Automated peritoneal dialysis in Brunei Darussalam

Ishrat KAMAL, Yin Ping LIEW, Shafiqul CHOWDHURY, Jackson Chee Seng TAN, Department of Renal Medicine, Rimba Dialysis Centre, Bandar Seri Begawan, Brunei Darussalam

ABSTRACT

Introduction: Management of chronic kidney disease in Brunei Darussalam has become more challenging as the number of patients reaching end-stage kidney failure increased dramatically within the last ten years. Currently, most are managed with haemodialysis while a smaller proportion is managed with continuous ambulatory peritoneal dialysis (CAPD). Automated peritoneal dialysis (APD) is a form of peritoneal dialysis and has been used in Brunei Darussalam since May 2008. **Materials and Methods:** Eight patients participated in this prospective clinical trial. As all APD patients had previously been on CAPD, comparisons are made between the outcomes of APD against CAPD. **Results:** The median and mean age of APD patients were 42 and 45.5 ± 12.73 years respectively. After switching to APD, the serum haemoglobin and albumin improved from 10.56 ± 1.95 gm/L and 27.88 ± 7.71 gm/dL to 12.26 ± 1.82 gm/L and 33.63 ± 6.89 gm/dL respectively (p values <0.05). This corresponded to improvements in seven (87.5%) and six (75%) patients respectively in both parameters. Erythropoietin requirement was reduced in six (75%) patients, including three (37.5%) patients who were able to stop erythropoietin completely. There was no peritonitis encountered. All patients reported improved quality of life with better sleep, appetite and general well-being. **Conclusions:** Our study showed that APD was as good as CAPD with improvement seen in both laboratory and quality of life parameters. There was also reduction in erythropoietin requirement. Based on these findings, we will actively encourage and promote APD as opposed to CAPD in our population.

Keywords: End stage renal failure, dialysis, renal replacement therapy, peritoneal dialysis

INTRODUCTION

Management of chronic kidney disease in Brunei Darussalam has become more challenging as the number of patients reaching end stage kidney failure increased dramatically within the last ten years. There are currently 482 patients in the chronic dialysis programme compared to 218 patients ten years ago. This represents an increase of 117% and is largely disproportionate when compared to the 20% increase in the general population over the same time period. This problem is compounded by the limited role of renal transplantation. Currently, dialysis patients have to be referred to Singapore for renal transplantation and at present, the numbers of patients having transplantations are not enough to cancel out the incidence of

Correspondence author: Jackson TAN
Department of Renal Medicine,
Rimba Dialysis Unit,
Bandar Seri Begawan, Brunei Darussalam.
Tel: +673 2450483, Fax: +673 2450483
E mail: drjacksontan@yahoo.co.uk

new dialysis patients. As such, the number of patients on the chronic dialysis programme is expected to increase.

There are currently three modalities of dialysis available in Brunei Darussalam: haemodialysis (HD), chronic ambulatory peritoneal dialysis (CAPD) and automated peritoneal dialysis (APD). At present, there are 413 patients on HD, 61 patients on CAPD and eight patients on APD. More patients from the pre-dialysis programme are expected to join the dialysis programme the future years. This excludes those patients who are currently not known to the renal services but may present acutely requiring long term dialysis.

APD is a type of peritoneal dialysis which involves the use of an automated machine to perform fluid exchanges (Figure 1). This differs from the manual exchanges that are required for CAPD. APD patients will usually connect themselves to the APD machine at night before going to bed and the machine will perform the required dialysis exchanges as the patients sleep. Patients are not usually required to perform any more dialysis exchanges during the rest of the day. Preparation and care for the peritoneal dialysis tube is usually the same for both types of peritoneal dialysis. Uncomplicated APD patients are assessed in the outpatient settings every two months, which is similar in management for CAPD.

MATERIALS AND METHODS

This APD pilot study was carried out in our local setting from March 2008 to March 2009. The purpose of this pilot project was to assess the feasibility of carrying out APD in our local setting and to assess for differences in outcomes and performances compared to that achieved in CAPD.

Seven existing CAPD patients were enrolled into the study. These patients were selected for different reasons: peritoneal fluid leak associated with CAPD (n=1), carer-related problem (n=1) and work-related convenience (n=5). One patient who was already on privately funded APD was also included in the study. All eight patients were advised that they could opt out of the project at any time. They were required to sign the consent and lease forms in order to participate in the project as well as use the APD machines. They were given sufficient training by our PD staff before being allowed to use the machine

