Can Catheter Dormancy Be the Only Risk Factor for Delayed Small Bowel Perforation by Peritoneal Catheter?

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Abstract
With the progression of chronic kidney disease (CKD), it is sensible to prepare patients for the need for renal replacement therapy. Peritoneal dialysis (PD) remains an advantageous option for those with residual kidney function and those who seek treatment adaptable to their daily routine. Timely catheter insertion is recommended to reduce the risk of peri-catheter leak associated with urgent-start PD. We present the case of a 49-year-old woman with CKD due to diabetic renal disease, who underwent peritoneal catheter placement via mini-laparotomy, using Moncrief- Popovich technique. Due to CKD stability, she remained dialysis-free for two years. In September 2024, she presented with pain over the catheter and an adjacent pustule, with identification of *Citrobacter braakii* in the exudate. She started cotrimoxazole, with clinical improvement. One month later, she reported catheter-tunnel tenderness, occasional vomiting and weight loss. Catheter exteriorization was planned due to symptoms suggestive of uremic syndrome. Upon testing the catheter, the macroscopic appearance of the drained fluid was suggestive of enteric matter, with subsequent confirmation of bowel perforation on computed tomography scan, requiring its removal. While bowel perforation during catheter insertion is uncommon, bowel erosion over time is even rarer, usually described in dormant catheters. Other risk factors described in the literature were not found in our case, posing the question of whether catheter dormancy alone may predispose to delayed bowel perforation. This exceptional case highlights the importance of determining the right time for catheter placement, avoiding prolonged catheter dormancy and bowel erosion, which can compromise the peritoneal membrane and the future feasibility of PD itself.

Keywords: Catheters, Indwelling/adverse effects; Intestinal Perforation/etiology; Kidney Failure, Chronic/therapy; Peritoneal Dialysis

What's already known about this topic?
- Bowel perforation is an uncommon complication secondary to peritoneal catheter placement, often related to blind placement techniques.
- Delayed bowel erosion is a very rare complication, usually not related to catheter placement itself.
- Risk factors for delayed bowel erosion include dormant catheters, bowel diseases, amyloidosis and immunosuppression.

What does this study add?
- It highlights that peritoneal catheter dormancy and risk of delayed bowel erosion do not occur only in patients who have transitioned to hemodialysis or kidney transplantation, but also in patients who have an embedded Tenckhoff catheter that has still not been used.
- Despite risk factors described above, catheter dormancy can be the only risk factor for delayed bowel erosion.
- Patients can be asymptomatic or have only vague symptoms, especially if perforation is not in the colon segment of the bowel.

Learning points/Take-home messages:
- Delayed bowel erosion can present with very few symptoms, stressing the need for a high level of clinical suspicion.

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- Although rare, this complication may render peritoneal dialysis infeasible due to changes to the peritoneal membrane and possibly the peritoneal cavity.
- This case underscores the need to better predict the appropriate timing of catheter insertion to avoid prolonged indwelling when the catheter is not being used, actively reducing the risk of this complication.

INTRODUCTION

Peritoneal dialysis (PD) is a form of renal replacement therapy (RRT) in which solute clearance and ultrafiltration occur through the peritoneal membrane. This technique has similar efficiency to hemodialysis, while allowing for an autonomous and flexible treatment, minimizing its interference with daily routine. Since it promotes higher hemodynamic stability, PD helps preserve residual kidney function, which in turn facilitates extracellular fluid volume control, diminishing volume overload and decreasing cardiovascular comorbidities and mortality.[1,2]

Before initiating PD, it is necessary to place a peritoneal catheter in the abdominal cavity. This procedure should be done at least 2 weeks before dialysis is required, to reduce the risk of early complications, namely peri-catheter leak associated with urgent-start PD.[3] Other common complications associated with catheter insertion include leakage, infection, hematoma and peritonitis.[4] Bowel perforation is a rare complication related to PD catheter placement, which usually leads to peritonitis.[5]

While extremely rare, bowel erosion by peritoneal catheters has been described, with less than 40 cases published in the literature. We present the case of delayed bowel perforation in a dormant peritoneal catheter.

