sciendo
ПРИЛОЗИ. Одд. за мед. науки, XLIV 2, 2023 МАНУ
CONTRIBUTIONS. Sec. of Med. Sci., XLIV 2, 2023 MASA

10.2478/prilozi-2023-0031 ISSN 1857-9345

PERCUTANEOUS ONSITE INSERTION OF CATHETER FOR PERITONEAL DIALYSIS – A NEW METHOD INTRODUCTION IN THE COUNTRY

Vladimir Pushevski[1], Igor G. Nikolov[1], Pance Karagjozov[2], Darko Dzambaz[2], Irena Rambabova-Bushljetik[1]

[1] University Clinic of Nephrology, Faculty of Medicine, University "SS Cyril and Methodius", Skopje, RN Macedonia
[2] University Clinic of Digestive surgery, Faculty of Medicine, University "SS Cyril and Methodius", Skopje, RN Macedonia

Corresponding author: Vladimir Pushevski, University clinic of Nephrology, Faculty of Medicine, University" SS Cyril and Methodius", RN Macedonia, email: pushev@yahoo.com

ABSTRACT

Peritoneal dialysis (PD) is one of the options for renal replacement therapy (RRT) in the end stage renal disease (ESRD) patients. Compared to hemodialysis (HD), patients on PD experience a greater sense of well-being, an improved steady state in terms of extracellular fluid volume shifts and hemodynamics and it is preferred method for patients with problematic vascular access, bleeding tendencies, heart failure and elderly patients.

In order to perform PD, a tunneled catheter should be placed through the abdominal wall and into peritoneal space, with positioning of the catheter within the most dependent portion of pelvis. Currently, there are several techniques available for PD catheter placement: open surgery, laparoscopic and percutaneous. We present for the first time in our country a case of 65 year old male patient to whom percutaneous onsite insertion of peritoneal catheter was performed. The idea is to emphasize that sometimes this should be a method of choice for RRT, especially in patients where general anesthesia should be avoid.

Compared to other methods, percutaneous insertion is a simple procedure with no need for general anesthesia, and the benefits of quick recovery, earlier ambulation, and less delay in catheter placement.

Keywords: End stage renal disease, peritoneal dialysis, PD catheter, percutaneous insertion

INTRODUCTION

Peritoneal dialysis (PD) is one of the major renal replacement therapy (RRT) options for patients with end stage renal disease (ESRD). Patients on PD experience a greater sense of well-being, an improved steady state in terms of hemodynamics and extracellular fluid volume shifts, preserved residual renal function, and have lower complication rates attributed to the method as compared to those on dialysis [1–7].

HD is typically performed three times weekly at an outpatient facility or rarely at home, and it represents a great burden for the healthcare system budget, while PD is performed almost always at home with no need for each day assistance from medical staff. Furthermore, patients on PD experience greater autonomy, higher satisfaction scores, and steadier volume status equilibrium, as there are shorter intervals between the dialysis sessions. It has been reported survival benefit of PD over HD patients during the first year, and particularly in patients younger than 65 years, while both methods provide similar risk of death for up to 5 years [8–12]. Moreover, PD is a preferred modality for patients waiting for kidney transplant, it may be used for urgent-start dialysis and being a home-based method it is associated with greater patient independence and improved quality of life [13–17].

PD is a technique where the vessel-rich peritoneum functions as a semipermeable membrane, expelling toxins and accumulated volume into a dialysate fluid within the peritoneal cavity via an osmotic interaction. One of the keys to successful PD and avoidance of urgent hemodialysis is the timely insertion of a well-functioning peritoneal dialysis catheter [18, 19]. Currently, there are several techniques available for PD catheter placement: open surgery, laparoscopic and percutaneous. Each technique has its own advantages and shortcomings. In two of these techniques patients need to be under general anesthesia, a condition that can increase hemodynamic instability especially in patients with heart failure and elderly patients.

