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Original Article

Delayed graft function in living-donor renal transplantation: a single-center experience with 1537 patients

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Abstract: Objectives: To analyze the incidence, clinical characteristics and possible causes of delayed graft function (DGF) among a large number of living kidney transplant recipients at a single center. Patients and Methods: We analyzed the medical records of 1537 patients over 18 years of age who received a kidney transplant from a living donor between January 2003 and June 2014. The demographic characteristics of the patients, graft survivals, acute rejection rates and renal functions were compared between patients with and without DGF. Results: Longer dialysis time before transplantation (50.6 ± 53.1 vs. 31.4 ± 42.9 months; P<0.001) and lower donor GFR (48.2 ± 10.2 vs. 45.4 ± 13 months; P=0.014) were associated with a greater incidence of DGF in this series. The DGF cases showed a higher incidence of acute rejection episodes (19.9% vs. 4.8%), chronic graft dysfunction (10% vs. 1%), prolonged hospitalization (16.8 ± 6.7 days vs. 8.3 ± 5.6 days), and worse renal function after 1-year follow-up period compared with non-DGF patients. Conclusions: Longer dialysis time before transplantation and lower donor GFR were associated with a higher risk for DGF, with prolonged hospitalization time, worse graft prognosis and higher rates of acute rejection episodes and chronic graft dysfunction.

Keywords: Delayed graft function, living donor, renal transplantation

Introduction

Delayed graft function (DGF) is defined as the need for dialysis within the first week after renal transplantation [1]. It is a form of acute renal failure and usually observed after cadaveric kidney transplantation due to extended cold ischemia time [2, 3]. Several published studies have extensively investigated the DGF in deceased-donor cases and they have demonstrated an association of DGF with decreased graft survival [3-5]. However, the incidence and clinical significance of DGF in living donor renal transplantation (LDRT) is unclear and there are only limited studies with relatively small patient groups in the literature. In this study, we analyzed the incidence, clinical characteristics and possible causes of DGF among a large number of living kidney transplant recipients at a single center.

Patients and methods

We analyzed the medical records of 1537 patients over 18 years of age who received a kidney transplant from a living donor between January 2003 and June 2014. We excluded from our analysis recipients of deceased donor kidneys, pediatric cases and pancreas/kidney recipients. Seventy-five recipients (4.8%) required dialysis within the first week of transplantation and this condition was defined as DGF regardless of the urine output.

We retrospectively reviewed the medical data on the donor; age, gender, body mass index (BMI), comorbidities, blood pressure, kidney size, serum creatinine and glomerular filtration rate (GFR). We reviewed these data on recipients; age, gender, primary renal disease, mean blood pressure, serum creatinine, duration of

Table 1. Demographic data and patient characteristics in DGF and non-DGF groups

	DGF	Non-DGF	*P* value
No. patients (%)	75 (4.8%)	1464 (95.2%)	
Mean donor age ± SD, years	47 ± 12.6	44.3 ± 11.9	0.08
Mean recepient age ± SD, years	37.6 ± 12.3	37.4 ± 12.3	0.372
Recepient gender			
Male/female	51/24	934/399	0.704
Recepient BMI (kg/m^2)			
BMI > 25 (%)	17.6	18.8	0.796
HLA mismatching	3.5 ± 1.3	3.5 ± 1.5	0.789
Duration of dialysis	50.6 ± 53.1	31.4 ± 42.9	<0.001*
Donor GFR	45.4 ± 13	48.2 ± 10.2	0.014*

*Significant at 0.05 level.

