Continuous Ambulatory Peritoneal Dialysis programme: Experience of state run tertiary care centre

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Abstract:

Background: Chronic ambulatory peritoneal dialysis (CAPD) is a form of renal replacement therapy in patients with end-stage renal failure in India, other than hemodialysis. Because of its cost and technical demand was mostly used in urban area in India. The objective of this paper is to report the experience with CAPD as a modality of renal replacement therapy from a tertiary care hospital in south India with low socioeconomic group of population.

Methods: We report a prospective study in a large south indian tertiary hospital. This study involved the patients who were initiated on CAPD between april 2011 and january 2016 and who survived and/or had more than 6 months follow up on this treatment with last follow up till July 30, 2016 Infection rates as well as factors that may influence them were studied.

Results: Forty five patients were enrolled. There were 24 males and 21 females. The mean age was 46±10 (range 5–70) years and mean duration on dialysis at the end of the trial period was 23 months. Shift to haemodialysis occurred in 13.3% of patients (n=6). One patient had exit-site infection, six patients had peritonitis and 4 lead to removal of catheter. Other 2 cases catheter removal done for migration and in that one underwent reinsertion.16 patients died in the study. The main cause of death was cardiovascular complications. Peritonitis rate is 1 in 32 patient months, which is better than the guidelines.

Conclusion: Chronic ambulatory peritoneal dialysis (CAPD) is a safe and viable mode of renal replacement in low socioeconomic group of population. The peritonitis rate and aetiology are similar to the developed world. It can use as procedure for ESRD patients dwelling in low socioeconomic group of population in developing countries such as India.

Keywords: CAPD, hemodialysis, peritonitis, catheter removal

Introduction

In developing countries like India, the management of end-stage renal disease (ESRD) is largely based by economic considerations. In the absence of health insurance plans, only 5-10% of all patients with ESRD in India obtain some form of renal replacement therapy(1,2). Most hemodialysis units are situated in cities and are not accessible to patients living in rural areas. In the early 1980s, the combined financial burden and considerable patient morbidity and mortality associated with peritonitis limited the appeal of continuous ambulatory peritoneal dialysis (CAPD) as a dialysis modality in ESRD patients(3).
However, technical advances in connecting system, flush before-fill technique and use of Ultra Bag have recently decreased the peritonitis rate, thereby making CAPD a feasible alternative to hemodialysis (HD) in India (3). Although CAPD has been an established form of therapy in adult patients with end-stage renal failure in India for more than a decade, less than 10% of patients are started on peritoneal dialysis (PD) to date because the cost of PD is two times higher than that of HD. Majority of the patients on this therapy are from urban areas (3-6).

In 2008, only 11% of the dialysis population worldwide was treated with PD and numbers are gradually increasing. The prevalence varies significantly between regions, with the proportion of dialysis patients on PD being as high as 79% in Hong Kong (7). Education of health care professionals and patients regarding this treatment strategy and its benefits is key for improving PD use.

The Karnataka state is inhabited by over 60 million people with majority of the population 74.2% living in rural areas as compared to the national average of 72.2% (2001 Census). Institute of Nephro-Urology (INU), Bangalore, Karnataka is the only government run tertiary care hospital in the state of Karnataka providing renal replacement therapy services. There is no other dialysis center in this state that offers transplant and Peritoneal dialysis. Therefore, chronic PD was started as a modality of renal replacement therapy for ESRD patients.

All patients had surgical implantation under spinal anesthesia of two-cuff straight Tenckhoff catheters. After the break-in period, the patients were initiated on manual exchanges using twin-bag system; the first 10 patients, the treating nephrologist gave education and training in PD and was helped in this job by the corporate colleagues in the rest of the patients.

All patients were taught to apply 2% mupirocin cream to the exit site with a cotton bud, following daily exit-site care. Patients were advised to immediately contact telephonically the treating nephrologist for any assistance and advice. Patients with suspected peritonitis were advised to come to the hospital for microbiological analysis of the cloudy peritoneal effluent and treatment. Peritonitis was defined as cloudy fluid and/or abdominal pain associated with a white blood cell count >100 (with >50% neutrophils). All patients with peritonitis were treated as per the International Society for Peritoneal Dialysis protocol (8). All patients who survived and/or had more than 6 months follow up on this treatment were included. The comorbid illnesses, survival and complications related or unrelated to peritoneal dialysis were reviewed.

**Results**

A total of 45 patients, all were included in the analysis. Demographic and clinical characteristics of the patients are shown in Table 1.

