Clinical Kidney Journal, 2019, vol. 12, no. 3, 443–446

doi: 10.1093/ckj/sfz008
Advance Access Publication Date: 21 March 2019
Editorial Comment

EDITORIAL COMMENT

The modality of choice, manual or automated, for urgent start peritoneal dialysis

Muhammad M. Javaid [1,2], Behram A. Khan[3,4] and Srinivas Subramanian[3,4]

[1]School of Rural Health Mildura, Monash University, Mildura, VC, Australia, [2]Department of Medicine, Mildura Base Hospital, Mildura, VC, Australia, [3]Division of Nephrology, National University Hospital, Singapore and [4]Yong Loo Lin School of Medicine, National University of Singapore, Singapore

Correspondence and offprint requests to: Muhammad M. Javaid; E-mail: mmjavaid@doctors.org.uk

ABSTRACT

Over the last decade, urgent start peritoneal dialysis (USPD), defined as initiation of peritoneal dialysis (PD) before the traditionally recommended break-in period of 2–4 weeks, has increasingly been seen as a viable option for late-presenting end-stage renal disease patients, obviating the need for haemodialysis via central venous catheter. Different prescriptions and protocols involving both manual and automated exchanges have been published, but there is no head-to-head comparison of the two modalities and no consensus on the most suitable modality exists. Evaluation of the available evidence suggests that PD can be initiated urgently using either or both options without much difference in the outcome. The two most critical aspects dictating the success of a USPD programme are using low dwell volumes and keeping patients in a strict supine position during the dialysis exchanges in the first couple of weeks of the therapy. These measures are crucial in keeping the intraperitoneal pressure to a minimum and reduce the risk of mechanical complications, including catheter leaks and malpositioning.

Keywords: automated peritoneal dialysis, continuous ambulatory peritoneal dialysis, end-stage renal disease, urgent start

In a recently published paper in the *Clinical Kidney Journal* (CKJ), Naljayan *et al.* [1] reported the successful use of manual exchanges for their urgent start peritoneal dialysis (USPD) programme. The article adds to the growing number of publications describing the successful initiation of peritoneal dialysis (PD) before the recommended waiting period of 2 weeks after PD catheter insertion—often referred to as USPD. Late-presenting end-stage renal disease (ESRD) is a frequently encountered problem and in some countries as many as 60–70% of patients start dialysis in an unplanned manner without definitive functioning dialysis access [2]. Traditionally, haemodialysis (HD) through a central venous catheter (CVC) is the default initial dialysis modality for all such patients and PD is not considered as a viable option, even for patients who had chosen PD at the pre-dialysis education stage [2]. Concerns about the mechanical complications, especially pericatheter leaks and poor wound healing, have traditionally prevented PD from being started urgently; a break-in period of 2–4 weeks after PD catheter insertion to allow adequate wound healing is usually recommended [2]. Once initiated on HD, a majority of patients continue with HD and are often not converted to PD. This situation has led to a high number of CVC users in the dialysis population even though CVC use has been identified as an independent risk for poor patient outcomes and an increased risk of bloodstream infections and other vascular complications [3]. Over the last decade, a number of articles describing different protocols and prescriptions using both manual and automated exchanges to initiate PD urgently have been published in the literature,

Received: 5.12.2018. *Editorial decision:* 9.1.2019

Table 1. Urgent start PD prescriptions using manual exchanges

Publication	Number of patients	Dwell volumes	Patients' position during dwells	Total mechanical complications (%)
Jo *et al.* [4]	51	500 mL for 3 days then 1000 mL for 4 days then 2000 mL/day	Supine	15.6
Yang *et al.* [5]	226	500 mL for Days 1–5 750 mL for Days 6–7 1000 mL for Days 8–11 1500 mL for Day 12 onwards	Not available	9.3
Naljayan *et al.* [1]	20	700 mL for BSA $<1.7\ m^2$ and 1000 mL for BSA $>1.7\ m^2$ for Week 1. Increased to 1500 mL and 2000 mL, respectively, in Week 2	Supine	10

Table 2. Urgent start PD prescriptions using automated exchanges

Publication	Number of patients	Dwell volumes	Patients' position during dwells	Total mechanical complications (%)
Povlesn *et al.* [6]	52	1200 mL for <60 kg and 1500 mL for >60 kg for initial 10–14 days	Supine	28.9
Ghaffari [7]	18	500 mL for BSA $<1.65/m^2$ 750 mL for BSA 1.65–$1.8/m^2$ 1000–1250 mL for BSA $>1.8/m^2$	Supine	61
Koch *et al.* [8]	66	Gradually increased from 500 to 2000 mL during the first 3 weeks	Supine	Not available
Alkatheeri *et al.* [9]	30	Gradually increased from 1000 to 1200–2000 mL in 3–4 weeks	Supine	30

making PD a viable, practical and safe option for late-presenting ESRD patients, obviating the need for interim HD via CVC [4–11]. However, a head-to-head comparison of manual versus automated exchanges for USPD has not been made and, to date, there is no consensus on the more desirable modality. This article summarizes the literature on USPD using both manual and automated exchanges and makes an informed inference to help nephrologists interested in developing such programmes in their institutions.

