Comparison of Hospitalization and Survival Between Patients Treated With Renal Replacement Therapy

Renal Replasman Tedavisi Alan Hastaların Hastaneye Yatış ve Sağkalım Açısından Karşılaştırılması

ABSTRACT

AIM*:* Renal replacement therapy (RRT) prolongs survival in patients with end-stage-renal-disease (ESRD). We compared patient survival, number and duration of hospitalization in patients treated with RRT in this study.

MATERIAL and METHODS: Two hundred and eighty seven patients (87 hemodialysis (HD), 97 peritoneal dialysis (PD), 103 renal transplant (RT) patients) were enrolled in this study. Patients' data were collected retrospectively from hospital records.

RESULTS*:* HD patients were older and had more comorbid diseases compared to PD and RT patients. Mortality rates were not different between the modalitites. The number and duration of hospitalization episodes were significantly lower in the PD group than that of the other two groups. Survival rates of HD patients were 84%, 55% and 30% for the 1st, 5th and 10th years, respectively while these rates were 93%, 81% and 59% for PD and 95%, 81% and 77% for RT patients.

CONCLUSION*:* PD and RT patients were younger than HD patients and had less comorbid diseases. As a result, the number and duration of hospitalization episodes were significantly lower in the PD group when compared to the others. Survival rates in the RT group were better than that of the HD and PD groups.

KEY WORDS: Renal replacement therapy, Survival, Hospitalization, Hemodialysis, Peritoneal dialysis, Renal transplantation

ÖZ

AMAÇ: Böbrek yerine koyma tedavisi son dönem böbrek yetmezliği (SDBY) hastalarında yaşam süresini uzatmaktadır. Biz bu çalışmada, SDBY hastalarında böbrek yerine koyma tedavisi sağkalım, hastaneye yatış sıklığı ve hastanede kalış süresi üzerine olan etkilerini karşılaştırmayı amaçladık.

GEREÇ ve YÖNTEMLER: İki yüz seksen yedi (87 hemodiyaliz (HD), 97 periton diyalizi (PD), 103 böbrek nakli (BN)) hastası çalışmaya alındı. Hasta verileri geriye dönük olarak hasta dosyalarından kaydedildi.

BULGULAR: Hemodiyaliz hastalarının PD ve BN hastalarına oranla daha yaşlı ve daha fazla yandaş hastalığa sahip oldukları görüldü. Her 3 grupta mortalite oranları bakımından farklılık saptanmadı. PD grubunda hastaneye yatış sıklığı ve hastanede kalış süresi diğer iki gruba oranla daha düşüktü. 1, 5, 10 yıllık hasta sağ kalımları HD grubunda %84, %55, %30 iken, PD grubunda %93, %81, %59, BN grubunda ise %95, %81 ve %77 olarak bulundu.

SONUÇ: PD ve RT hastaları HD hastalarına oranla daha genç, HD hastaları daha fazla ek hastalığa sahip, PD hastalarında hastaneye yatış oranı daha az iken en iyi hasta sağ kalımı ise BN grubundadır.

ANAHTAR SÖZCÜKLER: Böbrek yerine koyma tedavisi, Sağkalım, Hastaneye yatış, Hemodiyaliz, Periton diyalizi, Böbrek nakli

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INTRODUCTION

Chronic renal failure (CRF) is defined as permanent impairment of exocrine and endocrine renal function caused by irreversible loss of functioning nephrons (1). Renal replacement therapy (RRT) by hemodialysis (HD), peritoneal dialysis (PD), or renal transplantation (RT) prolongs survival in patients with end-stage-renal-disease (ESRD) and in most cases, provides a good quality of life (2). The prevalence of CRF is increasing worldwide.

Hospitalization and survival in RRT are significantly influenced by advanced age, anemia, diabetes mellitus (DM), cardiovascular disease (CVD), coexistence of other diseases, causes of CR, delayed referral to nephrologist, lack of permanent vascular access, infections, low serum albumin level, inadequate dialysis and poor nutritional status (3-10) .

The studies exploring mortality outcomes in dialysis have mostly compared the survival rates between HD and PD therapies and yielded conflicting results with some studies reporting no difference in survival rates (11,12), whereas other studies showing a survival benefit for HD (13) or PD (14). However, RT is generally accepted as the optimal form of RRT in that it provides the best prognosis for survival and quality of life for patients with ESRD (15,16).

In this study, we compared patient survival, number and duration of hospitalization in patients treated with different modalities of RRT.

MATERIAL and METHODS

All patients who were at least 18 years old, who had been on RRT for a minimum of three months and under active follow-up at Dokuz Eylul University Medical School, Department of Nephrology were enrolled in the study. Patients' data were obtained retrospectively from patient's charts.

Patient's were grouped as 18 to 45, 46-65 or >65 years old according to age. The cause of ESRD was classified as diabetes, hypertension, glomerulonephritis, polycystic kidney disease, chronic pyelonephritis, aetiology unknown and other aetiology.