In the present paper, we report for the first time in the country our experience of general anesthesia free percutaneous insertion of catheter for peritoneal dialysis patients using modified Seldinger technique.

CASE REPORT

A 65 year old male patient with ESRD on HD for a period of 4 months was admitted to our department for switching to peritoneal dialysis. Medical history showed that he had obstructive nephropathy, status post prostatectomy due to chronic ascending purulent prostatitis, chronic cystitis and arterial hypertension. After physical and ultrasound examination, along the standard blood tests, a percutaneous insertion of catheter for PD was proposed. Prior to the catheter insertion, the procedure and risks were explained, and informed consent was obtained.

Preparation prior the procedure

The patient preparation is the same for the different PD catheter insertion strategies. Routinely, the patient received a bowel preparation the evening before the procedure to avoid perioperative constipation. The patient was kept fasting overnight for the procedure. To avoid puncturing the bladder prior the procedure, the patient was asked to void. This procedure took place in a standard operation room. Blood pressure, heart rate and oxygen saturation were monitored before and during the procedure. The abdomen was shaved before disinfection with chlorhexidin digluconate 2% in 70% ethylalcohol. The operators prepare the instrumentation table, including an introduction needle, and the dialysis catheter kit containing a Tenckhoff double-cuffed straight dialysis catheter, a guide-wire and dilator with peel-away sheath. The dialysis catheter was soaked in normal saline to remove the air from the catheter cuffs prior to insertion.

Insertion of the catheter

This procedure was performed under local anesthesia (lidocaine 2%) through around 2 cm in length para-umbilical incision (around 3 cm lateral of the mid-line) followed by blunt dissection onto the linea alba. The bleeding risk is low because there are no significant abdominal wall vessels in that area. After the identification of the linea alba, the peritoneal cavity was punctured through the transversalis fascia and the parietal peritoneum using the needle. The needle was directed towards the pelvis in an angle of 45*. Once the peritoneal space was punctured, the intraperitoneal position was confirmed by injecting 10mL saline solution and around 50 ml air through the needle. Then, a guide-wire was inserted through the needle into the peritoneal cavity (Fig 1). The needle was withdrawn and a dilator with overlying peel-away sheath was advanced over the guide-wire (Fig. 2). Keeping the peel-away sheath in the direction of the pelvis, the guide-wire and dilator were removed and the catheter was inserted through the sheath towards the pelvis. Once the deep cuff was positioned up to the linea alba the sheath was peeled away. The dialysis catheter kit includes a plastic connector with luer lock. This connector piece was then mounted onto the catheter to check again outflow function using sterile dialysate solution (Fig. 3). After the function was confirmed, the catheter was clamped and the connector piece removed. Additional local anesthesia was provided at the level of the desired exit site and subcutaneous tunneling of the catheter to the selected exit site was performed using a tunneling stylet (Fig. 4). Next, the titanium connector piece was mounted, and outflow of the catheter was again tested (Fig. 5). Finally, the procedure ended by connecting the catheter extension line with a roller clamp. The incision site was sutured using two cutaneous sutures and together with the peritoneal dialysis catheter exit site it was covered with an absorbent dressing (Fig 6). The dressings of both the exit and the incision site were not opened for 10 days when the sutures were removed. After the intervention the patient

