International Journal of Medical Research & Health Sciences

www.ijmrhs.com Volume 3 Issue 1 (Jan- Mar) Coden: IJMRHS Copyright @2013 ISSN: 2319-5886

Received: 2nd Sep 2013 Revised: 6th Oct 2013 Accepted: 3rd Nov 2013

Research article

THE USE OF PERITONEAL DIALYSIS IN THE MANAGEMENT OF PATIENTS WITH RENAL FAILURE AT INSTITUTE OF KIDNEY DISEASES, PESHAWAR

*Akhtar Sultan Z[1], Saleem Nasir[2], Hajira Bibi[3]

[1]Professor and Head, Department of Nephrology, Institute of Kidney Diseases, Hayatabad Medical Complex, Peshawar

[2]Training Medical Officer, Medical B Unit, Hayatabad Medical Complex, Peshawar.

[3]Clinical Nutritionist, Institute of Kidney Diseases, Hayatabad Medical Complex, Peshawar.

*Corresponding author email: nasirsaleems@hotmail.com

ABSTRACT

Peritoneal dialysis (PD) using an ordinary stylet cannula was studied in 253 patients (67% male and 33% female with age ranging from 3-67 years) suffering from renal failure. The study was conducted between January 2007 and December 2012. The procedure was well tolerated by the patients. The desired aims of dialysis including improvement in chemistry were achieved in all surviving (94.5%) cases. Mortality during PD was 5.5% and was related to the underlying causes of renal failure. Peritonitis seen in 30% cases was the commonest complication. Other complications in order of frequency were, hypokalemia (8%), severe hyperglycemia in diabetic patients (6%), and sever hypovolemia (5%), pericatheter leak (5%) and catheter blockage (2%). Perforation of the bowel, a serious complication occurring during insertion of the PD cannula was not seen in any of the cases. It is concluded from the study that PD is a simple and cost effective alternative to hemodialysis and have special advantages in the current set-up of the institute. The objective of our work was to study the results and complications of peritoneal dialysis in light of its efficacy as an alternative form of renal replacement therapy (RRT) to hemodialysis.

Keywords: Peritoneal dialysis, peritonitis, hyperglycemia, hypovolemia

INTRODUCTION

Renal replacement therapy (RRT) in the form of dialysis (hemodialysis/ peritoneal dialysis) or transplantation remains the sole treatment for patients who sustain renal failure. The gold standard for renal failure (End stage renal disease-ESRD) is transplantation but unfortunately it is restricted by financial limitations in developing countries like Pakistan.[1] Similarly the hemodialysis (HD) facilities are scarce due to the lack of necessary funds. At present there are only 175 dialysis centers throughout the country[2] and few of them are available in remote areas. The dialysis treatment is in-fact expensive and at the same time lifesaving but due to meager facilities and poverty, the PD is a cheaper option in CKD patients with good residual renal function.

Renal failure is becoming a public health problem with increasing incidence and prevalence, high cost and unfortunately poor outcome.[3]The total burden of ESRD continues to rise including patients with many advanced comorbidities.[4]The growing burden of this special population requires the use of alternative renal replacement therapy. Peritoneal dialysis (PD) is an alternative renal supportive therapy (RST) to HD which if use wisely can share some of the load. The utilization of peritoneal dialysis is low despite of equal patient survival on HD and PD, and fluctuates

only at around 15% of the ESRD population.[5,6] Both PD and HD have their specific advantages and disadvantages and different factors influence the choice of RRT. PD is generally preferred to HD in very small children and those with severe cardiovascular instability.[7,8]

The better preservation of residual renal function, lower risk of infections with hepatitis B and C, better outcome after transplantation, preservation of vascular access and lower cost are arguments to promote PD as a good initial treatment. Hospital based PD may be the only option for elderly with significant morbidities making them unable to undergo HD. Despite a valuable and effective option with acceptable survival rates the use of PD is still low for special group of ESRD.[6,9]

There have been very few publications on the clinical experience of PD in our country; this study was therefore conducted with the aim to describe our experience and results of PD at our institute.

MATERIAL AND METHODS

Sample size and study location: This study was conducted at the department of Nephrology, Institute of Kidney Diseases, HMC, Peshawar between Jan 2007 and December 2012 after taking approval from the ethics committee of our institution. A total of 253 patients who presented with end stage renal disease (ESRD) / Acute Renal Failure (ARF) were recruited from January 2007 to December 2012 (6 years).