EVIDENCE FOR MANUAL OR AUTOMATED EXCHANGES FOR US PD

In the *CKJ* paper in question [1], PD was typically started within 48 h of catheter insertion, using manual exchanges and low dwell volumes in a strict supine position. For patients with a body surface area (BSA) $<1.7\ m^2$, an initial dwell volume of 750 mL was used, and for those with a BSA $>1.7\ m^2$, a dwell volume of 1000 mL was used. The dwell volume was doubled after 7 days of treatment and patients were started on conventional PD after a further 7 days of therapy if there were no complications. Patients received two to three exchanges per day, 3–5 days a week, with a dwell time of 2–2.5 h per exchange. Of 20 patients, only 1 developed a pericatheter leak and 1 developed PD peritonitis. Nineteen patients remained on PD for 3 months post-initiation, with only one dropping out due to housing issues. Similarly, others have also described the successful initiation of PD urgently using manual exchanges, with a low rate of mechanical complications [4, 5]. An analysis of the available publications (Table 1) describing the combined experience of USPD in 297 patients using manual exchanges shows that the rate of total mechanical complications, including catheter leaks, catheter migration, poor flow and haemoperitoneum, in these patients was 10.4%.

Table 2 summarizes the key publications describing the USPD protocols using automated exchanges. Four studies [6–9] present the collective experience with 166 patients. The rate of mechanical complications in three studies involving a total of 100 patients was comparatively higher, at 35%. Povlesn *et al.* [6] attributed this high rate of mechanical complications to a relatively larger dwell volume used for the initial cohort of patients. The complication rate improved after reducing the dwell volumes for subsequent patients. Interestingly, in the study by Alkatheeri *et al.* [9], six patients who initiated PD immediately after PD catheter insertion did not encounter any mechanical complications as compared with the overall rate of 30%. Although Koch *et al.* [8] did not provide the details of mechanical complications in 66 patients involved in their study, the outcomes of USPD were comparable with urgent HD via a CVC. Importantly, the rate of bacteraemia and further surgical procedures was significantly less in USPD as compared with urgent HD.

Two studies (Table 3) describe the utilization of a hybrid prescription involving a combination of manual and automated exchanges for USPD [10, 11]. In a total of 113 patients, only 5 (4.5%) encountered a mechanical complication. No patient developed a catheter leak in these studies. Catheter migration was the only complication seen in all five patients requiring readjustment.

Table 3. Urgent start PD prescriptions using both manual and automated exchanges

Publications	Number of patients	Dwell volumes	Patients' position during dwells	Total mechanical complications (%)
Jin *et al.* [10]	96	750–1200 mL initially increased gradually to 2000 mL over 2 weeks	Supine	3.1
Javaid *et al.* [11]	17	500 mL for <60 kg, 750 mL for 61–80 kg and 1000 mL >80 kg in Week 1. Increased to 1000 mL, 1500 mL and 2000 mL, respectively, in Week 2	Supine	11

Different methods of PD catheter insertion were used, including percutaneous [4, 7, 9, 11], laparoscopic [1, 8, 9, 11] and open surgical techniques [5, 6, 10] in studies employing both manual and automated exchanges. The mode of PD catheter insertion does not appear to be a common denominator dictating the outcome in these studies.

WHAT IS THE VERDICT?

From the available evidence, it is safe to say that both PD modalities using manual or automated exchanges can be successfully used for starting PD urgently, within 2 weeks of catheter insertion, for late-presenting ESRD patients. Although, the earlier publications on USPD using automated exchanges reported a relatively higher rate of mechanical complications [6, 7], more recent papers describing USPD protocols using low-volume automated exchanges in a supine posture [10, 11] stated low rates of mechanical complications, comparable with those published in protocols using manual exchanges [1, 4, 5]. In a review published elsewhere, the authors reported that USPD has comparable short-term outcomes to both urgent HD and conventional PD. In contrast to urgent HD via a CVC, USPD has a significantly lower rate of bacteraemia and other catheter-related complications [2]. Similarly, the method of PD catheter insertion, whether surgical, laparoscopic or percutaneous, seems to have minimal effect on the provision of USPD and the outcome [2].

A closer look at all the prescriptions suggests that the most critical factors in determining the success of USPD are the dwell volume and patient's posture during the PD exchange. Studies have shown that there is a linear correlation between the intraperitoneal fluid volume and intraperitoneal pressure. Hence the higher the dwell volume, the higher the intraperitoneal pressure and the likelihood of mechanical complications and pericatheter leaks [12]. Similarly, the patient's posture has been shown to affect both intraperitoneal pressure and peritoneal permeability [13]. The intraperitoneal pressure is lowest in the supine position and rises significantly if the patient sits or stands [13]. In one study, Fischbach *et al.* [13] showed that the intraperitoneal pressure increases by 130% from supine to erect postures. Therefore, using low PD fluid fill volume in strict supine positions is vital for the success of any USPD programme, regardless of the PD modality and method of PD catheter insertion.

