

## Outcome and Complications of Acute Intermittent Peritoneal Dialysis in Al-Kindi Teaching Hospital

Ali J Al-Saedi *FIBMS*

Dept. of Medicine, Al-Kindi College of Medicine, Baghdad University

### Abstract

<b>Background</b>	Acute peritoneal dialysis is commonly practiced in IRAQ.
<b>Objective</b>	To evaluate and improve the management of peritoneal dialysis in Al-Kindi Teaching Hospital.
<b>Methods</b>	Six hundred and sixty nine patients underwent peritoneal dialysis during the period from January 2011 to June 2012. The mean age of patients was 54±13.9 years. Among the patients, there were 168 cases of acute renal failure, and 501 cases of chronic renal failure requiring acute dialysis.
<b>Results</b>	Acute peritoneal dialysis performed on patients admitted in dialysis unit of Al-Kindi Teaching Hospital was safe, a simple procedure, easily tolerated by the patient and requiring less expertise than hemodialysis and had complication rates nearly comparable to other established centers. Complications occurred in 349 patients (52%). The most common complication was bleeding in the peritoneal cavity (30%) while dialysis solution leak was the second most common complication (25%). Dialysis episodes complicated by peritonitis was (2.5%). Death rate was 15%.
<b>Conclusion</b>	Acute peritoneal dialysis was performed safely and effectively in Al-Kindi Teaching Hospital. Improvements are possible through closer supervision of new doctors and tighter nursing precaution.
<b>Key Words</b>	Acute peritoneal dialysis, outcome.

### Introduction

Peritoneal dialysis (PD) is a procedure that has gained widespread acceptance in the treatment of acute and chronic renal failure because of its simplicity and advantages compared with other modes of dialytic treatment such as hemodialysis (HD) <sup>(1)</sup>.

This has led to the widespread use of peritoneal dialysis in the treatment of renal failure over the past four decades in many hospitals, both large and small <sup>(2)</sup>.

It provides the nephrologists with nonvascular alternative for renal replacement therapy. It is an inexpensive modality in developing countries and does not require highly trained staff or a

complex apparatus <sup>(3)</sup>. Systemic anticoagulation is not needed, and it can be easily initiated. It can be used as continuous or intermittent procedure and, due to slow fluid and solute removal, helps maintain hemodynamic stability especially in patients admitted to the intensive care unit. PD has been successfully used in acute kidney injury (AKI) involving patients with hemodynamic instability, those at risk of bleeding, and infants and children with AKI or circulatory failure <sup>(4)</sup>.

The intention of the study is to evaluate the outcome and complications of acute intermittent peritoneal dialysis (IPD) in Al-Kindi Teaching Hospital, Baghdad, Iraq.

**Methods**

A cross sectional study was done from January 2011 to June 2012 on adult patients admitted to dialysis unit in Al-Kindi Teaching Hospital who had undergone PD. we designed a form that staff completed to evaluate the cause of renal failure, the indications for dialysis, the complications and outcome of PD. The technique of insertion of peritoneal dialysis is described below.

The patient was asked to empty his/her bladder before the procedure. An area below the umbilicus was prepared aseptically and a point at the middle third from the umbilicus to symphysis pubis was infiltrated with lignocaine. A small skin incision was made and the abdomen punctured vertically with firm pressure on the stylet catheter. The stylet was withdrawn slightly and the catheter introduced to either the iliac fossa posteriorly or to the pelvis.

The infusion tubing was then connected using meticulous aseptic technique. The dialysate bottles (commercially prepared) were suspended from a high stand and the fluid was infused into the peritoneum by gravity. We planned for 72 cycles of IPD in all patients. Each cycle was prescribed to be 1 hour in duration, with a drain time of 10 minutes, a dwell time of 30 minutes, and an outflow time of 20 minutes. Each exchange volume (2 L) contained 1.7% dextrose. In patients with fluid overload, dialysate containing a higher concentration of dextrose was used. Intraperitoneal gentamycin was used 12hourly as a prophylactic measure.

