# THE STATUS OF INTERMITTENT PERITONEAL DIALYSIS IN HOSPITAL UNIVERSITY SCIENCE MALAYSIA

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*ABSTRACT*

***Acute (stab) peritoneal dialysis is commonly practised in Malaysia. This study is designed to improve the management of peritoneal dialysis (PD) in Hospital University Science Malaysia (HUSM). Consecutive peritoneal dialysis (PD) on adult inpatients from May 1992 to September 1992 were reviewed prospectively.***

***There were 40 episodes of peritoneal dialysis on 27 patients during this period given at the rate of 2 PD per week. The mean age of patients were 53±15 years. Uraemia was the main indication for dialysis, while hyperkalaemia and pulmonary oedema were indications for urgent dialysis. Complications occurred in 14 episodes of dialysis (35%). The most common complication was bleeding in the peritoneal cavity while peritonitis was the second most common complication. Dialysis episodes complicated by peritonitis were done by less experienced performers compared to uncomplicated dialysis episodes.***

***Overall mean time spent on each dialysis and time per cycle were longer than recommended (59±24 hours and 77±14 minutes)***

***In conclusion, acute PD performed on patients admitted in Hospital University Malaysia was safe and had complication rates comparable to other established centres. However, improvements are possible through closer supervision of new doctors and tighter nursing precautions.***

*Keywords: complications, peritonitis, renal failure*

**SINGAPORE MED J 1995; Vol 36: 379-382**

## INTRODUCTION

Peritoneal dialysis became widely used in 1959 after it was shown to be safe and effective in the treatment of uraemia[1]. Commercial dialysate solution rapidly became available. Acute (stab) peritoneal dialysis (PD) was used in most centres initially. However this was soon replaced by the permanent "chronic" catheter in most centres. The permanent catheter obviates the need for repeated punctures of the abdomen with substantial reduction in the risk of perforation of abdominal viscera.

In Malaysia, acute (stab) PD still remains an important mode of treatment of acute and chronic renal failure. This is mainly due to financial and technical problems. An earlier review in 1985 on peritoneal dialysis in the Nephrology Department of the General Hospital Kuala Lumpur has shown the procedure to be safe and effective[2]. However there remain problems in the form of medical infection and mechanical problems that need to be evaluated closely[3].

This study aims to evaluate and improve the management of patients on peritoneal dialysis done in our hospital.

## METHODS AND MATERIALS

A prospective study was done from May 1992 to September 1992 on all adult inpatients admitted to Hospital University Science Malaysia (HUSM) who had undergone PD. Dialysis may need to be repeated in the same patient and each episode was evaluated singly. The following points were analysed: indication for starting dialysis, effectiveness and complications of PD, previous experience of performer and recommendation for improvement. 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 pre-warmed fluid was infused into the peritoneum by gravity. One litre of fluid will run in through the catheter in about 10 minutes. The tubing was then clamped and the dialysate was allowed to remain in the abdomen for 20 minutes. It was then allowed to drain by gravity through a closed system into a collecting bag. Each cycle takes about one hour. Peritoneal dialysis was generally conducted for 48-60 hours for a total of 40-60 cycles. The patients were monitored closely to ensure that they were comfortable, have stable vital signs and free from immediate complications such as mechanical blockage, bleeding, peritonitis or bowel perforation. The serum creatinine, blood urea 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. Fever and abdominal signs may be absent because of early effective treatment. Treatment of peritonitis consisted of rapid peritoneal exchanges for four cycles and starting intravenous antibiotics with cloxacillin and gentamicin (as first line therapy).

Refractory peritonitis usually resolved with the removal of catheter and continuation of intravenous antibiotic adjusted according to culture and sensitivity results.

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The performers and nursing staff involved with each dialysis were interviewed on the same day as far as possible.

**Statistical analysis**

Analyses of the results were performed using student "t" test and $x^2$ (chi-squared) test as appropriate.

## RESULTS

Forty consecutive PD treatments were evaluated during the study period. There were 27 patients with a mean age 53±15 years [range 20-79] and the sex distribution was almost equal (13 female and 14 male patients). The Malay race predominated with 26 patients. Twenty-two patients had chronic renal failure and five had acute renal failure.

The underlying causes of acute and chronic renal failure are shown in Table I. Uraemia was the most common indication for dialysis while hyperkalaemia and pulmonary oedema were indications for urgent dialysis. Their mean blood urea, serum potassium and serum bicarbonate prior to the initiation of PD were 49.0±24.9 mmol/L, 4.9±4.7 mmol/L and 11.8±4.8 mmol/L respectively (Table II).

