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Bohorques, Raúl; Álvarez, Yanet; Martínez, Atilano; Ballard, Yuliet; Pérez, Sucel;
Gutiérrez, Francisco

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Use of Home Peritoneal Dialysis by Cuba's Nephrology Institute, 2007–2012

Raúl Bohorques MD, Yanet Álvarez MD, Atilano Martínez MD, Yuliet Ballard, Sucel Pérez, Francisco Gutiérrez MD

ABSTRACT

INTRODUCTION Peritoneal dialysis is a maintenance therapy option for patients with end-stage renal disease. Continuous ambulatory peritoneal dialysis in Cuba was introduced in December 2007, and automated peritoneal dialysis one year later. This paper presents the outcomes attained with this blood purification technique, enabling an assessment to decide on scaling up its use in Cuba.

OBJECTIVE Describe the clinical course of patients in the first five years of the Home Peritoneal Dialysis Program at Havana's Nephrology Institute.

METHODS An observational, descriptive study with a retrospective cohort was conducted. The universe comprised the 40 Nephrology Institute patients who underwent treatment with home peritoneal dialysis from December 20, 2007 to December 20, 2012. Relative and absolute frequencies were calculated for the study variables and the Kaplan-Meier method was used for survival curves for patients and for the peritoneum as dialysis membrane.

RESULTS Of the 40 patients in the program, 23 were men and 17 were women, primarily aged 40 to 59 years. The most frequent

causes of chronic kidney failure were hypertension (42.5%), glomerulopathies (22.5%), and diabetes mellitus (22.5%). A total of 103 complications occurred, both infectious (68, 66%) and non-infectious (35, 34%). The most common infectious complication was peritonitis (45, 66.2%); the most frequent non-infectious complication was catheter displacement (13, 37.1%). Seven patients left the peritoneal dialysis program. Of these, three died, two lost function of the peritoneum as a dialysis membrane, one received a kidney transplant and one recovered kidney function. Survival was 100% at one year, 97% at 2 years, 93.2% at 3 and 4 years, and 92% at 5 years. However, the peritoneal membrane was functional in 100% of patients during the first 2 years, decreasing to 96% at 3 and 4 years and to 88.6% at 5 years.

CONCLUSIONS In our setting, peritoneal dialysis attained outcomes similar to those obtained internationally, which supports its usefulness as a renal replacement therapy method in Cuban patients with end-stage renal disease.

KEYWORDS Peritoneal dialysis, dialysis, renal replacement therapy, end-stage renal disease, ESRD, Cuba

INTRODUCTION

Chronic kidney disease (CKD) is defined as structural or functional abnormalities of the kidney, present for >3 months, with implications for health. It is a major cause of death and disability, reaching epidemic proportions in recent years: an estimated 1.37 million people worldwide suffered from chronic kidney failure (CKD stage ≥ 3) in 2011. Three methods exist for renal replacement therapy (RRT), indicated when glomerular filtration rate (GFR) falls to ≤ 15 mL/min/1.73 m², stage 5 CKD or end-stage renal disease (ESRD): globally, some 940,000 (68%) of patients are treated with hemodialysis, while some 315,000 (23%) have received kidney transplants, and 120,000 (9%) receive peritoneal dialysis.[1,2]

Peritoneal dialysis was described by Popovich in 1976,[3] and two years later the first results were published.[4] Its use, still relatively low worldwide, is increasing because of the good outcomes obtained, including better quality of life for patients and reduced family stress, owing in large part to home-based treatment and low costs observed in developed countries.[5–8]

The term peritoneal dialysis means replacement therapy that uses the peritoneum as the dialysis membrane. The method consists essentially in instilling a solution with controlled electrolytes and osmolarity into the peritoneal cavity through a catheter specifically designed for this purpose (Tenckhoff catheter). The instilled fluid remains in the abdominal cavity for four to six hours and is then drained. During dwell time, water and solutes diffuse from peritoneal capillaries into the dialysis fluid through the peritoneum, a biological membrane with a large surface area and high vascularity lining the abdominal cavity, producing an exchange of water and solutes between plasma and intracavitary fluid.[9–11]

