

# ORIGINAL ARTICLE

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## Comparing Individual and Family Member Assisted Peritoneal Dialysis In Elderly End-Stage Renal Disease Patients

## Yaşlı Son Dönem Böbrek Hastalarında Asiste Periton Diyalizinin Karşılaştırılması

### ABSTRACT

#### Objective:

With the increase in the elderly population, the number of patients in end-stage renal disease (ESRD) and in correlation with renal replacement therapy (RRT) has increased. We aimed to compare the efficiency and complications between individual and family member-assisted peritoneal dialysis (APD) in a patient group with geriatric ESRD.

#### Material and Methods:

This retrospective study included 50 patients > 65 years of age who received continuous ambulatory peritoneal dialysis treatment between 2017-2019 in the peritoneal dialysis unit. In the daily routine dialysis method, pre-observational evaluation was evaluated with the 6-item activity of life and 8-item daily activities of life. Their three years' follow-up results were evaluated in terms of dialysis efficiency parameters and dialysis complications.

#### Results:

There was no statistical difference in terms of gender, age, and biochemical data between the two groups compared. There was also no difference between edema, exit-site infection, and leakage; however, a significant difference was observed between the total number of peritonitis and the time until the first peritonitis attack. The time until the first peritonitis attack was shorter in the APD group than in the other group. Besides, the number of total peritonitis attacks was higher in the assisted PD group.

#### Conclusion:

Despite the increase in end-stage renal disease in the elderly population, the number of patients undergoing peritoneal dialysis is decreasing. However, if APD is not done well, it may not be an effective strategy to reverse this decline and provide safe and successful treatment to many frail, elderly patients.

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**Key Words:**

Assisted, Elderly, Peritoneal Dialysis

**ÖZ****Amaç:**

Renal replasman tedavisi (RRT) alan son dönem böbrek yetmezliği (SDBY) olan yaşlı hastaların sayısında sürekli bir artış olmuştur. Geriatrik SDBY'li bir hasta grubunda birey ve aile üyesi destekli periton diyalizi (APD) arasındaki etkinlik ve komplikasyonları karşılaştırmayı amaçladık.

**Gereç ve Yöntemler:**

Bu retrospektif çalışmaya 2017-2019 yılları arasında periton diyalizi ünitesinde SAPD tedavisi gören 65 yaş üstü 50 hasta dahil edildi. Diyaliz yöntemi seçiminden önce hastaların fonksiyonel durumları altı maddelik günlük yaşam aktiviteleri ve sekiz maddelik enstrümantal günlük yaşam aktiviteleri ile değerlendirildi. Üç yıllık takip sonuçları, diyaliz etkinlik parametreleri ve diyaliz komplikasyonları kayıt altına alındı.

**Bulgular:**

Karşılaştırılan iki grup arasında cinsiyet, yaş ve biyokimyasal verilerde istatistiksel olarak anlamlı bir fark saptanmadı. Ödem, çıkış yeri enfeksiyonu ve sızıntı arasında da fark yoktu; ancak toplam peritonit sayısı ile ilk peritonit atağına kadar geçen süre arasında anlamlı bir fark gözlemlendi. APD grubunda ilk peritonit atağına kadar geçen süre diğer gruba göre daha kısaydı. Ayrıca asiste PD grubunda total peritonit atak sayısı daha fazlaydı.

**Sonuç:**

Yaşlı SDBY popülasyonu artmasına rağmen, PD uygulanan hasta sayısı dünya çapında azalmaktadır. Bununla birlikte, APD iyi yapılmazsa, bu düşüşü tersine çevirmek ve birçok zayıf, yaşlı hastaya güvenli ve başarılı tedavi sağlamak için etkili bir strateji olmayabilir.

**Anahtar Sözcükler:**

Yardımlı, Yaşlılık, Periton diyalizi

**INTRODUCTION**

The incidence of chronic diseases increases with increasing age. One of the most common among these chronic diseases is chronic kidney disease (CKD). With GFR estimated by the CKD-EPI equation, data from the NHANES database showed that the overall prevalence of CKD stages 3 to 4 increased from 4.8 percent in 1988 to 6.9 percent in 1994. Thereafter, it remained stable with a prevalence of 6.9 percent from 2011 to 2012, showing the prevalence was 21.7 percent in individuals aged 65 to 79 years (1).

