



Early Rehospitalization Post–Kidney Transplant Due to Infectious Complications: Can We Predict the Patients at Risk?

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ABSTRACT

Introduction. Rehospitalization early post–kidney transplant is common and has a negative impact in morbidity, graft survival, and health costs. Infection is one of the most common causes, and identifying the risk factors for early readmission due to infectious complications may guide a preventive program and improve outcome. The aim of this study was to evaluate the incidence, characterize the population, and identify the risk factors associated with early readmission for infectious complications post–kidney transplantation.

Methods. We performed a retrospective cohort study of all the kidney transplants performed during 2015. The primary outcome was readmission in the first 3 months post-transplant due to infectious causes defined by clinical and laboratory parameters.

Results. We evaluated 141 kidney transplants; 71% of subjects were men, with an overall mean age of 50.8 ± 15.4 years. Prior to transplant, 98% of the patients were dialysis dependent and 2% underwent pre-emptive living donor kidney transplant. The global readmission rate was 49%, of which 65% were for infectious complications. The most frequent infection was urinary tract infection ($n = 28$, 62%) and the most common agent detected by blood and urine cultures was *Klebsiella pneumoniae* ($n = 18$, 40%). The risk factors significantly associated with readmission were higher body mass index ($P = .03$), diabetes mellitus ($P = .02$), older donor ($P = .007$), and longer cold ischemia time ($P = .04$). There were 3 graft losses, but none due to infectious complications.

Conclusion. There was a high incidence of early rehospitalization due to infectious complications, especially urinary tract infections to nosocomial agents. The risk factors identified were similar to other series.

HOSPITAL readmission in early post kidney transplant (KT) period is frequent and nearly one-third of KT recipients are rehospitalized within 30 days of discharge [1,2]. Early rehospitalization (ERH) is associated with increased morbidity, transition-of-care errors, and costs both to patients and the health care system [3,4]. One of the most common causes for ERH is infection, and KT recipients have a cumulative incidence of infections of over 75% in the first year [3,5,6]. The high incidence of infection is multifactorial and related in part to the surgical procedure, immunosuppressive drugs, exposure to nosocomial pathogens, and necessity for devices such as urinary catheters and intravascular lines [7].

Despite improvements in immunosuppressive therapy and surgical techniques, infectious complications remain a major cause of morbidity, and these complications, especially urinary tract infection (UTI), have been associated with increased risk for graft rejection and general worst graft outcome [1,7,8].

The aims of this study were to evaluate the incidence of infectious complications in the first 3 months post-KT, characterize the population- and transplant-related variables, and identify risk factors associated with ERH.

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Patients and Methods

We performed a retrospective, single-center cohort study of all the 141 KT's performed during 2015 in our center. Follow-up was until March 2016, which included a post-transplant time range of 3 to 15 months.

All patients were followed up according to our center surveillance protocol: medical and nurse visit twice a week for the first month and once a week at the second and third months post-transplant. At every visit, blood tests for graft function, urinalysis, and hemogram are obtained. At the end of the third month, cytomegalovirus (CMV), Epstein-Barr virus, and donor-specific antibodies are searched in every patient. If dysfunction occurs during the time of follow-up, patients receive blood tests for CMV, Epstein bar virus, and donor-specific antibodies and Doppler ultrasound. If an infection is suspected, blood and urinary cultures are performed.

The primary outcome was hospital readmission due to infectious causes in the first 3 months post-transplant. The diagnosis of infection was defined based on clinical features at presentation, laboratory parameters (positive biological fluid cultures, CMV detection by viral proteins or isolation of the virus in the blood, C-reaction protein levels, procalcitonin, and leukocytes), and radiology exams. Demographic and baseline characteristics of the study population including donor, recipient, and transplant-related variables were abstracted from patient records.

Data were analyzed using SPSS statistics software version 15 Windows (SPSS, Inc, Chicago, Ill, USA). Comparisons used the χ^2 test for categorical variables and Student *t* test or the Mann-Whitney *U* test for continuous variables, as appropriate. To measure odds ratios of categorical data and their significance, we used the cross-tabs method with risk estimation; for continuous variables, we used binary regression. All tests were 2 tailed; *P* < .05 was considered significant.

