Renal transplantation recipient patients survival

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Abstract

Introduction: The Bajío High Specialty Regional Hospital started operating in 2007 to tackle the health demands of 5.8 million inhabitants. It has 184 beds and a transplant unit with 26 beds. In 2008, the renal transplant program launched activities. **Objective:** To describe the survival of kidney transplant receptor patients and of the grafted kidney at the Bajío High Specialty Regional Hospital. **Method:** Retrospective cohort study, where consecutive transplants carried out between 2008 and 2016 were included. Statistical analysis was performed using the Kaplan-Meier method. **Results:** A total of 837 transplants were analyzed. Graft survival censored for death, with a functional graft at one and five years, was 94.6 % and 78.9 %. Patient survival at one and five years was 95.4 % and 88.1 %. **Conclusions:** The renal transplant program is one of the best programs established in Mexico, both for the number of deceased-donor kidney transplants performed and for the patient and graft survival achieved. These data indicate that the renal transplant program has had a sustained development.

KEY WORDS: Renal transplant. Patient survival. Graft survival.

Supervivencia de los pacientes receptores de trasplante renal

Resumen

Introducción: El Hospital Regional de Alta Especialidad del Bajío inició sus funciones en 2007 para atender la demanda de salud de 5.8 millones de habitantes, cuenta con 184 camas y una unidad de trasplantes con 26 camas. En 2008 inició actividades el programa de trasplante renal. **Objetivo:** Presentar la supervivencia de los pacientes receptores de trasplante renal y del riñón injertado en el Hospital Regional de Alta Especialidad del Bajío, Guanajuato, México. **Método:** Estudio de cohorte retrospectivo en el que se incluyeron los trasplantes consecutivos realizados entre 2008 y 2016. El análisis estadístico se efectuó con el método de Kaplan-Meier. **Resultados:** Se analizaron 837 trasplantes. La supervivencia del injerto censurada para muerte con injerto funcional a uno y cinco años fue de 94.6 y 78.9 %. La supervivencia del paciente a uno y cinco años fue de 95.4 y 88.1 %. **Conclusiones:** El programa de trasplante renal constituye uno de los mejor establecidos en México, tanto por el número de trasplantes renales de donante fallecido realizados como por la supervivencia obtenida de paciente injerto. Los datos indican que el programa de trasplante renal ha tenido un desarrollo sostenido.

PALABRAS CLAVE: Trasplante Renal. Supervivencia paciente. Supervivencia injerto.

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Introduction

Renal transplantation is the best treatment alternative for chronic end-stage renal disease.¹ The first successful renal transplant in humans was carried out in 1954 (Boston, United States). In Mexico, the first renal transplant was performed on October 22, 1963 at the General Hospital of the National Medical Center of the Mexican Institute of Social Security.² Currently, in Mexico there are 248 hospitals authorized to carry out kidney transplants; however, only 142 have this type of activity.³ In 2017, the Bajío Regional High Specialty Hospital (HRAEB – *Hospital Regional de Alta Especialidad del Bajío*) ranked fourth among the establishments with the largest number of transplants, with 129 procedures during that year, and ranked first in deceased-donor transplants.⁴ The national donation rate in 2016 was 32.2 per million population, with the rate of deceased-donor transplants being 15.5 per million population and the rate of brain-dead donor transplants 4.1 per million population.⁵ Over the last five years, an average of 2901 renal transplants were performed annually in Mexico, and there are 12477 patients waiting for a kidney.³

The HRAEB is a public institution and receives federal resources. It started operating in 2007 to address the health demands of approximately 5.8 million inhabitants of the states of Guanajuato, Jalisco, Michoacán, Aguascalientes and Zacatecas. It is a tertiary care hospital located in León, Guanajuato, in Central-Western Mexico, which has 184 beds, including 16 in the intensive care department, 15 in the emergency department and 26 in the transplant unit. In 2008, it started the kidney transplant program and, since 2014, it has a medical residency to train specialists in kidney transplantation surgery.⁶

This document analyses the survival of kidney transplant recipients and that of the grafted kidney, as well as relevant epidemiological information related to kidney transplant recipients at the HRAEB.

Method

Retrospective cohort study of 837 kidney transplants carried out from January 26, 2008 to December 31, 2016. The following variables were analyzed: age, gender, donor type, kidney disease etiology, immunosuppression, affiliation status, state of origin, mortality and graft loss. Measures of central tendency and dispersion (mean and standard deviation) were obtained for

Table 1. Characteristics of 837 patients who underwent kidney transplantation at the Bajío High Specialty Regional Hospital