In many developed countries, the number of elderly patients with end-stage renal disease (ESRD) receiving renal replacement therapy (RRT) has been increasing in recent years.

The RRT treatment rate more than doubled from 1995 to 2004 in patients  $\geq 75$  years of age in ESRD cases in the Canadian Organ Replacement Registry 2006 annual report (2). The average age of patients receiving RRT therapy has increased to 60 in most European countries (3).

The elderly constitute the most extensive and fastest-growing patient group starting dialysis.

Although there has been an increase in the number of patients receiving RRT, there has been no increase in the number of patients undergoing PD. The choice of dialysis methods may differ between countries. While 5.23% of patients aged 65-74 years received PD treatment in the USA, only 3.9% of patients aged over 75 years were treated for PD (4). The European Kidney Association/European Society for Dialysis and Transplantation (ERA-EDTA) registries have shown that the older the patients, the more likely they are to start treatment with hemodialysis (HD) (5). According to the 2018 data of the Turkish Nephrology Association Registry, the ratio of patients who underwent PD in RRT was 3.94%. Approximately 28.85% of this patient group consisted of patients  $\geq 65$  years (6).

PD has the advantage of being done at home. For the fit elderly, this means they can travel, enjoy their retirement, and have an active social life.

Many elderly patients can be trained to do their PD, although this may take longer than younger patients.

More than 80% of these patients need assistance (7). Assisted PD (APD) is defined as PD treatment performed at the patient's home and with the help of a health care technician, a family member, or a community nurse (8).

With family members willing to assist with all or part of the procedure, the use of community nurses increasingly allows frail patients to have PD in their homes. Therefore, assisting with PD will increase the proportion of patients who start PD treatment (9). Physical and cognitive dysfunction, depression, social isolation, and decreased vision and hearing functions can create a barrier to selecting PD in elderly patients (10).

The role of assistive modalities (family or nurse-assisted PD) on technical failure and peritonitis occurrence should also be explored. The disease burden for family members may prevent the technique from being more effective and increase peritoneal infection risk in assisted PD (11). The present study compares the efficiency and complications between individual and family member-assisted PD in a patient group with geriatric ESRD.

**MATERIAL and METHODS**

This retrospective study included 50 patients  $> 65$  years of age who received PD treatment between 2017-2019 in the Continuous Peritoneal Dialysis Unit.

The demographical information and clinical data such as the 4-hour peritoneal equilibration test (D/P Cr), total Kt/V, normalized protein catabolic rate (nPCR), and peritoneal ultrafiltration were recorded for each patient. The study was performed after the approval of Erciyes University Scientific Research Ethical Committee (Number: 2020/619). Three years follow up data of the patients with Ambulatory Peritoneal Dialysis were recorded on study form. The research was carried out by the publication of ethics and the Declaration of Helsinki. Patients who were receiving PD treatment before and continuing were also included in the study. Twenty-five of these patients were undergoing dialysis themselves, and 25 were doing it with their family members' help. Since there are not enough PD training and follow-up nurses in our center, nurse-assisted PD cannot be provided. The relatives of the patients come to the hospital at

regular intervals and receive support. Therefore, when the patient decides on assisted PD, the patient's relative is subjected to the training process. When the patient decides on assisted PD, the relatives of the patient are subjected to the education process and their experiences are checked at regular intervals. The decision of which patient to help is made according to Lawton's scale. These patients were followed up for three years.

In the daily routine dialysis method, pre-observational evaluation was evaluated with the 6-item activity of life (ADL) and 8-item daily activities of life (IADL). The ADL scale is based on six levels, including carrying out personal toileting, bathing or showering dressing, eating and moving from bed to chair, and bowel or urine continence. The (IADL) scale is based on eight levels, including the telephone, shopping, cooking, housekeeping, laundry, transportation, ability to take his/her medications, and financial management. Each item is evaluated on a three-point scale (1=unable, 2= needs assistance, 3=independent). An ADL score of  $\leq 12$  points is considered a dependent, IADL score of 17 points is regarded as a dependent (12). Validation of Katz index of independence in activities of daily living in Turkish older adults was also performed (13).

