COMPLICATIONS OF PERITONEAL DIALYSIS: A REVIEW OF 226 DIALYSIS EPISODES IN 100 CONSECUTIVE PATIENTS TREATED WITH PERITONEAL DIALYSIS

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SUMMARY

226 peritoneal dialyses were performed on 100 patients. 28 patients presented with acute renal failure. Uraemia was the most frequent indication for dialysis. Peritonitis was an important complication and *Acinetobacter* species accounted for 51.5% of the positive cultures. Other complications included poor dialysate drainage and hypokalemia. Mortality was mainly due to causes unrelated to peritoneal dialysis.

INTRODUCTION

Peritoneal dialysis was first used for treatment of renal failure by Ganter in 1923.[1] Initially, it was not popular due to frequent complications such as peritonitis, leakage and poor dialysate drainage. Later, with newly designed catheters and commercial prepared solutions, its use in the treatment of uraemia rapidly increased after 1959, especially in the United States.[1]

Peritoneal dialysis is commonly used for treatment of uraemia in the General Hospital Kuala Lumpur, and is also practised in many other hospitals in Malaysia. This report reviews the experience in 100 consecutive patients treated by peritoneal dialysis in a single centre.

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MATERIALS AND METHOD

A retrospective review was done on 100 consecutive patients treated by peritoneal dialysis at the Department of Nephrology, General Hospital Kuala Lumpur, between October 1981 to October 1982. Indications for dialysis included uraemia (generally when blood urea exceeded 30 mmol/l), pulmonary oedema, hyperkalemia and pericarditis. Patients with acute and chronic renal failure were included in this review.

Dialysis was performed more than once in some patients. Patients with chronic renal failure had peritoneal dialysis performed during the period of evaluation. No patient had chronic peritoneal dialysis performed as a definitive procedure. The procedure was carried out in the general nephrology wards.

Technique

The peritoneal dialysis catheter was introduced by the stab method. Each cycle of one litre of standard peritoneal dialysis solution, not containing potassium was infused by gravity. After a dwell time of approximately 20 minutes, the dialysate was drained from the abdominal

cavity by gravity into a sterile plastic bag. Smaller exchange volumes were used for children. Peritoneal dialysis was generally conducted for 48 hours unless peritonitis occurred when the dialysis would be continued with intraperitoneal antibiotics until the peritonitis was controlled. The serum creatinine, blood urea and serum electrolytes were determined daily while the patient was on dialysis. Dialysate effluent was routinely sent for daily culture and sensitivity testing.

Definition of peritonitis

Peritonitis was diagnosed by the presence of the following: turbidity of dialysate; fever; abdominal pain and tenderness. As treatment of peritonitis was routinely started when turbidity of dialysate was detected, fever, abdominal pain and tenderness were not invariably present.

Treatment of peritonitis

Hourly exchanges containing intraperitoneal Gentamicin or Cefotaxime at 8 mg/l and 250 mg/l respectively were used in treatment of peritonitis. This was continued till the dialysate became completely clear.

RESULTS

226 episodes of peritoneal dialysis were performed on 100 consecutive patients. The age of these patients ranged from five months to 17 years (Fig. 1). 28 patients were treated for acute renal failure, and 72 for chronic renal failure. The aetiology of acute and chronic renal failure are presented in Table I. Uraemia was the most common indication for dialysis.