RESULTS

Demographic and Transplant Characteristics of the Study Population

We evaluated 141 KT's during the study period, including 71% (*n* = 100) male recipients, 96% (*n* = 135) Caucasians, with an overall mean age of 50.8 ± 15.4 years. Prior to transplant, 98% of the patients performed dialysis (79% hemodialysis and 19% peritoneal dialysis) with a mean length of time of dialysis of 44.6 ± 28.9 months, and 3 patients (2%) underwent pre-emptive living donor KT. It was the first transplant in 92% of the patients (*n* = 130), and 95% (*n* = 134) received a cadaveric graft. Regarding immunosuppression, induction with basiliximab was performed in 84% of the recipients (*n* = 118), and maintenance therapy with calcineurin inhibitors was used in 94% patients (*n* = 133).

Readmission Rate and Infection

Overall, 69 patients were readmitted in the first 3 months post-transplant, representing a readmission rate of 49%.

Among them, 28 (41%) patients had 1 and 41 (59%) had 2 or more readmissions. Infection was the main cause for ERH, affecting 45 patients (45/69, 65%), followed by graft dysfunction (13/69, 19%) and surgical complications (11/69, 16%).

The main site of infection was the urinary tract (*n* = 28), followed by surgery-related infections (*n* = 8), infection of the dialysis access (*n* = 3), respiratory tract infection (*n* = 2), gastrointestinal infection (*n* = 2), and CMV infection (*n* = 2). *Klebsiella pneumoniae* was the most frequently isolated micro-organism (*n* = 18), followed by *Pseudomonas aeruginosa* (*n* = 5), *Escherichia coli* (*n* = 3), and *Enterococcus faecium* (*n* = 2). In one patient with respiratory tract infection, *Aspergillus fumigatus* was isolated. In 14 patients, no agent was isolated. The mean duration of antimicrobial therapy was 12.5 ± 7 days.

Predictors of Early Rehospitalization Due to Infectious Complications

The risk factors that were significantly associated with readmission for infectious causes in the first 3 months post-transplant were higher body mass index (26.3 vs 24.4, *P* = .03; odds ratio [OR] = 1.254, 95% confidence interval [1.09–1.348], *P* < .05), the presence of diabetes mellitus (DM) (OR = 3.27 [1.1–9.6], *P* < .05), older donor (56.5 vs 51.2, *P* = .007, OR = 1.03 per year [1.02–1.063], *P* < .05), and longer cold ischemia time (19.0 vs 16.9; *P* = .04, OR = 1.7 per hour [1.04–2.67], *P* < .05; Table 1).

Follow-up

Time of follow-up varied between 3 and 15 months, and no graft lost or death was registered. The mean value of serum creatinine at follow-up was 1.65 ± 0.42 mg/dL.

Table 1. Epidemiology and Risk Factors for Rehospitalization Due to Infectious Complications During the First 3 Months Post-Kidney Transplant

	Rehospitalized	Not Rehospitalized	<i>P</i>
Recipient characteristics			
Age (y)	52.2 ± 18	49.4 ± 13.4	NS
Gender, female (n)	19	22	NS
Body mass index (kg/m ²)	26.3 ± 3.8	24.4 ± 3.7	.02
Dialysis duration (mo)	44.9 ± 23	43.8 ± 29	NS
Diabetes mellitus, yes (n)	11	6	.03
Urological pathology, yes (n)	12	13	NS
Transplant characteristics			
Donor age (y)	56.5 ± 8.7	51.2 ± 11.3	.007
Living donor, yes (n)	2	5	NS
Retransplant, yes (n)	5	6	NS
HLA mismatches (mean)	3.0 ± 1.2	3.2 ± 1.1	NS
Cold ischemia time (h)	18.8 ± 4.7	16.8 ± 6.2	.04
Surgical complications during transplantation (n)	8	9	NS
Urinary catheterization (d)	6.5 ± 3.2	6.1 ± 2.1	NS
Delayed graft function (n)	7	8	NS

Abbreviation: NS, not significant.

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