Original Article

http://journals.sbmu.ac.ir/jpn
https://doi.org/10.22037/jpn.v8i3.30716

Continuous Ambulatory Peritoneal Dialysis in Children: Experience from a Tertiary Care Center of Bangladesh

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Abstract

Background and Aim: Continuous ambulatory peritoneal dialysis (CAPD) is the most commonly used modality of renal replacement therapy (RRT) in children in different parts of the world. There is a paucity of published experience of CAPD in children from developing countries and also from Bangladesh.

Methods: We retrospectively studied children with end-stage renal disease (ESRD) that had been on CAPD from January 2014 to December 2018 in a tertiary care center of Bangladesh, over the past 5 years. The objective was to assess the clinical and biochemical profile, complications encountered and outcome of children on maintenance CAPD.

Results: Seven patients with ESRD were analyzed, mean age was 103 months (range 28-168 month), 4 were male and three were female. CAPD was done in 2014 to a 7year old girl and subsequently 6 patients underwent CAPD. Outcome analysis of CAPD showed that only 6 episodes of peritonitis occurred among these 7 patients. Their follow up parameters showed that they are performing very well in context of growth, biochemical parameters and albumin level but one patients died due to sepsis and poor adherence.

Conclusion: It can be concluded from these series of CAPD patients that CAPD could be a good choice of RRT in children in Bangladesh. It can reduce the uremic features as well as improve health status.

Keywords: Children; Continuous ambulatory peritoneal dialysis; End stage renal disease.

Received: June, 2020
Revised: June, 2020
Accepted: June, 2020

Conflict of interest: The authors declare no conflict of interest.
Please cite this article as: Mamun AA, Rahman MH, Jesmin T, Huque S, Begum A, Uddin GM, et al. Continuous Ambulatory Peritoneal Dialysis in Children: Experience from a Tertiary Care center of Bangladesh. J Ped Nephrol 2020;8(3):1-5. https://doi.org/10.22037/jpn.v8i3.30716

Introduction

End stage renal disease (ESRD) is increasing day by day in children and reported prevalence is 15 to 74.7 cases per million children (1). Renal Replacement Therapy (RRT) is the ultimate treatment for ESRD. Among the modalities, continuous ambulatory peritoneal dialysis (CAPD) has become popular around the globe in children (2-4).

For its simplicity, Peritoneal dialysis (PD) has been well encouraged and practiced in developing countries (5). PD is gaining its popularity as, it can be performed at a relatively low cost, less reliant than other dialysis techniques like hemodialysis (HD) which need expensive infrastructure and also because it is a home-based technique, there are savings on travel expenses (6).

There are two methods of CAPD catheter insertion. Surgical method of catheter insertion is performed by surgeons under general anesthesia (G/A). Percutaneous technique is performed by nephrologists, which is minimally invasive, reliable, safe and cost effective method7. But the major and significant problem with PD is development of peritonitis (7).

Though, in adult studies have shown estimated global CAPD-related peritonitis rates are 0.24–1.66 episodes per patient-year (8), very few studies have

been reported in children. Although developed countries have observed a gradual decline in the prevalence of CAPD-related peritonitis due to improvements in the CAPD techniques, the same trends have not been reported in low-income and middle-income countries (9). Various socio-demographic factors, including availability of safe water, sanitation, number of occupants at home (10), level of education, distance from the dialysis units as well as clinical and biochemical factors have been associated with CAPD-related peritonitis in developing countries (11). It is assumed that for every 0.5 per-year increase in peritonitis rate, can increase death rates by 4% – 18% (12).

Since CAPD program was initiated, there has been no report on the outcome of pediatric patients undergoing CAPD from this center. This study was aimed to assess the clinical and biochemical profile, complications encountered and outcome of children on maintenance CAPD, the first five-year experience.

Methods

This single center retrospective analytic study was done from January 2014 to December 2018 in a tertiary care center of Bangladesh to assess the clinical and biochemical profile, complications encountered and outcome of children on maintenance CAPD. Study population: As we had started CAPD form January 2014 in our institution, all the patients who underwent CAPD within last 5 years were included in the study.

