Peritoneal Dialysis In Chronic Kidney Failure Research In Bach Mai Hospital: Advantages And Limitations

Nhan T. Tran[1] , Le Vuong D. Tran[1*] , Thi Tuyet V. Trieu[2] , Tien P. Nguyen[1]

[1]Department of Pharmacy, Bach Mai Hospital, Hanoi, Vietnam;

[2]Representative office of Hoffman-La Roche, Hanoi, Vietnam

Le Vuong D. Tran, 78, Giai Phong St., Dong Da District, Hanoi, Vietnam.

Abstract

Background: Peritoneal dialysis becomes one of the full methods of substitution renal therapy. The modern literature discussion is about the importance of predictors in the aspect of further development objective criteria for choosing the type of peritoneal dialysis and its start time. This is especially important for high-risk peritoneal dialysis patients.

The main aim was an assessment of the treatment results with permanent peritoneal dialysis, identify the factors determining its outcomes.

Materials and Methods: The retrospective cohort study on patients with chronic renal failure who were prescribed peritoneal dialysis was conducted. The observation was made in the kidney-urology department Bach Mai Hospital through medical records from January 1, 2017, to December 31, 2019. The patient's gender division was: 46.15% males and 53.85% females, with the average age was 46.32±11.37 (for males) and 48.07 ±16.49 (for females).

Results: Have been founded, 38.01% of patients started peritoneal dialysis over the age of 60 and 32.58% of patients aged 40-59. The majority of peritoneal dialysis patients had renal failure at grade IV (70.14%). The main cause of chronic kidney failure was chronic glomerulonephritis (75.11%), diabetes mellitus and kidney stones (8.6 and 8.1%). There were 116 cases having complications during peritoneal dialysis and complications of peritonitis accounted for the highest rate (50%). Cardiovascular disease, malnutrition, and stroke were main cause of mortality (25.0; 20.0; and 17.5%). The patients with baseline Hb levels ≥61 g/L had a higher mean survival time than patients with baseline Hb ≤60 g/l (P<0.05).

Conclusions: The main reason for the cessation of peritoneal dialysis and the translation of patients on hemodialysis was dialysis peritonites. The initial anemia of the degree can be named as a predictor of higher mortality in patients on peritoneal dialysis. This can reflect the role of a low level of hemoglobin as a factor that aggresses the forecast of patients on peritoneal dialysis.

Keywords: peritoneal dialysis, chronic renal disease, substitutional tenal therapy, survival, mortality

1. Introduction

Chronic kidney disease (CKD) becomes all sick serious medical and social problem. Epidemiological data indicate more than 10% of the world's population have signs of CKD [1-3]. The increase in the prevalence of CKD leads to an appropriate increase in the number of patients with terminal stages of kidney diseases in need of substitution renal therapy (SRT). According to existing forecasts, by 2030, chronic renal failure (CRF) in some countries will reach the epidemic threshold [4-5].

Indication to the beginning of SRT is reduced glomerular filtration rate (GFR) below 10.5 mL/min/1.73 m². When the patient appears symptoms of uremia and its complications (pericarditis, nausea, vomiting, edems resistant to therapy, severe acidosis, violation blood coagulation, nutrition, neuropathy) development of SRT can be started at SCF <15-20 mL/min/1.73 m³ [6-7]. In any case, dialysis must be started before the SCF decreases to level 6 mL/min/1.73 m³, even with optimal predialysis. Patient and the absence of clinical manifestations of the disease. In patients high risk, for example, with diabetes, preferably more early start of dialysis [8] .

Since the beginning of the 80s, the twentieth century, peritoneal dialysis (PD) is actively introduced into the practice of treating patients with the V stage of the CRF and becomes one of the full methods of SRT. Currently, more than 3 million patients receive SRT in more than 150 countries of the world [9-10]. It should be noted, peritoneal dialysis has a number advantages compared with the standard software gemodyalisis (GD) (in the dialysis center). PD is an outpatient view of dialysis, while it significantly remains the residual kidney function [11-12].

