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Peritoneal Dialysis Drop-Out Causes - A Single Center Retrospective Study

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Abstract

Introduction. Peritoneal dialysis (PD) offers a greater rate of patient comfort and better survival at lower costs than other forms of kidney replacement therapy (KRT). However, long-term therapy appears to be exceedingly challenging because of peritonitis, mechanical issues, and possibly dialysis failure. It is possible to take the proper steps for treatment and prevention if the precise causes of PD discontinuation are known. In this study, we looked into the causes of PD treatment termination in our facility.

Method. A retrospective study was done on the data of PD patients who were monitored in our facility between 2012 and 2023. Data included the etiology, comorbidities of the patients, catheter placement technique, duration of PD, reasons for stopping therapy, and types of mechanical problems.

Results. Of the 132 PD patients treated between 2012 and 2023, 83 stopped their treatment. Male patients made up 50.6% of the population, with a mean age of 54.4 years and a PD duration of 33.5 months. The causes of end-stage kidney disease were identified as diabetic nephropathy in 39.8%, nephrosclerosis in 16.9%, autosomal dominant polycystic kidney disease in 12%, and chronic glomerulonephritis in 13.3%. Only one patient had cancer, and 59% of the patients had diabetes mellitus. A nephrologist placed 12% of the PD catheters, whereas the surgeon laparoscopically implanted 37.3% of them. The primary causes of stopping PD therapy between 2020 and 2022 were death (10 out of 27 patients), dialysis failure (20 patients), peritonitis (19 patients), and kidney transplant (7 patients). In 10 of the cases, mechanical difficulties occurred; one had hydrothorax, two had hernias, and seven had leaks. Patients who had a catheter placed by a nephrologist experienced no difficulties, underwent PD treatment for a longer duration of time (35.6+-33.3 months), and the most frequent cause of treatment termination was dialysis failure. Catheters implanted through open surgery were more likely to cause mechanical issues and peritonitis.

Conclusion. PD is a reliable alternative to KRT. Only a few of our patients experienced mechanical issues. The widespread death rate was attributed to the Covid-19 epidemic. The third reason for stopping treatment was peritonitis. In order to diagnose and treat peritonitis, it is evident that closer monitoring and quicker action are needed. Most likely because the surgical technique was favored in more problematic patients, there were less problems in those who had a catheter put by the nephrologist.

Keywords: peritoneal dialysis, drop-out, catheter replacement, peritonitis

Introduction

The number of persons with chronic kidney disease is rising too quickly in recent years. According to The Global Kidney Health Atlas, almost 850 million people globally suffer from chronic kidney disease (CKD) [1]. Patients who require kidney replacement therapy (KRT) to survive, such as kidney transplants or some type of dialysis, are growing along with this number.

As a result of its affordability, ease of use, low need for technical assistance, ability to enhance life satisfaction, and independency, peritoneal dialysis (PD) has become an important KRT modality. Despite major technological advancements in dialysis therapy, a large number of patients discontinue their PD treatment. Depending on the demographic and study period, rates of PD drop-out varied from 19.8 to 54.8% [2]. Among these difficulties, dialysis failure accounts to up to 35% of patients' transfer from PD to hemodialysis (HD) each year [2]. Also, death and transplantation account for a significant number of the reasons why people drop out of PD. The main cause of PD withdrawal during the first three-month period is problems linked to the catheter [2]. In the first year, the primary causes

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of the switch to HD are reported to be psychological issues and infectious concerns [2]. Finding the factors causing withdrawals is crucial for optimizing the dialysis planning and implementation programs, optimizing the peritoneal catheter implantation process, and wisely allocating resources.
In this retrospective cohort study, we aim to pinpoint the root causes of this manifestation and explore ways to enhance them.

Material and method

Participant

This is a retrospective study based on data from PD patients who were followed at the Dialysis Center at Bezmialem Vakif University between 2012 and 2023. Patients who were over the age of eighteen and who had not undergone PD treatment for a period of three months or longer were not eligible for the study. Since the examination of the electronic medical record was done retrospectively, informed consent at the individual level was not requested.

Data collection

The demographic characteristics, date of catheter placement, catheter replacement technique, primary disease, number of peritonitis, peritonitis in the first three months, comorbidities of the patients, PD dialysis vintage, PD solution types, drop-out causes, and types of mechanical complication were all gathered from the electronic medical system.

