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Original Article

How to start the late referred ESRD patient urgently on chronic APD

Johan V. Povlsen and Per Ivarsen

Department of Renal Medicine C, Aarhus University Hospital, Skejby Sygehus, Aarhus, Denmark

Abstract

Background. Peritoneal dialysis (PD) has become a well-established complementary alternative to haemodialysis (HD) as first-line renal replacement modality. At our department, ~50% of the end-stage renal disease patients are started urgently on chronic dialysis due to late referral or unexpected deterioration of residual renal function. These patients—although suitable for PD—were previously started on HD via a temporary central venous catheter. Since January 2000, patients have been offered urgent start on chronic PD right after PD-catheter insertion by open surgery.

Methods. Retrospective study describing how acute APD was initiated using a standard prescription for a 12 h overnight APD in the supine position right after (<24 h) PD catheter placement and comparing short-term (3 months) outcome measures and dialysis-related complications between a group of patients started acutely on chronic PD and a non-matched group of patients with a planned start on chronic PD.

Results. The number and type of infectious complications were equal in both the groups. The total number of mechanical complications was significantly higher in the acute group compared with the planned group ($P < 0.05$). Consequently, the need for surgical replacement of catheters was also significantly higher in the study group ($P < 0.02$). With death and transplantation being the censored events, there was no difference in short-term PD technique survival rates between the two groups [39/45 (86.7%) *vs* 45/50 (90.0%)].

Conclusions. The PD modality may be a feasible, safe and complementary alternative to HD not only in the chronic, but also in the acute setting. The concept of acute start on chronic PD may be an yet another tool to increase the PD penetration rate among incident patients starting chronic dialysis therapy.

Introduction

The better preservation of residual renal function [1,2], the superior survival of peritoneal dialysis (PD) patients compared with haemodialysis (HD) patients in at least the first years after initiation of chronic dialysis [3,4] although still controversial [5], the preservation of vascular access [6], the better outcome after renal transplantation [4,7,8], the lower risk of infection with hepatitis B and C [9,10], the superior quality of life [4,11] and the budgetary and logistical aspects are all arguments in favour of choosing PD as first-line renal replacement modality [12,13]. However, the PD penetration rate worldwide is only ~15% among prevalent patients on maintenance dialysis [14,15]. The major limitations for long-term PD technique survival are predominantly dialysis-related peritonitis, inadequate small solute clearance, patient burn-out and ultrafiltration failure leading to over-hydration, hypertension and cardiac diseases. One approach to utilize the advantages of PD as first-line renal replacement modality [1–12] is to increase the PD penetration rate among incident patients starting on chronic dialysis.

PD has become a well-established complementary alternative to HD as first-line renal replacement modality [12,13], when renal transplantation is not possible. However, this is true only for a planned and scheduled start on chronic dialysis. In the unplanned setting, the experience with urgent an start on chronic PD in patients with no access is scarce [16,17].

At our department, ~50% of the end-stage renal disease (ESRD) patients are started urgently on chronic dialysis due to late referral or unexpected deterioration of residual renal function among known patients. These patients—although suitable for PD—were previously started on HD via a temporary central venous catheter with the risk of HD catheter-related complications such as venous stenosis or thrombosis and septicemia. Moreover, it is a commonly held perception, that once started on HD, the patients have a tendency to continue with this modality.

Since January 2000, patients preferring or accepting PD have been offered an urgent start on chronic PD right after PD-catheter insertion by open surgery.

Correspondence and offprint requests to: Johan V. Povlsen, MD, Department of Renal Medicine C, Skejby Sygehus, Aarhus University Hospital, DK-8200 Aarhus N, Denmark.
Email: vpj@sks.aaa.dk

The aim of the present study is to describe, how these patients were managed by 12 h-APD daily in the supine position and to compare short-term (3 months) outcome measures and dialysis-related complications between a group of patients started acutely on chronic PD and a non-matched group of patients with a planned start on chronic PD.

Materials and methods

Design

The present study was conducted as a retrospective cohort study based on case records and data files.

Patient selection

Clinical judgement, including the patient's history, acute ultrasound of the kidneys including kidney size and various laboratory tests, was used to estimate whether the kidney failure was probably due to ESRD or acute renal failure. Patients with a probable ESRD and their relatives were given detailed information on possible dialysis modalities and access formation by nephrologists and expert PD and HD nurses. Patients preferring or accepting PD were subsequently offered an urgent start on chronic PD. Severe hypertension (diastolic blood pressure >120 mmHg), severe overhydration or pulmonary oedema, severe hyperkalaemia (s-K^+>6.5 mmol/l) and signs of uraemic pericarditis or colitis were all regarded as contraindications, where HD as primary modality was preferred. From January 2000 to June 2002, 52 patients (26 females and 26 males) with ESRD were started acutely on chronic PD. During the same period, 88 ESRD patients were started on chronic PD with a planned start (>12 days peritoneal rest after catheter placement before initiating APD). For each patient started acutely, a control patient was selected as the next consecutive patient, who had a PD-catheter implanted for planned start on chronic PD. This non-matched control group consisted of 23 females and 29 males.

