

Urgent-Start Peritoneal Dialysis – a viable option? A case report and literature review

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ABSTRACT

Background: Many patients with end-stage renal disease start renal replacement therapy in an unplanned manner. The vast majority initiate hemodialysis by a central venous catheter, since its use is more widespread and available. This technique is associated with a high risk of infection and damage of the vascular patrimony associated with the use of central veins. Urgent-start peritoneal dialysis comes as an alternative treatment for selected patients. **Case report:** A 55-year-old woman with focal segmental glomerulosclerosis presented with a rapid decline of renal function and was given renal replacement therapy counselling and opted for peritoneal dialysis. Her chosen modality was postponed for one month due to early uremic symptoms, followed by hemodialysis start through a central venous catheter. During this period a sepsis due to central venous catheter infection occurred, implying four weeks of intravenous antibiotics. **Discussion and Conclusion:** Although there has been an increase in the number of publications on urgent-start peritoneal dialysis, showing that this technique has comparable results either to urgent-start hemodialysis and planned-start peritoneal dialysis, there still is some resistance to the use of this modality. Given the importance of this subject, this review aims to describe and summarize the available evidence on urgent-start peritoneal dialysis outcomes. Moreover, specific barriers are addressed. Its use is encouraged in hospitals where peritoneal dialysis is available, as an opportunity to improve chronic kidney disease patient management and transition to dialysis.

Keywords: End-stage renal disease; Peritoneal Dialysis; Renal replacement therapy; Urgent-start dialysis.

BACKGROUND

Portugal has one of the highest incidence and prevalence of renal replacement therapy in the world. Worldwide, the incidence and prevalence of the Portuguese dialysis population ranks 5th and 9th, respectively¹.

According to the Portuguese Registry of Dialysis and Transplantation in 2018, not only has the prevalence increased proportionally throughout time, but the last twenty years have seen the highest-ever numbers of patients admitted to dialysis².

The majority (>90%) of Portuguese patients suffering from ESRD undergo hemodialysis (HD) as their first renal replacement therapy (RRT). In contrast, less than 10% begin peritoneal dialysis (PD)^{3,4}.

Moreover, around half of the patients initiate dialysis with no planned dialysis access, due to late referral or unexpected acute exacerbation of the disease^{5,6}.

This situation is illustrated by the Portuguese numbers registered in 2018, where 58.9% of the patients started dialysis through a central

venous catheter (51.6% via a tunneled catheter and 7.3% a temporary catheter)².

The downside of this practice is that the use of catheters in unplanned dialysis start has been listed as an independent risk factor of mortality, since it is associated with a higher number of infectious complications⁷. Moreover, after starting HD, most patients remain on this technique, as PD is rarely presented once the treatment is established⁸.

Urgent-start PD, defined as dialysis initiation within two weeks of catheter placement, has been accepted as a viable and safe practice for unplanned dialysis start⁹⁻¹¹.

CASE REPORT

A 55-year-old female, with a biopsy proven focal segmental glomerulosclerosis (FSGS), presented with a nephrotic syndrome refractory to multiple therapies. She rapidly evolved to end-stage renal disease within one year and PD was her choice for RRT. Unfortunately, before it was possible to plan PD start, the patient developed the

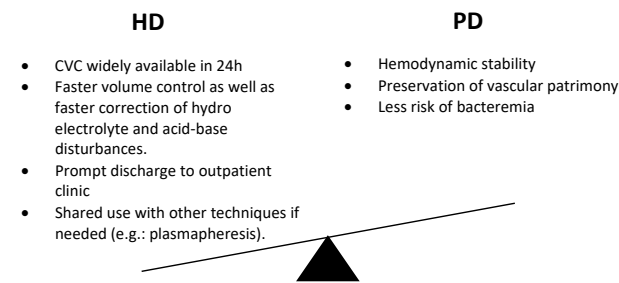
uremic symptoms of anorexia, nausea, pruritus and had anemia and hyperphosphatemia.

■ What to do next?

Figure 1 describes the advantages of each technique initiation.

Figure 1

Advantages of HD and PD in an unplanned setting



A tunneled central venous catheter (CVC) was placed and hemodialysis was started.

Two weeks later, she presented fever and hypotension during dialysis sessions, and the diagnosis of sepsis due to CVC infection was presumed. Blood cultures were collected and empiric therapy with vancomycin and ceftazidime was started. She rapidly showed signs of clinical and analytical improvement. However, no microorganism was identified, and both antibiotics were maintained for four weeks. Once the infection was resolved, a peritoneal catheter was placed and one month later, she started continuous ambulatory peritoneal dialysis (CAPD).