Causes of death were classified as cardiovascular, infection, cerebrovascular, cancer and other causes. Comorbidities recorded included diabetes, hypertension, cardiovascular disease, chronic liver and lung disease, peripheral vascular disease, cerebrovascular disease and cancer. Causes of hospitalization were classified as one of the following: cardiovascular, infectious, vascular access-related, rejection, cancer, and other causes.

The mean number and duration of hospitalization episodes and the survival rates were compared by using the data of HD, PD and RT patients. The association between the number of comorbid diseases and the number and duration of hospitalization was also assessed.

STATISTICAL ANALYSIS

Kruskal Wallis analysis, H test and ANOVA were used for the comparison of quantitative variables of three groups. Independent samples T test and the Post Hoc Test (ANOVA) were used to compare the three groups in pairs. Pearson Correlation was used to assess the degree of association between the groups. The Kaplan Meier (Log rank) test was used to compare the survival periods of the patients in three groups. The K square test was performed for the comparison of qualitative variables. SPSS 10.0 for Windows was used for analysis with a confidence rate of 95%. A p value less than 0.05 was accepted to be statistically significant.

RESULTS

Demographic Characteristics

There were a total of 287 patients (87 HD, 97 PD and 103 RT) who had been put on RRT at the Dokuz Eylul University

Table I: Demographic outline of study population.

PARAMETER	**HD (n=87)**	**PD (n=97)**	**RT (n=103)**
Female / Male	36 / 51	49 / 48	42 / 61
Mean age (yr)	63.4±13.3	52.7±13.8	38.8±11.1
Follow-up duration (mt)*	34.0±37.4	40.0±34.2	50.7±48.5
Age groups			
18-45**	7 (8%)	30 (30.9%)	79 (70.9%)
45-65***	41 (47.1%)	47 (48.5%)	28 (27.2%)
>65***	39 (44.8%)	47 (48.5%)	2 (1.9%)

* RT vs. HD; p<0.05, RT vs. PD and HD vs. PD; p>0.05
** RT vs. HD; p<0.05, PD vs. RT and HD vs. PD; p>0.05
*** HD vs. PD, HD vs. RT, PD vs. RT; p>0.05
**** HD vs. PD and HD vs. RT; p<0.05, PD vs. RT; p>0.05

Medical School, Department of Nephrology. The mean age for the HD, PD and RT patients was 63.4±13.3, 52.7±13.8, 38.8±11.1 years, respectively. HD patients were older than PD and RT patients. The average follow-up was 34.0±37.4 months for HD, 40.0±34.2 months for PD and 50.7±48.5 months for RT patients. The average follow-up duration of RT patients was significantly longer than HD patients ($p<0.05$). Table I shows the demographic characteristics of the treatment groups. Hypertension was the most common cause of ESRD in HD (39.1%) and PD (33%) patients. However, glomerulonephritis was the most common aetiology of ESRD in RT (33%) patients.

Causes of Hospitalization

Vascular access-related hospitalizations in HD patients and cardiovascular problems in PD patients were the most common cause of hospitalization. However, infections were the most common cause of hospitalization in the RT patients (Table II).

Number and Duration of Hospitalization Episodes

The number and duration of hospitalization episodes were significantly lower in the PD group than the HD and RT group ($p<0.05$). The number and duration of hospitalization (days) episodes were 2.99±2.02 and 48.91±42.09, respectively for HD patients, 1.27±1.50 and 14.24±17.66, respectively for PD patients, and 3.26±2.72 and 60.65±47.9, respectively for RT patients, (Table IV).

Causes of Death

Infections were the most frequent cause of death in HD (45%) and RT (54.5%) patients. On the other hand, cardiovascular disease was the most common cause of death in PD (50%) patients (Table IV).

Comorbid Conditions and Death Rates

Comorbid conditions (including DM and CVS disease) were observed more frequently in HD patients than PD and RT patients (Table VI). The mortality rate was 86.7% in patients with comorbid diseases and 13.3% in patients without any comorbidity ($p<0.05$)

Survival Rates

The survival rates were 84%, 55% and 30% for HD, 93%, 81% and 59% for PD and 95%, 81% and 77% for RT patients for the 1st, 5th and 10th years, respectively; (Table VI).

DISCUSSION

There may exist differences regarding quality of life, hospitalization and survival between patients receiving RRT. Data on this issue is scarce in the literature. Patients receiving RRT are hospitalized for various causes (17). This leads to many problems of which two important ones are decreased quality of life and increased costs. Better management of RRT may be possible by determining the factors that effect the survival and

Table II: Causes of hospitalization.

Causes of Hospitalization	HD	PD	RT
Cardiovascular*	23	11	3
Infection**	39	32	44
Cancer***	6	1	2
Vascular access related	28	-	-
Rejection	-	-	41
Aseptic necrosis	-	-	5

* HD vs. PD, HD vs. BN and PD vs. BN; $p>0.05$
** HD vs. PD, HD vs. BN and PD vs. BN; $p>0.05$.
*** HD vs. PD, HD vs. BN and PD vs. BN; $p>0.05$

Table III: Number and duration of hospitalization in treatment groups.