Statistical analysis

Version 22.0 of the IBM Statistical Package for the Social Sciences was used to compute all statistical analyses. The study population was evaluated using a descriptive analysis utilizing the percent distribution for categorical variables, mean ± SD continues normally distributed variables. To find statistically significant differences across groups, the Anova test was used. Statistics were considered statistically significant when $p<0.05$.

Results

Between 2012 and 2023, 83 patients discontinued their treatment. 50.6% of the patients were male (Table 1), the average age was 54.4±14.4 years, and the average duration of PD treatment was 33.5±27.5 months (Table 2). The causes of end-stage kidney damage were diabetic nephropathy in 39.8%, nephrosclerosis in 16.9%,

Table 1. Baseline Characteristics

		No of patients 83
Gender	Male	42(50.6%)
	Female	41(49.4%)
DM	No	49(59%)
	Yes	34(41%)
Etiology	Diabetic Nephropathy	33(39.8%)
	ADPKD	10(12%)
	Nephroangiosclerosis	14(16.9%)
	Unknown	11(13.3%)
	GN	9(10.8%)
	Nephrolithiasis	6(7.2%)
Chronic Heart Failure	No	73(88%)
	Yes	10(12%)
COPD	No	78(94%)
	Yes	5(6%)
Malignancy	No	78(94%)
	Yes	5(6%)
Ischemic Heart Disease	No	63(75.9%)
	Yes	20(24.1%)
Hepatomegaly	No	82(98.8%)
	Yes	1(1.2%)
Obesity	No	54(65.1%)
	Yes	29(34.9%)
Drop Out Causes	Death	27(32.5%)
	Dialysis Failure	20(24.1%)
	Mechanical Complication	10(12%)
	Peritonitis	19(22.9%)
	Transplant	7(8.4%)
Mechanical Complication	Hernia	2(2.4%)
	Leakage	7(8.4%)
	Hydrothorax	1(1.2%)

ADPKD in 12%, and chronic glomerulonephritis in 13.3%. In terms of comorbidities, only five patients had COPD and cancer, 41% of patients had diabetes mellitus (DM), 10% had chronic heart failure, 20% had ischemic heart disease, and 29% had a body mass index (BMI) of more than 30 kg/m2. PD catheter placement was performed by a nephrologist in 12% and by a surgeon in 37.3% laparoscopically. Only 3 patients were stratified as early discontinuation (defined as discontinuation occurring within the first 6 months on PD) and this was due to mechanical complications (leakage and hydrothorax). The main reason for late discontinuing PD treatment was death (10 of 27 cases died between 2020 and 2022), followed by dialysis failure (20 cases), peritonitis (19 cases), kidney transplantation (7 cases) and mechanical complications in 10 of the cases; hernia in two, and leakage in seven and only one patient had hydrothorax. There was no significant difference between a nephrologist and a surgeon in the Anova test when comparing the rate of peritonitis and the vintage of dialysis across the three groups in the catheter placement procedure (p=0.963 and p=0.137, respectively) (Table 3 and 4). Although there was no statistically significant difference between the groups, it was noted that patients who underwent nephrologist-inserted catheters did not experience any mechanical complications, they continued on PD treatment for a longer duration (35.6+-33.3 months) (Table 3), and dialysis failure was the most frequent cause of treatment discontinuation (Table 5). Patients who had open surgery to place a catheter were more likely to experience mechanical issues and peritonitis (Table 5).

Table 2. Baseline Characteristics

	N	Minimum	Maximum	Mean	Std. Deviation
Age	83	23	85	54.43	14.007
Dialysis Vintage	83	3	132	33.54	27.384
No of Peritonitis	83	0	6	.95	1.239
First 3 Months Peritonitis	83	0	2	.14	.417

Table 3. Comparison of dialysis vintage according to technique of catheter placement

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum	Sig.
					Lower Bound	Upper Bound			
Percutaneous	10	35.60	33.331	10.540	11.76	59.44	10	96	
Surgery	42	32.95	28.442	4.389	24.09	41.82	3	132	**.963**
Laparoscopic	31	33.68	24.677	4.432	24.63	42.73	7	120	

