Diagnostic Dilemma: A Case of Endogenous Peritonitis

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Endogenous peritonitis resulting from inflammation or perforation of an abdominal viscus—a result, for example, of diverticulitis, cholecystitis, or acute appendicitis—can be a complication in patients undergoing peritoneal dialysis (PD), with significant morbidity and a high incidence of catheter loss.

Here, we describe an end-stage renal disease patient on PD who presented with acute abdominal pain and who was diagnosed with uncomplicated PD peritonitis. His clinical course was complicated by development of eosinophilic peritonitis because of an allergy to vancomycin. Subsequently, when he failed to show clinical improvement, abdominal and pelvic imaging revealed severe appendicitis, which necessitated emergent surgical intervention.

Key words

Endogenous peritonitis, eosinophilic peritonitis

Introduction

Peritonitis is one of the many causes of acute abdominal pain in patients on peritoneal dialysis (PD). Occasionally, finding a specific cause of acute abdominal pain might not be an easy task, especially in the absence of typical symptoms or signs. The result can be a delay in diagnosis, with potentially fatal consequences. Early intervention with intraperitoneal (IP) antibiotics, a common clinical practice in such situations, might not only modify the clinical presentation, it might also hinder a proper bacteriologic diagnosis. Abdominal computed tomography (CT) imaging can be especially helpful in clarifying the cause in such cases. Imaging should be performed early (and repeated if required), because a negative result might not always imply the absence of an underlying pathology (1,2).

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Here, we describe an interesting case of acute abdominal pain in a patient on PD who was treated with IP antibiotics. Lack of an adequate response to initial treatment, together with an elevated eosinophil count in both peripheral blood and PD effluent, raised concern for eosinophilic peritonitis attributable to vancomycin, which was stopped. However, the persistence of abdominal symptoms on day 7 of admission led to abdominal CT imaging that was diagnostic for acute appendicitis. An inflamed appendix was eventually identified as the ultimate cause of the poor response in a patient who initially presented with PD-related peritonitis.

Case description

A 23-year-old white man presented with generalized abdominal pain (no relieving or aggravating factors), poor oral intake, headache, and a fever of 2 days' duration. He had end-stage renal disease (ESRD) resulting from progressive chronic kidney disease secondary to childhood hemolytic uremic syndrome. At the age of 15, he had undergone a living unrelated kidney transplant that was later complicated by chronic allograft nephropathy. He subsequently developed ESRD and started PD within a year of the current presentation.

The patient was on nightly automated PD. His prescription called for a total exchange volume of 10 L 1.5% dextrose overnight (5 exchanges, 2 L per exchange). He complained of nausea, but no vomiting. He had also noticed cloudy PD effluent. He presented to our emergency room concerned about peritonitis.

Physical examination on admission revealed an acutely ill man with a temperature of 38.5°C, a heart rate of 109 bpm, blood pressure 151/104 mmHg, and a respiratory rate of 20/min. Bowel sounds were audible in all quadrants, and generalized diffuse abdominal tenderness was present.

Laboratory data on admission showed a peripheral white blood cell count of 13,800/mm^3 (84.1% granulocytes, 5.9% lymphocytes), hemoglobin 8.6 g/dL, albumin 4.3 g/dL, and serum lactate 2.4 mmol/L. The PD fluid appeared cloudy, with a total white cell count of 5928/mm^3 (83% neutrophils, 3% lymphocytes, 1% eosinophils, and 13% monocytes, macrophages, or histiocytes). A diagnosis of PD peritonitis was made, and the patient was empirically started on IP vancomycin and ceftazidime per our institutional protocol.

Initial staining of the PD effluent showed gram-positive cocci in clusters. The final culture report at 72 hours showed the presence of oxacillin-sensitive coagulase-negative *Staphylococcus.* Intraperitoneal antibiotics were adjusted based on the sensitivity report.

The patient experienced a slight improvement in his symptoms, with a decrease in his peripheral white blood cell count to 8500/mm^3. However, the peripheral blood count showed worsening bandemia (14.7%) in association with eosinophilia (64.6% granulocytes, 14.7% bands, 13.8 lymphocytes, 3.1% eosinophils). The patient's symptoms did not improve as expected, and he continued to have generalized abdominal pain and poor oral intake.

On day 4 of admission, because of the lack of complete resolution of his symptoms and worsening bandemia, a repeat PD fluid analysis showed a worsening white cell count (18,255/mm^3 with 94% neutrophils, 2% lymphocytes, and 6% eosinophils).

The presence of eosinophils in the PD fluid in association with peripheral eosinophilia raised concern for eosinophilic peritonitis secondary to vancomycin, which was discontinued. Intravenous meropenem was started based on the recommendation of an infectious diseases specialist. Despite those measures, the patient's abdominal pain continued to worsen, and on day 7 of admission, his abdominal pain became much worse, with localization to the right lower quadrant. Imaging by CT of abdomen and pelvis (with oral contrast) showed appendiceal dilatation, with evidence of acute appendicitis.