The patients were monitored for any variation in heart rate, blood pressure, or respiratory rate and for hemorrhage, catheter leak, catheter blockage, and infection. The serum creatinine,

blood urea, sugar and serum electrolytes were determined daily while on PD. Peritoneal dialysate was sent for microscopic examination and culture only on suspicion of peritonitis. Peritonitis was diagnosed by the presence of turbidity of dialysate, abdominal pain / tenderness and fever.

The patients who refused to complete peritoneal dialysis for a cause other than development of complications (e.g. planning to consult other centers etc...) had been excluded in our study.

**Statistical analysis**

SPSS (statistical package for social science) version 16 software for windows was used. All data were entered and analyzed with appropriate statistical tests; Descriptive statistics were presented as (mean ± standard deviation), frequencies and percentages, Chi square was used for comparison of frequencies and percentage of different variables. In all statistical procedures and tests, level of significance was set at  $P = 0.05$  was assumed.

**Results**

A total of 669 patients underwent IPD during the study period, including 382 men and 287 women. The age of the patients ranged from 18 years to 81 years with mean age  $54 \pm 13.9$ . Among the patients, there were 168 cases of acute renal failure (ARF) and 501 cases of chronic renal failure (CRF) requiring acute dialysis (Table 1). The underlying causes of acute and chronic renal failure are shown in (Table 2). Indications for acute dialysis were metabolic acidosis, uremic encephalopathy, fluid overload, hyperkalemia, pericarditis and uremic symptoms (Table 3).

**Table 1. Demographic features of the studied patients**

Feature	Mean ± SD	Range
Age (yr)	54.6 ± 13.9	18 - 81
Sex	Male Female	382 (57.1%) 287 (42.9%)
Renal failure	Acute Chronic	168 (25.11%) 501 (74.89%)

**Table 2. Causes of renal failure of patients**

Causes		No.	%
Acute renal failure	Acute tubular necrosis	80	11.96
	Rapidly progressive GN	35	5.23
	Acute interstitial nephritis	32	4.78
	Obstructive uropathy	11	1.64
	Hepato-renal syndrome	10	1.49
	Total	168	25.11
Chronic renal failure	Diabetic nephropathy	170	25.41
	Chronic GN	102	15.25
	Hypertension	94	14.05
	Chronic Pyelonephritis	72	10.76
	Obstructive uropathy	63	9.42
	Total	501	74.89
Total		669	100

**Table 3. Indications of acute dialysis**

Indication	No. of patients	%
Metabolic acidosis	214	31.98
Encephalopathy	169	25.26
Fluid overload	151	22.57
Hyperkalemia	82	12.26
Pericarditis	29	4.35
Uremic symptoms	24	3.58
Total	669	100

Efficiencies of PD for the purpose of this study were estimated using the differences in the pre and post blood urea level and clinical improvement. The mean urea lowering was  $95 \pm 82$  mg/dL. Serum biochemistry of patients prior to initiation of peritoneal dialysis was

shown in (Table 4). Complications of PD were divided into mechanical, metabolic and infection (Table 5). The number of patients that developed complications were 349 carried a rate of (52%).

**Table 4. Serum biochemistry of patients prior to initiation of peritoneal dialysis**

Biochemistry	Range	Mean $\pm$ SD
Blood urea mg/dL	95 - 270	238 $\pm$ 26.7
Creatinine mg/dL	2.1 - 10.5	6.3 $\pm$ 0.65
Potassium mEq/L	3.2 - 5.8	4.7 $\pm$ 2.1
Sodium mEq/L	112 - 152	128.3 $\pm$ 6.3
Chloride mEq/L	90 - 104	95.2 $\pm$ 4.1
Total calcium mg/dL	7 - 10	7.9 $\pm$ 0.45
Phosphate mg/dL	3.3 - 6.1	5.36 $\pm$ 1.87
Albumin g/L	33 - 50	39.5 $\pm$ 7.1

**Table 5. Complications of acute intermittent peritoneal dialysis**

Complications*		Number of episodes	Percent
Mechanical	Bleeding	201	30
	Peritoneal solution leak	167	25
	Abdominal pain	147	22
	Bowel perforation	1	0.15
Metabolic	Hyperkalemia	132	20
	Hyperglycemia	33	5
Infection	Peritonitis	17	2.5

\* The patient may develop more than one complication at the same time

Bleeding from peritoneal cavity occurred in 201 episodes of dialysis, 143 of which were mild, 40 were moderate and 11 were severe bleeding required blood transfusion.