**Table I – Causes of renal failure in patients on intermittent peritoneal dialysis (IPD) in HUSM**

| Causes | | No. of patients |
|---|---|---|
| Chronic renal failure: | | 22 |
| Chronic glomerulonephritis | 13 | |
| Diabetic nephropathy | 4 | |
| Obstructive uropathy | 3 | |
| Urate nephropathy | 1 | |
| Analgesic nephropathy | 1 | |
| Acute renal failure: | | 5 |
| Acute tubular necrosis | 2 | |
| Acute interstitial nephritis | 1 | |
| Hepato-renal syndrome | 1 | |
| Obstructive uropathy | 1 | |
| Total | | 27 |

**Table II – Serum biochemistry of patients prior to initiation of peritoneal dialysis**

| Serum biochemistry | | mean ± 2 SD |
|---|---|---|
| Blood urea | (mmol/L) | 49.0 ± 24.9 |
| Sodium | (mmol/L) | 133.8 ± 8.3 |
| Potassium | (mmol/L) | 4.9 ± 4.7 |
| Bicarbonate | (mmol/L) | 11.8 ± 4.8 |
| Chloride | (mmol/L) | 100.4 ± 7.2 |
| Creatinine | (umol/L) | 1520.0 ± 1203.3 |
| Total calcium | (mmol/L) | 1.9 ± 0.2 |
| Phosphate | (mmol/L) | 3.1 ± 1.1 |
| Albumin | (G/L) | 33.4 ± 12.1 |

Efficiencies of PD for the purpose of this study were estimated using the differences in the pre and post serum urea level and fluid extractions. The mean urea lowering was 17.1±17.2 mmol/L and mean ultrafiltration was 2681±194 ml/day.

Complications of PD were divided into mechanical, metabolic and infection (Table III). Bleeding from peritoneal cavity occurred in 8 episodes of dialysis, 5 of which were light, 2 moderate and one severe bleeding needing blood transfusion. The bleeding was presumed to be related to uraemia as all of them with bleeding, except one, had prolonged bleeding time, normal platelet counts, normal prothrombin time and normal partial thromboplastin time. The fact that their bleeding settled spontaneously while patients were on PD further supported the view that the bleeding was uraemic in origin.

**Table III – Complications of intermittent peritoneal dialysis.**

| Complications | No. of episodes (n = 40) | % |
|---|---|---|
| A. Mechanical | | |
| Bleeding | 8 | 20.0 |
| Poor drainage | 4 | 10.0 |
| Bowel perforation | 1 | 2.5 |
| Abdominal pain | 1 | 2.5 |
| B. Metabolic | | |
| Hypokalaemia | 22* | 55.0 |
| Hyperglycaemia | 3 | 7.5 |
| C. Infection | | |
| Peritonitis | 6 | 15.0 |

*In 5 of the PD episodes there were more than one complications ie
2 episodes with bleeding + hypokalaemia
2 episodes with peronitis + hypokalaemia
1 episode with poor drainage + hypokalaemia

One of the patients with bleeding had acute leukaemia, and in addition to having a prolonged bleeding time she also had thrombocytopaenia. Her bleeding ceased following packed cells and platelet transfusion while she was on PD. Unfortunately she finally died of acute leukaemia.

Poor drainage occurred in 4 PD of which 3 needed reinsertion of catheter. Peritonitis occurred in 6 episodes and all presented with turbid effluent fluid. Culture was positive in 4. Two yielded mixed growth of gram negative bacilli, one grew *pseudomonas aerogenes* and the other grew *streptococcus pneumonia*. Treatment in 4 cases were intravenous cloxacillin and gentamicin. In two other cases intravenous cefotaxime was used. PD catheters were removed in all cases to control the unsettled infection. Treatment was successful in all except one patient who died of overwhelming septicaemia.

There were six deaths during this study period and the causes of death are shown in Table IV. Four of the patients who died had acute renal failure while the remaining two patients had chronic renal failure. Deaths were due to the underlying disease and not to uraemia as plasma biochemistry was well controlled in PD. Only one of the deaths can be attributed to uraemia. This patient developed pericardial tamponade soon after the initiation of PD. He presented with symptoms and signs of uraemia. His blood pressure was initially 190/110 mmHg, his jugular venous pressure was elevated. Heart sounds were clearly audible and there was no pericardial rub. While he was on PD, he suddenly became breathless and hypotensive. An echocardiogram done revealed massive pericardial effusion with features of pericardial tamponade. His blood pressure returned to his original baseline following pericardiocentesis. Unfortunately, the improvement in blood pressure was not sustained. He became hypotensive again and this time he did not respond to resuscitation. His relatives refused a post-mortem examination. Uraemic pericarditis with pericardial tamponade was presumed to be the cause of his death as the pericardial effusion aspirated was blood-stained and he was still clinically uraemic with the blood urea prior to his death being 55 mmol/L.

Various parameters of the procedure of PD were reviewed. The mean number of cycles per dialysis was 44±15, mean time spent on each dialysis was 59±24 hours and mean time per cycle was 77±14 minutes.

**Table IV – Causes of death in patients on intermittent peritoneal dialysis in HUSM**

| Causes of death | No. of patients | |
|---|---|---|
| | ARF | CRF |
| Septicaemia | 2 | – |
| Pericardial tamponade | – | 1 |
| Hepatorenal syndrome | 1 | – |
| Brain stem stroke | – | 1 |
| Acute leukaemia | 1 | – |
| Total | 4* | 2 |

ARF = Acute renal failure
CRF = Chronic renal failure
* $p < 0.05$ ($x^2$ with Fisher's correction).

