Kidney Medicine

Late Peritoneal Dialysis Exit-Site Leak: A Case Report

Laura Horowitz, Justin Ashley, Michael Brassil, Danny Marcuzzi, and Jeffrey Perl

Peritoneal dialysis (PD) pericatheter exit-site leaks most commonly occur early, within 30 days of catheter insertion. Late exit-site leaks are rare. The distinction between early and late exit-site leaks is important because the causes and subsequent management strategies may be different. Early leaks can often be first treated by delaying or holding PD therapy, allowing the prolongation of the healing time because fibrous tissue continues to form around the deep cuff. Late leaks are less likely to heal with cessation of PD alone and often require PD catheter replacement. In this case report, we provide an overview of the diagnosis and management of PD catheter exit-site leaks while highlighting a case of a late presenting exit-site leak resulting from a unique cause of PD catheter trauma.

Complete author and article information provided before references.

Kidney Med. 5(7):100647. Published online May 4, 2023.

doi: 10.1016/j.xkme.2023.100647

INTRODUCTION

Peritoneal dialysis (PD) pericatheter exit-site leaks most commonly occur early, within 30 days of catheter insertion. Late exit-site leaks are rare. The distinction between early and late exit-site leaks is important because the causes and subsequent management strategies may be different. In this case report, we provide an overview of the diagnosis and management of PD catheter exit-site leaks while highlighting a case of a late presenting exit-site leak resulting from a unique cause of PD catheter trauma.

CASE REPORT

A 70-year-old man with diabetic kidney disease was started on therapy with automated PD after fluoroscopic percutaneous PD catheter insertion. Two years later, he was admitted with a fall and PD-associated peritonitis due to *Corynebacterium* species, which was successfully treated with 2 weeks of intraperitoneal vancomycin and antifungal prophylaxis. During his hospitalization, all home medications were continued with the addition of subcutaneous heparin thromboprophylaxis. Furthermore, his prescription was optimized to include a daytime PD fluid dwell for fluid and small molecule clearance optimization. On admission, it was noted that his PD catheter's superficial cuff was extruding from the exit site but showed no signs of infection.

Two weeks after discharge, he reported early morning leakage around his catheter, which was characterized by wet bed sheets. He was mostly bedbound and showed no significant history of physical strain. On examination, his vitals and weight were within the normal range, and he appeared euvolemic. Despite his superficial cuff being exposed, the exit-site appeared clean. There were no signs of subcutaneous edema, erythema, hernias, and leaking or fluid tracking after a PD catheter flush. His day dwell was suspended, and he was prescribed prophylactic cephalexin because of high suspicion of PD fluid leak. A magnetic resonance imaging was ordered to look for subcutaneous PD fluid given that the patient recorded a contrast-related anaphylaxis history, making a computed tomography peritoneal leak study impossible. While awaiting the magnetic resonance imaging, the patient was sent home with urine dipsticks to test for glucose positivity should any fluid come from the exit-site or dressings become wet. The following day, the patient noted a leakage recurrence and, by successfully applying the urine dipsticks, noted that the fluid tested strongly positive for glucose—suggestive of peritoneal fluid.

Given this was a late presenting exit-site leak and his superficial cuff was exposed, there was suspicion for either a suboptimal PD catheter position or trauma as a cause. Because this was unlikely to heal with temporary cessation of the PD, the decision was made to lower the overnight fill volumes from 2 to 1.5 L and remove and reinsert the PD catheter in interventional radiology in the same procedure. During removal, the deep cuff was found to be fibrosed into the deep tissues and rectus sheath, which required repeated dissection and cutting of the catheter between both cuffs for removal. Once removed, the PD catheter was flushed from the proximal end with saline, which showed a small needle-sized pinhole adjacent to the deep cuff, the likely culprit of the late presentation of his PD fluid leak (Fig 1).

After the procedure, owing to a residual urine volume of 1 L/d, dialysis was held for 5 days with escalation of diuretics and addition of a potassium binder with close monitoring of patient's biochemistry. He was restarted on low 1.5-L volume cycler exchanges without a last fill and was encouraged to stay in the supine position. A week later, his prescription was intensified to 2-L volume cycler exchanges because there were no signs of leakage recurrence. He resumed his regular PD prescription 4 weeks after his procedure without any complications.

DISCUSSION

Pericatheter PD fluid leaks most often occur shortly after PD catheter insertion whereas late pericatheter leaks, often defined as developing over 30 days from PD catheter

