ELSEVIER

Dialysis as a Bridge Therapy to Renal Transplantation: Comparison of Graft Outcomes According to Mode of Dialysis Treatment

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ABSTRACT

Background. Renal transplantation is the ideal renal replacement therapy in patients with end-stage renal disease. It was unclear whether a difference in dialysis modality influences outcomes after kidney transplantation. Therefore, we evaluated the influence of dialysis modality.

Methods. We compared various clinical and laboratory parameters of 70 peritoneal dialysis (PD) and 180 hemodialysis (HD) patients ($n = 250$), including 91 females and an overall age 36.7 ± 9.7 years who underwent transplantation between 2000 and 2008 to evaluate factors affecting delayed graft function (DGF) and of transplant graft failure.

Results. Overall graft survival was 82% at 3 and 75% at 5 years. Among HD patients, 16% displayed DGF, versus 12% of PD patients. Multivariate analysis showed that factors affecting DGF were: mode of dialysis (relative risk [RR] = 1.39, 95% confidence interval (CI): 1.35–1.43; $P < .01$); parathyroid hormone (RR = 0.32, 95% CI: 0.30–0.34, $P < .05$), C-reative protein (RR = 1.03, 95% CI: 0.97–1.09; $P < .05$), hemoglobin levels (RR = .75, 95% CI: 0.72–0.79; $P < .05$). At 3 and 5 years follow-up, PD patients' showed fewer graft failures than HD patients (14% vs 20%; $P < .05$ and 17% vs 28%; $P < .05$).

Conclusion. Early graft function rates were better for PD than for HD patients. Inflammation and anemia should be carefully investigated and corrected to achieve better graft function.

RENAL TRANSPLANTATION (RT) is the ideal treatment for renal replacement therapy among patients with end-stage renal disease (ESRD). The role of pretransplant dialysis modality to affect transplant outcomes has been the subject of long-standing interest. It has been well documented that preemptive RT is the best way to reduce the incidence of acute rejection episodes and prolong graft survival.[1] The limited availability of kidneys makes the use of other modalities of renal replacement therapy essential. Hemodialysis (HD) and peritoneal dialysis (PD) are the standard methods of renal replacement therapy. Comparative effects of various modalities of dialysis on patient and graft survivals have been extensively investigated; however, there is no consensus on the impact.[2]

Delayed graft function (DGF) is associated with an increased risk of an early acute rejection episode, of perioperative death, of a longer posttransplant hospitalization, of increased cost and of shortened allograft survival.[3] Cold ischemia time, donor age, human leukocyte antigen (HLA) mismatch, and recipient age have been previously identified as risk factors for DGF.[4] The purpose of the present study was to determine the influence of dialysis modality and duration of dialysis on the occurrence DGF and of long term graft outcomes in RT patients.

METHODS

We retrospectively analyzed the case records of patients who underwent their first RT from January 2000 to December 2005. We compared various clinical and laboratory parameters of 70 PD and 180 HD patients. We analyzed all patients above 16 years of age, none of whom had received a preemptive transplantation. Exclusion criteria also included a dialysis period more than 3 months that included a switch from one to the other dialysis modality, multiple

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organ transplantation, and acute renal graft failure caused by a surgical complication. Table 1 shows the patient characteristics and major causes of ESRD.

The pretransplant dialysis strategy was similar in the HD study group. All subjects received an adequate dose of dialysis (Kt/V ≥ 1.4). The continuous ambulatory PD patients were treated with four daily exchanges, each using 2 L PD solution (Baxter Healthcare, Deerfield, Ill, USA). HLA mismatch and cold ischemia time were recorded for all individuals.

Posttransplant immunosuppressive therapy was based on cyclosporine (μ 60%), tacrolimus(T μ 23%), or rapamycin (17%). Methylprednisolone doses were similar for all patients.

The primary endpoints of the study were graft and patient survivals. The secondary endpoints included complications in the early and long-term posttransplant periods. We evaluated factors affecting DGF and graft failure. The study protocol was approved by the local scientific ethics committee.

The results are expressed as mean values ± standard deviations. For the analysis of graft survival, we used Kaplan-Meier analysis. Survival curves for graft and patient survivals were compared using log-rank tests. A statistical software package (SPSS 13 for Windows, SPSS Inc, Chicago, Ill, USA, 1998) was used for the calculations. Statistical significance was set at $P < .05$.