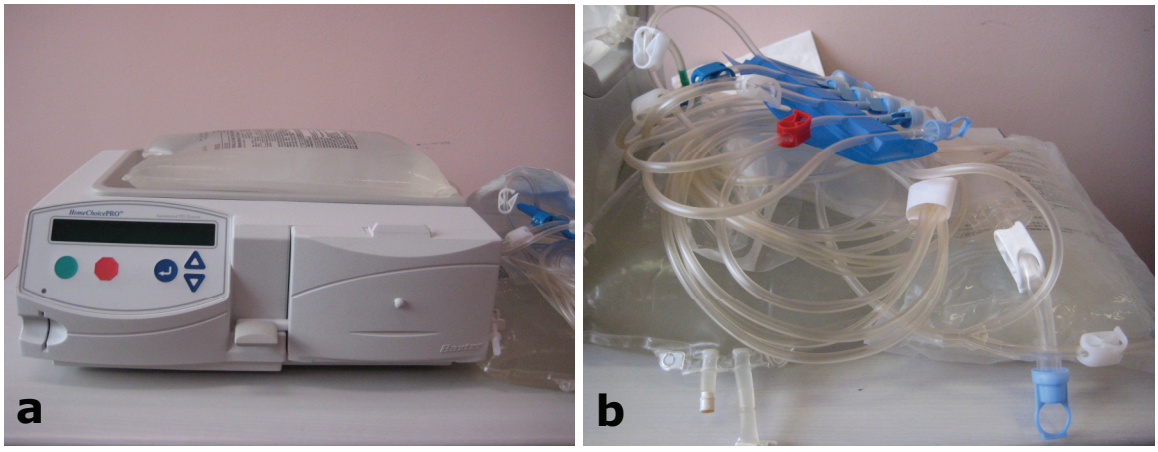

Fig. 1: Automated peritoneal dialysis machine and the connectors required for carrying our dialysis.

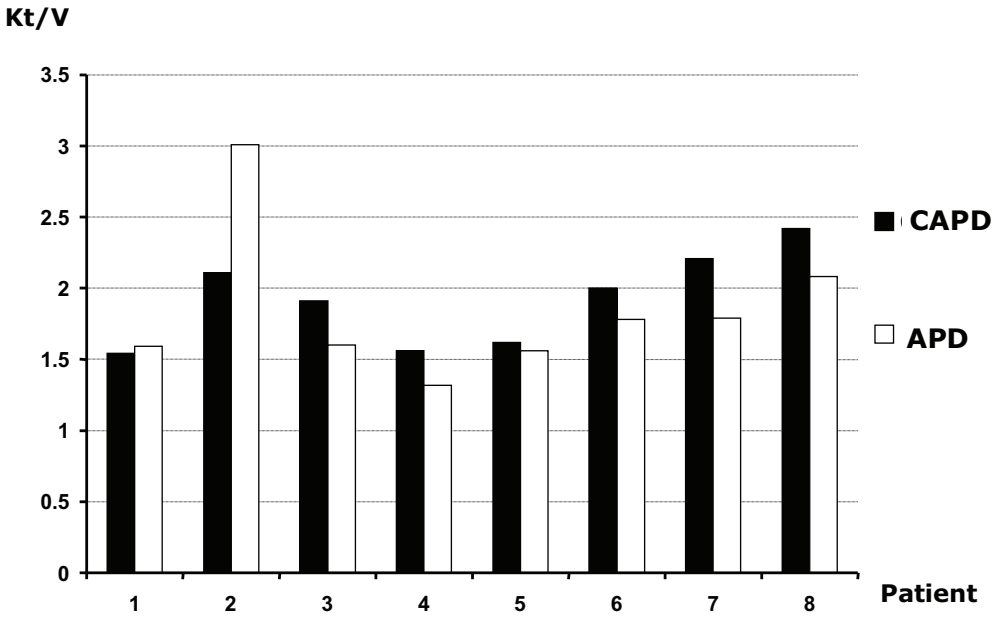

Fig. 2: Changes in the KT/V (clearance) during CAPD and APD (Target Kt/V = 1.7).

independently.

The patients were reviewed monthly over a period of six months and twelve months to assess for changes in renal biochemical parameters, renal drugs requirements, peritonitis rates and changes in quality of life. The renal biochemical parameters included were: serum urea, creatinine, calcium, phosphate, haemoglobin, urea clearance (Kt/V) and albumen. Changes in dosages of erythropoietin, hypertensive medications and phosphate binders were also documented. Quality of life questionnaires were used at two monthly intervals. Patients could also seek advice directly from the peritoneal dialysis unit during working hours and on call nursing and medical staff after working hours.

RESULTS

Overall, the Kt/V achieved with CAPD was slightly better compared to APD. However, despite this, after six months of APD, six (75%) patients had achieved their target Kt/V (Figure 2).

There was also an improvement in the serum haemoglobin (Figure 3) and albumen levels. Serum phosphate levels were however elevated but this was explained by the improved appetite demonstrated by these patients over the six month period.