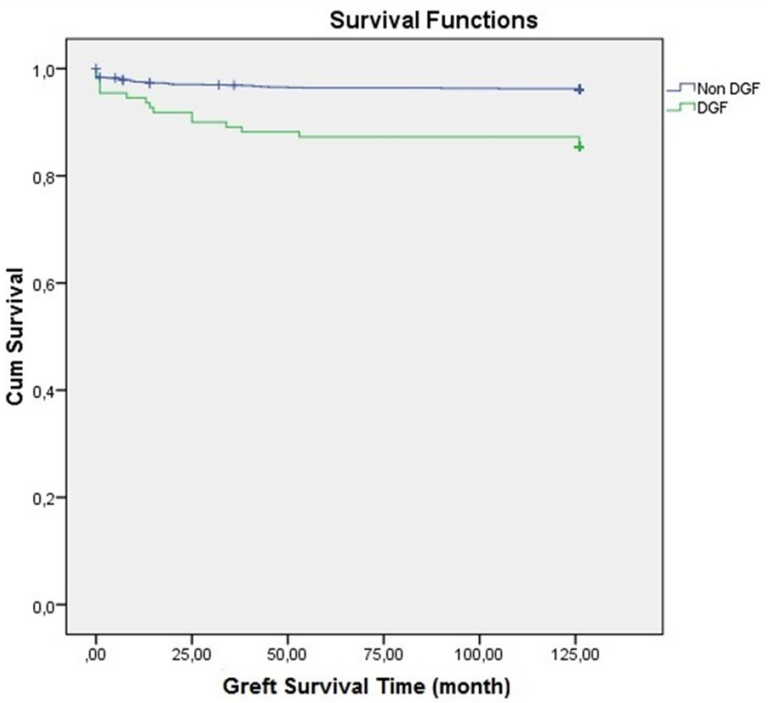

Figure 1. Graft survival according to DGF.

the dialysis, medical history of hypertension and diabetes, HLA halotype matches, vascular anastomosis time, total surgical time and surgical complications. Posttransplantation follow-up included the presence of DGF, acute rejection episodes, total hospitalization times and laboratory parameters at 1, 6, and 12 months after transplantation.

Logistic regression model was used to determine risk factors associated with DGF. The demographic characteristics of the patients, graft survival, acute rejection rates and renal functions were compared between patients with and without DGF.

Statistical analysis

All statistical analyses were performed using SPSS version 19.0 for Windows. Univariate analysis was performed using the chi-square test for categorical variables and Mann-Whitney U test for continuous ones. Graft and patient survival were calculated using the Kaplan-Meier method. Logistic regression analysis was used to identify risk factors associated with DGF. A *P* value less than 0.05 was considered statistically significant.

Results

In this study, mean follow-up period was 120.7 ± 24 months. There were no significant differences between the DGF and non-DGF patients in donor and recipient factors, such as gender, age, BMI, causes of renal failure and HLA mismatch. However, dialysis time before transplantation (50.6 ± 53.1 vs. 31.4 ± 42.9 months; P<0.001) was longer and donor GFR (48.2 ± 10.2 vs. 45.4 ± 13 months; P= 0.014) was lower in DGF patients. Clinical data for the independent donor and recipient factors between the DGF and non-DGF patients were summarized in **Table 1**.

The DGF group showed a prolonged hospitalization time (16.8 ± 6.7 days vs. 8.3 ± 5.6 days; P<0.001) and worse renal function after 1-year follow-up period. The postoperative serum creatinine level was 1.6 ± 0.9 mg/dL vs. 1.3 ± 2.2 mg/dL at 30 days (P<0.001); 1.5 ± 0.5 mg/dL vs. 1.2 ± 0.4 mg/dL at 6 months (P<0.001); and 1.4 ± 0.7 mg/dL vs. 1.2 ± 0.6 mg/dL at 1-year (P=0.013) for DGF vs. non-DGF groups.

Table 2. Comparison of operative and postoperative data in DGF and non-DGF groups

	DGF	Non-DGF	*P value*
Mean ± SD hospitalization time (days)	16.8 ± 6.7	8.3 ± 5.6	<0.001*
Mean ± SD serum creatinine (mg/dL)			
Discharge	1.7 ± 1	1.2 ± 0.6	<0.001*
1-month	1.6 ± 0.9	1.3 ± 2.2	<0.001*
6-months	1.5 ± 0.5	1.2 ± 0.4	<0.001*
12-months	1.4 ± 0.7	1.2 ± 0.6	0.013*
Acute rejection (%)	85.3%	16.1%	<0.001*
Chronic graft dysfunction	10%	1%	<0.001*
Graft survival (5 years)	87.3%	95.8%	<0.001*

*Significant at 0.05 level.