■ DISCUSSION

In this present case, it is inevitable to wonder that had the patient initially started PD, as she opted to do, one severe infection and the use of a central venous access could have been avoided.

With the improvement of the healthcare provided to end-stage renal patients comes increased life expectancy, which means that patients live longer and switch from one technique to the other. Accordingly, we should manage a patient considering the entirety of his or her pathway and the possible benefit of the transitions track, rather than focusing only on the actual modality at the time of our observation. With this goal in mind, why not consider, should the candidate be suitable, even in unplanned situations, a technique that offers protection of the vascular patrimony, protection of the residual renal function and, more importantly, protection of the patient throughout the disease course, as PD does? In fact, short-term survival on PD is benefited by the avoidance of central catheters and long-term survival is similar to HD, but more than survival, relevant outcomes such as sparing vessels and protecting residual renal function should also be taken as clinical priorities in CKD management.

■ Literature review

Since the beginning of the millennium, there has been mounting evidence of the feasibility of an urgent-start PD program. Tables I to III summarize the main characteristics of these studies. Most of these studies vary in terms of methods and population but the endpoints are quite similar, evaluating mechanical and infectious complications, as well as patient and technique survival. Urgent-start intervention varies from immediate start until 2 weeks after implantation. Incidence of leakage occurs in 1-10% of the patients and catheter dysfunction in 2.4-12% of the patients¹²⁻¹⁹. The patient and technique survival rates are high, 80-100% and 70-90% respectively^{12,14,16,18,19}. Wong et al., compared the results of different techniques of catheter placement in urgent-start PD programs: percutaneous, laparoscopic or surgical procedure are viable methods¹⁸. Recently Wang et al., showed that both intermittent and automatic peritoneal dialysis are suitable in an urgent setting¹⁷.

Urgent-start PD vs. Planned-start PD

In comparing unplanned to planned start of PD, the number of infectious complications does not differ significantly^{8,20-24}. Concerning mechanical complications, Povlsen and Ivarsen reported an overall increase of mechanical complications, in a study including 140 patients. However, when analyzing each complication, leakage and catheter dysfunction, separately, there were no statistically significant differences²². Later, in 2012 Ghafari et al. reported in a 27 patient-study an increase of the percentage of leakage ($p < 0.05$) in the urgent-start group, but most times it could be managed conservatively, and did not affect the survival of patient in the technique⁸. Patient survival rates were also similar between the two groups^{8,20-23}.

When it comes to dialysis efficiency, little data is available, but differences in analytical parameters such as Kt/V , hemoglobin, iron saturation, parathyroid hormone, calcium, phosphorus and albumin values in urgent-start PD and planned-start PD groups, were not reported⁸.

Urgent-start PD vs. Urgent-start HD

Other studies have shown similar outcomes between urgent-start PD and urgent-start HD in terms of survival, despite significant differences in infection risk. Koch et al. in 2012 showed a higher risk for bacteremia in the HD group, when comparing both techniques in a 123 patient-study. In addition, Jin et al. in 2016 presented that not only there was a higher overall infectious rate in the HD group ($p = 0.014$) but there was also an increase of overall non-infectious complications in this group ($p = 0.001$). Survival rates were similar in both modalities of treatment⁹⁻¹¹.

However, irrespective of the dialytic treatment option, it seems that unplanned start is associated with a worse outcome, possibly due to uremic syndrome and other comorbidities⁷.

Considering urgent-start PD a feasible technique for unplanned situations, it is vital to widen the use of PD for crashing patients. This is critical in patients who have chosen PD as the modality of chronic RRT and who need urgent-start dialysis. In these patients, efforts

