

Reason for “choosing” peritoneal dialysis: exhaustion of vascular access for hemodialysis?

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Submitted on: 09/15/2009

Accepted on: 11/24/2009

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Authors declare grants from Fundação ABM de Pesquisa e Extensão na Área da Saúde (FABAMED).

ABSTRACT

Introduction: Little is known about the prognosis of patients beginning peritoneal dialysis (PD) as their last alternative. **Objectives:** To describe the clinical-demographic profile of patients switching from hemodialysis (HD) to PD, due to exhaustion of the HD vascular access, and the occurrence of peritonitis among them. **Methods:** Review of the medical records of all patients in the PD program of the Hospital Roberto Santos in the city of Salvador, state of Bahia, Brazil. **Results:** The study comprised 22 patients (median age, 47.9 years), 54.5% of whom were men, 84.2%, black or mulattoes, and 68.2% originated from the inner Bahia state. Peritoneal dialysis was the initial modality of renal substitutive therapy (RST) in only four of those patients. The remaining 18 patients began RST through HD, mainly on an emergency basis and by using double-lumen catheter (DLC). In a median of 7.7 months on HD, most patients (64.7%) used four or more DLCs. In only 7/18 (39%) patients, the switch from HD to PD was based on the patient's choice; in most cases, 11/18 (61%), the reason for switching to PD was exhaustion of HD vascular access. Peritonitis was more frequent in patients switching to PD due to exhaustion of HD vascular access than in the rest of the group. **Conclusions:** Initiating RST on an emergency basis through HD and using DLC may lead to a fast exhaustion of vascular access, leaving PD as the only viable option. This inadequate mode of patient “selection” for PD is associated with a higher risk for peritonitis.

Keywords: chronic kidney failure, peritoneal dialysis, hemodialysis hospital units.

[J Bras Nefrol 2010;32(1):21-26]©Elsevier Editora Ltda.

INTRODUCTION

Chronic kidney disease (CKD) is a highly prevalent clinical entity among us. Current data from the Brazilian Society of Nephrology have shown that Brazil has more than 85,000 patients with CKD undergoing maintenance renal replacement therapy (RRT), and approximately 90% of them are on hemodialysis (HD) programs.¹ Due to the precariousness of the Brazilian primary health care and the delay in referring patients with CKD to a nephrologist, patients often enter the HD programs of the Brazilian Public Health Care System (SUS) through hospital units and on an emergency basis, with no time for the confection and maturation of the definitive vascular access. In such cases, the implantation of double-lumen catheters (DLC) is unavoidable.² In a study performed at a tertiary hospital unit of SUS in the State of Bahia, practically all patients initiated HD using a DLC.²

The DLC use is associated with several complications. The most immediate are those resulting from central venous puncture, such as pneumothorax, hemothorax, arterial puncture, and local hematoma.³ Later, bacteremias, venous thromboses, and malfunctioning occur⁴, requiring exchanging the DLC for continuing the hemodialytic treatment. Unfortunately, the use of multiple DLCs in jugular and subclavian veins bilaterally may end in stenoses or occlusions of the central circulation, making the confection of a definitive vascular access impossible. Consequently, those patients are doomed to remain on HD through DLC, sometimes in undesired sites, such as the femoral veins, which are associated with a higher probability of complications, such

as infection and deep venous thrombosis.⁵ In this situation, peritoneal dialysis (PD) becomes the only suitable alternative to long-term maintenance RRT.

Peritoneal dialysis is a RRT performed on an outpatient clinic basis and, thus, depends on the proficiency of patients and/or caregivers. In ideal conditions, PD would be used by patients living in adequate basic sanitary and hygiene conditions and capable of learning the aseptic technique for handling the Tenckhoff catheter for exchanging dialytic solutions. When properly indicated, PD provides performance and results compatible with those obtained with HD.^{6,7} However, the evolution of patients converted from HD to PD as their last alternative is scarcely known. The present study aimed at describing the clinical-demographic profile of patients switching from HD to PD due to lack of vascular access and the occurrence of peritonitis among them.