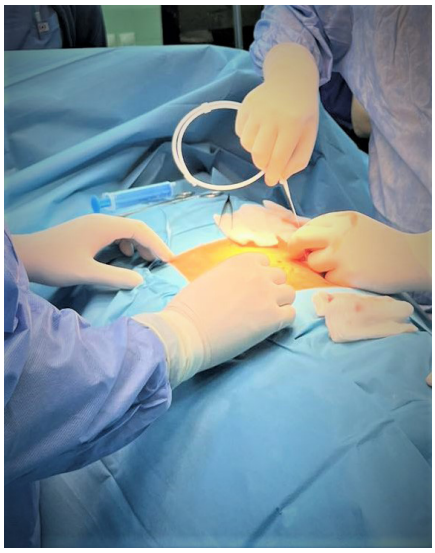


Figure 1. *Inserting the guide-wire*



Figure 2. *Inserting the dilatator*

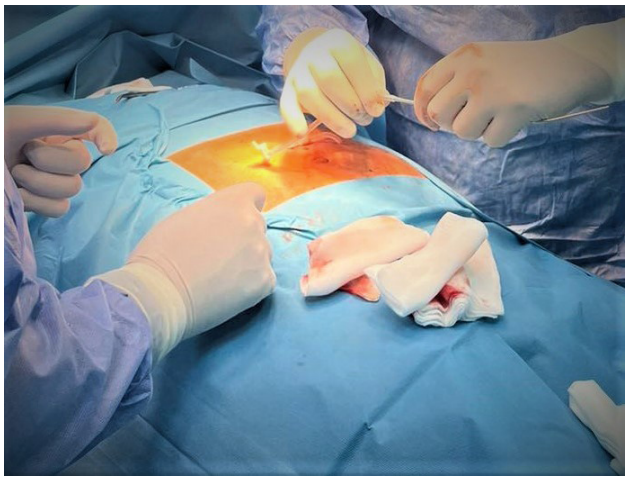


Figure 3. *Checking the functionality of catheter*

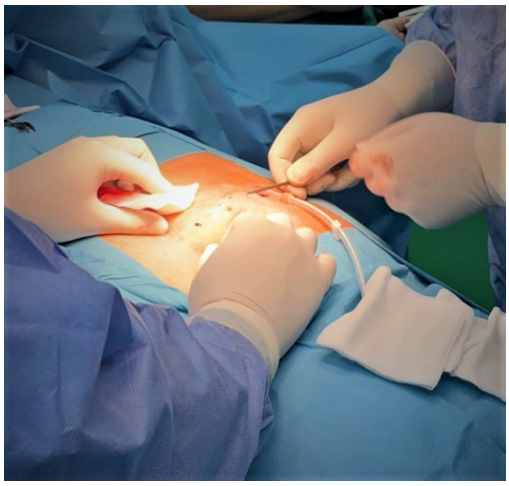


Figure 4. *Creating tunnel*

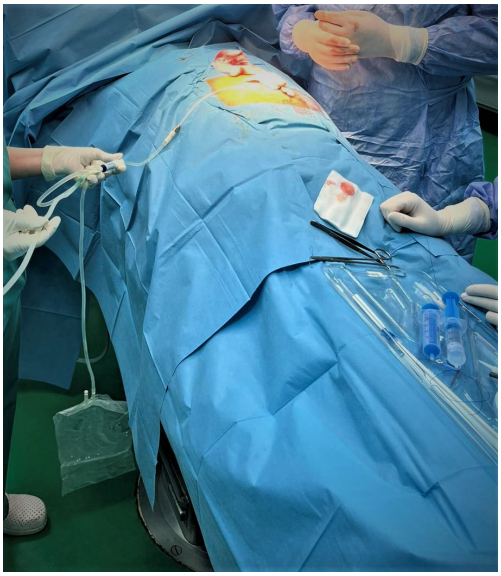


Figure 5. *Final check of the functionality*

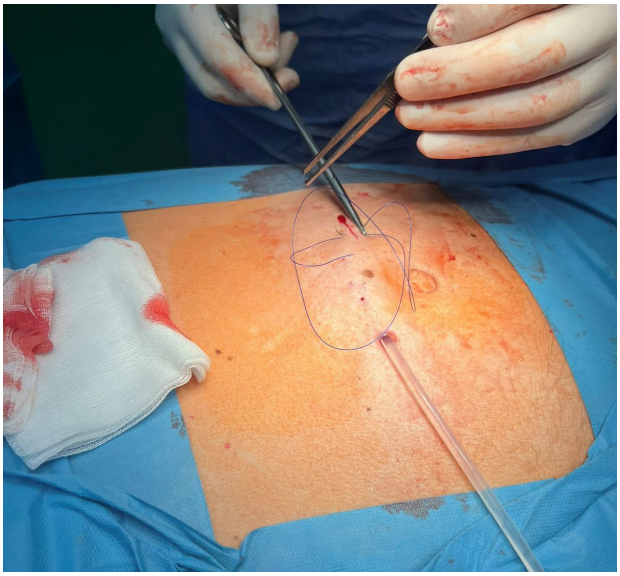


Figure 6. *Suturing the exit site*

received an intravenous 1 gr of Ceftriaxon and Ketoprofen for pain.

DISCUSSION AND CONCLUSION

We present for the first time in the country that percutaneous onsite insertion of PD catheter should be a method of choice for peritoneal dialysis in patients who need renal replacement therapy and where the insertion of PD catheter under general anesthesia is contraindicated.

Besides patients on dialysis who prefer to live active life and be more independent, peritoneal dialysis is a good option for patients who are hemodynamic unstable, have problematic vascular access, bleeding tendencies, patients with heart failure as well as elderly patients. Several techniques are available for PD catheter placement and these include open surgery, laparoscopic insertion and percutaneous placement. The traditional technique is a conventional open surgery where surgeons place a large percentage of PD catheters under general anesthesia. Recently, most of them have converted to laparoscopic method, which is less invasive and is associated with better outcome in terms of catheter function compared to conventional surgery [20]. The current guidelines of the International Society of Peritoneal Dialysis (ISPD) do not recommend one specific technique and only suggests that inserting the peritoneal dialysis catheter should be based on patient characteristics, facility resources and operator expertise [21].