PD catheter insertion

Coiled, double-cuffed Tenckhoff catheters were inserted by open surgery under local anaesthesia and without any use of prophylactic antibiotics. We had an exceptionally good 7 days a week surgical support for this procedure.

Acute, automated PD

Right after (<24 h) PD-catheter placement, acute APD (HomeChoice cyclers, Baxter Healthcare) was initiated using a standard prescription for 12 h overnight APD in the supine position (Table 1). The patients were instructed to stay in bed during the treatment, but were free to walk around during the dry day. The cyclers were pre-programmed with a chip (ProCard) so that using this standard prescription, the youngest doctor on duty could prescribe the treatment, and the youngest renal nurse on duty could carry it out. The rather low tidal volume was chosen to avoid too many alarms from the cycler during the first nights and was gradually increased to 75–85% during the first weeks of treatment. After 10–14 days, the patients were converted to standard 8 h overnight APD ± wet day and discharged from the hospital.

Table 1. Standard prescription for acute, automated peritoneal dialysis (acute APD)

Bodyweight	<60 kg	>60 kg
Time overnight	12 h	12 h
Total volume	10 l	14 l
Max. dwell volume	1.2 l	1.5 l
Tidal volume	50–75%	50–75%

Results and discussion

As shown in Table 2, the patients in the acute group had a significantly older age, higher number of comorbid conditions, lower serum-albumin and higher serum urea at the initiation of dialysis compared with the unmatched planned group. This may bias the results in favour of the planned start group. However, the number and type of infectious complications were equal in both groups (Table 3). A total of 16 episodes of dialysis-related peritonitis were observed during the observation period corresponding to one episode every 19.5 patient-treatment-months.

The total number of mechanical complications was significantly higher in the acute group compared with the planned group ($P < 0.05$, Table 3). Consequently, the need for surgical replacement of catheters was also significantly higher in the study group ($P < 0.02$, Table 3). Four PD catheters had to be removed due to pleural leakage. This rare, although well-known complication of PD is probably independent of the duration of peritoneal rest between PD-catheter implantation and initiation of PD. In the acute group, four patients had their PD-catheters replaced due to leakage, while eight patients had their catheter removed or replaced due to failure, mainly displacement. Several explanations deserve consideration: firstly, this markedly increased risk of leakage may be explained by the rather large dwell volumes used initially. Starting APD in the supine position with a large intraperitoneal volume right after catheter placement may also increase the risk of catheter displacement due to flotation of the catheter. Consequently, we have now reduced the maximum dwell volume to 1.5 l (Table 1). Secondly, we did not have time to empty the bowel of the patients in the acute group before catheter insertion and start on PD. Finally, in the acute setting with an urgent need for dialysis any failed catheter had to be surgically replaced at once. In the planned setting, in contrast, you have the time and nerve to wait a day or two, make your patient exercise, empty his bowel and then try again, which will often solve the problem.

Six patients in the acute group *vs* five patients in the planned group were transferred permanently or temporarily to HD due to pleural leakage ($n = 4$),

Table 2. Patient demographics

	Acute start (mean ± SD)	Range	Planned start (mean ± SD)	Range	*P*-value
Age (years)	61.7 ± 19.7	6–84	55.6 ± 13.8	23–86	<0.01
Gender (M:F)	26:26		29:23		
Number of comorbid conditions	2.5 ± 1.4	0–5	1.5 ± 1.1	0–5	<0.001
Serum creatinine (μmol/l)	590 ± 293	149–1477	591 ± 178	200–1024	NS
Serum urea (mmol/l)	30.9 ± 10.4	12.5–58.7	24.8 ± 6.5	13.3–38.5	<0.001
Serum albumin (μmol/l)	504 ± 123	238–711	563 ± 71	291–690	<0.01

NS, not significant ($P > 0.05$).

Table 3. Complications and outcome

	Acute start *n* (%)	Planned start *n* (%)	*P*-value
Infectious complications, total	10 (19.2)	11 (21.2)	NS
Peritonitis	8 (15.4)	8 (15.4)	NS
Exit-site infection	2 (3.9)	3 (5.8)	NS
Mechanical complications, total	15 (28.9)	4 (7.7)	<0.01
Pleural leakage	3 (5.8)	1 (1.9)	NS
Leakage along PD-catheter	4 (7.7)	0 (0)	NS
PD-catheters with dysfunction	8 (15.4)	3 (5.8)	NS
Surgical replacement	10 (19.2)	2 (3.9)	<0.02
PD technique survival, total	39/52 (75.0)	45/52 (86.5)	NS
PD technique survival, censored for death and renal transplantation	39/45 (86.7)	45/50 (90.0)	NS

NS, not significant ($P > 0.05$); PD, peritoneal dialysis; HD, haemodialysis.

exit-site and tunnel infections ($n = 5$), non-resolving peritonitis ($n = 1$) or repeated PD-catheter failure ($n = 1$). There was no difference between the groups regarding the type of complications leading to the transfer to HD.