Table I

Observational studies into Urgent-Start PD

Study	Patients (n)	Catheter placement	Urgent-start Intervention	Follow-up	Mechanical Complications	Infectious Complications	Patient and technique survival
Song et al., 2000	59	Percutaneous	Immediate start (<24h): (I) Gradual increase vs. (II) Full 2L exchange	12 months	Leakage: 9.5% (I) vs. 10.5% (II) [NS] Catheter dysfunction: 4.8% (I) vs. 5.3% (II) [NS]	Peritonitis: 24% (I) vs. 16% (II) [NS] ESI: 9.5% (I) vs. 5.3% (II) [NS]	Catheter survival: 86% (I) vs. 84% (II) [NS]
Banli et al., 2005	41	Percutaneous	Gradual start 6 days after implantation	NA	Leakage: 4.8% Catheter dysfunction: 2.4%	Peritonitis: 2.4% ESI: 0%	Not evaluated
Jo et al., 2007	51	Percutaneous	Immediate start (<24h)	12 months	Leakage: 2% Catheter dysfunction: 12%	Peritonitis: 4% ESI: 4%	Not evaluated
Alkathoori et al., 2016	30	Percutaneous (67%) or laparoscopic (33%)	Start in a median of 6 days	Median of 201 days	Leakage: 10% Catheter dysfunction: 20%	Peritonitis: 1: 319 patient-year ESI: 1:159 patient-year	Patient survival: 100% Technique survival: 93%
Wong et al., 2016	81	Either percutaneous, laparoscopic or surgical	Urgent start (before 2 weeks)	12 months	Leakage: 5% Catheter dysfunction: 15%	Peritonitis: 16%	Patient survival: 100% Technique survival: 74%
Bitencourt Dias et al., 2017	51	Percutaneous	Start in 72h with high-volume PD	6 months	Leakage: 9.7% Catheter migration: 16%	Peritonitis: 0,5 patient-year ESI: 17%	Patient survival: 82.4% Technique survival: 86%
Xu et al., 2017	922	Surgical	Start in the 1 st week	Median of 31 months	Abdominal wall related: 4.8% (mainly hernia) Leakage: 1% Catheter related: 9.5%	Not evaluated	Technique survival: 92%
Wang et al., 2017	101	Surgical	Start 2 days after. Intermittent group (IPD): 50% Automatic group (APD): 50%	12 months	Leakage: 10% (IPD) vs. 3.9% (APD) [NS] Catheter malposition: 4% (IPD) vs. 3.9% (APD) [NS]	Infections: 26% (IPD) and 13.7% (APD) [NS]	Not evaluated

APD – Automatic peritoneal dialysis; ESI – Exit site infection; HD – Hemodialysis; IPD – Intermittent peritoneal dialysis; NA – Not applied; NS – No significance; PD – Peritoneal Dialysis; PL – planned; US – Urgent start.

Table II

Urgent-start PD versus Planned-start PD

Study	Patients (n)	Catheter placement	Urgent-Start Intervention	Follow-up	Mechanical Complications	Infectious Complications	Survival
Povlsen and Ivarsen, 2006	140: 52 (US) vs. 88 (PS)	Surgical	Immediate start (<24h)	3 months	Overall: 28.9% (US) vs. 7.7% (PS), p < 0.01 Leakage and catheter dysfunction: [NS]	Peritonitis: 15% (US) vs. 15% (PS) [NS] ESI: 3.9% (US) vs. 3.9% (PS) [NS]	Technique survival: 87% (US) vs. 90% (PS) [NS]
Yang et al., 2011	310: 226 (US) vs. 84 (PS)	Surgical	Urgent start (before 2 weeks); Continuous ambulatory PD.	6 months	Leakage: 2.2% (US) vs. 2.4% (PS) [NS] Catheter dysfunction: 1.3% (US) vs. 0% (PS) [NS]	Peritonitis: 4% (US) vs. 2.3% (PS) [NS] ESI: 1.3% (US) vs. 0% (PS) [NS]	Not possible to be compared due to significant differences in the follow-up time between the groups.
Ghafari, 2012	27: 18 (US) vs. 9 (PS)	Percutaneous	Urgent start (before 2 weeks)	3 months	Leakage: 33% (US) vs. 11% (PS), p < 0.05 Catheter dysfunction: 11% (US) vs. 22% (PS) [NS]	Peritonitis: 1/110 patient-month (US) vs. 1/42 patient-month (PS) [NS] ESI: 1/55 patient-month (US) vs. 1/42 patient-month (PS) [NS]	Loss of follow-up. From the data available: Patient and technique survival (US): 100% (15 out of 15 patients)
Pai et al., 2016	310: 226 (US) vs. 84 (PS)	Surgical	6-13 days after implantation	30±25 months	Not evaluated	Peritonitis: 1/65 patient-month (US) vs. 1/95 patient-month (PS) [NS]	Patient survival: 80% (US) vs. 84% (PS) [NS] Technique survival: 43.8% (US) vs. 50.7% (PS) [NS]
Nayak et al., 2018	56: 32 (US) vs. 24 (PS)	Surgical	Start in 48h; APD.	3 months	Leakage: 9.4% (US) vs. 0% (PS) [NS] Catheter migration: 25% (US) vs. 16.7% (PS) [NS]	Peritonitis: 9.4% (US) vs. 0% (PS) [NS]	Technique survival: 90.6% (US) vs. 95.8% (PS) [NS]
Wojtaszek et al., 2019	129: 35 (US) vs. 94 (PS)	Surgical	Urgent start (before 2 weeks); APD.	Median of 19 months	Leakage: 11-14% (US) vs. 0-7% (PS) [NS] Catheter migration: 3-9% (US) vs. 3-16% (PS) [NS]	Peritonitis: 34% (US) vs. 33% (PS) [NS]	Patient survival: Worse US in the first 3 months, then similar. Technique survival: Excellent in both [NS].

