

A Comparable Study on the Outcomes of Urgent Initiated Peritoneal Dialysis Versus Conventional Start, A Single Centre Study from North-East India

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Introduction. To avoid temporary hemodialysis, urgent initiated PD (UIPD) has been designed. In these patients, PD is initiated within 3 days after PD catheter placement. In this study, we evaluated the outcomes of UIPD in end-stage renal disease patients compared with the conventional start of PD.

Methods. This is a single-center observational study, comparing outcomes of UIPD to conventional initiation of PD. All patients diagnosed with ESRD from March 2013 to February 2019 and were willing for CAPD were recruited. In UIPD group treatment was initiated at day 2 of catheter insertion with a dialysate volume of 1000 mL per dwell for 2 hours gradually increased to 2000 mL per dwell volume by 8 to 10 days.

Results. During the study period, 98 patients were started on peritoneal dialysis in our hospital: 35 UIPD, 63 conventional PD. The mean age was 60.81 ± 13.04 years. 67% of patients were males with diabetes mellitus (32%) being the most common cause of CKD. Among the patients in UIPD, the mean age was 58.49 ± 16.1 years, while as in conventional group mean age was 62.10 ± 10.9 years. The Median follow-up time was 381 days. Technique survival was seen in 95 patients (96.9%). There was no difference in technique failure between UIPD vs conventional group. Total complications in our study occurred in 16 patients out of 98 patients during this period. There was no significant difference in the complication rates between the UIPD group and the conventional group.

Conclusion. Our study showed that catheter patency, technique survival, and catheter-related complications were comparable between UIPD and conventional start peritoneal dialysis.

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INTRODUCTION

End-stage renal disease (ESRD) patients need renal replacement therapy (RRT) as part of their treatment. Peritoneal dialysis (PD) is one of the options of RRT. It involves inserting a catheter into the peritoneal cavity for filling the peritoneal cavity with PD fluid for removing toxins, regulating

electrolytes and remove volume. Peritoneal membrane acts as a semi-permeable membrane across which transport occurs. PD involves doing many daily exchanges either manually or using an automatic machine for a fixed period each day of the week. In conventional PD patients have to wait for around 14 days to initiate PD after the placement

of a PD catheter for avoiding complications such as peri-catheter leaks. Thus PD is usually reserved for planned starts and hemodialysis (HD) would be needed in patients who need urgent dialysis.¹

To avoid temporary HD, urgent initiated PD (UIPD) has been designed. In these patients, PD is initiated within 3 days after PD catheter placement, usually in an outpatient setting.² PD is initiated in the outdoor setting (home or clinic), however sometimes it can need a hospital setting. To mitigate the risk of leaks with UIPD, the use of fewer volumes of fluid in dwell in the supine position during the initiation can be important.³ In a study by Jo *et al.* gradually increasing the dwell volume from 500 mL in first 3 days to 2 liters at 1 week by continuous ambulatory PD (CAPD) had no significantly higher risk of complications of PD.⁴ Other studies have compared HD to UIPD and noticed that UIPD can be a safe and effective substitute to HD in patients without having established access for HD.^{5,6}

In this study, we evaluated the prevalence of complications and outcomes of UIPD in ESRD patients and compared it with the conventional start of PD.

Aims and Objectives

1. To compare 180 days of postoperative complications of urgently initiated manual PD exchange with elective PD exchange.
2. To compare the sustainability of urgently initiated PD with elective PD exchange.

MATERIALS AND METHODS

This is a single-center prospective observational study, comparing short term outcomes of urgent initiation of peritoneal dialysis (UIPD) to conventional initiation of peritoneal dialysis (initiation of PD > 14 days after catheter insertion). Between March 2013 to February 2019, all new patients of ESRD and willing for CAPD at the Gauhati Medical College and Hospital, Guwahati Assam were included in this study. ESRD was defined based on KDOQI criteria.⁷ The Total enrolled population was 98 patients with 35 in the UIPD group and 63 in the conventional start group.