Study subjects

Inclusion criteria: Subjects from all age groups, including paediatric population (less than 8 years old), patients with poor cardiovascular status (blood pressure less than 100 systolic, evidence of previous myocardial infarction or cerebrovascular accident) and those with hepatitis B surface antigen were given PD instead of HD. Patents from far flung areas were given palliative PD if it was felt that their prospects of long term dialysis or transplant were extremely poor. Lack of HD slot or unavailability of consumables in the HD unit as well as refusal for HD by the patients or their relative were another reason for choosing PD. Verbal and written informed consent was obtained from the participants of the study.

Exclusion criteria: Patients, who were hemodynamically stable, had prospects for long term maintenance hemodialysis and had prospects for renal transplantation. Those patients who had access and affordability for dialysis were excluded from the PD group. Age group more than 10 years with hemodynamic stability was also not included in the PD group.

Peritoneal Dialysis Procedure: Following urinary catheterization, PD cannula insertion was performed as a bedside procedure in the ward using aseptic techniques and local anesthesia. In order to avoid perforation of the bowl and facilitate optimum positioning of the PD catheter, intraperitoneal infusion of about two liter dialysate using an ordinary intravenous cannula was usually carried out prior to insertion of the PD cannula. The cannula was secured and the entry point was closed by applying a purse-string suture. Hourly exchanges with 500 ml to 2000 ml standard PD solution (Braun or Otsuka) were carried out. Two hundred units of heparin were added to each liter of dialysate. Proper record of exchange with emphasis on accurate fluid balance was kept.

Clinical and Biochemical assessment: Patients were assessed clinically and pre- and post-dialysis chemistry was measured to look at the efficacy of the dialysis.

Statistical analysis: All the results were expressed as percentages and frequencies by using Microsoft Excel (version 2010).

RESULTS

Gender based distribution of patients with renal failure

The data in table 1 show gender based distribution of patients with renal failure. It is clear from the table that among 253 patients 170 were male and 83 were female. The mean age of patients was 23 years ranged between 3 to 67 years.

Table 1: Gender based distribution of patients with renal failure

Gender	Number	Percentage
Male	170	67
Female	83	33

Causes of chronic renal failure (CRF)

The data in table 2 shows the various causes of chronic renal failure. Out of 253 cases 152 (60%) were suffering from chronic renal failure. Most of these patients had small echogenic kidneys (n=93) suggesting the underlying causes of glomerulonephritis in the majority followed by

diabetic nephropathy (n=18). The adult polycystic kidney disease was found in 16 cases followed by obstructive uropathy (n=14). Renal amyloidosis and cirrhosis was found in 6 and 5 cases, respectively.

Table 2: Causes of chronic renal failure (CRF) (n=152)

Causes of CRF	Number	%
Small echogenic kidneys (chronic glomerulonephritis)	93	61.18
Diabetic nephropathy	18	11.84
Adult polycystic kidney disease	16	10.53
Obstructive uropathy	14	9.21
Renal amyloidosis	6	3.95
Cirrhosis	5	3.29

Causes of acute renal failure (ARF)

40% (101) of the patients had ARF. Table 3 shows the causes of ARF from various causes.. The commonest cause of ARF was post-diarrheal volume depletion (n=24) followed by hemolytic uremic syndrome (n=15), obstetrics (n=13) and septicemia (n=12). Other factors responsible included obstruction from calculi (n=11), acute glomerulonephritis (n=7), acute tublo-interstitial nephritis (n=5), acute pyelonephritis (n=5), hemolysis (n=3), post-operative (post-CABG) (n=3), and poisoning (n=3), respectively.

Table 3: Causes of acute renal failure (ARF) (n=101)

Causes of ARF	Number	%
Post-diarrheal volume depletion	24	23.76
Hemolytic uremic syndrome	15	14.85
Obstetric	13	12.87
Septicemia	12	11.88
Obstruction from calculi	11	10.89
Acute glomerulonephritis	7	6.93
Acute tublo-interstitial nephritis	5	4.95
Acute Pyelonephritis	5	4.95
Hemolysis	3	2.97
Post-operative (post-CABG)	3	2.97
Poisoning	3	2.97

Reasons for choosing peritoneal dialysis

Reasons for choosing PD dialysis as an alternative to HD included; very small children (22.13%), HbsAg positive (11.86%), lack of HD slot (33.99%), palliative PD for CRF (33.99%) and cardiovascular instability (20.95%).