Forty five patients were enrolled. There were 24 males and 21 females. The mean age was 46±10 (range 5–70) years and mean duration on dialysis at the end of the trial period was 23 months.
Table 1: Demographic and clinical characteristics of the patients

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
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<tbody>
<tr>
<td>Age (year)</td>
<td>46 ± 10</td>
</tr>
<tr>
<td>Female gender n (%)</td>
<td>21 (46)</td>
</tr>
<tr>
<td>Cause of ESRD n (%)</td>
<td></td>
</tr>
<tr>
<td>Diabetic nephropathy</td>
<td>14 (32)</td>
</tr>
<tr>
<td>Chronic glomerulonephritis</td>
<td>12 (26)</td>
</tr>
<tr>
<td>Chronic tubulointerstitial nephritis</td>
<td>9 (20)</td>
</tr>
<tr>
<td>Polycystic kidney disease</td>
<td>1 (2.2)</td>
</tr>
<tr>
<td>Comorbidity n (%)</td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td>14 (32)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>45 (100)</td>
</tr>
<tr>
<td>Coronary artery disease</td>
<td>7 (16)</td>
</tr>
<tr>
<td>Follow up in patient-months Total</td>
<td>1064.1</td>
</tr>
<tr>
<td>Patient and technique survival in months Mean ± SD</td>
<td>32.1 ± 12.4</td>
</tr>
<tr>
<td>Peritonitis rate</td>
<td></td>
</tr>
<tr>
<td>Episode in patient-months</td>
<td>32</td>
</tr>
<tr>
<td>Exit site infection</td>
<td>1</td>
</tr>
</tbody>
</table>

The location of residence was 8 (32%) patients within 50 km, 12 (48%) patients within 50.150 km and 5 (20%) patients were located at a distance greater than 150.300 km. Eighteen (72%) patients out of the total lived in rural areas and all patients were BPL (Below poverty line) card holders. The causes of ESRD were as follows: diabetic nephropathy 8 (32%), chronic tubulointerstitial nephritis 9 (36%), hypertension 5 (20%), chronic glomerulonephritis 2 (8%) patients and autosomal dominant polycystic kidney disease 1 (4%) patient. Comorbid conditions were as follows: hypertension 45 (100%), diabetes 9 (36%), coronary artery disease 4 (16%) patients. The mean break-in period was 14 ± 3 days. The standard prescription for all patients consisted of three daily exchanges with 1.36% glucose solution. Some patients utilized 2.27% and 3.86% strengths for the night dwell to aid the achievement of better ultrafiltration.

The total follow up was 1064.1 patient-months with a mean follow up of 32.1 ± 12.4 months. At the last follow up, the mean values of urine output and ultrafiltration were 350 and 1120 ml, respectively. Five (12.5%) patients were anuric. All patients were treated with parenteral iron and erythropoietin. The latest value of hemoglobin was 10.5 ± 1.5 g/dl; albumin, 2.8 ± 0.5 g/dl; calcium, 8.7 ± 1.0 mg/dl; phosphorous, 3.4 ± 0.8 mg/dl; total cholesterol, 184 ± 43.3 mg/dl; and triglyceride, 137.6 ± 39.3 mg/dl.

All patients used mupirocin cream daily at the catheter exit site. One patient had exit-site infection (ESI). There were 6 episodes of peritonitis. One patient was associated with exit site or tunnel infection. Touch contamination is defined as a break in the sterile technique by which dialysis is supposed to be performed. Examples encountered were failure to wash or dry hands appropriately before performing the procedure, especially during winter months, and inattention to avoiding connector tip contamination when connecting and disconnecting the transfer set and the twin bag. In many patients, problems observed included the execution of dialysis by inadequately trained helpers such as family members and in general less meticulous adherence to hygienic technique. The culture report available in all patients showed the growth of microorganisms in 4 patients, gram-positive in 1 patients and gram-negative in 3 patients. The rate of peritonitis was 1 episode per 32 patient-months during the treatment period. Four patients with severe peritonitis required catheter removal after a mean duration of 13.7 ± 9.8 months on PD. One patient had successful reinsertion of catheter and the other 6 patients were transferred to hemodialysis. 29 (64.4%) patients were alive. 16 (35.6%) patients had died after a mean duration 19.7 ± 10.1 months on dialysis. The common cause of death was cardiac followed by infection.
Discussion

Our study demonstrates that CAPD is a safe and viable mode of renal replacement in low socioeconomic population. Although the demographic profile and pattern of comorbidities of our patients was comparable to other studies in the urban setup(2,3), only one-third of the patients under our study were diabetic, whereas the other studies have reported a higher proportion of diabetic patients. Patients on dialysis require ongoing supervision by nephrologists to adjust the dialysis prescription and manage complications. Since PD patients typically perform the treatment themselves in their own homes, they tend to have more autonomy than those treated with hemodialysis, which typically must travel to a health-care facility at least three times weekly to receive their dialysis treatment. Remote residence location might act as a geographical barrier to proper care once established on PD. Thus, it is plausible that patients who live further away from nephrology services may be more likely to initiate renal replacement on PD, allowing them to avoid relocation at the expense of adverse clinical outcomes(9). Our study found comparable clinical outcomes to previous studies of CAPD from major urban centers from this country.