Study Procedure

Data were collected from hospital records for children with ESRD who underwent CAPD during the study period. The demographic data, investigations performed and complications encountered were recorded for all patients included in the study and were analyzed for their indication of PD, procedure, complications, rate of infection and outcome. Peritonitis was defined as a white blood cell (WBC) count >100 cells/mm^3 in the affluent sample taken, preferably after a minimum dwell time of four hours. Exit-site infection (ESI) was defined as purulent drainage from the exit site, with or without erythema. Technique failure was defined as transfer to long-term HD with removal of PD catheter due to any reason.

The data of the study patients were analyzed by SPSS version 21 for statistical analysis. The data were described as mean and standard deviation.

Results

Seven patients with ESRD were analyzed, mean age was 103 months (range 28 to 168 months), 4 were male and three were female (Table 1).

Procedure and prescription

Among 7 patients only one patient underwent percutaneous insertion and 6 patients underwent surgical procedure with omentectomy. Tenckhoff, double cuff, coiled, silicon catheter was used in 6 patients where as Tenckhoff, double cuff, straight, silicon catheter was used for 1 patient. Exit site orientation was lateral in 2 patients and rest were downward.

Table 1. Socio-demography & Clinical profile

Case no.	Age	Sex	Cause of ESRD	Residence	Socio-economic status
01	4YR 6MO	F	Obstructive uropathy	Urban	Middle class
02	13YR	M	MPGN	Rural	Middle class
03	7YR	F	Primary VUR	Rural	Lower middle class
04	4YR	F	Neurogenic Bladder	Rural	Middle class
05	14YR	M	Nephro-calcinosis	Urban	Upper class
06	14YR	M	MESPGN	Urban	Lower middle class
07	28MON	M	Obstructive uropathy	Rural	Middle class

PET test was done in every patent after 4-6 week, 4 patients found to have low average, 2 had low and 1 had high transporter. For all patent, 4 cycles per day prescription was initiated (Table 2).

Complications

Five patients experienced 6 episode of peritonitis, 2 patients had exit site and tunnel infection. Non-infectious complications were observed very few with hernia in 1 patient (Table 3). Episode of peritonitis was found 0.85 episode per patient year. Two patients were found culture positive with gram positive cocci.

Biochemical parameters

After analysis of biochemical parameters, it was observed that all patients had better biochemical parameters regarding blood urea, serum creatinine, serum potassium, serum albumin and hemoglobin percentage (Table 4).

Table 2. Procedure & Prescription

Case no.	Catheter insertion	Catheter type	Exit site orientation	PET result	Prescription
01	Surgical	Tenckhoff, double cuff, Coiled, silicon	Downward	Low	4 cycle
02	Percutaneous	√	Lateral	Low average	4 cycle
03	Surgical	√	Downward	Low avarage	4 cycle
04	Surgical	√	Downward	Low	4 cycle
05	Surgical	√	Lateral	Low average	4 cycle
06	Surgical	Tenckhoff, double cuff, Straight, silicon	Lateral	High	6 cycle
07	Surgical	√	Downward	Low average	4 cycle

Table 3. Complications

A. Mechanical complications	
a. Catheter-related	
Outflow failure	1
Leakage	1
Pain	3
Catheter tip migration	1
b. Intra-abdominal pressure related	
Abdominal distension	1
Hernia	1
B. Infectious complications	
Infections	**Number of episode**
Exit site infection	2
Tunnel infection	2
Peritonitis	6

Table 4. Biochemical Parameters Before & After CAPD

Laboratory Parameter	Before CAPD (mean ± SD)	After CAPD (mean ± SD)
Blood Urea	205±13 mg/dl	94±18 mg/dl
Serum Creatinine	11.6±3.3 mg/dl	6.2±2.5 mg/dl
Serum Potassium	5.4±1.7 mg/dl	3.4±1.3 mg/dl
Serum Albumin	22.7±1.9 mg/dl	28.2±2.4 mg/dl
Hemoglobin	7.7±3.1 gm.dl	10.2±1.1 gm/dl

Outcome

Four patients (57.16%) are still on CAPD, 1 patient had renal transplantation, 1 patient transferred to hemodialysis and 1 patient died due to poor compliance and sepsis (Table 5).