We presented here the procedure for percutaneous insertion of PD catheter which is performed either by interventional nephrologist or radiologist where general anesthesia is avoided. The published reports till now show similar catheter function rates, mechanical and infectious complications, such as peritonitis, tunnel/exit site infection, catheter migration and catheter survival for percutaneous inserted peritoneal dialysis catheters compared to the surgically inserted peritoneal dialysis catheters [22-27]. Moreover, this technique might be useful for patients with normal BMI and no history of previous abdominal operation. In contrast, the surgical method can be reserved for cases of failed percutaneous placement or high-risk patients. The added benefit of minimal invasiveness and avoidance of general anesthesia in most cases provides a unique advantage at a time when home dialysis is becoming increasingly relevant in patients with ESRD. Compared to other methods, percutaneous insertion is a simple procedure that can be performed by non-surgeons, the classical operation room is not necessary, with the benefits of quick recovery, earlier ambulation, and less delay in catheter placement [22, 23]. In addition, because the large peritoneal incision is avoided, the percutaneous insertion can save much more time during the procedure.

In conclusion, we might say that the percutaneous method for PD catheter insertion can be performed at the bedside, negating the need for operating room time and removing the risks associated with general anesthesia and surgery. The choice of insertion is largely dictated by the patient's past surgical history. We think that this procedure should be initially attempted for all low-risk patients.