RESULTS

During the 5-year period, we collected data on 70 (28%) PD and 180 HD patients The mean dialysis duration was 18.5 ± 11.6 months for HD and 25.4 ± 18.6 months for PD ($P < .01$). There was no significant difference in the cold ischemia times between the groups.

Overall graft survival was 82% at 3 and 75% at 5 years. Pretransplant dialysis modality was associated with differences in graft outcomes after transplantation. Among HD patients, 16% of patients experienced DGF, while it occurred in 11% of PD patients ($P < .01$). At 3 years follow-up, 19% ($n = 35$) of HD and 14% ($n = 10$) of PD patients experienced graft failures ($P < .05$). After 5 years, 28% ($n = 50$) of HD and 17% ($n = 12$) of PD patients experienced graft failure ($P < .05$).

Table 1. Demographic and Baseline Clinical Characteristics of the Peritoneal Dialysis (PD) and Hemodialysis (HD) Groups

Characteristic	HD	PD
Patients (*n*)	180	70
Gender (male/female)	111/69	48/22
Mean age (y)	30 ± 9	29 ± 11
Mean body mass index (kg/m^2)	23.4 ± 10.2	24.6 ± 11.4
Mean time on dialysis (mo)	18.5 ± 11.6	25.4 ± 10.1
Mean duration of follow-up (mo)	79.8 ± 43.1	74.2 ± 50.5
Primary disease		
Hypertension	27%	25%
Glomerulonephritis	23%	26%
Vesicoureteral reflux	18%	19%
Other	32%	31%
Donors		
Living (%)	72	69
Cadaveric (%)	28	31
Mean age (y)	32	30
Gender (% male)	36	38

Multivariate analysis showed that factors affecting DGF were: mode of dialysis (relative risk [RR] = 1.39, 95% confidence interval [CI]: 1.35–1.43; $P < .01$); parathyroid hormone (RR = 0.32, 95% CI: 0.30–0.34 $P < .05$); C-reactive protein (RR = 1.03, 95% CI: 0.97–1.09; $P < .05$; and hemoglobin levels (RR = 0.75, 95% CI: 0.72–0.79; $P < .05$).

The actuarial 3- and 5-year survivals of PD and HD patients groups did not vary significantly (89% vs 86%, $P = .72$, and 81% vs 79%, $P = .06$).

DISCUSSION

The effects of pretransplant dialysis modality on allograft and recipient survival after RT are controversial. The present retrospective study of HD and PD groups matched for risk factors showed that the choice of dialysis modality before renal transplantation influenced DGF and graft failure. Some reports had shown a higher incidence of graft failure among PD patients. Guillou et al suggested that PD was a detrimental factor for long-term graft survival.[5] Other investigators did not observe this effect in a meta-analysis Winchester et al reported that graft survival was not influenced by dialysis mode.[6]

Hemodialysis exacerbates immune disturbances by causing recurrent activation of several inflammatory response pathways.[7] Many of the membranes used in HD activate circulating complement factors and phagocytic leukocytes, leading to free radical production. The authors postulate that this process leads to a state of chronic microinflammation. Inflammation should be carefully investigated and corrected to achieve better graft function. The transplanted kidney is already stressed by ischemia and reperfusion injury, conditions, that affect free radical production. Martin-Mateo et al have shown that this oxidative stress is less in PD than HD patients.[8] In our study, PD as a pretransplantation dialysis modality had a protective effect on renal functional recovery after transplantation. PD patients' fluid status might be implicated in this finding. Whereas HD is complicated by a continuously changing fluid status by relatively hypovolemic state in PD patients may have contributed to less DGF. Furthermore the use of artificial membranes activates the immune system of HD patients to a greater degree than those receiving PD. In our analysis, anemia affected DGF occurrence. Prolonged ischemic time or poorly perfused kidneys may result in DGF but cannot explain our data.

There was no difference in long-term patient outcomes between dialysis modalities. Recipient variables (ie, age, gender, cadaveric or living donation, and cold ischemia time) were similar in the our two groups. Furthermore, all selected recipients were in good general condition during transplantation which could explain their similar outcomes. The better preservation of residual renal function is an argument in favor of choosing PD as the first-line renal replacement modality.

In conclusion, pretransplant dialysis modality was associated a differential impact on clinical outcomes after RT. Early graft function rates and long-term graft outcomes were better for PD than for HD patients.

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