Dialysis solution leak occurred in 167 of the cases, 131 of them necessitated reinsertion of the catheter. One hundred forty seven patients complained of catheter-related pain. After an explanation and reassurance, 110 of them tolerated the pain. Thirty seven patients treated with analgesia for pain relief. Bowel perforation occurred in one patient who improved on conservative treatment and referred for HD.

Peritonitis occurred in 17 patients and all presented with turbid effluent fluid. Culture was positive in 12. Nine yielded mixed growth of

gram negative bacilli, two grew *staphylococcus aureus* and the one grew *pseudomonas aerogenes*. Treatment in 9 cases was intravenous cefotaxime. In two other cases intravenous vancomycin was used, last patient was treated with piperacillin.

PD catheters were removed in all cases to control the unsettled infection. Treatment was successful in all except three patients who died of overwhelming septicemia. Hypokalemia occurred in 132 patients and hyperglycemia in 33 patients. They were managed with potassium and insulin respectively. There were one hundred deaths during this study period and the causes of death are shown in Table 6.

**Table 6. Causes of death in patients on intermittent peritoneal dialysis**

Causes of death	Acute renal failure		Chronic renal failure		Total no.	P value
	No.	%	No.	%		
Septicemia	33	49.25	6	18.18	39	0.005
Brain stem stroke	20	29.85	16	48.48	36	0.11
Acute leukemia	3	4.48	-	-	3	0.54
Myocardial Infarction	8	11.94	7	21.21	15	0.36
Pericardial tamponade	-	-	4	12.12	4	0.55
Hepato-renal syndrome	3	4.48	-	-	3	0.54
Total	67	100	33	100	100	0.001

Sixty seven of the patients who died had acute renal failure while the remaining thirty three patients had chronic renal failure. Deaths were due to the underlying disease and not to uremia as plasma biochemistry was well controlled in

PD. Only four of the deaths can be attributed directly to uremia. Those patients developed pericardial tamponade soon after the initiation of PD. They presented with symptoms and signs of uremia. Their blood pressure was initially

high, jugular venous pressure was elevated. Heart sounds were clearly audible and there was no pericardial rub. While they were on PD, they suddenly became breathless and hypotensive. An echocardiogram was done for two of them which revealed massive pericardial effusion with features of pericardial tamponade. Their blood pressure returned to its original baseline following pericardiocentesis. Unfortunately, the improvement in blood pressure was not sustained. They became hypotensive again and this time they did not respond to resuscitation. Uremic pericarditis with pericardial tamponade was presumed to be the cause of their death as the pericardial effusion aspirated was blood-stained and they were still clinically uremic with the blood urea prior to their death being high. The relatives of other two patients refused any further intervention and eventually they died.

### Discussion

Peritoneal dialysis is performed frequently in Al-Kindi Teaching Hospital. This frequency gives a fair chance for doctors and nurses to be skillful in the technique and nursing care of the dialysis procedure.

Peritoneal dialysis is a simple procedure that can be started easily and without delay. The PD treatment modality is invaluable in patients with ARF, in whom short-term dialysis support can be life-saving and can affect a complete cure. Similarly, in patients with CRF, in whom various aggravating factors have caused acute exacerbation of their illness, short-term dialysis support can help both to reverse the acute component and to treat the precipitating factors. With restoration of renal function to baseline level, patients may remain independent of dialysis for several months or years.