REFERENCES

1. Tokgoz B. Clinical advantages of peritoneal dialysis. Perit Dial Int 2009;29(Suppl 2):S59–S61.
2. Chaudhary K, Sangha H, Khanna R. Peritoneal dialysis first: rationale. Clin J Am Soc Nephrol 2011;6(2):447–456.
3. Savader SJ, Geschwind JF, Lund GB, Scheel PJ. Percutaneous radiologic placement of peritoneal dialysis catheters: long-term results. J Vasc Interv Radiol 2000;11(8):965–970.
4. François K, Bargman JM. Evaluating the benefits of home-based peritoneal dialysis. Int J Nephrol Renovasc Dis 2014;7:447–455.
5. Mehrotra R, Kermah D, Fried L, et al. Chronic peritoneal dialysis in the United States: declining utilization despite improving outcomes. J Am Soc Nephrol 2007;18(10): 2781–2788.
6. Vonesh EF, Snyder JJ, Foley RN, Collins AJ. The differential impact of risk factors on mortality in hemodialysis and peritoneal dialysis. Kidney Int 2004;66(6):2389–2401.
7. Latich I, Luciano RL, Mian A. Image-Guided Approach to Peritoneal Dialysis Catheter Placement. Tech Vasc Interv Radiol 2017;20(1):75–81
8. Wong B, Ravani P, Oliver MJ, et al. Comparison of Patient Survival Between Hemodialysis and Peritoneal Dialysis Among Patients Eligible for BothModalities. Am J Kidney Dis 2018;71(3):344–351
9. Hansson JH, Watnick S. Update on Peritoneal Dialysis: Core Curriculum 2016. Am J Kidney Dis 2016;67(1):151–164.

10. Mehrotra R, Devuyst O, Davies SJ, Johnson DW. The current state of peritoneal dialysis. J Am Soc Nephrol 2016;27(11):3238–3252.
11. Weinhandl ED, Foley RN, Gilbertson DT, Arneson TJ, Sny-der JJ, Collins AJ. Propensity-matched mortality comparison of incident hemodialysis and peritoneal dialysis patients. J Am Soc Nephrol 2010;21(3):499–506
12. Jaar BG, Coresh J, Plantinga LC, et al. Comparing the risk for death with peritoneal dialysis and hemodialysis in a national cohort of patients with chronic kidney disease. Ann Intern Med 2005;143(3):174–183
13. Joachim E, Gardezi AI, Chan MR, Shin JI, Astor BC, Waheed S. Association of pre-Transplant Dialysis Modality and Post-Transplant Outcomes: a meta-analysis. Perit Dial Int. 2017;37:259–65
14. Ghaffari A. Urgent-start peritoneal dialysis: a quality improvement report. Am J Kidney Dis. 2012;59:400–8.
15. Sloan CE, Coffman CJ, Sanders LL, et al. Trends in peritoneal dialysis use in the united states after medicare payment reform. Clin J Am Soc Nephrol 2019;14(12):1763–1772.
16. Jung HY, Jeong KH, Lim JH, et al. Fp471a Better Choice for Quality of Life: Hemodialysis Versus Peritoneal Dialysis. Nephrol Dial Transplant 2018;33(suppl_1):i195–i195.
17. United States Renal Data System. Medicare Expenditures for Persons With ESRD, Chapter 11. Am J Kidney Dis 2016; S277–S282.
18. Goh BL, Ganeshadeva YM, Chew SE, Dalimi MS. Does peritoneal dialysis catheter insertion by interventional nephrologists enhance peritoneal dialysis penetration? Semin Dial. 2008;21:561–6
19. Medani S, Shantier M, Hussein W, Wall C, Mellotte G. A comparative analysis of percutaneous and open surgical techniques for peritoneal catheter placement. Perit Dial Int. 2012;32:628–35.
20. Shrestha BM, Shrestha D, Kumar A, Shrestha A, Boyes SA, Wilkie ME. Advanced Laparoscopic Peritoneal Dialysis Catheter Insertion: Systematic Review and Meta-Analysis. Perit Dial Int 2018;38:163-71.
21. Crabtree JH, Shrestha BM, Chow KM, et al. Creating and Maintaining Optimal Peritoneal Dialysis Access in the Adult Patient: 2019 Update. Perit Dial Int 2019;39:414-36
22. Abdel Aal AK, Guest SS, Moawad S, et al. Outcomes of fluoroscopic and ultrasound-guided placement versus laparoscopic placement of peritoneal dialysis catheters. Clinical kidney journal 2018;11:549-54.
23. Esagian SM, Sideris GA, Bishawi M, Ziogas IA, Lehrich RW, Middleton JP, Suhocki PV, Pappas TN, Economopoulos KP. Surgical versus percutaneous catheter placement for peritoneal dialysis: an updated systematic review and meta-analysis. J Nephrol. 2021 Oct;34(5):1681-1696. doi: 10.1007/s40620-020-00896-w. Epub 2020 Nov 16. PMID: 33197001..
24. Khositrangsikun K, Chujohn W, Kanokkantapong C, Kanjanabuch T. Comparison of the Seldinger technique and surgical technique in Tenckhoff catheter insertion in CAPD patients: a single center experience. J Med Assoc Thai 2011;94 Suppl 4:S77-80.
25. Xie D, Zhou J, Cao X, et al. Percutaneous insertion of peritoneal dialysis catheter is a safe and effective technique irrespective of BMI. BMC Nephrol 2020;21:199.
26. . Kim JH, Kim MJ, Ye BM, et al. Percutaneous peritoneal dialysis catheter implantation with no break-in period: A viable option for patients requiring unplanned urgent-start peritoneal dialysis. Kidney Res Clin Pract 2020;39:365-72.
27. Nicholas J, Thomas M, Adkins R, et al. Percutaneous and surgical peritoneal dialysis catheter placements have comparable outcomes in the modern era. Perit Dial Int 2014;34:552-6.
28. Abdel Aal AK, Guest SS, Moawad S et al (2018) Outcomes of fuoroscopic and ultrasound-guided placement versus laparoscopic placement of peritoneal dialysis catheters. Clin Kidney J 11:549–554. https://doi.org/10.1093/ckj/sfx132