Hemoglobin (Hb), leukocyte, transferrin saturation, ferritin, blood urea nitrogen (BUN), creatinine (Cr), calcium (Ca), phosphorus (P), uric acid, alkaline phosphatase (ALP), albumin, C-reactive protein (CRP), parathormone (PTH), total cholesterol, triglycerides, high-density lipoprotein (HDL) cholesterol, low-density lipoprotein (LDL) cholesterol, vitamin B12, and folic acid levels were obtained from patient records. Information about the medications they used was also obtained from their records. The blood chemistry values are obtained from the beginning of the period. All patients included in the study were in a standard PD treatment program with four or five cycles per day and 2000- or 2500-ml volume changes, and were evaluated for dialysis efficacy parameters and dialysis complications.

### Statistical Analysis

Statistical analysis of the study data was made with SPSS 15.0 (Statistical Packages for Social Sciences; SPSS Inc. Chicago, Illinois, USA). Measurable data suitable for parametric analysis were given as arithmetic mean $\pm$ standard deviation ( $\bar{x} \pm ss$ ). The distribution was defined as median (25% -75%) for the data measured and not suitable for parametric analysis. Suitability to normal distribution was evaluated with the Kolmogorov-Smirnov test. The Kruskal-Wallis test was used for nonparametric testing.

## RESULTS

The study included 50 patients aged  $>65$  years followed up regularly in the Peritoneal Dialysis Unit, Medical Faculty, Erciyes University. They were a group of patients who chose the PD method after being diagnosed with ESRD. They were divided into two groups: those who performed PD treatment themselves ( $n=25$ ) and those who received help from their family members. Their demographic, biochemical, and PD-related parameters were compared with each other (Table I).

**Table I:** Comparison of demographic and laboratory parameters between the patient groups.

Variables	Individual PD (n=25)	Assisted PD (n=25)	p
Age (years)	69.76 $\pm$ 5.43	68.92 $\pm$ 4.83	0.571
Body surface area (m <sup>2</sup> )	1.80 $\pm$ 0.19	1.78 $\pm$ 0.21	0.670
Body mass index (kg/m <sup>2</sup> )	27.57 $\pm$ 5.49	27.10 $\pm$ 4.72	0.750
Diabetes mellitus (present)	8 (32.0)	12 (48.0)	0.248
Hypertension (present)	18 (72.0)	19 (76.0)	0.747
Duration of PD (month)	65 (37.5-121.5)	48 (30.0-102.0)	0.322
BUN (mg/dL)	49.10 $\pm$ 16.98	49.51 $\pm$ 12.63	0.923
Creatinine (mg/dL)	7.34 $\pm$ 2.44	8.33 $\pm$ 2.77	0.185
Sodium (mmol/l)	135.56 $\pm$ 4.95	137.28 $\pm$ 4.69	0.213
Calcium (mg/dL)	9.03 $\pm$ 0.85	8.96 $\pm$ 0.61	0.731
Phosphorus (mg/dL)	4.53 $\pm$ 1.16	4.55 $\pm$ 0.93	0.954
Total cholesterol (mg/dL)	187.87 $\pm$ 45.35	186.52 $\pm$ 51.82	0.924
LDL cholesterol (mg/dL)	105.85 $\pm$ 38.39	114.96 $\pm$ 42.83	0.443
Albumin (g/dL)	3.60 $\pm$ 0.54	3.68 $\pm$ 0.49	0.595
Hemoglobin (g/dL)	11.87 $\pm$ 1.90	11.79 $\pm$ 1.74	0.877
Ferritin (ng/ml)	228 (97.3-415.0)	209 (133.0-580.5)	0.614
PTH (pg/ml)	377 (168.5-510.5)	361 (244.0-581.5)	0.541
Total Kt/V	1.91 (1.76-2.30)	2.01 (1.82-2.49)	0.491
nPCR	0.81 $\pm$ 0.20	0.81 $\pm$ 0.15	0.976

PD: peritoneal dialysis. Values are expressed as n (%).