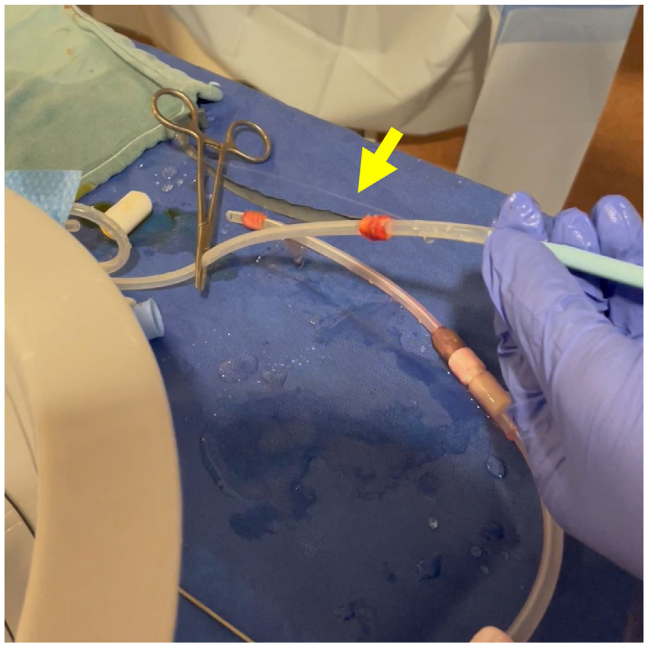

Figure 1. Catheter examination on removal in the interventional radiology suite with saline flush under pressure showed a small hole with fluid-jet visible above the deep cuff. Arrow points to the jet of fluid from the pinhole leak of the PD catheter.

insertion, are rare. Proposed mechanisms of early leaks relate to lack of establishment of a tight seal around the deep cuff of the PD catheter. Risk factors may relate to the early use of the PD catheter, excessive intraperitoneal pressure mediated by ambulatory and large dwell volume prescriptions, and patient-related factors that may delay or impair tissue healing. PD catheter leak risk may also be affected by a poorly positioned deep cuff, either not within the rectus abdominal muscle or a suboptimal central location within the rectus abdominal layer (Fig 2). Adjunct procedures at the time of PD catheter implantation (ie, application of a purse string suture at the deep cuff) may reduce these early leak risks.[1] Management of early leaks such as withholding PD therapy for short periods of time and restarting with low-volume supine exchanges allow for successful tissue healing. Weight lifting limitations of 7-10 kg can also be suggested to patients who are quite active and are at the risk of impaired healing or recurrence owing to physical strain.[1] On the contrary, late leaks frequently require surgical replacement of the catheter.

The diagnosis of an exit-site leak involves a clear clinical history of fluid coming from or around the exit site or an unexplained wetness around the catheter. Finally, confirmation often requires imaging by either a computed tomography or an magnetic resonance imaging.[2] Another technique to help with the diagnosis includes using urinary dipsticks to analyze the leaking fluid. Given that most PD solutions are glucose based, fluid testing with positive results for glucose on the urinary dipstick is highly suggestive of PD dialysate being the source of the fluid leakage. This is an easy, inexpensive, and accessible test that can help identify PD fluid leaks.

Once a diagnosis of exit-site leak is made, there is still the question of etiology and risk factors, particularly in the rare case of a late leak. A retrospective cohort study of all 5 centers in Albuquerque New Mexico collected PD fluid leak cases from 1979 to 1989 and compared early with late leaks. They found an incidence rate of 5% of late exit-site leaks, most of which presented in patients with a history of multiple abdominal surgeries, multiple pregnancies, and treated with corticosteroids at the time of continuous ambulatory PD.[3] Most of the late leaks (68%) occurred within the first year, whereas only 3.6% (1 case of 28) presented after 3 years. In addition only 25% of those with late leaks had actually presented as an exit-site leak, whereas most presented with poor dialysate outflow.[3]

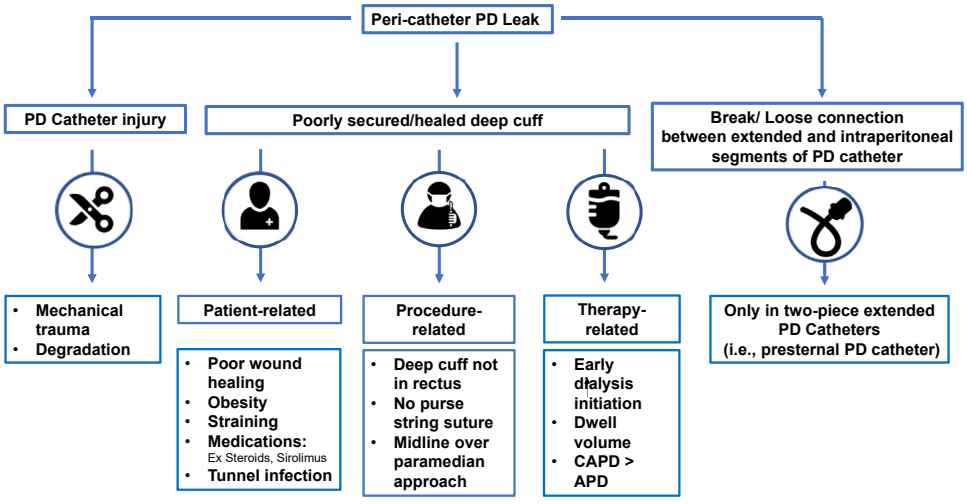

Figure 2. Common causes of pericatheter PD leak. PD, peritoneal dialysis, CAPD, continuous ambulatory peritoneal dialysis, APD, automated peritoneal dialysis.