CASE REPORT

We present the case of a 49-year-old woman with type-1 diabetes mellitus diagnosed during her first gestation at 23 years of age, currently taking insulin with reasonable glycemic control. She also had a past medical history of hypertension, hyperlipidemia, and tobacco use. Her chronic kidney disease (CKD), attributed to diabetic renal disease, was first diagnosed in 2021, when she presented to the emergency room complaining of longstanding lower leg oedema and fatigue. Blood work revealed a serum creatinine of 4.1 mg/dL, hypoalbuminemia and nephrotic range proteinuria, signs of nephrotic syndrome secondary to advanced diabetic renal disease.

She started follow-up in the outpatient setting and quickly evolved to stage 5 CKD.

RRT options were explained and the patient opted for PD. Her two potential living donors were unable to proceed with the investigation due to medical concerns regarding future kidney disease, rendering pre-emptive kidney transplantation unavailable to her. In the absence of surgical or other contraindications, a coiled-tip swan-neck double-cuffed peritoneal catheter was placed in January 2022, via mini-laparotomy and using Moncrief-Popovich technique. No complications were identified intra-operatively or in the following days. Her kidney function stabilized and she remained asymptomatic and dialysis-free for over two years.

In September 2024, the patient presented to her routine appointment complaining of pain over the catheter tunnel, with identification of an adjacent pustule without clear involvement of the external cuff. There were no cutaneous lesions or insect bites justifying an external origin for infection. The lesion was drained and a *Citrobacter braakii* was identified. She was started on cotrimoxazole with a good clinical response. One month later, she presented again with tenderness over the catheter tunnel, but with no visible fluid collections on inspection or after ultrasonography evaluation. She also complained of occasional vomiting and weight loss in the prior weeks, with no mention of abdominal pain or change in intestinal motility. Fever was also absent. She started cotrimoxazole again, and prompt catheter exteriorization was scheduled due to symptoms suggestive of uremic syndrome and end-stage renal disease. An incision above the catheter tunnel was made and the catheter tip was exteriorized successfully. However, upon testing the catheter, there was immediate drainage of a dark yellow fluid with suspended particles suggestive of enteric content, which raised the suspicion of bowel perforation (Fig. 1). An urgent computed tomography (CT) imaging of the abdomen and pelvis confirmed the diagnosis finding the distal 20 cm segment of the catheter inside the small bowel lumen, without pneumoperitoneum or fluid collections (Fig. 2). She was admitted to the Nephrology ward and started piperacillin and tazobactam. Laparotomy with catheter removal and small bowel raffia was performed the next day. On day 1 post-op, the patient developed septic shock, later known to be secondary to Pneumonia, probably due to aspiration during anesthesia induction. Peritonitis was excluded. She was admitted to the intensive care unit, where she underwent two sessions of sustained low-efficiency dialysis due to acute kidney injury with anuria and metabolic imbalances. She later regained diuresis and kidney function recovered to the previous baseline, with an estimated glomerular filtration rate (eGFR) of 11 mL/min/1.73 m2. She was discharged from the hospital and continued follow-up in the outpatient clinic. She maintained her option for PD, and is currently asymptomatic and with no need for RRT at this time.

Figure 1. Drainage obtained from peritoneal catheter, suggestive of enteric matter.