Specific advantages of this method and for transplanted kidney recipients are shown in aspect as a smoother nearest postoperative period and remote transplant results. The survival rate of patients receiving PD is not inferior to the survival of patients GD, while the cost of treating PD is lower in 1.2-2.5 times. So, it becomes apparent both clinical and economic advantages of the PD use, and the feasibility of using it in patients with terminal CKD stage [13-16]. Indications for choosing a method of PD in patients with chronic kidney disease are:

- ✓ no possibility of creating vascular access for hemodialysis;
- ✓ child-age (especially: from 0 to 5 years);
- ✓ preference for dialysis therapy at home;
- ✓ severe cardiovascular complications which may affect the portability of the hemodialysis procedure;
- ✓ the remoteness of the residence from the dialysis center or the need for greater freedom in patient's movement;
- ✓ young-age candidates for kidney transplantation patients;
- ✓ conscious choice of the patient [17-22].

There are a number of contraindications to select the method of perinetal dialysis in patients with chronik kidney disease:

- inflammatory diseases of the abdominal cavity; ischemic intestinal disease;
- malignant neoplasms of the abdominal organs;
- adhesive disease and a pronounced adhesion process in the abdominal cavity;
- congenital (developmental anomalies) or acquired anatomical defects of the anterior abdominal wall and/or abdominal cavity, and diaphragm;
- severe chronic obstructive pulmonary diseases (III or IV COPD Stage), massive cytostatic or glucocorticoid therapy;
- obesity;
- ✓ severe social or sanitary and hygienic life conditions .

A number of publications indicate that survival patients of PD and hemodialysis GD comparable. Nevertheless, the long-term use of PD is impossible for a significant part of patients. So, about half of the patients CKD can use PD for no more than 5-6 years, and after this period they need to be translated to GD. So, the problem of long-term treatment CKD by PD method is the subject of intensive study .

.

The adverse outcome of PD is largely due to factors directly related to its methodology. First of all, this is a functional failure of the peritone due to long-term contact with a dialysis solution and dialysis peritonites. Have to be said, the effectiveness of PD can not affect and factors that are determined by the state of the patient to the beginning dialysis. But according to a number of authors, many factors determine the prognosis of PD. So, analysis of the predictors' importance in the aspect of further development objective criteria for choosing the type of dialysis and its start time are the important discussion area. This is especially important for high-risk PD patients: patients with diabetes mellitus suffering from heavy cardiac pathology, pronounced protein-energy deficiency, and old-aged patients .

.

1.1. Purpose of the study

Assess the treatment results with permanent peritoneal dialysis, identify the factors determining its outcomes, and on this basis to develop approaches to optimization of the clinical use of peritoneal dialysis.

2. Materials and Methods

The research has been introduced like a complete retrospective cohort study on patients of the kidney-urology department Bach Mai Hospital. Was conducted observation research based on

analysis of the medical records from January 1, 2017, to December 31, 2019, of patients with chronic renal failure who were prescribed peritoneal dialysis

2.1. Criteria for selection and exclusion in the study

Including criteria:

✓ The patient was diagnosed with chronic renal failure and was prescribed peritoneal dialysis.

✓ Peritoneal dialysis treatment will begin from 1 January 2017 and receive peritoneal dialysis for at least 1 month until December 31, 2019

Exclusion criteria:

✓ inflammatory diseases of the abdominal cavity; ischemic intestinal disease;

✓ malignant neoplasms of the abdominal organs; adhesive disease and a pronounced adhesion process in the abdominal cavity;

✓ congenital (developmental anomalies) or acquired anatomical defects of the anterior abdominal wall and/or abdominal cavity and diaphragm;

✓ severe chronic obstructive pulmonary diseases (III or IV COPD Stage);

✓ massive cytostatic or glucocorticoid therapy;

✓ obesity.

2.2. Research methods

Were used a statistical data processing variables, normal distribution, characterized as the average, average Quadratic deviation, and average error. The student's criterion was used. For calculations of the relative risk of death applied regression model with proportional risks and step-by-step activation of variables. Differences in survival curves were estimated by Log Rank Test. The results were considered statistically reliable at the values of P<0.05. The data were processed using a statistical package SPSS (version 9.0).