Six (75%) patients reported better quality of life score compared to when they were on CAPD, specifically with sleep and appetite (Figure 4).

There was also a reduction in erythropoietin requirements.

No peritonitis was encountered during the study period.

One patient on CAPD experienced peritoneal leak which caused pleural effusion and was not expected to do well. She was not

able to undergo haemodialysis because of access failure, so as a last resort, was transferred to APD. Following which she achieved improvement in quality of life, even though her renal parameters measurements remained suboptimal. Another patient was able to return to work following change from CAPD to APD as there were previously time and place restrictions for her to perform dialysis exchanges with CAPD at work.

DISCUSSION

Our pilot study showed that all patients not only tolerated APD but also revealed some improvement after being transferred from CAPD. These improvements were seen, particularly in serum haemoglobin and albumin and subjective assessment parameters. The increase in serum haemoglobin level occurred despite reduction in the requirement of erythropoietin. Interestingly, a few patients were able to stop their erythropoietin completely. There was also improvement in the overall work performance. It is interesting to note that in the six month period, with the exception of Patient 2, the Kt/V values were lower than those achieved with CAPD. Despite this, 75% had achieved their target Kt/V. The remaining 25% (n=2) who had failed to achieve the target Kt/V while on APD had also failed to achieve the target level when they had previously been on CAPD. Kt/V in the range of 1.7 to 2.0 is linked to improved survival outcome.

APD has been known to confer numerous benefits to dialysis patients related to quality of life and time for work and social activities. However there is no advantage in mortality and hospitalisation rates when compared to CAPD. [1, 2] Generally, the benefits of APD can be seen from both patients and health care service perspectives.

An important benefit from the patients' perspective is the freedom to pursue

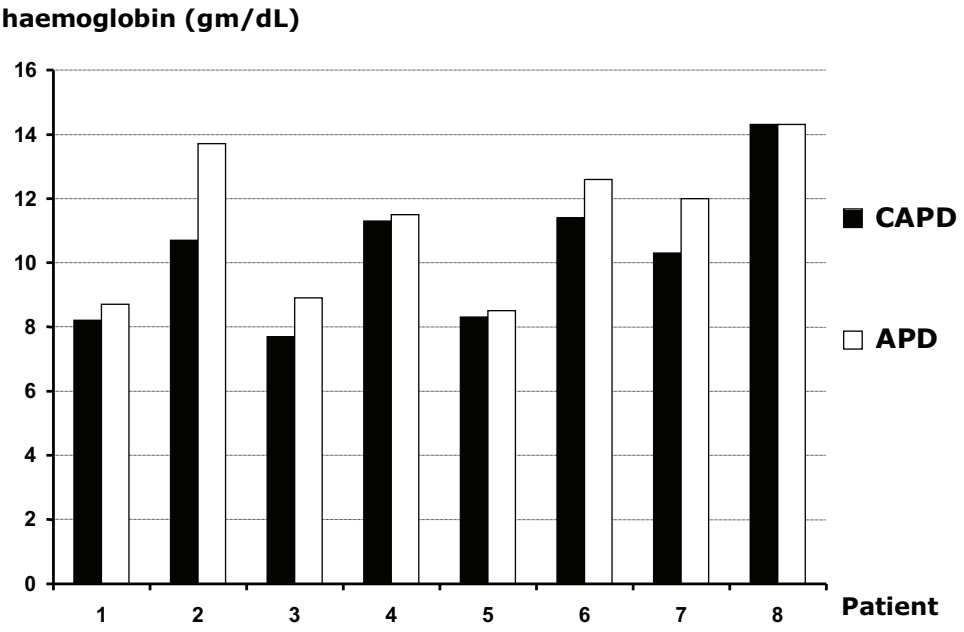

Fig. 3: Changes in the serum haemoglobin level during CAPD and APD.