Table 4. Peritonitis according to technique of catheter placement

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum	Sig.
					Lower Bound	Upper Bound			
Percutaneous	10	.40	.699	.221	-.10	.90	0	2	
Surgery	42	1.19	1.452	.224	.74	1.64	0	6	**.137**
Laparoscopic	31	.81	.980	.176	.45	1.17	0	4	

Table 5. Catheter placement and drop-out causes

			DROP-OUT CAUSES					Total
			Death	Dialysis failure	Mechanical Complication	Peritonitis	Transplant	
Catheter Placement	Percutaneous	Count	2_a	5_a	0_a	2_a	1_a	10
		% of Total	2.4%	6.0%	0.0%	2.4%	1.2%	12.0%
	Surgery	Count	11_a	9_a	7_a	11_a	4_a	42
		% of Total	13.3%	10.8%	8.4%	13.3%	4.8%	50.6%
	Laparoscopic	Count	14_a	6_a	3_a	6_a	2_a	31
		% of Total	16.9%	7.2%	3.6%	7.2%	2.4%	37.3%
Total		Count	27	20	10	19	7	83
		% of Total	32.5%	24.1%	12.0%	22.9%	8.4%	100.0%

Discussion

The main objectives of this study were to identify the risk factors for PD discontinuation. This could help nephrologist to more effectively select patients for PD therapy, identify prospective problems, and mitigate them so the patient can benefit from the treatment for as long as possible.

As the primary outcome we investigated the causes of discontinuation of PD treatment, and revealed that the most common reasons were death and dialysis failure. Only few patients had mechanical complication. Fac-

tors associated with the most common reasons were presence of comorbid conditions such as ischemic heart diseases, diabetes mellitus and dialysis vintage. Moreover, most of the cases died in the period of Covid-19 pandemia. It is well known that diabetes mellitus has a strong impact on survival. Patients treated with PD are subjected to high glucose absorption from dialysate solution; consequently, prolonged dialysate exposure may result in alteration of glycemic blood levels, which due to the production of advanced glycosylation end products (AGEs) may result in accelerating peritoneal aging in DM patients [3].

A study carried out in the Netherlands between 2012 and 2016 found that the most common reason for discontinuation was death, followed by infections like peritonitis and exit-site infections [4]. The factors indicating an increase in the incidence of death are cardiovascular disorders and the vintage of dialysis [4]. In contrast with the findings we observed, mechanical issues like leaks had a significant role in PD failure over the first six months [4]. A two-year study cohort examined the causes of death for individuals with PD between 2014 and 2015 using information from the Japanese Society for Dialysis Therapy (JSDT) registry [5]. Older age, vintage of dialysis, diabetes mellitus, atherosclerosis and ischemic heart diseases, use of dialysate with high glucose levels, higher levels of inflammatory and mineral bone diseases markers were found to be independently associated with an increased in mortality risk [5].

The majority of the deaths in our analysis occurred between 2020 and 2022, during the COVID-19 pandemic. Despite the fact that PD treatment gained popularity during the COVID-19 pandemic and was strongly advised as a first option for KRT by the International Society for Peritoneal Dialysis (ISPD) due to its safety, some researches [6,7] have found that the mortality rate was still quite high. The incidence of mortality in the PD group was higher than that of the HD population in two retrospective cohort studies, where data were taken from the ERA registry and published in 2021 and 2023. In the 2021 ERA Registry report, the adjusted risk of death at day 28 was greater in PD patients (21.6%) than in HD patients (18.0%), despite the fact that there was no statistically significant difference between PD and HD patients [6]. In contrast to HD patients, PD patients had greater mortality (crude HR: 1.49; 95% CI: 1.33-1.66) in the 2023 ERACODA study [7]. This difference persisted even after clinical presentation and comorbidities were taken into account (adjusted HR: 1.56; 95% CI: 1.39-1.75) [7]. Given the lack of data indicating a distinction in immune function between individuals with PD and those with HD, one possible reason for the differences could be the fact that PD patients arrived at the hospital much later than HD patients. Furthermore, research has demonstrated that they typically exhibit a prolonged clearance of viruses following Covid-19 recovery [7].

