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Switching of Renal Replacement Therapy in Chronic Kidney Disease Patients

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Abstract

Introduction: *Renal replacement therapy is performed in end-stage renal disease patients. There may be transitions between modalities during the treatment process. In our study, we evaluated the patients who switched to hemodialysis (HD) and combined therapy due to inadequate treatment in peritoneal dialysis (PD) patients.*

Methods: *Eighty four peritoneal dialysis patients analyzed. Twenty of these patients switched to combined therapy (PD+HD) (Group I) and 20 to HD (Group II) due to inadequate treatment. Clinical and laboratory values of the patients evaluated.*

Findings: *Five (25%) of group I and 11 (55%) of group II patients were female (p= 0.107). In group I, the ages of the patients ranged between 61 (25-77), and in group II between 52.5 (33-72) (p= 0.853). In group 1, there were 17% increases in Kt/V levels compared to PD period. In group 2, there was a 11.80% decrease in Kt/V level compared to PD period (p= 0.001). Group II serum albumin levels found higher than group I (p= 0.003). The decrease in hemoglobin levels after treatment change were more in group II than group I (p= 0.018).*

Discussion: *In patients with peritoneal dialysis, nutritional deficiency and anemia are more common in the transition to hemodialysis treatment. Modality selection and patient follow-up are important for patient compliance and treatment adequacy in renal replacement therapy.*

Keywords: *Chronic kidney disease, peritoneal dialysis, hemodialysis, treatment modalities.*

1. Introduction

In the end stage of chronic kidney disease, hemodialysis (HD), peitoneal dialysis (PD) and kidney transplantation (KTx) applied as renal replacement therapy [1]. Peritoneal dialysis is applied as an initial treatment in many countries (Mexico, Taiwan etc). There are transitions to HD, combined therapy (PD + HD) or KTx according to inadequate PD (peritoneal membrane permeability, frequent peritonitis attacks, etc.) and patient compliance after years [2, 3]. In our study, we evaluated the clinical and laboratory data of patients who switched from PD to PD+HD and HD therapy, retrospectively.

2. Methods

2.1. Patients

Eighty four PD patients who followed up in our clinic examined in the study for about 7 years, respectively (2012-2019). Six of these patients transferred to another center and 15 patients had been transplanted. Four patients died for different reasons (myocardial infarction, cerebrovascular accident). Treatment of 15 patients continued with PD. Twenty patients switched to PD+HD (Group I) and 20 patients to HD (Group II) treatment. Serum glucose, albumin, urea, creatinine, parathyroid hormone (PTH), ferritin, hemoglobin (Hgb) and Kt / V values analyzed, repectively.

2.2. Statistical Method

The suitabilty of the variables to normal distribution to normal distribution was examined by Shapiro-Wilk test. Continous variables are expressed as median (minimum-maximum) and mean standart deviation. Categorical veriables are expressed in n (%) according to the normality test, Indepented Samples t-test or Mann-Whiteney U test were used for between group comparisons where paired samples t-test and Wilcoxon signed rank test were used for whit in group comparisons. Chi-square test was used to compare gender distribution between groups. SPSS (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 22.0, Armonk, NY: IBM Corp.) was used for statistical analysis and $p < 0.05$ was considered statistically significant.

2.3. Ethical Statement

Hospital database used. Procedures followed were in accord with the ethical standards of the committee on human experimentation of your institution or in accord with the Declaration of Helsinki and its revisions. Our study was retrospective, no consent was obtained.

3. FINDINGS

Five (25%) of group I and 11 (55%) of group II patients were female (p= 0.107). In group I, the ages of the patients ranged between 61 (25-77), and in group II between 52.5 (33-72) (p= 0.853). Transition time from PD to other treatments was not different between both groups (p=0.638). There was no difference between the two groups in terms of age, gender and transition time from PD to other treatments. When both groups compared according to first treatment (PD), there were no difference between serum glucose, albumin, urea, creatinine, PTH, ferritin and hemoglobin values. Kt/V values of patients increased after treatment change in group I and decreased in group II (p<0.001) (Table 1, 2 and 3).

Table1: *Comparison of patients with baseline PD treatment and PD + HD treatment (Group I)*

n= 20	PD	PD+HD	p value
Kt/V	1.65(1.44-2.44)	1.94(1.75-2.55)	**<0.001**[b]
Serum glucose (mg/dL)	91.5(68-255)	93(57-383)	0.478[b]
Serum urea (mg/dL)	113(68-232)	109.5(35-235)	0.563[b]
Serum creatinine (mg/dL)	8.55(2.9-13.9)	8.35(3.1-80.2)	0.422[b]
Serum albumin (g/dL)	3.25(1.6-3.7)	3.4(2.5-4.3)	0.052[b]
Hemoglobin (g/dL)	11.78±1.64	11.98±1.87	0.616[a]
Paratyroid hormone (pg/mL)	274.5(16-875)	177(12.3-2051)	0.985[b]
Ferritin (ng/mL)	417(35.6-2000)	268(44-2000)	0.199[b]

a:Paired Samples t-Test, b:Mann Whitney U Test

PD: Peritonealdialysis. HD: Hemodialysis.