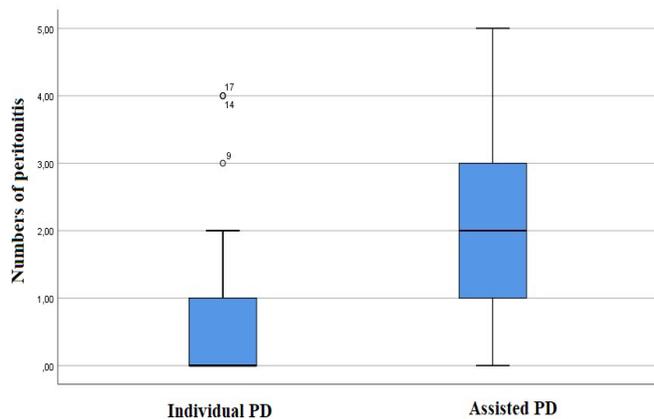
There was no statistical difference between the two groups regarding their gender, age, and biochemical data. At the same time, no significant difference was found in dialysis efficiency (Kt/V). Besides, PD-related complications patients experienced during the treatment process were also compared (Table II).

**Table II:** Comparison of peritoneal dialysis- related complications between patient groups.

Variables	Individual PD (n=25)	Assisted PD (n=25)	P
Edema	4(16.0)	9 (36.0)	0.107
Leakage	3(12.0)	2 (8.0)	0.999
Exit-site infection	0 (0-1)	0 (0-2)	0.974
Hernia	5(20.0)	5 (20.0)	0.999
Time to first peritonitis attack*	15 (9-50)	9 (2-35)	0.042
Number of peritonitis attacks	1(0-2)	2 (1-5)	0.001

PD: peritoneal dialysis. Values are expressed as n(%), mean $\pm$ SD or median(1<sup>st</sup>-3<sup>rd</sup> quartiles). \*month

There was no difference between edema, exit-site infection, and leakage; however, a significant difference was observed between the total number of peritonitis infections and the time until the first peritonitis attack. The time until the first peritonitis attack was shorter in the group with APD than in the other group. Also, the number of total peritonitis attacks was higher in the APD group (Figure 1).



**Figure 1:** Comparing number of peritonitis between the groups.

Five of the patients with assisted PD and one from the other group switched to HD. One person in each group died. The patients in the assisted PD group had more comorbidity. Of fifteen patients who made assisted PD, ten individual PD patients; required at least one hospitalization within 3 years (Table III).

**Table III:** Comparison of comorbidity and hospitalization between patient. groups

Variables	Individual PD (n=25)	Assisted PD (n=25)	P
Diabetes mellitus (present)	8 (32.0)	12 (48.0)	0.24
Hypertension (present)	18 (72.0)	19 (76.0)	0.74
Heart failure	3(12.0)	7(28.0)	0.02
Malignancy	-	1(4.0)	-
Cerebral vascular disease	2(8.0)	7(28.0)	0.03
Hospitalisation	10(40)	15(60)	0.045

PD: peritoneal dialysis. Values are expressed as n (%)

## DISCUSSION

The rate of ESRD in elderly patients is increasing worldwide. Immobile and physically disabled patients are not eligible for central hemodialysis in cases where vascular access is poor. CAPD may be the only treatment option in this specific patient group (14).

Physical and cognitive dysfunction, depression, social isolation, and decreased vision and hearing functions in elderly patients can create a barrier to selecting PD. However, at the same time, these factors may offer the dialysis option in their homes where they feel independent. Besides, factors that prevent patients from choosing PD may cause difficulties in adapting hemodialysis to their lives (9).

It has been shown that the quality of life of patients aged ≥65 years undergoing PD is superior to those <65 years of age (15). It was emphasized that PD treatment could be more successful in elderly individuals who receive family- and nurse-assisted care. Again, the annual cost of PD was found to be lower than hemodialysis, easing the economic burden (16).

PD treatment at home can offer several advantages compared to in-center hemodialysis (HD). That may be particularly important for elderly patients with severe comorbidity. Most importantly, it means avoiding commuting to and from the dialysis

unit, the associated bacteremia and access failure, vascular access for HD, the risk of post-treatment fatigue, and hemodynamic instability during HD sessions (17,18).