3. Results and Discussion

3.1. Research results on the number of peritoneal dialysis patients in 2017-2019

Analyzing the obtained data gives us a possibility to found a significant increase in the number of patients who were used by constant peritoneal dialysis in the observation period (Table 1).

At the same time, the mortality rate among patients on PD significantly decreased from 10% in 2017 to 8% in 2018. The number of patients in respect of which PD was used for the first time, significantly decreased from 50% in 2018 to 38.1% in 2019, with an increase in the total number of patients, which indicates the use of PD as the main and permanent method of substitution therapy in

an increasing number of patients.

3.2. Results of characteristics of the patient group

In order to identify the risk factors of the unfavorable PD outcome. A number of clinical and anthropometric indicators were considered. Were assess the value of the age of the patient, their growth, body weight, stage and causes of CKD, the presence of concomitant pathology.

Analysis sample data has shown the gender separation wasn't the same: 46.15% are male and 53.85% are female. The average age of males is 46.32 ±11.37 which is lower than the average age of females (48.07±16.49). The median age for the whole study group was 47.82 ±14.55. The results analysis also has shown that 38.01% of patients started PD over the age of 60 and 32.58% of patients were aged 40-59 (Table 2).

3.3. Research results on the kidney failure degree

We have analyzed the degree of renal failure in the study patient group. The majority of peritoneal dialysis patients have renal failure at grade IV (70.14%). Renal failure grade IIIb is 27.15% and IIIa is 2.71%. No patients with grade I and II renal impairment were indicated for peritoneal dialysis (Table 3).

3.4. Researchon causes of kidney failure, the rate of complications, and mortality in peritoneal dialysis

The main cause of chronic kidney failure were fixed chronic glomerulonephritis (75.11%), diabetes mellitus and kidney stones respectively 8.6% and 8.1% (Table 4). The remaining causes account for a low rate (2-3%).

But the analysisi of the PD duration in patients showed a high complicatioins rate in tested patients. And the complications of peritonitis accounted for the highest rate of all - 50% (Table 5). Total complications number in peritoneal dialysis was fixed 116 cases.

Due to analysed complications in PD, we had a goal to check the mortality rate in PD patients. We have fixed the main cause of death is due to cardiovascular disease - 25.0% - (Table 6). Malnutrition and stroke have been the else high mortality causes in 20 and 17.5%. Other causes were met with a lower rate. the obtained data do not conflict with the results and conclusions accumulated in previous researches and complement them [23-25].

Moreover, we have checked the correlation between hemoglobin concentration and the mortality rate in PD patients (Table 7). Was fixed the relation in hemoglobin rate and mortality in patients with kidney failure and peritoneal dialysis. So, the patients with baseline Hb levels ≥ 61 g/l had a higher mean survival time than patients with baseline Hb ≤ 60 g/l (P<0.05).

4. Conclusions

The mortality rate in patients with chronic kidney disease is greatly dependent on cardiovascular complications which are provided in total mortality caused complications.

The main reason for the cessation of PD and the translation of patients on hemodialysis was dialysis peritonites.

There was detected a correlation between hemoglobin rate and mortality. Was fixed, the initial anemia of the degree has been associated with less survival of PD patients. It can reflect the role of a low level of hemoglobin as a factor that aggresses the forecast of patients on PD.

Acknowledgments

References

1. Webster A, Nagler E, Morton R. Chronic Kidney Disease. Lancet. 2017;389(10075):1238-1252. doi: 10.1016/S0140-6736(16)32064-5.

2. As G, Chertow GM, Fan D, et al. Chronic Kidney Disease and the Risks of Death, Cardiovascular Events, and Hospitalization. N Engl J. 2016;351:1296–305.

3. Schlieper G, Hess K, Floege J, et al. The vulnerable patient with chronic kidney disease. Nephrol Dial Transplant. 2016;31:382–90. doi: 10.1093/ndt/gfv041

4. Breyer M, Susztak K. Developing Treatments for Chronic Kidney Disease in the 21st Century. Semin Nephrol. 2016;36(6):436–447. doi: 10.1016/j.semnephrol.2016.08.001

5. Whittaker CF, Miklich MA, Patel RS, Fink JC. Medication Safety Principles and Practice in CKD. Clin J Am Soc Nephrol. 2018;13(11):1738–1746. doi: 10.2215/CJN.00580118

6. Eckardt K, Bansal N, Coresh J, et al. Improving the prognosis of patients with severely decreased glomerular filtration rate (CKD G4+): conclusions from a kidney disease. Kidney Int Controversies Conf. 2018;93(6):1281-1292. doi: 10.1016/j.kint.2018.02.006.