Variable	Mean ± SD	
Recipient age (years)	26.2 ± 12.1	
	n	%
Male recipient	575	68.6
Deceased donor	409	48.8
Related living donor	385	45.9
Unrelated living donor	43	5.1
Renal disease etiology		
Unknown	631	75.3
Secondary glomerulopathy	106	12.6
Primary glomerulopathy	57	6.8
Nephropathy due to urinary tract malformation	20	2.3
Polycystic disease	20	2.3
Congenital glomerulopathy	3	0.3
Immunosuppression		
Induction with basiliximab	492	58.7
Induction with thymoglobulin	92	10.9
Induction with daclizumab	5	0.5
No induction	248	29.6
Cyclosporine-mycophenolate mofetil-prednisone	542	64.7
Tacrolimus-mycophenolate mofetil-prednisone	290	34.6
No immunosuppression due to patient death	5	0.5
Affiliation status		
No social security	511	61
Mexican Institute of Social Security	315	37.6
Institute of Social Security and Services for State Workers	10	1.1
National Ministry of Defense	1	0.1
State of origin		
Guanajuato	789	94.2
Jalisco	21	2.5
Zacatecas	15	1.7
Michoacán	7	0.8
San Luis Potosí	2	0.2
Querétaro	2	0.2
Distrito Federal	1	0.1

quantitative variables and proportions for qualitative variables. Survival analysis was carried out with the Kaplan-Meier method. Patient and graft survival censored for death with a functional graft is shown. To establish the differences in survival according to the type of donor, the log-rank test was used; the level of significance was established at $p < 0.05$. All information came from the HRAEB Transplant Unit database and from each patient's electronic medical record and physical file.

Results

Data from the first nine years of the HRAEB kidney transplant program were analyzed, i.e., 837 renal

Figure 1. Guanajuato State municipality of origin of patients undergoing kidney transplantation at the Bajío Regional High Specialty Hospital (n = 789).

Table 2. Causes of death in 69 patients with kidney transplantation

Cause	n	%
End-stage renal disease (graft failure)	26	37.6
Acute graft rejection	14	20.2
Graft-related chronic kidney disease	6	8.6
Unknown	3	4.3
Infection and subsequent graft removal	2	2.9
Graft primary dysfunction	1	1.4
Infectious	26	37.6
Neoplasms	7	10.1
Non-infectious lung disease	2	2.8
Acute myocardial infarction	2	2.8
Hemorrhage	2	2.8
Suicide	2	2.8
Diabetes mellitus complications	1	1.4
Homicide	1	1.4

transplantations carried out between January 26, 2008 and December 31, 2016. Of the kidney transplant recipient patients, only four received a second renal graft. Four-hundred and nine (48.8 %) deceased donor and 428 (51.1 %) living donor transplants were performed. Renal transplant recipients mean age $\pm$

standard deviation was 26.2 ± 12.1 years, with a range of 3 to 69.

As for deceased donors, mean age was 28.6 ± 15 years, with a range of 0 to 65. Regarding living donors, 385 were related and 43 unrelated, and their mean age was 36.4 ± 10.3 years, with a range of 18 to 54. When donor ages were compared, a significant difference ($p < 0.001$) was found between the deceased and the living donors.

Renal failure etiology was unknown in 631 recipients (75.3 %). Immunosuppression induction was used in 589 patients 70.4 %. The most commonly used immunosuppression scheme was that of cyclosporine. Among the kidney transplant recipients, 511 (61 %) had no social security (Table 1) and 94.2 % were natives to the state of Guanajuato; the municipality of origin is indicated in Figure 1.

A mortality rate of 8.2 % was recorded (69 deaths among 837 transplanted subjects); the causes of death are described in Table 2. One-hundred and eleven grafts were lost (13.2 % of those transplanted).

Graft survival censored for death with a functional graft at one, three, five and eight years was 94.6, 88.6, 78.9 and 69.4 %. Figure 2 shows the Kaplan-Meier curves for graft survival censored for death with a functional graft according to the type of donor. The log-rank test was used to compare both groups for graft survival according to the type of donor at nine

Figure 2. Kaplan-Meier curves for the survival of kidney grafts transplanted at the Bajío Regional High Specialty Hospital. LD = living donor, DD = deceased donor.

Figure 3. Kaplan-Meier curves for the survival of patients receiving a kidney transplant at the Bajío Regional High Specialty Hospital. LD = living donor, DD = deceased donor.

years, with a statistically significant difference being found ($p = 0.002$).

Kidney transplant recipient patients censored survival at one, three, five and eight years was 95.4, 92, 88.1 and 84.4 %, respectively. Figure 3 shows the Kaplan-Meier curves for renal transplant recipient patients' survival according to the type of donor. The log-rank test was used to compare nine-year recipient survival in both groups according to the type of donor, whereby a statistically significant difference was found ($p = 0.003$).