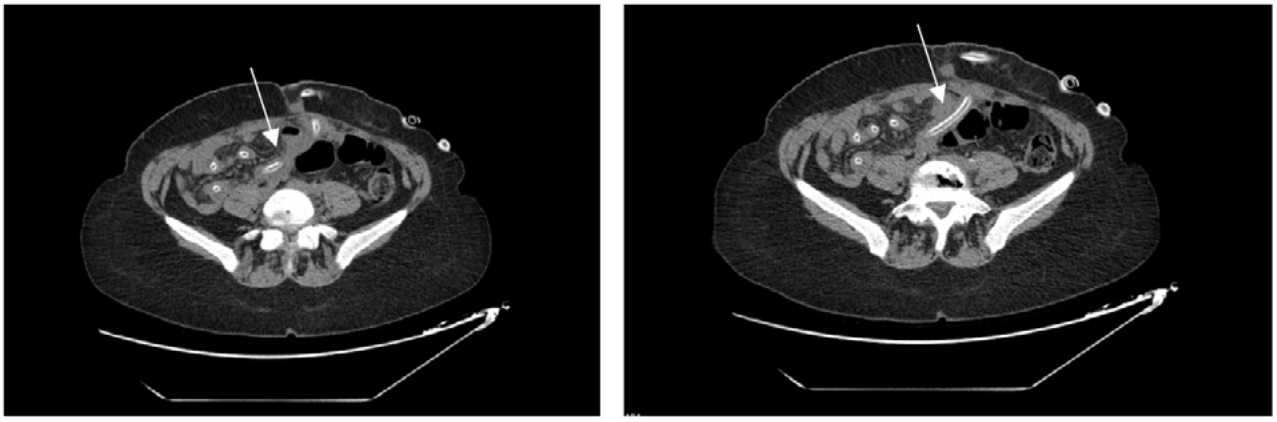

Figure 2. Peritoneal catheter found inside the ileal loops, as demonstrated by the arrows.

DISCUSSION

While bowel perforation in the setting of PD catheter insertion is a known complication and often related to blind placement techniques and the use of straight tip catheters, delayed bowel erosion is a very rare complication and is usually encountered in dormant catheters.[5-7] It most commonly occurs in the colon and manifests itself with watery diarrhea, rectal hemorrhage, catheter protrusion from the anus, feculent peritonitis, or acute abdomen.[8-10] Nevertheless, there have been some cases of asymptomatic patients, where catheter migration is identified upon signs of catheter malfunction, such as low or absent outflow during peritoneal dwell.[10] Risk factors for this complication are not well established, but some contributing factors have been identified. These include dormant catheters in an empty peritoneal cavity, enhancing the risk of pressure necrosis due to sustained direct contact between the catheter and the bowel without the lubricant effect of the dialysate, bowel diseases such as diverticulosis and constipation, amyloidosis and peritoneal friability due to immunosuppression.[6,8,11-14] Despite straight-tip catheters being associated with a higher risk of perforation upon their insertion, data are lacking on whether they harbour a higher risk of bowel erosion than coiled ones in patients with dormant or inactive PD catheters. The optimal timing for catheter implantation remains uncertain, and eGFR at the time of the procedure varies greatly.[3] Published cases of delayed bowel erosion occurred between 6 weeks and

4 years after catheter placement.[6,7] According to the International Society for Peritoneal Dialysis (ISPD), the timing for the procedure should be individualized and based on institutional capacity and individual patient factors.[3,15]

Treatment strategies have varied among reported cases in the literature, often depending on the severity of presentation. Some decided for the removal of the PD catheter and segmental resection of the affected bowel,[14] while others opted for catheter removal and closure of the wall defect only.[10] In pediatric patients, since PD catheter's internal diameter is smaller, some physicians simply removed the catheter and adopted a more conservative strategy.[13]

After reviewing the PD catheter insertion report and considering the absence of symptoms for over two years, we believe our patient's catheter migrated over time to the small bowel lumen. Since in this case the patient was not undergoing PD yet, the most typical symptoms as described above were not evident. Furthermore, those would be symptoms related to colonic perforation, not small bowel perforation. The silent presentation in our case could be explained by localized inflammation sealing off the wall defect, preventing the development of peritonitis and acute abdomen. In this case, no biopsy of the small intestine wall was obtained, which could have helped assess eventual underlying bowel disease contributing to this event, although unlikely. We found no other potential risk factors, such as immunosuppression.

CONCLUSION

Prolonged dormancy of the PD catheter may be the only factor increasing the risk of bowel erosion and subsequent need for surgical intervention, as was the case with our patient. This complication, in turn, may render the future of PD impossible and mandate the initiation of hemodialysis. With this case report, we want to highlight this complication and remind that it may present with minimal to no symptoms. While determining the appropriate time for catheter placement is crucial to prevent premature insertion and avoid prolonged indwelling in the peritoneal cavity, we acknowledge that this prediction is difficult in the real-world setting.

Awards and Previous Presentations

This case was presented as a poster in the EuroPD congress in 2025, in Valencia.

Ethical Disclosures

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RP: Conceptualization, bibliographical search, data collection, drafting of the article.
SP and BM: Drafting of the article and critical discussion.
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