METHODS

Location: The study was carried out at the Nephrology Service of the Hospital Geral Roberto Santos (HGRS), which is a tertiary hospital of the SUS network in the State of Bahia, with an emergency unit opened to the public and a total of 710 beds. The HGRS is a referral unit for nephrology and receives patients from the capital and all municipalities of the State of Bahia.^{2,8} The current program of nephrology of the HGRS began in December 2003, under the name of Nefro-Bahia, but has been known as the Nephrology Service of the HGRS since April 2009. That service consists of one adult hemodialysis unit with 18 beds, one pediatric hemodialysis unit with four beds, one intermittent peritoneal dialysis (IPD) unit with two beds, 12 adult ward beds, and seven pediatric beds. The ambulatory peritoneal dialysis program began in April 2006, and, at the time this study was conducted, it was caring for 22 patients.

Study design: retrospective analysis of a case series by use of medical record review. Data were collected from February 15 to February 29, 2008.

Case series: nonprobability sampling and sample size determined by convenience. All medical records of the patients on PD program at the HGRS were assessed.

Ethical aspects: this is a retrospective study based on medical record review. Data were collected with patient's knowledge and consent and kept confidential by the main investigator. The study protocol was approved by the head of service and the Committee on Ethics and Research of the institution.

Statistical analysis: data were summarized through measures of central tendency and dispersion. Due to the reduced size of the sample, we assumed that there was no normal distribution of the continuous variables, which, thus, were summarized through the median (50th percentile), 25th percentile, and 75th percentile. The categorical variables were summarized through their relative frequencies (valid percentages). The association between categorical variables was assessed through 2x2 contingency tables. However, because the sampling was not random and involved all patients of the peritoneal dialysis program, no statistical inference tests, such as the Fisher exact test, were used for analyzing the contingency tables. The Statistical Package for the Social Sciences (SPSS) for Windows, version 13.0, was used for all calculations.

RESULTS

The study assessed all 22 patients who were on the ambulatory program of PD at the HGRS during the period of data collection. Table 1 shows some demographic and clinical characteristics of the patients. The median age was 47.9 years, and 54.5% of the patients were men. Most participants were black or mulattoes, originating from inner Bahia State, with a family income between one and three minimum wages. Systemic arterial hypertension (SAH), diabetes mellitus (DM), and chronic glomerulonephritis (CGN) were the main presumed etiologies of CKD. Patients were on PD for a median period of 9.6 months, and most of them (76.2%) were on CAPD. During that period, 57.9% of the patients had already had at least one episode of peritonitis (Table 1).

Table 2 shows that, of the 22 patients assessed, only four (18%) began RRT through PD. The remaining 18 patients (82%) began RRT through HD, switching later to PD. Most patients assessed (14/22, 64%) began RRT on an emergency basis. A strong association was observed between RRT beginning on an emergency basis and RRT beginning through HD: all 14 patients beginning RRT on an emergency basis did so through HD. Of the eight patients beginning programmed RRT, 50% did so through HD, while 50% did so through PD (Table 2).

Table 3 assesses the characteristics of the 18 patients who began RRT through HD, switching later to PD. The median HD time prior to conversion to PD was 7.7 months. Most patients (89%) began HD through DLC, requiring access exchange in the period. Approximately 65% of the patients used three or more DLCs in the period. In most patients (61%), the reason for switching from HD to PD was exhaustion of the vascular access.

Table 1

DEMOGRAPHIC AND CLINICAL CHARACTERISTICS OF 22 PATIENTS ON PERITONEAL DIALYSIS PROGRAM AT THE HOSPITAL GERAL ROBERTO SANTOS, STATE OF BAHIA.

Variables	n = 22
Age, median (25%P; 75%P)	47.9 (39.6; 63.1)
Sex	
Male	54.5%
Female	45.5%
Ethnicity (self-referred)	
White	10.5%
Black	26.3%
Mulatto	57.9%
Other	5.3%
Civil status	
Single	38.1%
Married	28.6%
Divorced	14.3%
Widow(er)	14.3%
Other	4.8%
Monthly family income (minimum wages)	
1 - 2	40.9%
2 - 3	40.9%
3 - 4	9.1%
≥ 4	9.1%
Origin	
City of Salvador	31.8%
Inner Bahia State	68.2%
Presumed etiology of CKD	
SAH	45.5%
DM	13.6%
CGN	13.6%
Other	27.3%
PD time	
Months, median (25%P; 75%P)	9.6 (6.4; 19.0)
Current modality of PD	
CAPD	76.2%
APD	33.8%
Any episode of peritonitis?*	
Yes	57.9%
No	42.1%

SAH - systemic arterial hypertension; DM - *diabetes mellitus*; CGN - chronic glomerulonephritis; PD - peritoneal dialysis; CAPD - continuous ambulatory peritoneal dialysis; APD - automated peritoneal dialysis.