Hemodialysis and peritoneal dialysis began use as RRT in Cuba in the 1960s. Unlike hemodialysis, which in Cuba has kept pace

with international technological advances, peritoneal dialysis has not developed at the rate we would have liked: we have over 40 years' experience with peritoneal dialysis, but with the intermittent version of the procedure, which has fallen into virtual disuse internationally.[12] It was not until December 20, 2007, that continuous ambulatory peritoneal dialysis (CAPD) was introduced in the country by the Nephrology Institute (INEF) in Havana. Months later, automated peritoneal dialysis was introduced (this uses a dialysis machine also known as a cycler, to which the patient is connected from 9 to 12 hours a day).

Home peritoneal dialysis is becoming not only an alternative for Cuban patients but also a necessity for many due to increased survival rates on hemodialysis—annual mortality on hemodialysis dropped from 32% in 2004 to 25% in 2010[13]—indicating more patients require home peritoneal dialysis once their vascular capacity has been exhausted.

Our research objective was to analyze the clinical course of patients in INEF's Home Peritoneal Dialysis Program during its first five years of operation, including assessment of response to this therapy.

METHODS

This was a retrospective descriptive study based on administrative records. The universe comprised the 40 INEF patients who underwent treatment with home peritoneal dialysis (32 with CAPD and 8 with automated peritoneal dialysis) from December 20, 2007 to December 20, 2012.

Variables Table 1 lists study variables and descriptions.

Analysis Relative and absolute frequencies were calculated for each category of variables. Survival of the peritoneum as the

Table 1: Variables

| Variable | Description |
|------------------------------------|--|
| Age (years) | Age groups: 20–29, 30–39, 40–59, ≥60 |
| Sex | Male, female |
| Cause of CKD | Diabetes mellitus Hypertension Primary glomerulopathy Adult polycystic kidney disease Systemic lupus erythematosus Unknown |
| Complications | Infectious <ul style="list-style-type: none"> • Peritonitis • Exit site infection • Tunnel infection Noninfectious <ul style="list-style-type: none"> • Catheter displacement • Bloody outflow • Granuloma • Hernia • Outer cuff extrusion • Abdominal separation |
| Reason for withdrawal from program | Death Loss of peritoneal function as dialysis membrane Kidney transplant Recovery of kidney function |
| Peritoneal membrane status | Peritoneal function in most recent clinical record report (to December 20, 2012): functional, not functional |
| Patient vital status | Patient status in most recent clinical record report (to December 20, 2012): alive, deceased |

dialysis membrane and patient survival were assessed using the Kaplan-Meier curve. Small sample size ruled out analysis by type of home peritoneal dialysis.

Ethics Before beginning treatment with home peritoneal dialysis, all patients received detailed information on the therapy and provided written consent for inclusion in the study. The research was approved by INEF's scientific council.

RESULTS

Of the 40 patients, 23 were men and 17 women; the majority (22.6%) were aged 40–59 years. The most frequent cause of chronic kidney failure was hypertension, in 17 patients (42.5%), followed by glomerulopathies and diabetes mellitus, in 9 patients each (22.5%).

A total of 103 complications occurred. Of these, etiology was infectious in 68 (66%) and noninfectious in 35 (34%). The most frequent infectious cause was peritonitis, in 45 (66.2%), while the most frequent non-infectious complication was catheter displacement, in 13 (37.1%) (Table 2). There was one episode of peritonitis every 27.9 months/patient over the 5-year study period.

In all, seven patients left the program: three died, two lost peritoneal dialyzing capacity, one received a kidney transplant and one recovered kidney function (Table 3). Survival at 5 years was 89.2%. Figures 1 and 2 show patient survival and survival of peritoneal membrane dialysis capacity.