There were 39 (17.2%) episodes of clinical peritonitis. 27 of these had positive bacterial cultures. Turbidity of returned dialysate was the earliest sign of peritonitis. It was present in all cases of peritonitis. 30 of the 39 episodes of peritonitis were effectively treated by Gentamicin or Cefotaxime. The rest required

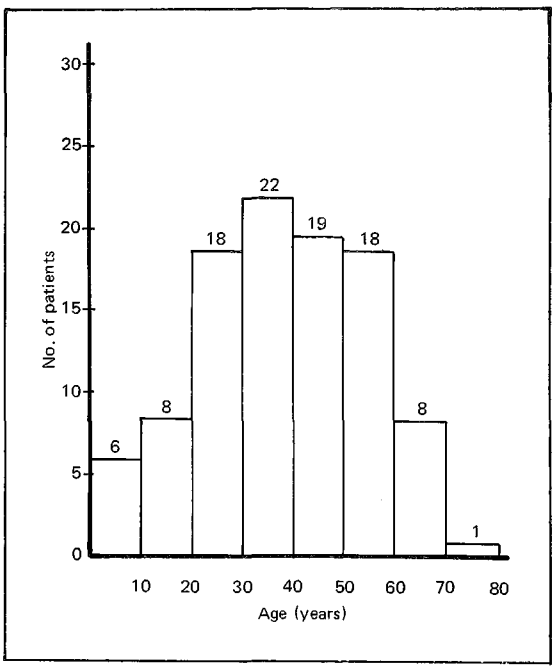

Fig. 1 **Age distribution of patients on peritoneal dialysis (youngest patient is five months; oldest patient is 70 years).**

TABLE I
AETIOLOGY OF ACUTE AND CHRONIC RENAL DISEASE

A: CAUSES OF ACUTE RENAL FAILURE

Cause	Number of patients	(%)
Acute tubular necrosis	15	60
Obstructive uropathy	8	22
Acute glomerulonephritis	5	18
Total	28	100

B: CAUSES OF CHRONIC RENAL FAILURE

Cause	Number of patients	(%)
Chronic glomerulonephritis	57	80
Obstructive uropathy	9	12
Diabetic nephropathy	6	8
Total	72	100

treatment with Carbenicillin, Tobramycin, Amikacin or Ampicillin. Only six of the 14

dialysis infected with *Acinetobacter* responded to treatment with Gentamicin or Cefotaxime.

Poor drainage was the commonest mechanical complication. 51 of the 52 cases had improved dialysate outflow after recannulation. Dialysate leakage was reported in 16 dialysis, five of which developed peritonitis. Bleeding was usually mild and self-limited. It occurred as dialysate-staining or oozing from around the cannula site. Only two patients had severe bleeding requiring blood transfusion.

Perforation of viscus occurred in three patients. Organs perforated were intestine, bladder and uterus. Hyperglycemia occurred in nine diabetic patients on dialysis. Only one patient had blood sugar levels above 15 mmol/l. Serum albumin measured in five patients before and after a bout of peritonitis showed a reduction in albumin level varying from 4g – 10 g/l.

There were 18 deaths amongst the 100 patients studied. One diabetic patient died from septicemia possibly secondary to peritonitis that did not respond to treatment. The other deaths were not related to treatment by peritoneal dialysis.

DISCUSSION

Pulmonary oedema and hyperkalemia were two indications for urgent dialysis. Patients were also dialysed for pericarditis, uraemia and

TABLE II
CULTURES OF PERITONEAL DIALYSATES IN PATIENTS WITH PERITONITIS

Organism	Number of dialysis episodes	(%)
Acinetobacter	14	51.9
E. coli	1	3.7
Klebsiella	1	3.7
Pseudomonas	1	3.7
Enterobacter	1	3.7
S. aureus	4	14.8
S. epidermidis	1	3.7
Mixed Growth	4	14.8
Total	27	100

TABLE III
MECHANICAL COMPLICATIONS OF PERITONEAL DIALYSIS

Complication	Incidence	(%)
Abdominal pain	17	7.5
Bleeding	24	10.6
Leakage around catheter	16	7.1
Poor drainage	52	23.0
Perforation of viscus	3	1.3
Miscellaneous:		
Haematoma	1)	
Hydrocoale	1)	1.8
Omental protrusion	2)	
Total	116	51.3