Table 5. Outcome of Children on CAPD

Outcome	No. (%)
On CAPD	04 (57.16%)
Transfer to HD	01 (14.28%)
Kidney transplantation	01 (14.28%)
Death	01 (14.28%)

Discussion

In the present study, the characteristics and outcomes of CAPD for children in a single center in Bangladesh were evaluated. From only 1 patient choosing CAPD as dialysis modality in 2014, the number of patients has grown to a total of 7 patients in the past five years. Though the number is not very significant but the institution is trying best to increase its popularity among patients. Patient satisfaction with CAPD might be increased over the period of time especially in parents with babies and young children, because PD could avoid the complications of HD access (13) Moreover, CAPD patients had more flexible diet and fewer fluid restriction compared with HD patients (14). They also had greater full-time school attendance rate compared to those on HD (15). These positive CAPD experiences have encouraged us to promote CAPD to other children with ESRD requiring dialysis.

In this center, the most common causes of ESRD were congenital anomalies of the kidney and urinary tract (Table 1), similar to the International Pediatric PD Network (IPPN) report (16).

Being presented acutely, emergent dialysis (initiation of HD < 48 hours after hospital admission) was required. Obtaining parental consents to choose CAPD as the initial RRT were quite challenging as some parents were more familiar with HD since HD had been a popular option as an ESRD treatment in adults. Furthermore, PD was perceived to be more hassle compared to HD and required caregivers' daily discipline.

Regarding procedure most children got surgical placement and most patient received Tenckhoff, double cuff, coiled, silicon catheter (Table 2). Though last two cases received straight catheter and now we are practicing straight catheter. As, catheters with a straight intraperitoneal segment like the Tenckhoff catheter showed in general slightly better results (17). The skills of the surgeon who implants the catheter remained the most important factor for success. Moncrief and Popovich proposed a new catheter implantation technique where the distal part of the catheter was buried and exteriorized shortly before its clinical use (18). Though, this was not confirmed in randomized studies. Direction of catheter was downward in most of the cases.

Peritonitis remains a serious complication of PD as it may directly contribute to the mortality in PD patients. Furthermore, peritonitis is the most important risk factor of PD technique failure. Therefore, International Society of Peritoneal Dialysis (ISPD) recommends every CAPD program to reduce the peritonitis incidence to be lower than 0.5 episodes per year at risk. In the current study it was little bit higher (0.85 episodes per patient year). Our peritonitis rate is higher with that of high-income countries, which are approximately 0.47 episodes per year at risk (16). PD fluid cultures were obtained for all patients with peritonitis in which

two patients were found culture positive with gram positive cocci. This culture results suggested that peritonitis was caused by skin-derived microorganisms. Poor hand hygiene might explain the bacterial contamination from the skin.

In the present study there was satisfactory level of improvement of weight, nutritional status (serum albumin) and declining of serum creatinine after CAPD (Table 4). There have not been any comparative studies of peritoneal dialysis and hemodialysis outcomes in children with end-stage renal disease to suggest superiority of one procedure versus the other. While the majority of pediatric patients with ESRD who require dialysis can be managed with chronic peritoneal dialysis (CPD), the choice of dialysis modality is most often based on patient and family preference, center philosophy, and availability of the desired modality. Four patients is still in CAPD, 1 got live related renal transplantation, 1 switched to hemodialysis and one patient died due to poor compliance and sepsis (Table 5). As a new approach this has been good so far. We need more dedicated team to improve the service and growing interest for the patients.

Limitation

It is a single center study with retrospective design and small sample size.

Conclusion

It can be concluded from these series of CAPD patients that CAPD could be a good choice of RRT in children in Bangladesh. It can reduce the uremic features as well as improve health status. Periodic evaluation of the program is also necessary.

Acknowledgments

Not declared.

Conflict of Interest

The author declares no conflicts of interest.

Financial Support

Not declared.

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