7. Grams M, Sang Y, Ballew S. Predicting timing of clinical outcomes in patients with chronic kidney disease and severely decreased glomerular filtration rate. Kidney Int. 2018;93(6):1442-1451. doi: 10.1016/j.kint.2018.01.009.

8. Grams M, Yang W, Rebholz C. Risks of Adverse Events in Advanced CKD: The Chronic Renal Insufficiency Cohort (CRIC) Study. Am J Kidney Dis. 2017;70(3):337-346. doi: 10.1053/j.ajkd.2017.01.050.

9. Mehrotra R, Devuyst O, Davies SJ, Johnson DW. The Current State of Peritoneal Dialysis. J Americ Society Nephrol. 2016;27(11):3238–3252. doi: 10.1681/ASN.2016010112

10. Zimmerman A. Peritoneal dialysis: increasing global utilization as an option for renal replacement therapy. J Glob Health. 2019;9(2). doi: 10.7189/jogh.09.020316

11. Xue J, Li H, Zhou Q, Wen S, Zhou Q, Chen W. Comparison of peritoneal dialysis with hemodialysis on survival of diabetic patients with end-stage kidney disease: a meta-analysis of cohort studies. Renal failure. 2019;41(1): 521–531. doi: 10.1080/0886022X.2019.1625788

12. Wearne N, Kilonzo K, Effa E. Continuous ambulatory peritoneal dialysis: perspectives on patient selection in low- to middle-income countries. Int J Nephrol Renovasc. 2017;10:1. doi: 10.2147/IJNRD.S104208

13. Chuasuwan A, Thakkinstian P. Comparisons of quality of life between patients underwent peritoneal dialysis and hemodialysis: a systematic review and meta-analysis. Health and Quality of Life Outcomes. 2020;18:191

14. Kaplan A. Peritoneal Dialysis or Hemodialysis: Present and Future Trends in the United States. Contrib Nephrol. 2016;189:61-64. doi: 10.1159/000450672.

15. Mehrotra R, Soohoo M, Rivara M. Racial and Ethnic Disparities in Use of and Outcomes with Home Dialysis in the United States. J Am Soc Nephrol. 2016;27(7):2123-34. doi: 10.1681/ASN.2015050472

16. Himmelfarb J. The current and future landscape of dialysis. Nature Reviews Nephrology. 2020;16:573–585.

17. Ajayi S, Raji Y, Bello T. Challenges and possible solutions to peritoneal dialysis use in Nigeria. PAMJ. 2020;35:138. doi: 10.11604/pamj.2020.35.138.21066

18. Sukul N, Zhao J, Douglas S. FullerPatient-reported advantages and disadvantages of peritoneal dialysis: results from the PDOPPSBMC. Nephrol. 2019;20(1):116. doi: 10.1186/s12882-019-1304-3.

19. Zee J, Zhao J, Subramanian L. Perceptions about the dialysis modality decision process among peritoneal dialysis and in-center hemodialysis patients. BMC Nephrol. 2018;19(1):298. doi: 10.1186/s12882-018-1096-x.

20. Thiery A, Séverac F, Hannedouche T. Survival advantage of planned haemodialysis over peritoneal dialysis: a cohort study. Nephrol Dial Transplant. 2019;33(8):1411-1419. doi: 10.1093/ndt/gfy007.

21. Herrera L, Gil F, Sanabria M. Hemodialysis vs Peritoneal Dialysis: Comparison of Net Survival in Incident Patients on Chronic Dialysis in Colombia. Canad J Kidney Health Dis. 2021;8:2054358120987055. doi: 10.1177/2054358120987055.

22. Elsayed M, Morris A, Li X. Propensity score matched mortality comparisons of peritoneal and in-centre haemodialysis: systematic review and meta-analysis. Nephrol Dial Transplant. 2020;35(12):2172-2182. doi: 10.1093/ndt/gfz278.