Comparisons were made between episodes with peritonitis and those that were uncomplicated (Table V). Risk factors for an increased likelihood of developing peritonitis were a longer cycle duration (87±17 mins vs 75±12 mins, $p < 0.05$) and a less experienced operator performing the peritoneal dialysis (2.5±1.2 previous successful attempts vs 8.0±7.2, $p<0.05$). No similar risk factors could be identified when patients with mechanical complications were compared with patients without complications.

**Table V – Comparison between dialysis episodes complicated by peritonitis and uncomplicated episodes**

| Variables | Episodes with Peritonitis | Uncomplicated |
|---|---|---|
| Age (years) | 56±9 | 52±16 |
| Mean no. of cycles/dialysis | 36±10 | 45±16 |
| Mean time spent/dialysis (hours) | 52±16 | 60±25 |
| Mean time per cycle (min) | 87±17** | 75±12 |
| Clinical experience of performer prior to procedure (month) | 6.5±2.3 | 16.0±18.0 |
| Successful attempts of performer prior to proccdure (times) | 2.5±1.2** | 8.0±7.2 |

** $p< 0.05$.

## DISCUSSION

Peritoneal dialysis is performed frequently in the Hospital University Science Malaysia (HUSM) with a frequency of two dialyses per week (40 over 5 months). This was half the load to PD in the department of Nephrology which handles about 4 dialyses per week[2]. This frequency gives a fair chance for doctors and nurses to be skilful in the technique and nursing care of the dialysis procedure.

The procedure is mainly done in chronic renal failure patients with uraemia who are waiting for more definitive renal replacement therapy. Pulmonary oedema and hyperkalaemia were indications for urgent dialysis.

Although intermittent peritoneal dialysis (IPD) is generally regarded as an inadequate form of renal replacement therapy[4,5], it is still useful in the short-term while awaiting definitive long-term plans as shown in this study.

The mortality rate in patients on PD has been reported to vary between 5% – 12%[3]. Mortality in our study was 22%. Four out of five patients with acute renal failure died compared to two out of twenty-two patients with chronic renal failure. 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 uraemia. Only one death could be directly attributed to uraemia. This patient had pericardial tamponade due to uraemic pericarditis soon after initiation of PD.

The complication rate of 35% was comparable with other studies[1,3,6]. Vaamonde and Valk[3] reported 30-32% of dialysis were complicated by bleeding most of which were minor. In our study only 20% had bleeding and only one required blood transfusion.

Uraemic patients invariably have abnormalities of platelet function characterised by a prolonged bleeding time, abnormal platelet aggregation, abnormal platelet adhesion test and decreased release of platelet factor 3[7,8]. 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[7]. 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 uraemia. Bearing in mind that platelet function is significantly improved, although not completely corrected, by the institution of an effective dialysis[9], we persisted 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 uraemic in nature.

Other therapeutic modalities that have been shown to correct bleeding time of uraemia are infusion of cryoprecipitate[10] and injection of 1-deamino-8D-arginine vasporessin[9] and oral or parenteral administration of a conjugated oestrogen preparation[11].

The above measures were used in only one of our patients who required blood transfusion. This patient who had acute leukaemia was noted to have thrombocytopaenia in addition to prolonged bleeding time. The bleeding ceased with PD and blood transfusion but she finally died of acute leukaemia.

Poor drainage occurred in 4 episodes. It is recommended that a blocked catheter should be changed rather than flushed as this would predispose to infection. Peritonitis was a potentially serious complication. It occurred in 6 patients, giving a rate of 15%. This compared well with 17.2% recorded in the General Hospital Kuala Lumpur[2]. However, rates as low as 0.1% to 2% have been quoted in the literature[6,12]. The rate of peritonitis can be lowered by meticulous attention to aseptic technique during catheter insertion, followed by careful nursing care.

The isolation of gram-negative organisms from the effluent fluid in three out of four cases with positive culture was surprising. This may imply the presence of unsuspected intraabdominal pathology. Bowel perforation occurred in one episode of PD. The patient recovered well on antibiotics and was converted to haemodialysis. It is important to note that while treatment of bowel perforation may be conservative in some cases, most require laparotomy[12-14] and that this complication may be fatal[13].

The various parameters assessing the total dialysis time and time per cycle indicated a longer period of treatment with 59±24 hours per dialysis and 77±14 minutes per cycle compared with

the usual practice of 48 hours per dialysis and 60 minutes per cycle[15]. The longer period of treatment and longer period of cycles required to complete an intermittent PD was probably the result of using one-litre rather than two-litres exchanges. In addition, it was noted that the delay in the cycle occurred during the drain phase. Guidelines would be helpful in educating and maintaining efficient dialysis.

In conclusion, acute (stab) peritoneal dialysis was performed safely and effectively in Hospital University Science Malaysia. Complication rates were comparable to other studies. Improvement in insertion technique, shorter dialysis time and cycle time would enhance the safety of the procedure.


## ACKNOWLEDGEMENT

The authors thank Ms Ang Ing Ing for her help in typing and preparing the manuscript.


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