	HD	PD	RT
Number of mean hospitalization*	2.99±2.02	1.27±1.50	3.26±2.72
Mean hospitalization duration (days)**	48.91±42.09	14.24±17.66	60.65±47.91

* PD vs. HD and PD vs. RT; $p<0.05$, HD vs. RT; $p>0.05$.
** PD vs. HD and PD vs. RT; $p<0.05$, RT vs. HD; $p>0.05$.

Table IV: Causes of death in the study population.

CAUSES OF DEATH	HD (%)	PD (%)	RT (%)
Cardiovascular	8 (40)	7 (50)	3 (27.3)
Infection	9 (45)	3 (21)	6 (54.5)
Cancer	0 (0)	1 (7)	1 (9.1)
Cerebrovascular	2 (10)	1 (7)	0 (0)
Other	1 (5)	2 (15)	1 (9.1)

Table V: Comorbid diseases in RRT groups.

	HD (n:87)	**PD (n:97)**	**RT (n:103)**
Mean number of comorbid diseases*	2.17±1.16	1.35±1.07	0.61±0.81
DM (-)	60 (69%)	82 (84.5%)	97 (94.2%)
DM (+)	27 (31%)	15 (15.5%)	6 (5.8%)
CVS disease (-)	48 (55.2%)	77 (79.4%)	99 (96.1%)
CVS disease (+)	39 (44.8%)	20 (20.6%)	4 (3.9%)

* : RT vs. HD and RT vs. PD; $p<0.05$, PD vs. HD; $p<0.05$.
DM (+): HD vs. RT and HD vs. PD; $p<0.05$, PD vs. RT; $p>0.05$.
CVS. (+): HD vs. PD and HD vs. RT; $p<0.05$, PD vs. RT; $p>0.05$.

duration of hospitalization of the RRT patients. Our results show that HD patients had less comorbidity, PD patients were less hospitalized and RT patients had better survival rates.

Chronic kidney disease patients, particularly those with ESRD, are at much higher risk of cardiovascular disease (CVD) than the general population. Locatelli F et al. found that the cardiovascular mortality rate in ESRD patients was ~10-20 times that in the general population (18). However CVD is a major source of mortality for patients with CRF (19). Cardivascular problems were the leading cause of death in only PD (50%) patients in our study. This data is concordant with the previous reports in the literature (20). Infection was the most frequent cause of death in HD (45%) and RT (54.6%) patients. We speculate that the mortality from cardiovascular diseases was lower in the RT group because of younger age and the lower incidence of CVD (3,9%) in this patient population. Infections were the most common cause of death in the HD patients the study population. The higher mortality rate of HD patients associated with infectious diseases despite their old age and many more comorbid diseases can be a result of strict regulation of blood pressure, volume and blood glucose levels in our department.

Table VI: Survival rates in the RRT groups.

Survival rates	**HD (%)**	**PD (%)**	**RT (%)**
1 year	84	93	95
5 year	55	81	81
10 year	30	59	77

Khan et al. have reported that an increase in the number of comorbid diseases increases the mortality rate of RRT patients (4). The mortality rates of patients with and without comorbidity were similarly 86.7% and 13.3% respectively.

We could not find any study comparing the hospitalization of HD, PD and RT patients in the literature. The number of hospitalization episodes of HD, PD and RT patients were 2.9±2.02, 1.27±1.50 and 3.26±2.72 respectively in our study. The number of hospitalization episodes of PD patients was significantly lower than in HD and RT patients. The mean duration of hospitalization (days) among RT patients was also significantly longer than HD and PD patients (60.65±47.91 vs. 48.91±42.09 and 14.24±17.66). Renal transplant patients have an increased incidence of malignancy and our study shows that the number of hospitalization episodes for these was higher than for PD or HD patients.

In the literature, the survival rates of PD patients were reported to be better than HD patients in first 2 years, but worse after this time (21). The loss of residual renal function, peritonitis attacks and deformation of peritoneal membrane are the reasons for this situation (22). The survival rates of PD patients in the 1st, the 5th and the 10th year were better than for HD patients.

This may be due to the younger age and better general status of PD patients compared with HD patients. The very strict criteria for selection of PD patients in our department could also affect this result.

RT patients have the best survival rates. These findings are in concordance with past knowledge in the literature. Wolfe et al. (23) reported that RT patients are specifically chosen from more healthy patients in the end stage renal disease patients' group. This may lead to the better survival rates of RT patients than dialysis patients. Our study provides similar findings. RT patients were of younger age and had less comorbid diseases compared to dialysis patients in our study.

In conclusion, our results show that the duration of hospitalization is shorter in PD patients and the survival rates are better in RT patients.

Declaration of Interest

The authors declare no conflict of interest. The authors alone are responsible for the content and writing of the paper.

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