Резиме

ПЕРКУТАНО “ONSITE” ПОСТАВУВАЊЕ НА КАТЕТЕР ЗА ПЕРИТОНЕАЛНА ДИЈАЛИЗА - ВОВЕД НА НОВА МЕТОДА ВО ЗЕМЈАТА

Владимир Пушевски[1], Игор Г. Николов[1], Панче Караѓозов[2], Дарко Џамбаз[2], Ирена Рамбабова-Бушљетиќ[1]

[1] Универзитетска клиника за нефрологија, Медицински факултет, Универзитет „Св. Кирил и Методиј“, Скопје, РС Македонија

[2] Универзитетска клиника за дигестивна хирургија Медицински факултет, Универзитет „Св. Кирил и Методиј”, Скопје, РС Македонија

Перитонеалната дијализа (ПД) претставува една од методите на бубрежно заместителна терапија (БЗТ) кај пациенти со терминален стадиум на хронична бубрежна болест (ХББ). Во споредба со пациентите на хемодијализа (ХД), оние на ПД се чувствуваат подобро, имаат постабилна состојба во однос на промените на екстраклеточната течност и хемодинамиска стабилност. Се работи за метод на избор кај пациенти што имаат проблеми со васкуларниот пристап, склоност кон крвавење, срцева слабост и кај повозрасни пациенти.

За изведување ПД потребно е да се внесе тунелизиран катетер преку абдоминалниот ѕид во перитионеалниот простор, а врвот на катетерот да биде поставен во најниските делови од карлицата. Денес постојат неколку техники за поставување на катетер за ПД: оперативен, лапароскопски и перкутан. Презентираме, за првпат во нашата земја, приказ на случај на 65-годишен маж каде што е поставен перкутано “onsite” катетер за ПД. Целта е да се покаже дека, особено кај пациентите каде што општата анестезија е контраиндицирана, овој метод може да биде метод на избор.

Во споредба со другите методи, перкутаното поставување катетер за ПД е поедноставна процедура, со брзо опоравување, кратка хоспитализација и намалено време на чекање за негово поставување.

Клучни зборови: терминален стадиум на хронична бубрежна болест, перитонеална дијализа, ПД катетер, перкутано поставување