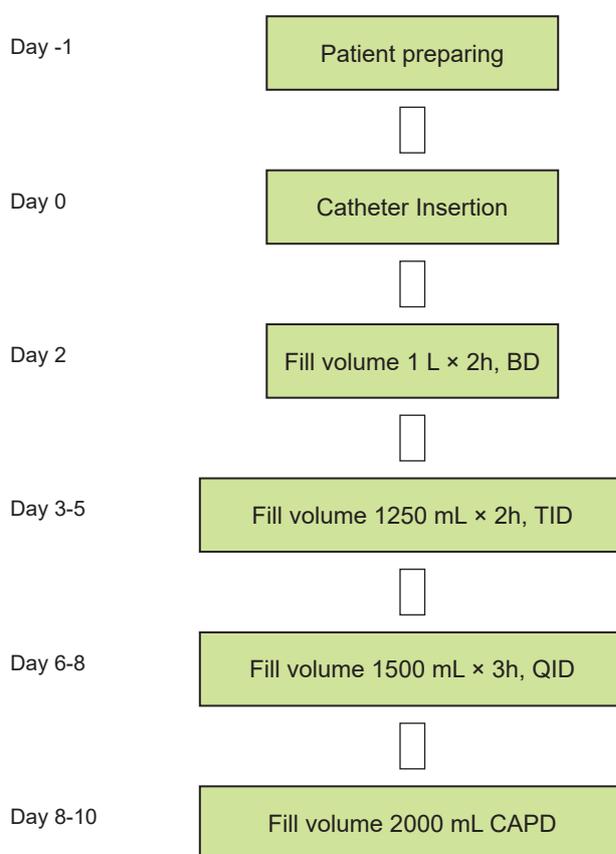
All patients satisfied the following inclusion criteria: (1) Diagnosis of ESRD; (2) Insertion of Tenckhoff catheters by urologists using sterile surgical technique; and (3) PD initiation within

14 days of catheter insertion in the UIPD group and more than 14 days in the conventional group.

Exclusion criteria—Patients having life-threatening pulmonary edema, resistant hyperkalemia, and age < 18 years were excluded from our study.

Urgent-initiated PD Program

We defined as urgent-initiated PD program when PD was started within 14 days after catheter insertion.⁸ Figure shows the flowchart of the urgent initiated program of our study. Tenckhoff catheters having double cuffs were inserted using the laparotomy technique by the experienced urologist in ESRD patients who chose PD. The deep cuff of the catheter was placed inside the rectus abdominis muscle. For catheter fixation and prevention of leakage purse-string, tie suture was used on the posterior rectus sheath and parietal peritoneum. For prophylactic antibiotic intravenous cefuroxime or cefazolin 30 min before catheterization was used, and in patients with a history of allergy/reactions to penicillins, single-dose ciprofloxacin for antibiotic prophylaxis was used. PD treatment



The flowchart of Urgent Initiated Peritoneal Dialysis Program

was started at day 2 of catheter insertion using a dialysate of 1000 mL per dwell for 2 hours (twice a day) in the supine position, then 1250 mL for 2 hours (thrice a day) in next 2 days and gradually increased to 2000 mL per dwell volume by 8 to 10 days. Patients then began continuous ambulatory peritoneal dialysis (CAPD). PD nurse managed PD cycles for 8 to 10 days. Patients and their caregivers were given standard training for CAPD by PD coordinators and PD nurse during this time. Post-discharge patients were followed up as per protocol.

Baseline Clinical and Laboratory Data, and Study Outcomes

Patient's clinical data including age, gender, cause of renal failure, history of surgery on abdomen, weight, height, and any other illnesses were collected before catheterization. Baseline evaluation included laboratory data. CKD-EPI equation was used to estimate residual renal function at the insertion of PD catheter.⁹

CAPD fluid (1.5%, 2.5% Dextrose or other) were prescribed according to the need and the final decision was taken by the nephrologist. Input/Output monitoring and routine monitoring of kidney function tests, serum albumin, and other parameters were routinely done. PD effluent fluid analysis and other peritoneal membrane related tests were done according to the need. We followed up the patients for a minimum duration of 180 days for any complication of PD or interruption

of PD (death, transplantation, or transfer to HD because of technique failure/complications of PD). Complications of PD included mechanical (migration of catheter tip, catheter obstruction and leakage of dialysate) and infectious complications (exit site infections (ESI) and peritonitis).¹⁰ Death was censored for technique survival evaluation.

Statistical Analysis

Data of our study were presented as mean \pm standard deviation (SD) and frequencies (percentages), as per the variables. Statistical results were obtained using Chi-Square and Fisher's Exact Test.