The patient was taken to the operating room for urgent operative intervention. Intraoperative findings demonstrated a significant quantity of fibrinous adhesions, without evidence of fecal spillage. The appendix was found to be significantly inflamed and thickened, but it was not perforated and was successfully removed. The PD catheter was left *in situ.* The patient began to improve postoperatively, and on day 3 after the surgery, an attempt was made to restart PD. The attempt was unsuccessful because of a blocked PD catheter. Several attempts to forcibly flush the catheter with 60 mL saline administered by syringe were unsuccessful. Imaging by CT of the abdomen, with contrast injection into the catheter, revealed an extensive fibrin sheath covering the PD catheter, with occlusion of the distal tip. It was decided to transition the patient to hemodialysis before discharge.

Culture of the PD effluent drawn on days 4 and 5 revealed gram-negative rods identified as *Bacteroides fragilis* and *Citrobacter braakii* respectively.

Discussion

Surgical abdomen in patients with ESRD on PD can be difficult to diagnose because the presentation might not include the typical symptoms—such as nausea, vomiting, and localized abdominal pain—found in non-ESRD patients. Those difficulties can lead to a significant delay in diagnosis, with potentially serious consequences (1). Use of empiric IP antibiotics with continuation of PD therapy tends to alleviate the symptoms because of the removal of inflammatory mediators, resulting in findings consistent with culture-negative peritonitis. Imaging by CT is usually very sensitive and specific in diagnosing appendicitis in non-PD patients; however, in PD patients, the sensitivity is lower. Imaging results could therefore be falsely reassuring despite the presence of an existing intra-abdominal pathology (2,3). The mortality in both instances rises significantly with delay in surgical intervention (3).

Because no imaging was obtained at initial presentation, it is unclear whether our patient's initial presentation was attributable to acute appendicitis. However, the initial culture result (positive for coagulase-negative *Staphylococcus*) supports a diagnosis of routine PD-related peritonitis instead of an intra-abdominal septic pathology causing endogenous peritonitis. Results of subsequent cultures grew gram-negative rods that could have raised suspicion for an endogenous cause of the peritonitis, but those results became available only after confirmation of acute appendicitis by imaging and surgical intervention. The elevated PD fluid eosinophil count could have been a result of peritonitis, but most likely represented an allergic reaction to vancomycin (given a history of a previous allergic reaction to vancomycin as a child,

which was revealed on subsequent inquiry). In one observational study, about 50% of PD eosinophilia was reported to be a result of infection; the rest was labeled as idiopathic (4).

Diagnosis of endogenous peritonitis in ESRD patients on PD should be made early because loss of the PD access is a very common complication of endogenous peritonitis (5). Early diagnosis reduces peritoneal damage, improves morbidity and mortality, and provides a chance of return to PD after surgery (5). Elevated levels of biomarkers such as matrix metalloproteinase 2 and 9 in the PD fluid (which become elevated as a consequence of direct peritoneal injury in the endogenous peritonitis) have been suggested as a possible means to differentiate endogenous peritonitis from simple PD peritonitis (6). Elevated serum C-reactive protein and amylase in PD effluent, together with the presence of gram-negative anaerobes, should also raise suspicion for the possibility of endogenous peritonitis (7).

Summary
Peritoneal dialysis peritonitis remains a major cause of morbidity and mortality. The incidence of PD peritonitis has declined through the years because of better catheter design and patient training. A high index of suspicion and early diagnosis are key to reducing the severity of illness and PD technique failure (8).

Disclosures
We understand that *Advances in Peritoneal Dialysis* requires disclosure of any conflicts of interest, and we declare that we have no conflicts to disclose.

References
1 Sayegh J, Lanoiselée S, Besson V, Balit G, Subra JF, Augusto JF. Fatal case of perforated appendicitis in an elderly CAPD patient. *Int Urol Nephrol* 2012;44:633–4.

2 Windpessl M, Prischl FC. Surgical peritonitis in peritoneal dialysis patients: an absence of (radiological) evidence is not evidence of its absence. *Intern Med* 2014;53:645.

3 Carmeci C, Muldowney W, Mazbar SA, Bloom R. Emergency laparotomy in patients on continuous ambulatory peritoneal dialysis. *Am Surg* 2001;67:615–18.

4 Fontán MP, Rodríguez-Carmona A, Galed I, Iglesias P, Villaverde P, García-Ureta E. Incidence and significance of peritoneal eosinophilia during peritoneal dialysis–related peritonitis. *Perit Dial Int* 2003;23:460–4.

5 Tzamaloukas AH, Obermiller LE, Gibel LJ, *et al.* Peritonitis associated with intra-abdominal pathology in continuous ambulatory peritoneal dialysis patients. *Perit Dial Int* 1993;13:S335 –7.

6 Takezawa Y, Saitou Y, Uchida T, Hirahara I, Kusano E, Kobayashi M. Matrix metalloproteinase levels in peritoneal effluents were increased in a patient with appendicitis undergoing continuous ambulatory peritoneal dialysis. *Clin Exp Nephrol* 2012;16:501–4.

7 Mizuno M, Suzuki Y, Ito Y. Future expectations of diagnostic approaches for treating endogenous peritonitis in patients on peritoneal dialysis. *Intern Med* 2014;53:647.

8 Miller GV, Bhandari S, Brownjohn AM, Turney JH, Benson EA. "Surgical" peritonitis in the CAPD patient. *Ann R Coll Surg Engl* 1998;80:36–9.

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