TABLE IV
MEDICAL COMPLICATIONS OF PERITONEAL DIALYSIS

Complication	Incidence	(%)
Hypokalemia (3.5 mmol/l)	41	18.1
Hypoalbuminemia (3.8 g/l)	5	2.2
Hyperglycaemia	4	1.8
Cardiac: chest pain	3)	1.7
arrythmia	1)	
Gastrointestinal tract: Diarrhoea	7)	3.5
Constipation	1)	
Others: Skin excoriation	5)	2.2
Bronchopneumonia	2)	
Total	69	30.5

TABLE V
CAUSES OF DEATH IN PATIENTS ON PERITONEAL DIALYSIS

Cause	Acute renal failure	Chronic renal failure	Total
Pulmonary oedema	2	3	5
Septicemia	1	3	4
Cardiac tamponade	–	2	2
Myocardial infarct	–	1	1
Uraemia	–	1	1
Massive GIT bleed	–	1	1
CVA	–	1	1
Unknown	–	3	3
Total	3	15	18

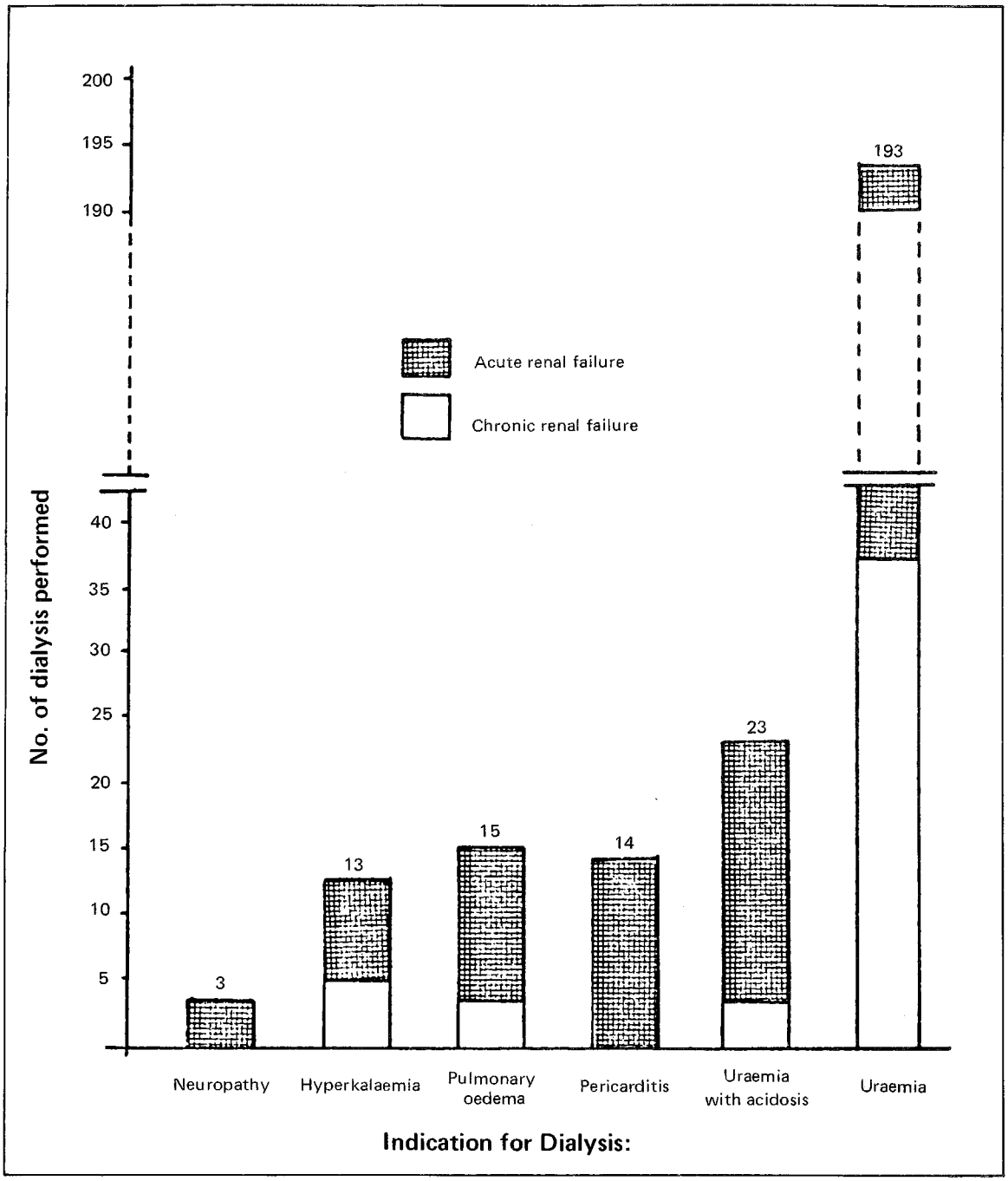

Fig. 2 Number of dialysis performed and indications for peritoneal dialysis.

neuropathy. Dialysis was performed early to avoid the onset of neuropathy in patients with chronic renal failure. In the three instances where dialysis was performed for neuropathy, the patients had presented late with neuropathy.

The main problems associated with peritoneal dialysis were peritonitis, inadequate drainage due to blockage by fribin and clots, minor episodes of bleeding and viscera perforation.

The incidence of culture proven bacterial peritonitis was 11.9%. There was a higher incidence of peritonitis in these cases with dialysate leakage and it was important that attention was paid to prevention of leakage at the start of dialysis.

Inadequate drainage due to blockage might require insertion of another catheter and flushing of the catheter should be avoided as it may cause infection. Bleeding into the dialysate was usually mild and self-limited. The low incidence of bleeding (10.0%) was probably an under-estimation as minor and transient bleeds may not have been documented. Vaamonde and Valk[2] reported that in 30–32% of dialysis blood-stained effluent was noted from the first exchange after catheter implantation.