Table2: *Comparison of patients with baseline PD treatment and HD treatment (Group II)*

n= 20	PD	HD	p value
Kt/V	1.82±0.35	1.58±0.23	**<0.001**[a]
Serum glucose (mg/dL)	97.5(78-356)	100(78-266)	0.478[b]
Serum urea (mg/dL)	129.8±33	131.9±27.4	0.779[a]
Serum creatinine (mg/dL)	8.98±2.7	9.34±2.07	0.533[a]
Serum albumin (g/dL)	3.65±0.56	3.44±0.41	0.172[a]
Hemoglobin (g/dL)	11.84±1.9	10.87±1.45	**0.005**[a]
Paratyroid hormone (pg/mL)	336(54-844)	275(80-1040)	0.985[b]
Ferritin (ng/mL)	659(136-1736)	430(35.6-1500)	0.199[b]

a:Paired Samples t-Test, b:Mann Whitney U Test

PD: Peritonealdialysis. HD: Hemodialysis.

Table3: *Comparison of treatment changes of patients receiving PD therapy*

	Group I (n=20)	Group II (n=20)	p value
Kt/ V			
PD	1.65(1.44-2.44)	1.82±0.35	0.383[c]
After PD	1.94(1.75-2.55)	1.58±0.23	-
% change	16.95% (-6.93%:50.62%)	-11.78% (-31.06%:5.11%)	**0.001**[c]
Serum glucose (mg/dL)			

Hgb levels decreased in patients switching from PD to HD (p= 0.005). The change in Hgb levels in Group 2 was higher than in Group 1 (p= 0.018). The decrease and change in serum albumin levels were higher in Group 2 (p= 0.003 and 0.005, respectively). There was no difference between other variables (Table 1, 2 and 3). No deaths observed in either group during follow-up.

4. DISCUSSION

Peritoneal dialysis is one of options for renal replacement therapy. Among all renal replacement therapies, peritoneal dialysis is applied between 7.24-12%. Peritoneal dialysis treatment is recommended, especially in young and socially active patients. Maintaining renal residual fluid (RRF) in end-stage renal failure affects mortality. Especially PD is superior to HD in protecting RRF. Peritoneal dialysis is more successful in maintaining residual renal function, especially in the first 2 years of end-stage renal failure. Treatment of peritoneal dialysis is suitable for those who do not have vascular access and are not able to transplantation. Nowadays, peritoneal dialysis

treatment is applied less frequently. Clinician experience, the increase in transplant centers and the number of dialysis centers affect the decrease of choice of peritoneal dialysis treatment [1, 2, 4-7]. Technique failure is a universal reality of PD, and its high incidence rate affects the globally low prevalence of PD. Over the years, the permeability of the peritoneal membrane may decrease due to the use of fluids with high glucose content and attacks of peritonitis. Finally, dialysis treatment may be inadequate. In many countries, 50% of PD patients can transfer to HD after 2-3 years of the beginning of PD treatment [4, 8-10].

Peritoneal dialysis patients can switch to HD or combined therapy (PD + HD) due to treatment failure and volüme control. In studies conducted, the effect of treatment changes on patient survival and patient compliance evaluated. Some studies shew that survival is better in patients who started treatment with PD and then switched to HD at appropriate time. In a study of Spain, survival of patients observed to be better who started treatment with PD and switched to HD (11, 12). In a study which more than 300 patients evaluated, it observed that treatment change (transition PD to HD) did not adversely affect the results of patients. In another study, it described that mortality increased due using vascular access in HD patients after treatment change [10, 13].

Maruyama et al. analyzed patients who switched from PD to PD + HD (combined therapy), they determined the benefits of treatment in patients, especially in volume control. In another study in which combined therapy evaluated, it found to be effective in terms of solute clearance (like beta 2 microglobulin), clinical condition, volume and blood pressure control. In another study of Japan blood pressure, weight control, and the use of erythropoietin were more significantly in combined therapy [14-16].

Anemia (Hemoglobin <10 g/dL) is seen around 20% in hemodialysis and peritoneal patients and half of the both patients need using erythropoietin. Intravenous iron requirement is higher in hemodialysis patients. In addition, anemia may be more seen in HD than PD due to the risk of bleeding and using of instruments [5, 17].

Some studies described that quality of life in aspects such as physical functioning, physical role functioning, general health perception, physical category, long term hospitalization and quality of life in general are significantly higher in the PD patients compared with HD patients [18, 19].

In some studies, nutritional status was better in HD patients than PD patients. Patients survival was similar or different between both groups. Serum albumin value varied according to nutrition and inflammation. Additional diseases (hypertension, diabetes, ischemic heart disease etc), treatment compliance etc. affect this condition [20-22].

In our study, we described a decrease in serum albumin and hemoglobin levels in the HD group when they transferred from PD after treatment failure (inappropriate volume control, clearance etc.). Hemoglobin and albumin levels were better preserved in patients receiving combined therapy than HD group. In our study, we explain this status related to blood loss from the dialysis sets and effective clearence of solutes. There was no patient who died during the follow-up period in both groups.

Finally, change of renal replacement therapy at the appropriate time affects patient compliance and survival when dialysis insufficiency develops. In end-stage renal failure, beginning time of treatment, patient selection, clinician experience and informing patients about renal replacement therapies are important.

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