RESULTS

From March 2013 to February 2019, 98 patients were started on peritoneal dialysis in our hospital: 35 UIPD (35.7%), 63 conventional PD (64.3%). In our study population mean age was 60.81 ± 13.04 years. 67% of patients were males with diabetes mellitus (32%) being the most common cause of CKD. Uremia (72%) was the most common indication of starting of dialysis. Table 1 describes the baseline characteristics of the study population at the time of the start of PD. Among the patients in UIPD, age was 58.49 ± 16.1 years; while as in conventional group mean age was 62.10 ± 10.9 years. Diabetes was the commonest etiology of CKD in both groups and uremia was the most common indication of dialysis in both groups. All PD catheter implantations were carried out

Table 1. Characteristics of Study Population, According to PD Initiation

Characteristics	Whole Cohort (n = 98)	UIDP Group (n = 35)	Conventional Group (n = 63)	P
Age, y	60.81 \pm 13.04	58.49 \pm 16.1	62.10 \pm 10.9	> .05
Gender M/F, n (%)	66 (67) / 32 (33)	23 (65.7) / 12 (34.2)	43 (68.3) / 20 (31.7)	> .05
Etiology of CKD				
Diabetes	32	12	20	> .05
Glomerulonephritis	30	11	19	
Hypertension	21	06	15	
Obstructive	05	03	02	
CIN	09	02	07	
Others	02	01	01	
Indication of Dialysis				
Uremia	71 (72.4%)	24 (68.6%)	47 (74.6%)	> .05
Volume Overload	20 (20.4%)	06 (17.1%)	14 (22.2%)	
Anuria	06 (6.1%)	2 (5.7%)	04 (6.3%)	
Refractory Heart Failure	01 (1%)	0	01 (1.5%)	
eGFR, mL/min /1.72m ²	7.20 \pm 1.8	7.19 \pm 1.9	7.20 \pm 1.7	> .05

by urologists using the surgical technique. PD exchanges were started within 3 days in every patient. With the variability in patients' condition, the dialysis prescriptions varied from day to day. The type of dextrose solution (1.5%, 2.5%, or 4.25%) was decided as per the judgment of the PD nurse and the treating nephrologists as per patients' condition (weight, edema).

The Median follow-up time was 381 days. Technique survival was seen in 95 patients (96.9%). There was no difference in technique failure between UIPD vs conventional group (1 patient in UIPD group vs 2 patients in the conventional group; $P > .05$). Total complications in our study occurred in 16 patients out of 98 patients during this period. Complications included mechanical (pericatheter leak, catheter block, catheter tip migration) and infectious complications (peritonitis, exit site infection). Table 2 shows the complications in our study group comparing UIPD and conventional groups. In mechanical complications catheter block (5 patients) was the most common complication while infections (peritonitis and exit site infection) were seen in 5 patients. Rates of PD complications did not differ significantly between the patients of UIPD and conventional groups. Re-hospitalization was needed in 5 patients of the UIPD group while 7 patients of the conventional start PD required re-hospitalization (Table 3). There was no statistically significant difference in hospitalization rates. One patient in the UIPD group presented with cardiogenic shock due to myocardial infarction

and died during hospitalization.

DISCUSSION

Most patients with ESRD start with unplanned renal replacement therapy (RRT) needing a central venous catheter (CVC) for HD. Urgent HD in patients with ESRD is associated with increased mortality.^{11,12} Urgent initiated PD can be used to avoid the unplanned HD and CVC and has been shown to decrease the immediate mortality.¹³⁻¹⁵ In UIPD, PD is initiated within 3 days after PD catheter placement. A concern of increased mechanical complications with the urgent initiation of PD can be overcome by using low dwell volume and gradually increasing the dwell volume.⁴ In this study, we evaluated the use of UIPD in ESRD patients using several, lower volume exchanges in the starting period and compared it to the conventional start of PD. The main outcome was technique survival and the complications of PD between the two groups.