The incidence of visceral perforation was similar to that reported by other authors.[3] The risk of intestinal perforation was higher in patients with previous abdominal surgery and abdominal distension secondary to ileus. Many treatment regimes have been proposed for intestinal perforation. Simkin and Rubin[3,4] recommended continuation of peritoneal dialysis under antibiotic cover while Maher and Denovales[5] suggested hemodialysis in these patients. In our patients, dialysis was resumed under antibiotic cover without complications. Bladder perforation should be avoided by complete emptying of bladder prior to initiating peritoneal dialysis.

Catheterisation might be necessary in comatosed patients. Bladder perforation in one patient was treated by continuous bladder drainage with a Foleys' catheter and cessation of dialysis.

Cardiovascular complications during dialysis might manifest as angina, myocardial infarction, arrythmias or cardiac arrest.[6] Tachyarrythmias were seen during dialysis especially in patients with underlying heart disease or those on digitalis.[6] The symptom of chest pain in our three patients was not related to any obvious cardiac disease.

Mortality associated with acute peritoneal dialysis was difficult to determine. Most of these patients were very ill and mortality has been reported to vary between 5–12%.[2] In our experience, all deaths except one were due to causes unrelated to the peritoneal dialysis procedure.

Peritoneal dialysis is a safe and invaluable method of treating uraemia particularly in Malaysia, where centre haemodialysis facilities are presently confined to Kuala Lumpur. From our experience peritoneal dialysis could be practised safely in general wards. Considering the severity of illness of these patients undergoing dialysis, mortality and morbidity had been minimal. Complications could be avoided by meticulous attention to detail during the procedure and frequent clinical assessment of the patient undergoing dialysis. This was particularly important in the treatment of acute renal failure where our experience had been that acute renal failure could be effectively treated by peritoneal dialysis.[7] Complications that do occur were readily treatable when detected early.

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