Table 4: Reasons for choosing peritoneal dialysis

Reasons for choosing PD	Number	Percentage
Small children	56	22.13
HbsAg +ve	30	11.86
Lack of HD slot	86	33.99
Palliative care for CRF	86	33.99
Cardiovascular instability	53	20.95

Hepatitis B surface antigen status of the patients given peritoneal dialysis

Thirteen patients in the ARF group and twenty patients in the CRF group had hepatitis B surface antigen positive (Table 5). Infection with hepatitis B may be associated with a variety of renal diseases i.e. membranous glomerulonephritis, membrane proliferative glomerulonephritis, IgA nephropathy, mesangial glomerulonephritis and amyloidosis etc.[23,24]

Table 5: Hepatitis B surface antigen of the patients given peritoneal dialysis

	HbsAg(+ve)	HbsAg(-ve)	Total
ARF	13	88	101
CRF	23	129	152
Total	36	216	253

(ARF: Acute renal failure, CRF: Chronic renal failure)

Effect of peritoneal dialysis on the blood chemistry of the patients

There was an overall improvement in the blood chemistry of the patients. The peritoneal clearance of blood urea and serum creatinine before and after dialysis in both ARF and CRF patients is presented in table 6.

Table.6 Effect of peritoneal dialysis on the blood chemistry of the patients

	Blood urea (mg/dl)	S. Creatinine (mg/dl)
Pre-dialysis in ARF	170-400 (mean 190)	8-18 (mean 12)
Post-dialysis in ARF	50-110 (mean 64)	1.2-3.5 (mean 1.4)
Pre-dialysis in CRF	280-324 (mean 300)	13-25 (mean 15)
Post-dialysis in CRF	100-150 (mean 120)	4-6 (mean 5.0)

(ARF: Acute renal failure, CRF: Chronic renal failure)

Complications during peritoneal dialysis

Various complications during peritoneal dialysis were also experienced (Table 7). The most common complication was peritonitis which occurred in 76 (30%) cases, which responded to antibiotic therapy and removal of the PD cannula. Traumatic complications from insertion of the PD cannula were infrequent and were mainly minor intra-peritoneal bleed (n=15). None of the patient had perforation of the bowl. Other catheter related complications included pericatheter leak (n=13). Scrotal edema (n=10), pain on running fluid (n=8) and blockage of catheter (n=5), the later responding to repositioning of the catheter. Metabolic complications encountered were hypokalemia in 20 cases, severe hyperglycemia in 15 diabetic patients and severe hypovolemia requiring intravenous fluids in 13 cases.

Table.7 Complications during peritoneal dialysis

Complications	Number	%
PD peritonitis	76	30.04
Blood stained effluent	15	5.93
Pericatheter leak	13	5.14
Scrotal edema	10	3.95
Pain on running fluid	8	3.16
Blockage of catheter (catheter repositioned)	5	1.98
Hypokalemia	20	7.91
Hyperglycemia (in diabetes)	15	5.93
Hypovolemia	13	5.14

Signs and symptoms of peritonitis

Signs and symptoms of peritonitis in order of frequency were abdominal pain (98%), fever (77%), rigors (33%), diarrhea (17%), nausea and vomiting (13%) and constipation (10%).

Table 8: Signs and symptoms of peritonitis (n=76)

Symptoms and signs	Number	%
Abdominal pain	75	98
Fever	59	77
Rigors	25	33
Diarrhea	13	17
Nausea and vomiting	10	13
Constipation	8	10
Abdominal tenderness	64	84
Leukocytosis	56	74
Cloudy fluid	76	100

Most patients with peritonitis had pyrexia (77%), abdominal tenderness (84%) and leukocytosis (74%). All (100%) patients suffering from peritonitis had cloudy fluid on return. Multiple other studies have also observed that more than 90% of the patients have cloudy fluid (100% of ours) and many have abdominal pain (98% of our patients).[27,28]

Frequency of organisms isolated from patients peritonitis

Table 9 shows the incidence of different organisms responsible for peritonitis. Gram positive organisms were responsible for 44 cases of peritonitis and were either due to Staph aureus (28 cases) or Staph epidermis (16 cases). Peritonitis caused by Gram negative organisms was seen in 32 cases. These comprised Pseudomonas (19 cases), Enterobacter (10 cases) and E.coli (3 cases). Culture from 13 cases of peritonitis did not reveal any growth. Findings from other studies also revealed that gram-positive organisms are more responsible for causing most episodes of peritonitis (64.6%) than gram-negative organisms (20.5%).[29]

Table 9: Frequency of organisms isolated from patients peritonitis (n=76)

Organisms	Number	%
Staphylococcus aureus	28	36.84
Pseudomonas	19	25.00
Staphylococcus Epidemidis	16	21.05
Enterobacter	10	13.16
E.coli	3	3.95