The mortality rate in patients on PD has been reported to vary between 5% - 12 %<sup>(5)</sup>. Mortality in our study was 15% which is nearly comparable to a study in Koirala Institute of Health Sciences in Eastern Nepal at 2003 (death rate was 12.5%). Sixty seven out of one hundred sixty eight (40%) patients with acute renal failure died compared to thirty three out of five hundred one patients

(6.5%) with chronic renal failure (statistically significant). It has been shown in most series that patients with acute renal failure have higher mortality rates because of concomitant medical problems. This was well illustrated in our study where deaths were attributed to the severe underlying disease rather than to uremia. Only four deaths could be directly attributed to uremia. Those patients had pericardial tamponade due to uraemic pericarditis soon after initiation of PD.

Vaamonde and Valk<sup>(5)</sup> reported 30-32% of dialysis was complicated by bleeding most of which were minor. In our study 30% of patients had bleeding (majority was mild) which is nearly comparable with bleeding rate (20%) in a study that done in Hospital University Science Malaysia Zainaland Loo 1992. Uremic patients invariably have abnormalities of platelet function characterized by a prolonged bleeding time, abnormal platelet aggregation, abnormal platelet adhesion test and decreased release of platelet factor 3<sup>(6,7)</sup>. The platelet count is generally normal and alteration in the concentration of circulating clotting factors, when present, is not consistent and does not contribute to a bleeding tendency. The result that correlates best with the occurrence of clinical bleeding is the abnormality of bleeding time<sup>(6)</sup>. Even though detailed platelet function tests have not been carried out, the presence of prolonged bleeding time, normal platelet counts and the appropriate clinical setting have allowed us to conclude that bleeding in our patients was due to uremia. We continued with PD despite bleeding from the peritoneal cavity. The bleeding ceased while the patients were on PD and this further supported our initial impression that the bleeding was uremic in nature. Other therapeutic modalities that have been shown to correct bleeding time of uremia are infusion of cryoprecipitate<sup>(8)</sup> and injection of l-deamino-8D-arginine vasopressin<sup>(9)</sup> and oral or parenteral administration of a conjugated estrogen preparation<sup>(10)</sup>. The above measures were not used in our patients (not available) apart from

cryoprecipitate. Those patients who developed severe bleeding had different hematological disorders.

Peritonitis was a potentially serious complication. It occurred in 17 patients, giving a rate of 2.5%. This rate is low as compared with 17.2% recorded in the General Hospital Kuala Lumpur<sup>(11)</sup> and 15% in Hospital University Science Malaysia Zainal and Loo, 1992

However, rate is comparable with 0.1% to 2% which have been quoted in the literature<sup>(12,13)</sup>.

The rate of peritonitis can be lowered by meticulous attention to aseptic technique during catheter insertion, followed by careful nursing care and the use of intra peritoneal prophylactic antibiotic.

The isolation of gram-negative organisms from the effluent fluid in nine out of twelve cases with positive culture was surprising. This may imply the presence of unsuspected intra-abdominal pathology.

Bowel perforation occurred in one patient (0.1%) which is low as compared with (2.5%) in Hospital University Science Malaysia.

The patient recovered well on antibiotics and was converted to hemodialysis. It is important to note that while treatment of bowel perforation may be conservative in some cases, most require laparotomy<sup>(13,14)</sup> and this complication may be fatal<sup>(15)</sup>.

In conclusion, acute (stab) peritoneal dialysis was performed safely and effectively in Al-Kindi Teaching Hospital, complication rates were nearly comparable to other studies, bleeding that occurred during PD was due to effect of uremia on platelet function, the rate of peritonitis can be lowered by using highly aseptic technique during catheter insertion and careful nursing care, use of intra peritoneal prophylactic antibiotic may have a role in decreasing the rate of peritonitis, and acute renal failure is associated with higher mortality rate and is related to underlying disease and co morbidity, rather than PD procedure itself.

Further study is recommended to assess the quantitative effect of PD in removal of excessive body fluid, to correlate between the delay in

initiation of PD and the rate of complications which definitely increase due to delayed referral, continuous type of PD is recommended in our country as a type of renal replacement therapy for both ARF and CRF especially for those who have contraindications to HD.

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E-mail: [dralijasim@yahoo.com](mailto:dralijasim@yahoo.com)

Mobile +964 7901615990

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