Considering the challenges of running an APD program, its success relies critically on a well-organized multidisciplinary team of dedicated kidney nurses, nephrologists, surgeons, assistants, social workers, dieticians, and others. APD should be considered a safe and viable better alternative to in-center HD for the growing group of dependent elderly patients with ESRD (19).

APD treatment is carried out in the patient's home with the assistance of a healthcare technician, a community nurse, a family member, or a spouse (7). Although PD complications are similar between young and older patients, several studies have shown that the risk of peritonitis is higher in the elderly (20-23). The risk of malnutrition is also higher in elderly patients, but this can be overcome with adequate nutritional counseling and amino acid-based dialysis solutions (24). Exit site infection, malposition, and other catheter-related complications occur at similar rates in younger patients (25,26). Some studies report that hernia and leakage occur more frequently or at similar rates (27,28).

The survival rates of elderly patients with chronic PD are shorter than those of younger patients, as expected (29). Several reports have shown that rates of peritonitis and exit site infection are not significantly different between home care nurse-assisted dialysis patients and those receiving self-dialysis treatment (30). The home-care nurse can help treat peritonitis episodes and other complications and reduce hospitalization rates (31). Lobbedez et al., demonstrated that even the assistance of a family member or a private nurse could provide safe CAPD treatment in elderly patients. This study clearly shows that APD is an appropriate method for patients who cannot perform their PD replacement. The risk of peritonitis was relatively high in the assisted group; however, the PD modality may affect the rate of peritonitis. In addition, diverticulosis is more common in elderly patients (32).

In a study by Solene et al., APD was not associated with a higher risk of peritonitis in automated PD patients (33). This observation is consistent with data from a recent Australian study in PD patients where CAPD was not associated with an increased risk of peritonitis (34). The results of a UK study showed that PD modality did not affect peritonitis-free survival (35).

Cheng et al., compared those patients who performed PD themselves and those who underwent APD. The results demonstrated that APD patients had a worse outcome in patient survival and technical failure, but there was no increase in peritonitis incidence (36). Similar results were found in other studies, which suggested no relationship between technical survival and adjunct method (37). Finally, it has been shown that assisted care by non-professional staff leads to worse outcomes in both patient and technical survival in PD (38). Similarly, we found worse outcomes in the APD group compared with self-care PD. In our study, like other previous studies, we found that hospitalization rates were higher in patients with APD. Because, as in other studies, comorbidity was higher in patients in this group. APD evaluation should be done in order not to make these patients completely dependent on dialysis centers (32).

As the number of peritoneal dialysis decreases in Turkey and worldwide, the number of patients is correspondingly low. However, the complication rate can be high in relative-assisted peritoneal treatment. In recent years, pandemics have taught us that we need to reduce the arrival and departure of elderly patients in hospitals and their presence in crowded environments such as dialysis centers. For this, we should increase the training of relatives in countries that do not have adequate nurse support and facilitate patient follow-up by expanding telemedicine.

## CONCLUSION

As a result, the elderly ESRD population is increasing and PD use is declining worldwide. However, in the elderly patient group with high comorbidity, assisted PD may be an appropriate approach due to both socioeconomic reasons and the problems experienced in the transfer of these patients. In addition, we may have protected these patients from public environments with a high risk of infection.

### Ethics Committee Approval:

This research complies with all the relevant national regulations, institutional policies and is in accordance with the tenets of the Helsinki Declaration, and has been approved by the Erciyes Medical Faculty Ethical Committee, Erciyes University (approval number: 2020/619).

### Informed Consent:

All the participants' rights were protected and written informed consents were obtained before the procedures according to the Helsinki Declaration.

### Author Contributions:

Concept – S.K., İ.K.; Design – S.K., S.A.; Supervision – B.T., S.A.; Resources – C.U.A.G.; Materials - S.K., İ.K, Data Collection and/or Processing – S.K, İ.K., A.G Analysis and/ or Interpretation – S.K., O.O., İ.K.; Literature Search – S.K., A.A., C.U; Writing Manuscript – M.H.S., C.U.; Critical Review – S.K., İ.K, C.U.

### Conflict of Interest:

The authors have no conflict of interest to declare.

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