DISCUSSION

Home peritoneal dialysis was introduced as RRT for advanced chronic kidney failure in Cuba on December 20, 2007.[14]

Table 2: Complications of home peritoneal dialysis (n = 103)

| Complications | Episodes n (%) |
|-------------------------------|----------------|
| Infectious (n = 68) | |
| Peritonitis | 45 (66.2) |
| Exit site infection | 15 (22.1) |
| Tunnel infection | 8 (11.8) |
| Noninfectious (n = 35) | |
| Catheter displacement | 13 (37.1) |
| Bloody outflow | 7 (20.0) |
| Hernia | 6 (17.1) |
| Outer cuff extrusion | 5 (14.3) |
| Granuloma | 3 (8.6) |
| Abdominal separation | 1 (2.9) |

Table 3: Reasons for withdrawal from home peritoneal dialysis program (n = 40)

| Reason | Withdrawals n (%) |
|---|-------------------|
| Death | 3 (7.5) |
| Loss of peritoneum as dialysis membrane | 2 (5.0) |
| Kidney transplant | 1 (2.5) |
| Recovery of kidney function | 1 (2.5) |
| Total | 7 (17.5) |

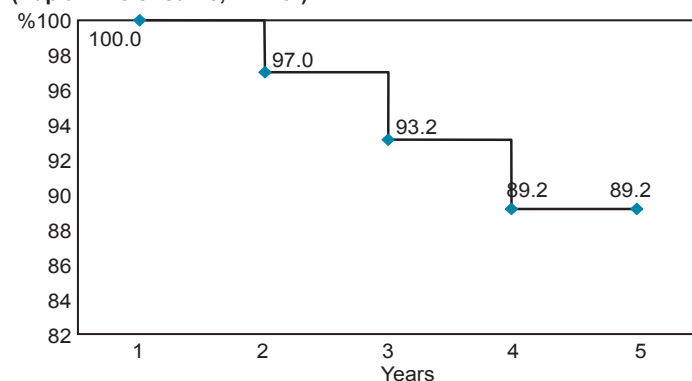
Inclusion of patients in the program increased gradually: from 2007 to 2012, 40 patients were included, a small proportion of patients enrolled in the National Hemodialysis Program (some 2600). This is true, despite the fact that home peritoneal dialysis is capable not only of keeping patients alive but also of facilitating their ability to carry out normal daily activities. [9–11]

The predominance of men and of the 40–59 year-old age group in our program are consistent with the EPICRE study (Spanish epidemiological study of chronic kidney failure) with regard to sex, but not to age; the EPICRE study had more patients aged >64 years.[15] CKD is a disease of aging; it is the final common end-point of many vascular diseases, and thus its frequency increases proportionally with age.

Generally, the disease that most frequently causes chronic kidney chronic is diabetes mellitus, followed by hypertension.[16–19] In our study, however, hypertension was the leading cause and glomerulopathies gave rise to as many cases as diabetes, although the small sample size limits inferences from these results. Quirós-Ganga, in a study of 1464 incident peritoneal dialysis patients, found that diabetic nephropathy and glomerular pathology were the most prevalent primary renal diseases.[16] Other authors report similar findings.[17–19]

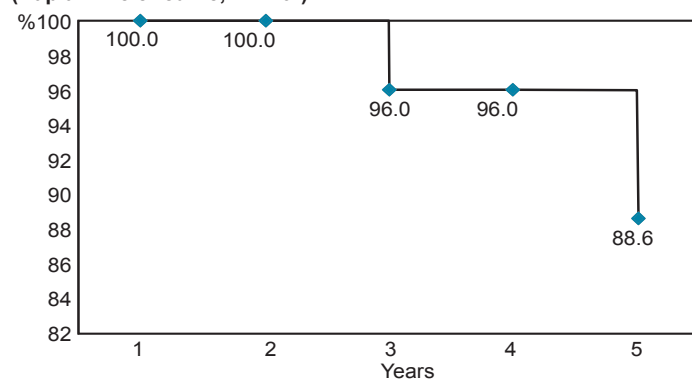
Infections are relatively common in peritoneal dialysis patients, since normal skin barriers are broken and the patient has a depressed immune system. Infections may be located at the catheter exit site or in the tunnel created during its placement. They can be more severe if the infection reaches the peritoneum (peritonitis).[20]