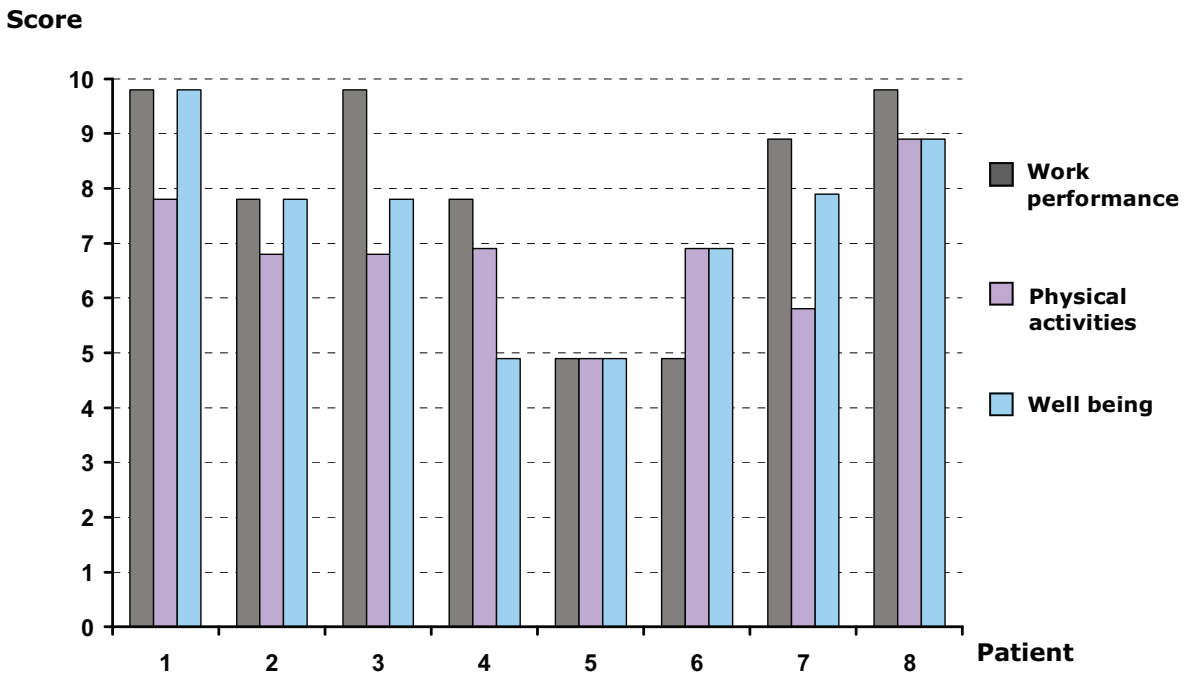

Fig. 4: Subjective reporting by patients on work performance, physical activity and well being.

other activities. This is particularly important for young patients who are either students or a member of the work force. As dialysis is performed at night during sleep, there is minimal disruptions to their daily activities, especially the ability to work, support themselves and their families. As a result, self-esteem is improved, which is extremely important for general well being. Our quality of life survey mirrored findings published in many prominent publications over the past ten years. [1, 3, 4]

Compared to CAPD, there are fewer episodes of peritonitis in APD. [5] Reduced incidence of peritonitis means that there is less damage to the peritoneal membrane, resulting in improved long term outcomes, reduced antibiotic expenditure and inpatient hospital stay. Patients will also take less time off work to recuperate from illness. In our study, no patient experience APD associated peritonitis. However, the sample size was small and the follow up duration was short.

APD causes fewer problems with intraperitoneal pressure compared with CAPD which helps prevent problems related to hernias and leakages into pleural cavities. [6] Higher intra-peritoneal pressure may cause more abdominal complaints. One of our patients had resolution of pleural effusion that was associated with higher intra-peritoneal pressure of CAPD. The authors have experienced similar improvement and positive responses to APD in other centres.

There are also financial benefits from patients' point of view. As APD is usually performed by the bedside, there is no requirement of a designated clean area for dialysis exchanges such as in CAPD. As automated exchanges are done at night, it would also required less assistance on the part of carers which in our local setting are usually family members, hired helpers or maids.

The APD program benefits not only patients but also the health care system. As

the HD population increases exponentially, there are plans to create more HD centres with great cost implications. However, if the APD program can be expanded and if uptake increases, it is anticipated that patients may be more willing to convert to APD. This will translate into cost savings in terms of the operation of HD units while society also benefits from having more productive members in the community. Our pilot study has demonstrated that erythropoietin usage declined with APD. This appears to be a novel observation as there is no other published information in the literature supporting this view. Cost saving from erythropoietin reduction can be channelled into other important areas. The discomfort associated with frequent injections can also be reduced.

Finally, APD is better tolerated than HD or CAPD. As illustrated by one of our patients (Case 4), APD provides a life-saving option to patients who may not tolerate the other modalities of dialysis. The patient who was not able to tolerate CAPD because of raised intra-peritoneal pressure will likely not have survived had she had not been managed on APD. APD is an invaluable alternative treatment option for other patients in similar situations.

The major limitation of our study is the small sample size and short duration of study. Nevertheless, it is important that we perform this study to provide more evidence for pursuit of this viable and sustainable alternative to HD and CAPD.

In conclusion, our results showed that APD is a viable form of renal replacement therapy in our local setting. While there is no doubt that renal transplantation is the preferred option, this is sadly unrealistic for most patients. Management by HD has been at maximum capacity for many years and it is important to consider other options for the increasing dialysis population. There are many advantages with APD many of which cannot be measured in just financial terms. It is our opinion that the psychosocial advantages gained over the other forms of dialysis far outweigh any potential cost implications that may arise.

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