Reproducible Model to Perform Kidney Transplantation in a Low-Resource Population

A. Rossano[a], R. Valdez-Ortiz[b], L. Garcia[a], O. Valdés[a], A. Cícero[a], H. Hinojosa[a], D. Fernandez[a], R. Bautista[a], P. Díaz[a], J. Zavala[c], F. Navarro-Reynoso[c], V. Soto[d], P. San-Cristobal[a,b,*], and H.S. Díliz[a]

Departments of [a]Transplantation, [b]Nephrology, [c]Surgery, and [d]Pathology, Hospital General de México, Mexico City, Mexico

ABSTRACT

Background. In several countries, organ transplantation is limited. We describe the implementation of a model to perform kidney transplantation in a low-resource population through a financial mechanism sharing public, patient, and private foundations funds.

Methods. This was a cohort study of 100 low-resource patients undergoing renal transplantation at the Hospital General of México. The mean age of the transplanted population was 30.07 ± 11.4 years, from which 84% reported an income <400 USD/month. Ninety percent of grafts were obtained from live donors.

Results. The survival rate at 1 year after the procedure was 98%. Patient rehabilitation after transplantation included the incorporation of individuals into productive life and work. The economically active population increased from 8% to 40% after the transplant procedure. The model was successfully implemented as the result of (i) adequate incorporation of medical staff with solid experience in organ transplantation; (ii) institutional public policy and collaboration between diverse services to support donors and receptors; and (iii) financial collaboration to attract resources and funds to guarantee access to immunosuppressants.

Conclusions. Our results led toward an operational, reproducible model for transplanting patients in developing and financial crisis countries, reflecting beneficial long-lasting effects on the patient from the therapeutic, clinical, and economic points of view.

KIDNEY transplantation is the best method of treatment for patients with end-stage renal disease; it improves the quality of life and decreases long-term mortality rates compared with lifetime dialysis treatments [1,2]. Mexico, with a population of 118 million, has an incidence and prevalence rate of chronic kidney disease estimated at 600 and 1200 patients per million populations, respectively, figures considered among the highest in the world [3]. Data published by the KEEP Mexican study reveal that chronic kidney disease is under-diagnosed, and perhaps its prevalence is greater than the data recorded thus far [4]. These numbers, unfortunately, are associated with a high prevalence of diabetes, obesity, and hypertension in our country [5–8].

The Mexican health system is complex and fragmented [9]. In general, it comprises two sectors, public and private [9,10]. In most of the cases, patients who undergo kidney transplantation in Mexico are those who have secured full medical coverage (approximately 45%); however, for the remaining 65%, the possibility of kidney transplantation in Mexico is difficult and complicated [11,12]. The National Transplant Center (CENATRA) data have reported a rate of renal transplantation of 23 transplants per million population [13]; this can be considered as inadequate if we consider that there are approximately 8497 people registered on the waiting list for a kidney transplant [13].

The Hospital General de México is one of the most historical and important teaching hospitals in Central America [14]. Since its founding (more than 100 years ago), it has been

A. Rossano and R. Valdez-Ortiz contributed equally to this work.

*Address correspondence to Pedro San-Cristobal, MD, PhD, Transplantation Department, Hospital General de México, Route 304-b, Dr. Balmis #148, Colonia Doctores, Delegación Cuauhtémoc, México, City, ZP 06726 México. E-mail: zepedapedro@hotmail.com

0041-1345/14
http://dx.doi.org/10.1016/j.transproceed.2014.07.028

characterized by providing medical care to the population of more limited economic resources [14]. With a limited number of kidney transplants in 2009, the Transplant Service was restructured, incorporating medical staff, surgeons with recognized expertise in organ transplantation, and a group of young doctors with academic training in the management of transplants [15]. All the mentioned points allowed us to establish a comprehensive and multidisciplinary service with clinical, academic, and scientific infrastructure sufficient to allow us to perform kidney transplantation adapted to a low-income population economic.

In this article, we present a model to perform successfully kidney transplants in a low-resource population and explain the financial, medical, and scientific mechanisms through which it was possible to provide access to such specialized medical care; therefore, it also shows the significant clinical and social impact of renal transplantation in this population. We believe that this information may be applied and replicated in other medical centers of our country as well as other countries facing economical crisis.

PATIENTS AND METHODS

Location and Population From the Hospital

The Hospital General de México is part of the public health sector; it is located in Mexico City and is considered as a tertiary level center of medical attention. The Hospital General de México has approximately 1200 hospital beds, including intensive care, outpatient therapy, and emergency services. For this study, we included all patients undergoing kidney transplant from May 2009 to August 2012. The database was obtained from the clinical records of the Transplant Service. All receptor and donors patients were informed and signed a medical consent to undergo to a transplant or nephrectomy procedure as well as authorization for future publication of the actual study.