The incidence of DGF and acute rejection among patients undergoing living donor patients were 4.8% and 19.9% respectively. The incidences of acute rejection in the DGF cases and the non-DGF cases were 85.3% and 16.1%, respectively (P<0.001). Chronic graft dysfunction was also higher in DGF patients (10% vs. 1%; P<0.001). The 5-year graft survival rate of patients with and without DGF were 87.3% and 95.8%, respectively (P<0.001) (**Figure 1**). The mean graft survival time was 112 ± 3.6 months in DGF group and 121.8 ± 0.5 months in non-DGF group (**Table 2**).

Discussion

DGF is a well-known postoperative complication after cadaveric kidney transplantation [6]. It is a form of acute renal failure that results in post-transplantation oliguria and increases the risk of early and late graft loss [3]. Its incidence and clinical significance have been extensively investigated in deceased-donor cases. The usual rate of DGF is 10% to 60% after deceased renal transplantation but depends on many variables [8]. However, few studies have examined risk factors for DGF in LDRT, therefore the impact of DGF on the outcome of LDRT is controversial. Generally published studies report lower incidence of DGF in LDRT compared with cadaveric kidney transplantation [4].

We know that LDRT is associated with a better long-term survival and graft function compared with cadaveric donors [3]. Because cold or warm ischemia time is relatively short in LDRT [2]. In a study Kwon et al. analyzed 93 LDRT recipients and found the overall incidences of DGF and acute rejection were 18% and 30% respectively [1]. Brennan et al. observed a low incidence of DGF (4.7%) among 469 living donor kidney recipients [9]. In a study by Ghods et al. on 689 LDRT cases, the incidence of DGF was 7.7% [4]. In the present study, we observed the DGF incidence among 1537 patients to be 4.8%, which was comparable to previous reports.

The long term effects of DGF are controversial especially in LDRT cases. Some authors reveal that DGF increases the risk of acute rejection and has negative effects on graft survival but some authors do not claim such an association [1, 6]. Chatziantoniou et al. reported that completely reversible DGF should have no effect on long term graft prognosis [10]. In another study Sainz et al. showed that DGF adversely affects graft survival, in particular when associated with episodes of acute rejection [11]. We found that occurrence of DGF was associated with the prolonged hospitalization time, reduced graft survival, higher rates of acute rejection episodes and higher chronic graft dysfunction. We believe that this association can be related to increased graft immunogenicity [12].

In a recent study, the risk factors for DGF in LDRT recipients were found as donor female gender and previous renal transplantation [4]. In another study, Bronzatto et al. reported that older donor age, previous systemic hypertension and higher BMI were associated with DGF [5]. Parekh et al. recently studied DGF after living donor kidney transplantation and discovered that recipient diabetes and increased warm ischemia time emerged as the only two risk factors for poor initial graft function [13]. Our study disclosed different risk factors for DGF than other trials, which may be due to the large number of our cases. Longer dialysis time before transplantation and lower donor GFR were associated with a greater incidence of DGF in this series. Although the importance of older donor age as a risk factor for DGF has been described in many trials we did not observe its significance in the present study.

In conclusion, longer dialysis time before transplantation and lower donor GFR were associat-

ed with a higher risk for DGF in LDRT patients, with prolonged hospitalization time, worse graft prognosis and higher rates of acute rejection episodes and chronic graft dysfunction. On the other hand, the present study also had several limitations. The most important one is retrospective nature of this study. Therefore, further multicenter studies with a prospective design are needed to confirm our findings.

Disclosure of conflict of interest

None.

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