APD – Automatic peritoneal dialysis; ESI – Exit site infection; HD – Hemodialysis; IPD – Intermittent peritoneal dialysis; NA – Not applied; NS – No significance; PD – Peritoneal Dialysis; PL – planned; US – Urgent start.

Table III

Urgent-start PD versus Urgent-start HD

Study	Patients (n)	Catheter placement	Urgent-Start Intervention	Follow-up	Mechanical Complications	Infectious Complications	Survival
Lobbedez et al., 2008	60: 34 (US PD) vs. 26 (US HD)	Not specified	Median of 4 days	12 months	Leakage: 5.8% <i>Not specified for HD group.</i>	Survival free peritonitis: 55% at the end of follow up. <i>Not specified for HD group.</i>	Patient survival: 83% (US PD) vs. 79% (US HD) [NS] Technique survival: 88% (US PD)
Koch et al., 2012	123: 66 (US PD) vs. 57 (US HD)	Laparoscopic	12h after; APD.	6 months	Catheter dysfunction: 7.6% (US PD) vs. 5.3% (US HD) [NS]	Bacteremia: 3% (US PD) vs. 21% (US HD) , p=0.003 Peritonitis 3% ESI: 4,5%	Patient survival: 70% (US PD) vs. 58% (US HD) [NS]
Jin et al., 2016	178: 96 (US PD) vs. 82 (US HD)	Surgical	Urgent start (before 2 weeks)	12 months	Overall: 3.1% (US PD) vs. 13.4% (US HD) , p=0.011	Overall: 2.1% (US PD) vs. 11% (US HD) , p=0.014	Patient survival: 92.1% (US PD) vs. 93% (US HD) [NS]

APD – Automatic peritoneal dialysis; ESI – Exit site infection; HD – Hemodialysis; IPD – Intermittent peritoneal dialysis; NA – Not applied; NS – No significance; PD – Peritoneal Dialysis; PL – planned; US – Urgent start.

should be made to improve the circuit of peritoneal catheter implantation toward an opportune schedule, sparing the vessels for later stages of CKD and respecting patient option. Even patients who starts HD with a temporary vascular access in emergency situations should be counselled as to the different dialysis modalities available, enabling the patient to make an informed subsequent decision.

Additionally, alternatives to hospital admission for urgent-start PD sessions (with inherent consumption of hospital resources and cost), nurse domiciliary visit and training or domiciliary hospitalization should be considered, as recently promoted in the management of chronic diseases and in hospital contracts processes.

To this end, protocols should be developed and the whole hospital community must be involved to make this possible.

■ What does it take to make an Urgent-Start PD Program?

In order to implement an urgent-start PD program (Table IV), a specialized team must always be on hand to insert a peritoneal catheter (it can be a nephrologist, a general surgeon, or even an intervention radiologist). Plus, a trained and specialized team is required for education and technique support throughout the initiation of the modality. Last but not the least, only selected candidates who have shown previous interest in PD should be forwarded to this process.

■ CONCLUSION

Urgent-start PD is a feasible and safe technique, with comparable results to HD and planned-start PD. In selected patients, and especially if PD was the patient’s option for RRT, Urgent-Start PD should be considered as first-line therapy and a quality parameter in centers that are able to offer this kind of treatment. Trained staff and adequate infrastructure are required to run an Urgent-Start PD program, but

Table IV

Requirement for an Urgent-Start Peritoneal Dialysis Program

Prompt catheter placement (<48h)	<ul style="list-style-type: none"> • Critical step • Nephrologist/ Surgeon/ Intervention radiologist (According to Center availability) • All techniques are suitable (Percutaneous/ Surgical/ Laparoscopic)
Trained and specialized staff	<ul style="list-style-type: none"> • Minimize complications: Low infusion volumes and dorsal decubitus • Recognize and manage complications (E.g.: Leakage)
Selected candidates	<ul style="list-style-type: none"> • Patient’s option (if previously or presently expressed in capable patient) • No criteria for emergent dialysis start (Severe hyperkalemia or metabolic acidosis; Diuretic resistant hypervolemia; Severe uremia) • No absolute contraindication for peritoneal dialysis such as acute abdomen or inflammatory/oncologic intraperitoneal disease. • No relative contraindications for peritoneal dialysis <ul style="list-style-type: none"> – Social: Sanitary conditions, family support (if applied) – Medical: Functional status, vision or hearing deficiency, dementia or previous surgeries.

overall a strategic plan is needed to promote value-based healthcare. We propose a simple algorithm that could be implemented and adapted in other centers (Figure 2).