Figure 1: Patient survival on home peritoneal dialysis (Kaplan–Meier curve, n = 40*)



* not all patients entered in year 1

Figure 2: Peritoneum survival in home peritoneal dialysis (Kaplan–Meier curve, n = 40*)



* not all patients entered in year 1

Peritonitis is the complication most feared by patients and nephrologists and is the main reason for transfer to hemodialysis. [21] In the period studied, the 45 episodes of peritonitis occurred in 21 patients. Peritonitis from *Staphylococcus aureus* is, in general, the most severe peritoneal infection caused by gram-positive organisms and occurs in nasal carriers of the organism and patients with skin and hand colonization, and is also related to catheter exit site colonization and infection. [22,23]

Incidence rates of peritonitis in this study are consistent with quality standards for peritoneal dialysis units in the Practical Clinical

Guidelines for Peritoneal Dialysis of the Spanish Nephrology Society, which defines as acceptable fewer than 0.6 episodes/patient/year, equivalent to one episode every 24 months/patient, [24] a rate higher than that found in our series.


In recent years, prognosis for survival has improved more in peritoneal dialysis than in hemodialysis, even though this has not led to an increase in its use. Comorbidities and associated factors have the greatest influence on mortality, with similar outcomes for both techniques over the long term. [13,25] The main cause of death is cardiovascular complications; hence the need for early diagnosis of cardiovascular morbidities in the interest of achieving greater patient survival. [26]

Peritoneal dialysis programs lose patients. The most fortunate withdrawals are due to kidney transplants or the rare case of recovery of renal function; in our series, we had one case of each. Negative reasons for withdrawal from the program are failure of the technique—obliging patients to switch to hemodialysis—and death. Over the course of our five-year research, few patients were withdrawn from the program for either of these reasons. While it is clear that this is a small sample, the withdrawal rate is similar to that of several dialysis centers in Japan, which documented an annual all-cause withdrawal rate of 10%. [22,26]

Peritoneal dialysis, both in our country and throughout the world, has improved its outcomes for patients in recent years (unlike hemodialysis, where results have remained essentially the same). Technological improvements have enabled lower rates of peritonitis, as well as fewer alterations of the peritoneum, thanks to more biocompatible dialysis solutions. [16]

Limitations of this study include small size of the series and short evaluation time. It does allow us, however, to recommend increasing the number of patients who could benefit from this therapy, and expanding its use to all of Cuba's 51 nephrology services.

CONCLUSIONS

In our study, home peritoneal dialysis had outcomes similar to those attained internationally, making it a potentially promising RRT, which, along with hemodialysis and kidney transplant, can help prolong the life of patients with ESRD. 

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THE AUTHORS

Raúl Bohorques Rodríguez, nephrologist. Full professor and senior researcher, Nephrology Institute (INEF), Havana, Cuba.

Yanet Álvarez González (Corresponding author: alvarezyanet@infomed.sld.cu), nephrologist. Assistant professor and adjunct researcher, INEF, Havana, Cuba.

Atilano Martínez Torres, nephrologist. Associate professor and senior researcher, INEF, Havana, Cuba.

Yuliet Ballard Álvarez, nurse, INEF, Havana, Cuba.

Sucel Pérez Canepa, nurse, INEF, Havana, Cuba.

Francisco Gutiérrez, biostatistician. Assistant professor, INEF, Havana, Cuba.

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