The authors use very low fluid volumes for their USPD patients, based on the patient's weight, build and body habitus, during the initial week of treatment and cautiously increase the dwell volume during the second week of treatment. We keep patients in a strict supine position for the duration of the dwell and only allow them to sit or stand after the fluid has been drained completely. Similar to the protocol of Jin *et al.* [6], we are flexible with the choice of modality and use both manual and automated exchanges, at times in the same patient and during the same treatment cycle, to accommodate individual patient's needs, the patient's choice of future modality, available resources and clinical situation. Our USPD programme has been hugely successful and we have encountered very few mechanical complications [7]. Along with the other interventions, the USPD programme has helped to expand our overall PD programme, and the number of patients on PD has gradually increased year on year [14].

In conclusion, USPD is a viable option for late-presenting ESRD patients regardless of the modality and the method of PD exchanges used. This technique should be encouraged to reduce the use of CVC and associated complications. The most important aspects of treatment are to ensure that the lowest possible dwell volumes are used in the initial phase of therapy, with gradual increases over 10–14 days. It is also advisable to keep patients in a strict supine posture during the first 2 weeks of dialysis to minimize the risk of leaks and other mechanical complications. Nephrologists can develop their own protocols or use the one already reported in the literature to suit their needs, skills and resources using manual and/or automated exchanges.

AUTHORS' CONTRIBUTIONS

M.M.J. contributed to the concept, design, literature review and writing and revising the manuscript. B.A.K. and S.S. contributed to critically reviewing, revising and writing the manuscript.

CONFLICT OF INTEREST STATEMENT

None declared. We confirm that the results presented in this article have not been published previously in whole or part, except in abstract form.

REFERENCES

1. Naljayan MV, Yazdi F, Reisin E. Using manual exchanges for an urgent-start peritoneal dialysis program. *Clin Kidney J* 2018; 11: 720–723
2. Javaid MM, Khan BA, Subramanian S. Peritoneal dialysis as initial dialysis modality: a viable option for late-presenting end-stage renal disease. *J Nephrol* 2018, doi: 10.1007/s40620-018-0485-3
3. Coentrão L, Santos-Araújo C, Dias C *et al.* Effects of starting hemodialysis with an arteriovenous fistula or central venous catheter compared with peritoneal dialysis: a retrospective cohort study. *BMC Nephrol* 2012; 13: 88

4. Jo YI, Shin SK, Lee JH *et al*. Immediate initiation of CAPD following percutaneous catheter placement without break-in procedure. *Perit Dial Int* 2007; 27: 179–183.
5. Yang YF, Wang HJ, Yeh CC *et al*. Early initiation of continuous ambulatory peritoneal dialysis in patients undergoing surgical implantation of Tenckhoff catheters. *Perit Dial Int* 2011; 31: 551–557
6. Povlsen JV, Ivarsen P. How to start the late referred ESRD patient urgently on chronic APD. *Nephrol Dial Transplant* 2006; 21(Suppl 2): ii56–ii59
7. Ghaffari A. Urgent-start peritoneal dialysis: a quality improvement report. *Am J Kidney Dis* 2012; 59: 400–408
8. Koch M, Kohnle M, Trapp R *et al*. Comparable outcome of acute unplanned peritoneal dialysis and haemodialysis. *Nephrol Dial Transplant* 2012; 27: 375–380
9. Alkatheeri AM, Blake PG, Gray D *et al*. Success of urgent-start peritoneal dialysis in a large Canadian renal program. *Perit Dial Int* 2016; 36: 171–176
10. Jin H, Fang W, Zhu M *et al*. Urgent-start peritoneal dialysis and hemodialysis in ESRD patients: complications and outcomes. *PLoS One* 2016; 11: e0166181
11. Javaid MM, Lee E, Khan BA *et al*. Description of an urgent-start peritoneal dialysis program in Singapore. *Perit Dial Int* 2017; 37: 500–502
12. Dejardin A, Robert A, Goffin E. Intraperitoneal pressure in PD patients: relationship to intraperitoneal volume, body size and PD-related complications. *Nephrol Dial Transplant* 2007; 22: 1437–1444
13. Fischbach M, Terzic J, Dangelser C *et al*. Effect of posture intraperitoneal pressure and peritoneal permeability in children. *Pediatr Nephrol* 1998; 12: 311–314
14. Javaid MM, Khan BA, Yeo XEE *et al*. Sustained increase in peritoneal dialysis prevalence through a structured PD initiation service. *Perit Dial Int* 2018; 38: 374–376

CLINICAL KIDNEY JOURNAL
ckj