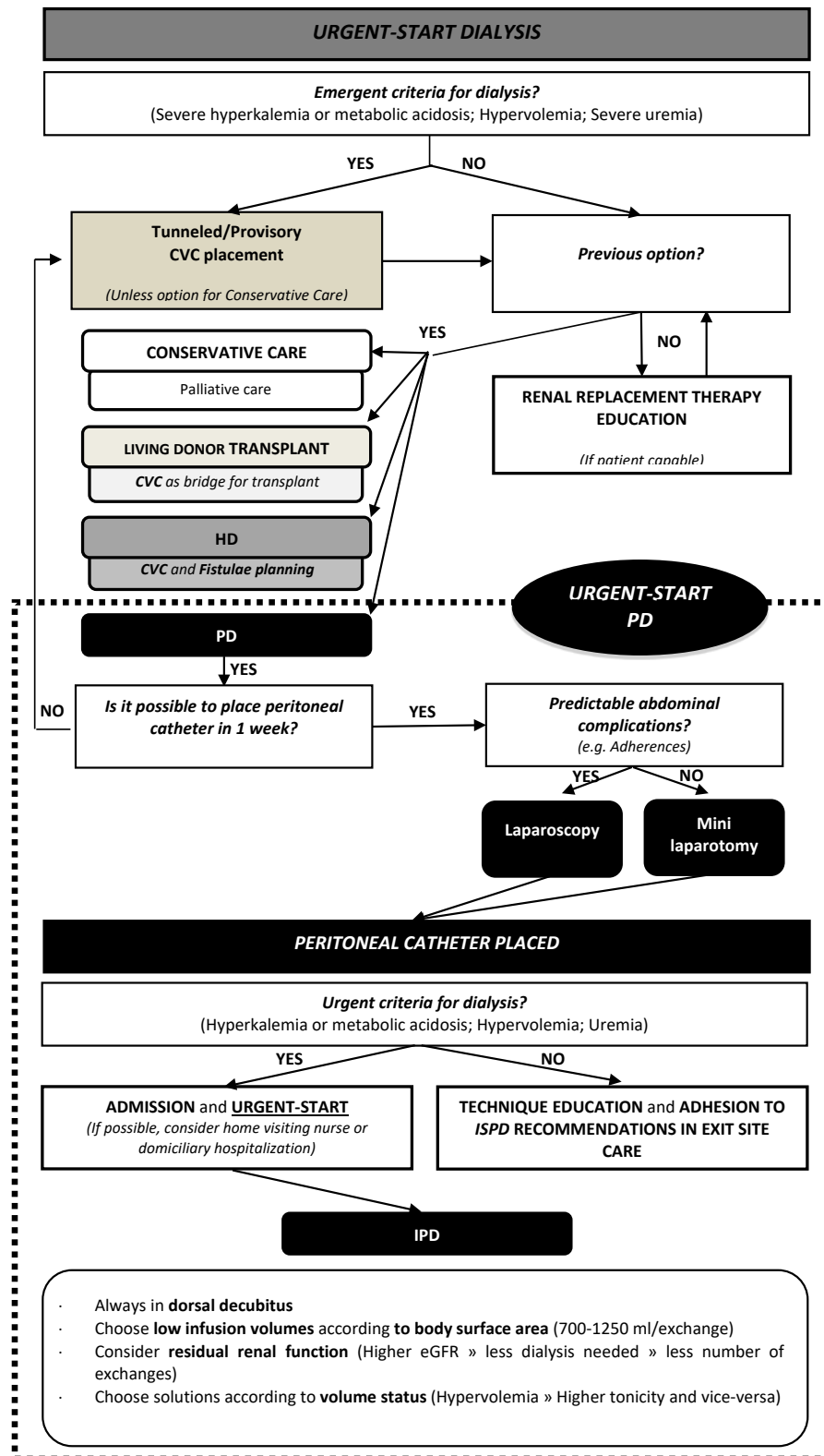
Additional studies should be performed in terms of dialysis efficiency and in terms of urgent-start dialysis prescription.

This proposal is meant to signal an updated approach to patient-centered integrated CKD care and moreover quality improvement management of dialysis access in integrated dialysis units.

Disclosure of potential conflicts of interest: none declared



Figure 2
Algorithm Urgent-Start Peritoneal Dialysis



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