Protocol Evaluation Before Renal Transplantation

The studies requested before transplantation included blood type and Rh factor, blood count, and blood chemistry (glucose, urea, creatinine, sodium, potassium, chloride, calcium, and serum phosphorus) and liver function tests such as bilirubin total (direct and indirect), total protein, albumin, globulin, alanine aminotransferase, aspartate aminotransferase, alkaline phosphatase, gamma-glutamyl transpeptidase, and lactate dehydrogenase. In patients with residual renal function, we performed: 24-hour creatinine excretion, urinalysis, and albuminuria. Infectious diseases were scanned by use of protocol and included the performance of nasal and pharyngeal exudates, tuberculin skin tests at 72 hours, serological determination of cytomegalovirus (immunoglobulin [Ig]M and IgG), *Toxoplasma gondii* (IgM and IgG), venereal disease research laboratory (VDRL), enzyme-linked immunoassay to human immunodeficiency virus, and surface antigen and antibody detection to the hepatitis B and C viruses. Imaging and complementary studies such as chest radiography, sinus radiography, electrocardiography, and transthoracic echocardiography at baseline were always included. Gynecologic assessment of cervical-vaginal cytology was mandatory for women. In some cases in patients over 50 years of age with a history of smoking, respiratory function tests and rectosigmoidoscopy were also requested. Depending on the age of the patient, other laboratory values such as tumor markers (prostate-specific antigen and carcino-embryonic antigen) were required. Also, before the transplantation procedure, all patients received a specific vaccination scheme (tetanus, measles, hepatitis B, influenza, and pneumococcal species). All candidates undergoing renal transplant were evaluated by means of cardiology, dentistry, psychology, and/or psychiatry services. On minimal suspicion of any clinical finding, patients were referred to services such as infectious diseases, lung clinic, or others.

Surgical Techniques

Kidney donors underwent transperitoneal hand-assisted laparoscopic nephrectomy. The surgery was performed in most of the cases by accessing midline below the supraumbilical region with a variable length, depending on the size of the surgeon's hand, and placing two additional working ports of 10 mm, a first one in the subxiphoid region and a second one lower to the left quadrant. Routinely, the left kidney was always selected regardless of the number of arteries and vascular variants. All graft recipients were placed on the receptor in the right iliac fossa (with exemption of two re-transplantation procedures), and most of the vascular reconstructions were performed by means of a termino-lateral anastomosis to the external iliac artery and iliac vein. Neoureterocis-to-anastomosis was performed, creating a mucosa-mucosa seal, extravesical, and placement close to drainage to closely monitor any urinary leakage.

Evaluation and Follow-Up After Transplantation

After renal transplantation, patients have a 7-day hospital stay. Patient follow-up after discharge from the hospital was established with visits to the unit 3 times per week (first month); 2 times per week (second month); once per week (third month), and then monthly until the first year after transplantation. After the first year, medical follow-up was performed each 3 months according to the evolution of the patient-allograft binomial clinical relation. Immunosuppressant protocol included steroid induction therapy with or without monoclonal antibody to interleukin-2 (basiliximab); maintenance therapy included a triple scheme that was based on a calcineurin inhibitor (cyclosporine or tacrolimus), anti-proliferative (mofetil micophenolate or azathioprine) plus steroid (prednisone). Serum levels of calcineurin inhibitors were quantified until reaching a therapeutic dose (between 150 and 250 ng/mL for cyclosporine and 4 to 8 ng/mL for tacrolimus). All patients received prophylaxis with trimethoprim-sulfamethoxazole (800/160 mg), and acyclovir (400 mg) once daily was given during the first 3 months. Surgical prophylaxis included cefuroxime (750 mg) once in 24 hours for 3 days. Additionally, patients with positive skin test results for tuberculosis and no evidence of active tuberculosis received isoniazide (300 mg) daily for 6 months. Laboratory studies (biometry, glucose, urea, creatinine, sodium, potassium, and chloride serum) were requested according to the time of transplantation and before the medical visit. Urinalysis and urine culture were requested before Foley catheter removal as well as a renal Doppler ultrasound before discharge. Other laboratory studies commonly included were calcium, phosphorus, lipid profile, and microalbumin in urine for 24 hours during the first 3 months of follow-up. Parathyroid hormone determination was performed at a pre-transplant time point and, depending on the patient, again after the transplant procedure.

Statistical Analysis

Depending on the distribution of variables, the results of the present study are expressed as mean ± SD or median with ranges. We performed survival curves and Kaplan-Meier analyses and