The overall 3-month PD technique survival rates were 39/52 (75.0%) and 45/52 (86.5%) for the acute and planned groups, respectively. With death and transplantation being the censored events, the corresponding short-term PD technique survival rates were 39/45 (86.7%) and 45/50 (90.0%).

In the present study, the use of PD catheters for acute APD right after insertion was associated with an increased risk of mechanical catheter complications, while there was no difference in the risk of infectious complications. Alternatively, the risk of using temporary vascular access for HD is bacteremias and central venous stenosis or thrombosis, which may be life threatening.

In conclusion, we realize that the retrospective design of our study and the use of a non-matched control group is a limitation. Nevertheless, our observations suggest that the PD modality may be a feasible, safe and complementary alternative to HD not only in the chronic, but also in the acute setting. Moreover, the concept of acute start on chronic PD may be an yet another tool to increase the PD penetration rate among incident patients starting chronic dialysis therapy.

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Conflict of interest statement. None declared.

References

1. Lysaght M, Vonesh E, Gotch F *et al*. The influence of dialysis treatment modality of decline of remaining renal function. *ASAIO Trans* 1992; 37: 598–604
2. Jansen MAM, Hart AAM, Korevaar JC, Dekker FW, Boeschoten EW. Krediet RT for the NECOSAD Study Group. Predictors of the rate of decline of residual renal function in incident dialysis patients. *Kidney Int* 2002; 62: 1046–1053
3. Fenton S, Schaubel D, Desmeules M. Hemodialysis versus peritoneal dialysis: a comparison of adjusted mortality rates. *Am J Kidney Dis* 1997; 30: 334–342
4. Heaf JG, Løkkegaard H, Madsen M. Initial survival advantage of peritoneal dialysis relative to haemodialysis. *Nephrol Dial Transplant* 2002; 17: 112–117
5. Ganesh SK, Hulbert-Shearon T, Port FK, Eagle K, Stack AG. Mortality differences by dialysis modality among incident patients with and without coronary artery disease. *J Am Soc Nephrol* 2003; 14: 415–424
6. Hakim R, Himmelfarb J. Hemodialysis access failure: a call to action. *Kidney Int* 1998; 54: 1029–1040
7. Van Biesen W, Vanholder R, Van Loo A, Van Der Vennet M, Lameire N. Peritoneal dialysis favorably influences recovery of renal function after transplantation. *Transplantation* 2000; 69: 208–214
8. Vanholder R, Van Loo A, Heering P *et al*. Reduced incidence of acute renal graft failure in patients treated with peritoneal dialysis compared to hemodialysis. *Am J Kidney Dis* 1999; 33: 934–940
9. Pereira B, Levey A. Hepatitis C virus infection in dialysis and renal transplantation. *Kidney Int* 1997; 51: 981–999
10. Cendoroglo M, Draibe S, Silva A *et al*. Incidence and risk factors for hepatitis B virus and hepatitis C virus infection

among hemodialysis and CAPD patients: evidence foe environmental transmission. *Nephrol Dial Transplant* 1995; 10: 240–246
11. Merkus M, Jager K, Dekker F, de Haan R, Krediet R. Quality of life in patients on chronic dialysis: self-assessment 3 month after the start of treatment. *Am J Kidney Dis* 1997; 29: 584–592
12. Van Biesen W, Vanholder R, Lameire N. The role of peritoneal dialysis as the first-line renal replacement modality. *Perit Dial Int* 2000; 20: 375–83
13. Gokal R, Mallick N. Peritoneal dialysis. *Lancet* 1999; 353: 823–828
14. Gokal R. Taking peritoneal dialysis beyond the year 2000. *Perit Dial Int* 1999; 19: S35–S42
15. Heaf J. Underutilization of peritoneal Dialysis. *JAMA* 2004; 291: 740–742
16. Stegmayr BG. Three purse-string sutures allow immediate start of peritoneal dialysis with a low incidence of leakage. *Semin Dialysis* 2003; 16: 346–348
17. Berglund J, Wigandt S, Holsti-Heijbel M. Acute initiation of peritoneal dialysis in patients with chronic renal failure. 6-Year results from one centre [abstract]. *Perit Dial Int* 2001; 21 [Suppl 2]: 76