed cardiomyopathy were seen in 44, 1, 1, and 4 patients, respectively. A family history of cardiomyopathy was reported in 7 patients (14%). Six patients required ECMO postoperatively.

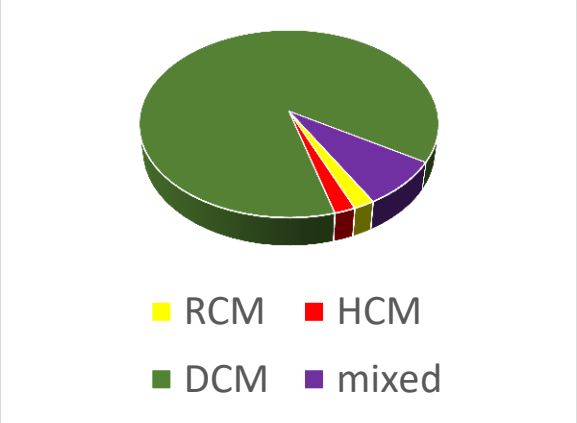

Figure 2: The image illustrates the frequency distribution of cardiomyopathy causes in the studied patients.
RCM, Restrictive cardiomyopathy; HCM, Hypertrophic cardiomyopathy; DCM, Dilated cardiomyopathy

Renal failure before transplantation was detected in 3 patients (6%), of whom 2 patients (4%) required dialysis. After transplantation, 11 subjects required dialysis. Eight patients (16%) developed hepatic failure before transplantation. Infectious complications were seen in 14 patients (28%) after transplantation. As is shown in Figure 3, 9 patients (18%) had 1 rejection time. The mortality rate was 6%.

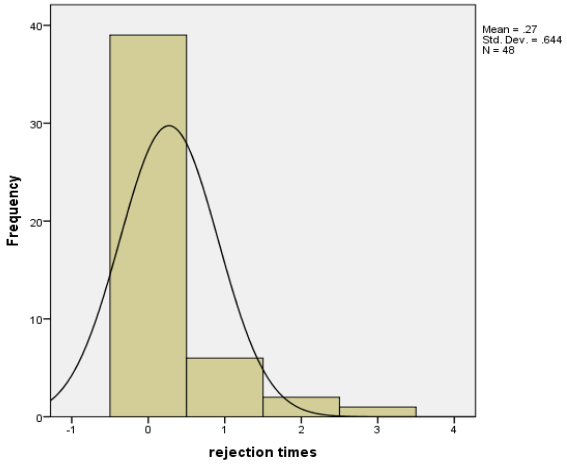

Figure 3: The image demonstrates rejection times after transplantation in the study population.

DISCUSSION

We assessed 50 patients with a mean follow-up duration of 19 months. The main indication for heart transplantation in our study population was dilated cardiomyopathy. In the majority of other studies, 20% to 30% of heart transplantation cases in children were due to congenital heart diseases.[13-18] Among patients undergoing transplantation in our center, nearly one-third had infectious complications, which is higher than the rate reported by other studies.[14,15] A rejection rate of 18%, alongside a mortality rate of 6%, was demonstrated in our study. Sarris et al[15] reported a rejection rate of 78%, Shin et al[13] reported a rejection rate of 67.6% (mean follow-up=57 mon), and Huebler et al[18] reported a rejection rate of 76%.

The 1-month survival rate in a 20-year period in an investigation by Miana et al[16] on 114 cases undergoing heart transplantation was 90%. The authors also reported 1-year, 5-year, 10-year, 15-year,

and 20-year survival rates of 81%, 71%, 61%, 44%, and 27%, respectively. In their study, ECMO was similarly used in 3 patients. Additionally, they demonstrated that the mortality rate was not significantly related to the mean ischemia duration. In our study, 6 patients required ECMO post-transplantation. The mean pumping time in our study was 131 minutes, with a mean ischemia time of 175 minutes. Miana et al[16] reported a 1-year mortality rate of 21.1%. The main causes of mortality in the first year were rejection in 9 cases, infection in 6 cases, multi-organ failure in 5 cases, graft dysfunction in 2 cases, and sudden death in 1 case. They reported 40 deaths in a 20-year period, with rejection and infection as the most common causes. In our study, death occurred in 3 cases. When considering 36 cases with a follow-up time of more than 1 year, the mortality rate in the first year was lower in our center. Possible explanations include a lack of background cardiac disease in patients under transplantation in our study and the time interval between studies entailing technical progression.