Catheter-related infections (CRIs) have become a prominent morbidity factor in CAPD. Staphylococcus aureus (S. aureus)-associated peritonitis and catheter exit-site infections (ESIs) are important causes of hospitalization and catheter loss in patients undergoing chronic peritoneal dialysis. Several controlled studies have shown that prophylactic use of mupirocin, either intranasally or at the exit site, in S. aureus carriers reduces the incidence of both ESI and peritonitis(10,11). Recent studies have shown that when prophylactic mupirocin is used at the exit site in patients on PD, even when their carrier status is not known, there is still a significant reduction in the incidence of ESI and peritonitis in comparison to historical controls(12,13). All our patients used mupirocin cream daily at the catheter exit site. Only 1 patient had exit-site infection. Only 1 of the peritonitis was associated with exit site or tunnel infection. Our study demonstrates that the daily application of mupirocin at the exit site is an effective strategy in reducing the incidence of ESI and peritonitis which may thus have important benefits in reducing the rate of technique failure, thereby maintaining a greater number of patients on PD for longer periods, even in tropical countries such as India.

The peritonitis remains a major cause of technique failure, morbidity and mortality in CAPD patients. The peritonitis rate in the major centers in India is one episode in 22-26 patient-months(14). The rate of peritonitis in our patients was 1 episode per 32 patient-months during the treatment period. The peritonitis episodes are well within the accepted ISPD 2016 Guidelines. One episode every 36 patient-months (0.67 per year at risk). It has been found that climatic factors affect the incidence of peritoneal dialysis-related peritonitis. More extensive training and retraining and meticulous adherence to hygienic technique need to be pursued for all patients. Proper hand hygiene techniques need to be well taught and persistently respected by patients and medical staff. In our peritonitis patients, the culture could be carried out in all patients(6) and growth of microorganisms was observed in 3 of them. Thus, the culture-negative infection rate was almost 50%, that is, higher than the maximum of 20% recommended by the ISPD. Deficiencies in culture techniques, culture done after the institution of antibiotics, late processing and poor preservation of PD fluid could account for this large number of culture-negative peritonitis episodes. Several difficulties impede the implementation of the appropriate processing technique in our setting as advised by the ISPD guidelines. Blood culture bottles are expensive and not uniformly available. The culture procedure followed many circumstances is injection of a few milliliters of the dialysate directly into solid culture media and checking daily for growth.
However, certainly there is a need to improve the results of our microbial cultures. In developing countries, infections are the leading causes of morbidity and the second commonest cause of mortality in the dialysis population. Further, the infection rate is higher in government funded hospitals that cater to patients from the lower socioeconomic groups. The principal causes of death are cardiovascular (40–51%) and infections (15–23%)(15). A similar morbidity and mortality figures were observed in our patients. There are certain limitations for PD practice in our setting.

Continuous ambulatory peritoneal dialysis (CAPD) seems to be the ideal dialysis option for patients of low socio-economic population and rural areas, but high costs preclude its widespread usage (our study funded 50% by government of Karnataka). Hospitals are unwilling to invest in PD program as the in-center HD is more visible than in home PD. As our PD program is relatively small, the PD training support team such as trained healthcare staff and a regular clinical coordinator (CC) are not available. Due to lack of laboratory facilities, adequacy studies are not possible. The local manufacture of PD solution either by major international companies or by their local competitors avoids onerous tariffs and transport costs, and it is beginning to turn the economics in favor of PD. Increasing the affordability, PD attaining critical mass and gaining acceptance, increasing patient awareness and understanding the realistic therapy price difference in PD vs HD will facilitate the widespread use of PD. As the output and use of PD solution manufactured by indigenous companies increase and numbers of PD patients treated rise, one hopes the economies of scale will further decrease PD costs.

In conclusion, CAPD is a procedure for ESRD patients of low socioeconomic population and rural places. It is an excellent alternative suitable for patients who are living in far areas where facility of hemodialysis is not available. Good results can be achieved by carefully selecting patients who have sufficient resources and can strictly adhere to the basic principles of asepsis. It can emerge as a safe, viable mode of renal replacement therapy for ESRD patients of low socioeconomic population and rural areas in developing countries such as India.

References