*N = 19, due to data loss referring to peritonitis in 3 cases.

Table 2

ASSOCIATION BETWEEN INITIAL MODALITY OF DIALYSIS AND FORM OF ENTERING RENAL REPLACEMENT THERAPY (EMERGENCY X PROGRAMMED).

Form of entering		First dialytic method		
		HD	DP	Total
Form of entering	Emergency	14	0	14
	Programmed	4	4	8
Total		18	4	22

Table 3 ANALYSIS OF THE 18 PATIENTS BEGINNING RRT THROUGH HD AND SWITCHING TO DP.

Variables	n = 18
Time on HD before switching to PD Median (25%P; 75%P), months	7.73 (2.68; 18.78)
Initial vascular access	
AVF	11.1%
DLC	88.9%
Was vascular access switched in the period?	
Yes	11.1%
No	88.9%
Reason for switching vascular access*	
DLC infection	18.75%
DLC obstruction/thrombosis	62.5%
Switch from DLC to AVF	6.25%
AVF malfunctioning	12.5%
Number of DLC per patient	
1	11.8%
2	17.6%
≥ 3	70.6%
Reason for switching from HD to PD	
Exhaustion of HD vascular access	61.0%
Patient's will	39.0%

*n = 16, because two patients did not switch access and used only one DLC until beginning PD.

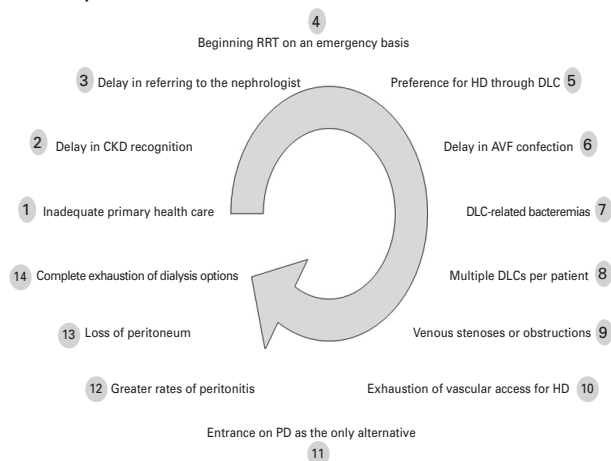
Table 4 ASSOCIATION BETWEEN PERITONEAL DIALYSIS DUE TO EXHAUSTION OF VASCULAR ACCESS AND OCCURRENCE OF PERITONITIS.

		Peritonitis		Total*
		Yes	No	
PD due to exhaustion of access	Yes	7	2	9
	No	4	6	10
Total*		11	8	19

*Total = 19, due to data loss referring to peritonitis in 3 cases.

The overall frequency of peritonitis was 57.9%. Table 4 shows the association of the occurrence of peritonitis and PD due to exhaustion of the vascular access. The frequency of peritonitis among those beginning PD due to exhaustion of the vascular access was almost twice that found in the remaining patients (77.8% versus 40.0%). The odds ratio of peritonitis in those beginning PD due to exhaustion of the vascular access was 5.25. The median time of exposure to PD was slightly longer in the group of vascular access exhaustion than in the remaining patients (median = 11.3 months, IQD 3.6 to 21.0 versus 9.5 months, IQD 6.5 to 17.0).

Figure 1 illustrates the sequence of events leading to beginning PD due to exhaustion of the vascular access for HD, which, by being associated with a higher frequency of peritonitis, should fatally culminate in complete lack of dialytic options.

Figure 1. Sequence of events leading to exhaustion of HD vascular access and use of peritoneal dialysis as the only alternative of RRT.