In light of the results of the present study, it can be concluded that despite similarities in indications for heart transplantation in different centers, the results of this procedure at Rajaie Cardiovascular Medical and Research Center, Tehran, Iran, are more favorable than those reported by previous investigators. Technical and skill differences between physicians in various settings should be considered possible explanations. Further multicenter studies with larger populations can yield more definite results.

REFERENCES

1. Deng MC. Cardiac transplantation. Heart. 2002 Feb; 87(2):177-84.
2. Mortensen SA, Boesgaard S, Arendrup HC, Andersen LW, Aldershvile J. Heart transplantation. UgeskrLaeger. 2000 Oct 30; 162(44):5895-900.
3. Simonsen S, Geiran OR. Heart transplantation. Tidsskr Nor Laegeforen. 2004 Apr 22;124(8):1116-8.
4. Hunt SA. Current status of cardiac transplantation. JAMA. 1998 Nov 18; 280(19):1692-8.
5. Toyoda Y, Guy TS, Kashem A. Present status and future perspectives of heart transplantation. Circ J. 2013; 77(5):1097-110.
6. Yun JJ, Gonzalez-Stawinski G. Heart transplantation. Minerva Chir. 2009 Feb; 64(1):23-35.
7. Toyoda Y, Guy TS, Kashem A. Present status and future perspectives of heart transplantation. Circ J. 2013; 77(5):1097-110.
8. Schweiger M, Stiasny B, Dave H, et al. Pediatric heart transplantation. J Thorac Dis. 2015 Mar; 7(3):552-9.
9. Uzark K, Griffin L, Rodriguez R, et al. Quality of life in pediatric heart transplant recipients: a comparison with children with and without heart disease. J Heart Lung Transplant. 2012 Jun; 31(6):571-8.
10. Thrush PT, Hoffman TM. Pediatric heart transplantation-indications and outcomes in the current era. J Thorac Dis. 2014 Aug; 6(8):1080-96.
11. Irving CA, Webber SA. Immunosuppression therapy for pediatric heart transplantation. Curr Treat Options Cardiovasc Med. 2010 Oct; 12(5):489-502.
12. Thrush PT, Hoffman TM. Pediatric heart transplantation-indications and outcomes in the current era. J Thorac Dis. 2014 Aug; 6(8):1080-96.
13. Shin HJ, Jhang WK, Park JJ, et al. Heart transplantation in pediatric patients: twelve-year experience of the Asan Medical Center. J Korean Med Sci. 2011 May; 26(5):593-8.
14. Parisi F, Carotti A, Esu F, Abbattista AD, Cicini MP, Squitieri C. Intermediate and long-term results after pediatric heart transplantation: incidence and role of

pretransplant diagnosis. Transpl Int. 1998; 11 Suppl 1:S493-8.

15. Sarris GE, Smith JA, Bernstein D, et al. Pediatric cardiac transplantation. The Stanford experience. Circulation. 1994 Nov; 90(5 Pt. 2):II51-5.

16. Miana LA, Azeka E, Canêo LF, et al. Pediatric and congenital heart transplant: twenty-year experience in a tertiary Brazilian hospital. Rev Bras Cir Cardiovasc. 2014 Jul-Sep; 29(3):322-9.

17. Chinnock RE, Bailey LL. Heart transplantation for congenital heart disease in the first year of life. Curr Cardiol Rev. 2011 May; 7(2):72-84.

18. Huebler M, Schubert S, Lehmkuhl HB, et al. Pediatric heart transplantation: 23-year single-center experience. Eur J Cardiothorac Surg. 2011 May; 39(5):e83-9.