DISUCUSSION

The effectiveness of PD was evaluated in 253 subjects at the institute of Kidney Diseases, Peshawar. Kidney failure was more prevalent among male than in female. This was in agreement with the finding of Neugarten et al., (2000) that man experiences a more rapid decline in renal function and worse outcome than in female. The underlying mechanisms for this gender disparity are potentially related to differences between the sexes in glomerular structure, glomerular hemodynamics, diet, variations in the production and activity of local cytokines and hormones, and/or the direct effect of sex hormones on kidney cells.[10,11] Further it is stated that men with chronic kidney disease (CKD) are 50% more likely to progress to renal failure.[12]

The causes of CRF findings suggested that a broader spectrum of CKD risk factors including both infectious and environmental factors as well as genetics predisposes to earlier onset and more rapid progression of CKD. Therefore a basic understanding of the vulnerabilities will help the treatment and prevention of CKD in this population. [13] On the other hand there is variably among the causes of ARF and differ from country to country and vary from center to center in a country. However, there has been an overall increase in the incidence of ARF with the changing etiology of ARF in the recent years. The incidence of obstetrical, surgical and diarrhea related ARF have decreased significantly, whereas those of ARF associated with malaria, sepsis, nephrotoxic drugs and liver diseases have increased. [14]

The reason for using PD in our unit has gradually increased not only in ARF but also in CRF. 60% of our patients who had received PD had CRF. The usual form of PD given to CRF patients is CAPD using tencknoff catheter.[15,16] Unfortunately, both the tenckoff catheter and the CAPD solution are imported items making the treatment costly and practically unaffordable for most of our patients. Hence we carry out IPD using stylet cannula and ordinary PD solution.

In addition to financial restraints there are other reasons for our increasing use of PD. The majority of patients with CRF are usually illiterate with poor insight and hence generally non-compliant. Suffering from "denial syndrome" they often consult Hakims and visit shrines with the hope that their illness will be cured. Some of the patients belong to the far flung areas and are unable to attend frequently for maintenance HD. Commencing such patients on HD without ensuring HD its maintenance is of little benefit and may, in fact hazardous. For example, HD often causes loss of residual renal function and aggravates oliguria.[17] Oliguria has been implicated as a poor prognostic factor in ARF and often lead to life threatening pulmonary edema in CRF.[18,19] A few days of palliative PD rather than commencing on HD, in our experience stabilizes such patients and provides time for counseling and further planning such as establishing a permanent vascular access.

Our patients with CRF often face delays in getting a successful arterio-venous fistula. Dialysis in the meantime is often provided via a temporary vascular catheter usually inserted into the subclavian vein, which often gets infected. This can lead to life-threatening septicemia.[20] It also causes stenosis or occlusion of the vein and may lead to failure of arteio-venous fistula on that side subsequently.[21,22] By giving PD initially, we can prevent these complications.

Provided certain precautions are taken, insertion of the style peritoneal cannula is usually a safe procedure. Perforation of the bowl is, however, a known complication which usually responds to conservative treatment.[25,26] None of patients had either perforation of the bowel or severe hemorrhage. This was mainly due to our policy of introducing 2 to 3 liters of fluid into the peritoneal cavity before cannulation which minimizes the trauma. Minor bleeding occurred in five patients.

Peritonitis curing in 76 patients was the commonest complication and was mainly due to lack of proper aseptic condition on part of patient's relative. Dialysis was concluded when either the required aims were achieved or when peritonitis occurred. With removal of catheter and antibiotic therapy, peritonitis usually quickly settled. Pericatheter leak occurred in only five patients and responded to reduction in volume exchanges. Due to tremendous ultra-filtration, significant hypovolemia requiring the replacement fluid occurred in thirteen patients. Hypokalemia occurring in twenty of our cases was treated by the addition of potassium in the dialysate.

Most our patients accepted PD well. The immediate aims of dialysis such as amelioration of uremic symptoms, correction of acidosis and improvement in azotemia were achieved in all patients. Fluid overload was also successfully treated with PD. Fluid removal facilitated the use of nutritional fluid. Some of the patients initially treated with PD due to lack of space in HD unit were later shifted to HD when space became available and further dialysis required.

CONCLUSION

From our experience, we conclude that PD is an excellent form of dialysis for the treatment of ARF, especially in children and elderly with cardiovascular-instability. In addition, it can be used as an initial treatment in those cases of CRF where the prospects of regular follow-up for long-term dialysis are extremely poor or when there is likelihood of delay in getting a permanent vascular access established.

ACKNOWLEDGMENT

The authors sincerely thank the record keepers of our institution for maintaining and helping in retrieval of the relevant record.

RECOMMENDATION

There is a need for further studies including a larger sample size and long term follow up.

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