During the study period, 98 patients were started on peritoneal dialysis with 35 patients on UIPD (35.7%) and 63 patients on conventional start PD (64.3%). Most of the patients were males in our study with diabetes mellitus being the most common cause of ESRD. This is understandable as diabetes mellitus is the common cause of CKD worldwide.¹⁶ Catheter insertions in all patients were done by the urology team using surgical technique and dialysis was started within 3 days. In our cohort of study, technique survival at the end of follow up was seen in 95 patients (96.9%). Catheter malfunction can be a major worry in the early start of PD. In our study, technique survival was not statistically different between UIPD and conventional start dialysis. A similar finding was seen in a study by Silva *et al* with no difference in technique failure between early start PD patients versus late start PD patients, with DM and body mass index > 25 kg/m² being a risk factor for technique failure.¹⁷ In another study by Ye *et al* catheter patency at the end of 1 month was seen in 97% of early start PD patients and it was 96.4% at the 1 year and 96.2% at 5 years.¹⁸ The Re-hospitalization rate in our study was seen in 12.24%. Catheter block was the major reason for re-hospitalization with peritonitis and volume overload being the other important causes. Re-hospitalization rates did not differ significantly between the patients of UIPD

Table 2. Complications According to PD Initiation

Complication	UIPD n (%)	Conventional Group n (%)	P
Peri-catheter Leak	1 (2.9)	2 (3.2)	$> .05$
Peritonitis	1 (2.9)	2 (3.2)	$> .05$
Rehospitalisation	5 (14.3)	7 (11.1)	$> .05$
Catheter Block	2 (5.8)	3 (4.8)	$> .05$
Exit site Infection	1 (2.9)	1 (1.6)	$> .05$
Catheter Tip Migration	1 (2.9)	2 (3.2)	$> .05$

Table 3. Causes of Rehospitalisation According to PD Initiation

Cause of Rehospitalisation	UIPD n (%)	Conventional Group n (%)	P
Volume Overload	1 (2.9)	2 (3.2)	$> .05$
Peritonitis	1 (2.9)	2 (3.2)	
Catheter Block	2 (5.8)	3 (4.8)	
Cardiogenic Shock	1 (2.9)	0	

and conventional start PD. Complications in the abdominal wall (including the peri-catheter leak, which can happen after implantation of PD catheter) are also important worries in UIPD.¹⁹ Increase in intraperitoneal pressure during intraperitoneal infusion of PD fluid increases the risk of developing abdominal wall complications. The occurrence of dialysate leakage vary between 1.5% to 37% in patients with peritoneal dialysis from various studies.²⁰⁻²³ In UIPD, dialysate leakage has been seen in 0 to 13.5% of patients.^{08,13,22}

In our study, peri-catheter dialysate leakage was seen in 3% of patients. There was no difference between UIPD and conventional group with 1 patient (2.8%) in the UIPD group and 2 (3.07%) patients in the conventional group developing dialysate leakage. The use of a purse-string suture to fix the PD catheter and strengthen the weakness at the catheter site (posterior layer of rectus sheath) in our study may have helped in decreasing the risk of dialysate leakage. Also, gradually increasing the PD regimen in the UIPD group (Figure) could help to prevent a sudden increase in intra-peritoneal pressure. Thus the lower intraperitoneal pressure in the UIPD group could prevent dialysate leakage and allows abdominal incisions to heal. Thus the increase of dialysate leakage with UIPD can be mitigated with this approach. Early-onset of peritonitis is another concern with UIPD. A study from Denmark reported an incidence of 15.4% of peritonitis in the UIPD group within 3 months which was similar to the conventional group.²⁴ In another study from China, the rate of peritonitis was not increased with UIPD.¹⁸ In our study, there was no significant increase in the rate of early peritonitis (within 6 months) in the UIPD (2.9%) group compared to the conventional group (3.2%). For preventing infections prophylactic antibiotics half an hour before implantation of the catheter was used in all patients. Also, regular training of doing PD and precautions needed during doing PD was given to all patients and their attendants. Thus with the use of the aseptic procedure, pre-operative antibiotics and proper training of patients and their caregivers may help to decrease the risk of peritonitis in both UIPD and conventional PD groups. Our study had several limitations. Firstly, due to a single-center cohort study selection bias was inevitable. Our study had a short follow-up period and a longer follow-up period would be

needed to show whether UIPD is equivalent to planned PD. We have not evaluated the adequacy of dialysis in our study which also is a limitation of this study.

CONCLUSION

This study showed that urgent initiated peritoneal dialysis was comparable to planned start peritoneal dialysis in terms of outcomes (catheter block, technique survival, and abdominal wall complications). UIPD can be a reliable, effective, and realistic approach for patients with ESRD who need urgent start of dialysis. To study the long term adequacy and reliability of the UIPD approach we need studies with longer follow-up period.

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