Discussion

The results of the first nine years of the HRAEB kidney transplant program are presented. In 2016,

3.2 % of renal transplants performed in Mexico (98 out of 2970 procedures) and 6.7 % of deceased donor kidney transplants (57 out of 844 performed in the country) were carried out at the HRAEB, whereby it was ranked first in Mexico among the establishments with higher deceased-donor renal transplantation activity.⁵

The number of kidney transplants carried out in similar hospitals in Mexico, such as the National Institute of Medical Sciences and Nutrition "Salvador Zubirán", which in 44 years (1967-2011) performed 1000 kidney transplants,⁷ and the Veracruz Regional High Specialty Hospital, which in a period of 10 years (2006-2016) carried out 95 kidney transplantations,⁸ is in contrast with the 837 procedures practiced in nine years (2008-2016) at HRAEB, which makes it one

of the most important hospitals in Mexico with regard to this procedure.

The HRAEB is a regional hospital, i.e., it has to cover the demands of the Guanajuato, Jalisco, Michoacán, Aguascalientes and Zacatecas populations. However, 94.2 % of patients who receive kidney transplants are from Guanajuato and 30.4 %, i.e., 255 of the recipients from the Guanajuato state belong to the municipality of León, which is explained by the location of this hospital in León.

Patients from 41 of the 46 municipalities of the state of Guanajuato have been included in the HRAEB transplant program, but there are no patients from Atarjea, Tierra Blanca, Xichú, Santa Catarina and Victoria, which are municipalities located northeast of the Guanajuato state, far away from the HRAEB, which may be one of the reasons why patients of these municipalities are not referred, do not attend the HRAEB, and are treated in other hospitals such as the “Dr. Ignacio Morones Prieto” Central Hospital, in San Luis Potosí (if they are affiliated to the Mexican Institute of Social Security) or the Querétaro Regional Hospital 1.

Patients receiving renal transplantation at HRAEB were young adults with an average age of 26.2 years, similar to that reported at the National Institute of Medical Sciences and Nutrition “Salvador Zubirán” (31.7 ± 11.3 years),⁷ at Veracruz Regional High Specialty Hospital (31.4 ± 12.8 years),⁸ at National Cardiology Institute “Ignacio Chávez” (29.9 ± 11.6 years),⁹ at “Bernardo Sepúlveda” Specialty Hospital of the National Medical Center *Siglo XXI* (31.4 ± 10.5 years),¹ at Hospital Miguel Hidalgo in Aguascalientes (29.3 ± 15 years),¹⁰ at “Dr. Ignacio Morones Prieto” Central Hospital (26.8 ± 16.6 years)¹¹ and at the Mexican Institute of Transplants (31 ± 10 years).¹²

The etiology of end-stage renal disease was unknown in 75.3 % of cases, since HRAEB is a reference hospital and the majority of transplanted patients were at late stages of the disease, and renal biopsy for diagnostic purposes was therefore no longer an option. To avoid this, it is necessary for early detection programs to be implemented at primary care hospitals and health centers.

During the reported period, only two immunosuppression schemes were used at HRAEB: cyclosporine-mycophenolate mofetil-prednisone and tacrolimus-mycophenolate mofetil-prednisone.

Comparisons with data reported in the literature regarding kidney transplant recipients and graft survival in Mexico are limited due to the variability in the

methodology of analysis and data handling, as well as for the fact that cohorts with different periods were analyzed;^{1,7-12} however, we can point out that there are differences ($p > 0.05$) regarding the survival of patients with renal transplantation reported in Spain: 91, 81 and 57 % at one, two and three years respectively,¹³ in contrast to the survival rates found in this study: 95.4, 93.2 and 92 %, for the same periods.

In this study, survival of the living-donor kidney transplantation recipient, both of the patient and the graft, was higher in comparison with that of the deceased-donor renal transplant recipient, as noted in other investigations.^{1,7-12} According to different analyses, there are several factors that might contribute to explain the better survival and glomerular filtration of living-donor transplants,¹⁴⁻¹⁶ such as blood group typing and histocompatibility tests that are routinely practiced at HRAEB:

- Donor and recipient HLA typing through molecular biology with sequence-specific primer (SSP)-type polymerase chain reaction for classes I and II (A, B, DRB1 and DQB1).
- Anti-HLA alloantibodies through the antibody reactive panel with the ELISA methodology (solid phase).
- Lymphocyte crossmatch assay for complement-mediated cytotoxicity, with the use of total lymphocytes and dithiothreitol.

Regarding living donors, we did not have the HLA compatibility data of 5.1 % (22/428) of donor-recipient dyads, 64.5 % (276/428) did match in one donor-recipient haplotype and 9.1 % (39/428) did match in two donor-recipient haplotypes; therefore HLA identity (matching of one and two haplotypes) contributed for 73.6 % (297/428) of living-donor kidney transplant recipients to have a better survival than deceased-donor kidney transplant recipients.

Conclusions

The HRAEB renal transplant program is one of the more robust programs in Mexico, both for the number of deceased-donor kidney transplants performed and for the patient and graft survival obtained. Despite being a relatively recent program (nine years) in a hospital with barely 10 years of existence, recipient and graft survival is better than in other hospitals with more experience in the procedure. Our data also indicate that the renal transplant program has had a sustained development.

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