23. Al-Natour M. Peritoneal Dialysis. Semin Intervent Radiol. 2016;33(1):3-5. doi: https://journals.physiology.org/doi/pdf/10.1152/ajprenal.00566.2016

24. Kwan J, Chong T, Low GZ et al. Outcomes following peritoneal dialysis catheter removal with reinsertion or permanent transfer to haemodialysis. J Vasc Access. 2019;20(1):60-64. doi: 10.1177/1129729818773984.

25. Kasuga H. After peritoneal dialysis discontinuation: When will we remove peritoneal dialysis catheter? J Vascular Access. 2018;20(1):31-34. doi: 10.1177/1129729817751620.

Table 1: Changes in the number of patients in the 2007-2009 period

Targets		Patients		Total
		Previous	Incomed	
2017	Being treated	0	77	77
	Dead	0	9	9
	Total	0	86	86
2018	Being treated	73	71	144
	Dead	4	9	13
	Total	77	80	157
2019	Being treated	132	49	181
	Dead	12	6	18
	Total	144	55	199

Table 2: Characteristics of the patient group

Targets		Gender				Total	
		Male		Female			
		N	Ratio (%)	N	Ratio (%)	N	Ratio (%)
Age	≤ 19 years old	8	7.84	11	9.24	19	9.05
	20-39	18	17.65	27	22.69	45	20.36

40-59	35	34.31	37	31.09	72	32.58
≥ 60 years old	41	40,20	44	36,97	85	38,01
Total	102	100	119	100	221	100
Age ($\overline{X} \pm SD$)	46.3 ± 11.37		48.1 ± 16.49		47.3 ± 14.55	
Weight($\overline{X} \pm SD$) (kg)	57.0 ± 5.60		44.4 ± 5.21		55.9 ± 5.35	
Height ($\overline{X} \pm SD$) (cm)	165.1 ± 4.73		152.8 ± 4.41		158.5 ± 4.12	

Table 3. Distribution of patients according to degree of renal failure

Degree of renal failure	Male		Female		Total	
	Count	% rate	Count	% rate	Count	% rate
Stage I	0	0.00	0	0.00	0	0.00
Stage II	0	0.00	0	0.00	0	0.00
Stage IIIa	2	1.96	4	3.36	6	2.71
Stage IIIb	31	30.39	29	24.37	60	27.15
Stage IV	69	67.65	86	72.27	155	70.14
Total	102	100	119	100	221	100

Table 4. Research results on the causes of kidney failure

Causes of kidney failure	Male		Female		Total	
	Count	% rate	Count	% rate	Count	% rate
Chronic glomerulonephritis	85	83.33	81	68.07	166	75.11
Kidney stones	3	2.94	15	12.61	18	8.14
Diabetes	7	6.86	12	10.08	19	8.60
Lupus	1	0.98	6	5.04	7	3.17
Polycystic kidneys	2	1.96	3	2.52	5	2.26
Other	4	3.92	2	1.68	6	2.71
Total	102	100	119	100	221	100

Table 5. Percentage of complications in peritoneal dialysis

Complications	Patient's count	% rate
Peritonitis	58	50.00
Inflammation around the catheter	20	17.24
Inguinal hernia	4	3.45

Tune in around the Catheter	12	10.34
Abdominal bleeding	3	2.59
Catheter switch	7	6.03
Peritoneal catheter placement	2	1.72
Pulmonary edema	10	8.62
Total	116	100

Table 6. The mortality rate in PD patients

Causes of death	Patient's count	% rate
Cardiovascular disease	10	25.0
Malnutrition	8	20.0
Stroke	7	17.5
Hyperfiltration failure	5	12.5
Sepsis	3	7.5
Stomach bleeding	3	7.5
Persistent diarrhea	2	5.0
Tuberculosis	2	5.0
Total	40	100

Table 7. Distribution of patients by hemoglobin concentration group

Hemoglobin concentration (g/l)	Patient's count	Mortality rate	Alive patients	
			Count	% rate
Hb ≤ 60	67	25	42	62.7
Hb≥ 61	154	15	139	90.3
Total	221	40	181	81.9