Telemedicine use is another factor that could have a significant impact on the rise in mortality. A retrospective study including 103 participants in Brazil revealed that the number of hospitalization episodes during the post-pandemic period rose from three to fifteen [8]. Our lack of preparation for the COVID-19 pandemic was evident in a number of ways, such as insufficient training for PD nurses, nephrologists, and patients during telemedicine, difficulties identifying patients who would benefit from consultations as outpatients, the inability to conduct a physical examination of patients-particularly those with peritoneal catheters-using a phone or video call, and patients' reluctance to seek medical attention when something went wrong out of fear being infected with the virus [8].

The second result is that we look into the differences in catheter placement techniques, such as laparoscopic, percutaneous, and surgical techniques. In the study we conducted, there was no statistically significant difference between these three groups with regard to mechanical problems, dropout reasons, or peritonitis. Nevertheless, it was observed that patients who had nephrologist-inserted catheters did not have any mechanical issues, they continued on PD treatment for a longer period of time (35.6+-33.3 months), and the most common reason for treatment discontinuation was dialysis failure. On the other hand, mechanical problems and peritonitis were more common in patients who underwent open surgery to implant a catheter. Similar to our results, a meta-analysis conducted by Esagian *et al*., showed that percutaneous placement was linked to a significantly lower incidence of catheter issues, like migration or removal, and tunnel/exit-site infections [9]. In the subgroup analysis, the percutaneous group had a lower catheter removal rate than both the laparoscopic and open surgery groups. Regarding mechanical issues and hernias, the subgroup analysis did not reveal any statistically significant differences between the percutaneous and laparoscopic groups. Compared to the open surgical group, the percutaneous group had a significantly greater leakage rate, as reported in 28 studies, which is in contradiction to our findings. Additionally, the rate of peritonitis was documented in 24 investigations, and there was no statistically significant difference observed between the groups that underwent open surgery or laparoscopic procedures and the percutaneous group [9].

This study has several shortcomings. It is retrospective, single center study. Data presented were not compared with survived patient or patients on HD. Also, risk factors for patients' outcome were not performed by proper statistical analysis.

Conclusion

PD is a reliable alternative to KRT. Only a few of our patients experienced mechanical issues. The widespread death rate was attributed to the Covid-19 epidemic. The third reason for stopping treatment was peritonitis. In order to diagnose and treat peritonitis, it is evident that closer monitoring and quicker action are needed. Most likely because the surgical technique was favored in more problematic patients, there were less problems in those who had a catheter put by the nephrologist.

Conflict of interest statement. None declared.

References

1. ISN-Global Kidney Health Atlas: www.theisn.org/global-atlas.
2. Luo Q, Xia X, Lin Z, *et al*. Very early withdrawal from treatment in patients starting peritoneal dialysis. *Ren Fail* 2018; 40(1): 8-14.
3. Kolesnyk I, Dekker FW, Boeschoten EW, Krediet RT. Time-dependent reasons for peritoneal dialysis technique failure and mortality. *Perit Dial Int* 2010; 30(2): 170-177.
4. Bonenkamp AA, van Eck van der Sluijs A, Dekker FW, *et al*. Technique failure in peritoneal dialysis: Modifiable causes and patient-specific risk factors. *Peritoneal Dialysis International* 2023; 43(1): 73-83.
5. Abe M, Hamano T, Hoshino J, *et al*. Predictors of outcomes in patients on peritoneal dialysis: a 2-year nationwide cohort study. *Sci Rep* 2019; 9(1): 3967.
6. Jager KJ, Kramer A, Chesnaye NC, *et al*. Results from the ERA-EDTA registry indicate a high mortality due to COVID-19 in dialysis patients and kidney transplant recipients across Europe. *Kidney Int* 2020; 98: 1540-1548.
7. Abrahams AC, Noordzij M, Goffin E, *et al*. Outcomes of COVID-19 in peritoneal dialysis patients: A report by the European Renal Association COVID-19 Database. *Peritoneal Dialysis International* 2023; 43(1): 23-36.
8. Nerbass FB, Vodianitskaia RM, Ferreira HC, *et al*. Increase in peritoneal dialysis-related hospitalization rates after tele-medicine implementation during the COVID-19 pandemic. *Nefrologia (Engl Ed)* 2023; 43(2): 239-244.
9. Esagian SM, Sideris GA, Bishawi M, *et al*. Surgical versus percutaneous catheter placement for peritoneal dialysis: an updated systematic review and meta-analysis. *J Nephrol* 2021; 34(5): 1681-1696.