Furthermore, a Canadian study from 1990 similarly reported a 5% incidence of late leaks, most occurring between 3 and 12 months of treatment, with no difference between women and men. Only 2 patients weighed >80 kg (median, 72.5 kg), and none were receiving oral corticosteroids at the time of diagnosis.[4] Two of their 8 late leak cases presented with associated ventral hernias, and only 1 case was documented to have underwent an event that may have provoked this leak.[4] Another report from Turkey comparing 25 cases of late leaks with no-leak cohorts indicated that late leaks occurred more often in females, in patients receiving continuous ambulatory PD as opposed to automated PD, and more often associated with left sided catheters. No increased risk was found for elevated body mass index, surgical or percutaneous implantation technique, or increasing fill volumes.[5] Although a variety of modifiable and nonmodifiable patient risk factors have been suggested to contribute to the exit-site leak, mechanical trauma to the PD catheter has infrequently been documented as an unusual cause of dialysate leak.[6]

Our patient presented quite late at over 2 years after PD initiation with an exit-site leak. Given the rarity of his presentation, a complete examination was performed of his removed PD catheter. On careful examination, a small hole was found just proximal to the deep cuff. The size seems to suggest that the catheter may have been punctured by a needle. Given his clinical history, possible causative factors may include the iatrogenic damage to the catheter by subcutaneous administration of low molecular weight heparin and darbepoeitin to erythrocyte stimulation agent (27 gauge, 12.7-mm needle), thromboprophylaxis administration during his most recent hospitalization, or with his new home care assistance. Although the self-injecting of insulin (variable needle sizes) or darbepoetin (27 gauge, 12.7 mm) by the patient is a possibility, he is a long-term patient who understood the importance of injection site location. Although insulin comes in a variety of needle-gauges, most are too small to result in catheter trauma, making dalteparin or darbepoetin the most likely causative factors. Finally, although the finding of the catheter hole is the likely explanation for his late catheter leak, it is unlikely that this catheter puncture may have occurred during the time of catheter removal while receiving the local anesthetic along the PD catheter tunnel.

To date, this may be the first-documented case of suspected PD catheter trauma from a needle injection presenting as a late exit-site leak. Given this hypothesis, subcutaneous injections in proximity to the catheter and tunnel sites may be risk factors for late leaks within the population treated with PD. We believe that providing education in the home and inpatient settings to patients, care partners, and health care providers around PD catheter safety should further include avoiding injections along the tunnel and in proximity to the exit-site. In addition, it is relevant to avoid injection sites close to the subcutaneous tunnel among patients with embedded PD catheters who have not yet undergone PD catheter exteriorization. Moreover careful examination of the PD catheter when removed for a persistent pericatheter leak may yield interesting insights into the etiology. Future studies should consider investigating whether recent hospitalization may be an independent risk factor for late PD leaks.

ARTICLE INFORMATION

Authors' Full Names and Academic Degrees: Laura Horowitz, MD, Justin Ashley, MSc, MD, Michael Brassil, MD, Danny Marcuzzi, MD, and Jeffrey Perl, MSc, MD, FRCP

Author's Affiliations: Division of Nephrology (LH, JA, JP), and Division of Interventional Radiology (DM), St. Michael's Hospital, Unity Health, University of Toronto, Ontario, Canada; and Consultant for Interventional Radiologist, Tallaght University Hospital, Dublin, Ireland (MB).

Address for Correspondence: Jeffrey Perl, MSc, MD, FRCP, 3-060 Shuter Wing, 30 Bond Street, Toronto, Ontario M5B 1W8, Canada. Email: Jeffrey.perl@unityhealth.to

Support: None.

Financial Disclosure: The authors declare that they have no relevant financial interests.

Acknowledgements: The authors thank Dr J Crabtree and Dr Edgar V Lerma for their inputs and recommendations in Figure 2.

Patient Protections: The authors declare that they have obtained consent from the patient reported in this article for publication of the information about him that appears within this case report and any associated supplementary material.

Peer Review: Received December 1, 2022. Evaluated by 1 external peer reviewer, with direct editorial input from the Editor-in-Chief. Accepted in revised form February 27, 2023.

REFERENCES

1. 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(5):414-436.
2. Scanziani R, Pozzi M, Pisano L, et al. Imaging work-up for peritoneal access care and peritoneal dialysis complications. *Int J Artif Organs*. 2006;29(1):142-152. doi:10.1177/039139880602900115
3. Tzamaloukas AH, Gibel LJ, Eisenberg B, et al. Early and late peritoneal dialysate leaks in patients on CAPD. *Adv Perit Dial*. 1990;6:64-71.
4. Hirsch DJ, Jindal KK. Late leaks in peritoneal dialysis patients. *Nephrol Dial Transplant*. 1991;6(9):670-671.
5. Albaz M, Kantaci G, Tuglular S, Tercüman N, Tetik G, Ozener C. Causes of late leaks in peritoneal dialysis patients. *EDTNA ERCA J*. 2002;28(4):170-172.
6. Hassan K, Rubinchik I, Hassan F, Ron E, Hassan S. Unusual cause of late peritoneal dialysate leakage. *Perit Dial Int*. 2012;32(3):360-361.