Trends in Renal Transplantation Rates in Patients with Congenital Urinary Tract Disorders

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Purpose: Improved bladder and renal management benefit patients with congenital uropathy and congenital pediatric kidney disease. This may translate to delayed initial renal transplantation in these patients, and improved graft and patient survival. Our primary study purpose was to determine whether patients with congenital uropathy and congenital pediatric kidney disease have demonstrated later time to first transplantation and/or graft survival.

Materials and Methods: SRTR (Scientific Registry of Transplant Recipients) was analyzed for first renal transplant and survival data in patients with congenital uropathy and congenital pediatric kidney disease from 1996 to 2012. Congenital uropathy included chronic pyelonephritis/reflux, prune belly syndrome and congenital obstructive uropathy. Congenital pediatric kidney disease included polycystic kidney disease, hypoplasia, dysplasia, dysgenesis, agenesis and familial nephropathy.

Results: A total of 7,088 patients with congenital uropathy and 24,315 with congenital pediatric kidney disease received a first renal transplant from 1996 to 2012. A significant shift was seen in both groups toward older age at initial renal transplantation in those 18 through 64 years old. In the congenital uropathy group this effect was most facilitated by decreased renal transplantion in patients between 18 and 35 years old (38% in 1996 vs 26% in 2012). The congenital pediatric kidney disease group showed a substantial decrease in patients who were 35 to 49 years old (from 39% to 29%). At 10-year followup the congenital uropathy group showed better graft and patient survival than the congenital pediatric kidney disease group. However, aged matched comparison revealed comparable survival rates in the 2 groups.

Conclusions: Analysis of trends in the last 14 years demonstrated that patients with both lower and upper tract congenital anomalies experienced delayed time to the first renal transplant. Furthermore, patients had similar age matched graft and patient survival whether the primary source of renal demise was the congenital lower or upper tract. These findings may indicate that improved urological and nephrological care are promoting renal preservation in both groups.

Key Words: kidney transplantation, congenital, kidney diseases, graft survival, mortality

Abbreviations and Acronyms

CKD = chronic kidney disease
CPKD = congenital pediatric kidney disease
CU = congenital uropathy
DD = deceased donor transplant
ESRD = end stage renal disease
LD = living donor transplant
RT = renal transplant

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KIDNEY transplantation remains the gold standard treatment for children with ESRD, providing a known survival advantage over hemodialysis.[1] Congenital causes such as anomalies of the upper and lower urinary tract, and hereditary nephropathies are disproportionately responsible for the development of CKD in children. In the United States approximately 60% of pediatric CKD is attributable to such congenital disorders.[2]

Progression of CKD in these patients is variable and depends on several factors, including severity of underlying disease, early recognition of the problem, proper selection of management strategies and various socioeconomic factors.[2] In the United States the modern era has been marked by improved understanding of congenital disease states leading to CKD as well as advancements in prenatal screening, and more aggressive bladder and nephrological management strategies with improved access to care.

We postulated that such advancements in the treatment of patients with congenital urinary tract disorders may slow progression to ESRD and secondarily delay time to the first RT in these patients. Furthermore, such advances could also translate to improved RT graft and patient survival. To investigate this hypothesis the primary objectives of this study were to determine whether patients with CU and CPKD have demonstrated later time to the first transplant and/or graft survival.

MATERIALS AND METHODS

Data Source

SRTR is a national database of transplant statistics collected by OPTN (Organ Procurement and Transplantation Network), a collection of hospitals and organ procurement organizations across the United States. Since 1987, SRTR has maintained comprehensive information on all solid organ transplants in the country with current and past information on the full spectrum of transplant activity. Data include information on organ donors, candidates and recipients as well as organ specific and patient outcomes.[3]

Variables

SRTR was queried to identify the first RT, and graft and patient survival data in patients with CU and CPKD between 1996 and 2012. The study was limited to the period after 1996 due to some incomplete data in SRTR prior to this year. CU included diagnostic codes 3007 (chronic pyelonephritis/reflux), 3036 (prune belly) and 3052 (congenital obstructive uropathy). CPKD included codes 3008 (polycystic kidney disease), 3025 (hypoplasia, dysplasia, dysgenesis, agenesis) and 3032 (familial nephropathy).

In addition to time of transplantation, characteristics of donors and recipients were extracted from identified cases, including age, gender, race, body mass index and comorbidity data. Furthermore, recipient transplant and kidney function data were collected.

Statistical Analyses

Descriptive statistics were used to examine the distribution of clinical characteristics of and between the CU and CPKD groups. Univariate analysis and its associated p values were used to evaluate differences in the unadjusted prevalence of the mentioned characteristics. SAS® Proc freq and gplot procedures were applied to calculate the percent of frequencies, which are simple proportions of number per age group over the total transplant number per year. Scatterplots were constructed, and simple regression models and associated p values were used to evaluate differences in each age group. Also, to support the results regression models focused on age and diagnosis groups, and the first RT year. Test results revealed that in general all were statistically significantly associated with recipient age at first RT ($p < 0.0001$). The younger age group (18 to 35 years) in the CU group and the middle age group (35 to 49 years) in the CPKD group substantial decreased with time and were strongly associated with patient age at the first RT. Graft and patient survival were evaluated using the Kaplan-Meier method. Analyses were performed with SAS 9.2 for UNIX.

The Cleveland Clinic institutional review board gave this study exempt status.

RESULTS

Study Population

A total of 7,088 patients with CU and 24,315 with CPKD received a first RT between 1996 and 2012. Of patients with CU the preoperative diagnosis was chronic pyelonephritis/reflux in 3,768, prune belly syndrome in 380 and congenital obstructive uropathy in 2,940. Of patients with CPKD the preoperative diagnosis was polycystic kidney disease in

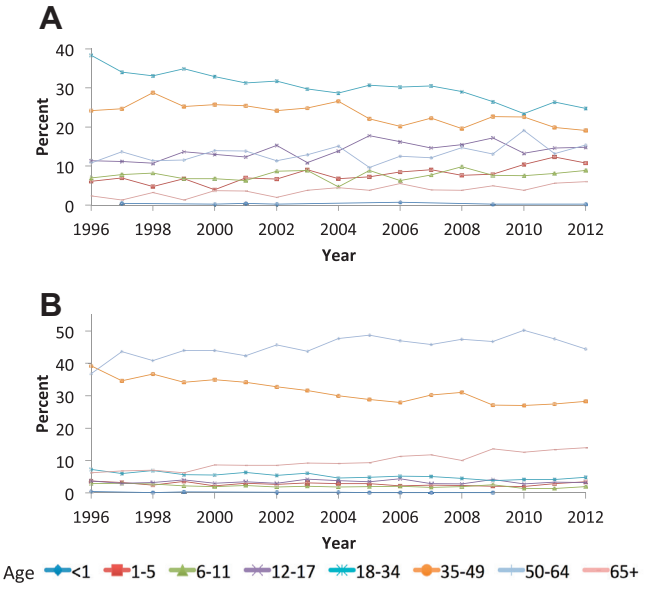

Figure 1. Age at first RT as percent of all RTs with time in patients with CU (*A*) and CPKD (*B*).