CKD - chronic kidney disease; RRT - renal replacement therapy; HD - hemodialysis; DLC - double-lumen catheter; AVF - arteriovenous fistula; PD - peritoneal dialysis.

DISCUSSION

This study assessed all 22 patients from the ambulatory PD program of a referral tertiary hospital of the SUS network in the city of Salvador, State of Bahia. Several aspects are worth emphasizing.

Most patients (68%) originated from the inner Bahia State municipalities, confirming previous observations of our group 2 and evidencing the poor infrastructure of those locations regarding the specialized care in nephrology and RRT. Considering the vastness of the territory of the State of Bahia and the small number of HD units in the inner Bahia State, PD is a very attractive alternative for maintenance RRT, because it keeps the patients from traveling long road distances three times a week to undergo HD.⁸ However, most patients were assigned to PD as their last alternative, when vascular access to HD no longer existed. Specifically, only four of the 22 patients studied began RRT through PD. One cause for that low penetration rate of PD in our population may have been RRT beginning on an emergency basis. In fact, most patients studied (14/22 \approx 64%) began RRT on a nonprogrammed manner, which unfortunately is usual for the SUS network patients in the State of Bahia.² The emergency beginning of RRT evidences another big problem, which is the lack of an effective program of primary health care for the groups at risk for CKD, such as diabetic patients, hypertensives, elderly, and relatives of CKD patients. With no appropriate primary health care, CKD is only diagnosed in its late form, when dialysis is mandatory.

Although PD may also be used as the initial method in dialytic urgencies, well-trained professionals are often not available for implanting the Tenckhoff catheter with the required urgency or even adequate beds for PD are not available. In such situations, the fastness and easiness of DLC implantation for HD ends up prevailing. On the other hand, when analyzing our eight patients beginning RRT electively, no preference for a certain dialytic method was observed (four patients began through PD and four began through HD). This suggests that, if patients could choose the initial dialytic method, the penetration rate of PD in the population would be much higher than the current one.

Once RRT is initiated through HD with DLC, certain inertia may be observed in patients and doctors in switching the dialytic method, even among residents of the inner State, who would benefit most from PD due to the reduced need for long distance traveling.

The delay in the confection of the arteriovenous fistula (AVF) at the SUS network in the State of Bahia contributes to the longer permanence of patients on HD through DLC, leading to bacteremia, multiple exchanges of DLC, ending in exhaustion of the HD vascular access. Then, starting PD is mandatory even for those patients who, in a more favorable situation, such as the elective beginning of RRT, would not be considered adequate candidates for that dialytic method. The present study showed that patients switching to PD due to exhaustion of the HD vascular access have 5.25 times more chances of having at least one episode of peritonitis than the rest of the group.

Our study has several limitations, such as its small sample, collected from a single hospital of the city of Salvador, in the State of Bahia, which may hinder the external validity of our findings. Additionally, due to its retrospective character, the quality of the data cannot be dissociated from the quality of the medical records. Appropriate records about the total number of peritonitis per patient and their dates of occurrence could not be found. Consequently, the peritonitis rate ("n" episodes per "n" patients-months) could not be calculated, and Cox regression model could not be used for comparing the time required for peritonitis to occur in the groups (PD due to exhaustion of vascular access versus others). Finally, no detailed records about the etiologic agents of the peritonites were found.

Despite those limitations, this study complements others already carried out in our service^{2-4,8} emphasizing the preoccupying sequence of events illustrated in Figure 1, ranging from the inadequate primary health care to patients at risk for CKD to the complete exhaustion of dialysis options. Shortly, several measures can be adopted to alleviate that situation, such as the following: 1) to consider PD as the initial modality of dialysis even for patients presenting on dialytic urgency; 2) to use long-term tunneled catheters instead of Sorensen catheters for the initial access while awaiting for AVF confection and maturation; 3) to institute protocols aiming at reducing the incidence of bacteremias related to DLC; 4) to organize an efficient vascular surgery service to reduce the time for AVF confection. However, we believe that an actual change in that scenario will require a set of measures privileging the early detection of patients at risk for CKD or at initial phases of CKD. This is the only way through which such patients can be referred to the nephrologist in time to delay the progression of CKD and to plan the beginning of RRT.

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