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# Sevelamer-associated gastrointestinal mucosal injury with bleeding and Enterococcus faecalis peritonitis in a peritoneal dialysis patient: a case report

**Takayuki Yamada**
taka.yamada0125@gmail.com

Omihachiman Community Medical Center
**Arjun Kalaria**
Florida Kidney Physicians
**Kosuke Inoue**
Omihachiman Community Medical Center
**Kenta Okada**
Omihachiman Community Medical Center
**Tetsuro Aoi**
Omihachiman Community Medical Center
**Yumi Nonaka**
Omihachiman Community Medical Center
**Yuki Obayashi**
Omihachiman Community Medical Center
**Yasuto Sunahara**
Omihachiman Community Medical Center
**Tomoharu Ida**
Omihachiman Community Medical Center
**Shula Schechter**
University of Michigan
**Filitsa Bender**
University of Pittsburgh Medical Center

**Case Report**

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## Abstract

Background: Sevelamer is a non-calcium-containing phosphate binder widely used in patients with end-stage kidney disease (ESKD). Although sevelamer is generally well tolerated, sevelamer crystals can rarely cause gastrointestinal (GI) mucosal injury, including colitis, ulceration, and bleeding. In patients undergoing peritoneal dialysis (PD), GI mucosal injury may coexist with or contribute to peritonitis caused by enteric organisms.

Case presentation: A 24-year-old woman with ESKD on PD presented with abdominal pain, dark stool, cloudy peritoneal dialysis fluid, and inability to perform PD. Laboratory testing showed severe anemia and a positive fecal occult blood test, and abdominal computed tomography revealed colonic wall thickening from the cecum to the transverse colon. Sevelamer was discontinued on the day of admission. Colonoscopy demonstrated multiple shallow ulcers in the cecum. Biopsy showed focal neutrophilic inflammation with characteristic sevelamer crystals. PD fluid culture grew *Enterococcus faecalis*, and she was treated with intraperitoneal vancomycin. She was switched from sevelamer to ferric citrate and discharged while continuing PD.

Conclusions: This case highlights an important diagnostic pitfall in patients undergoing PD who are receiving sevelamer. Abdominal pain and cloudy dialysate should not be attributed solely to peritoneal dialysis-related peritonitis when signs of GI bleeding or colitis are present. Early evaluation of both the peritoneal cavity and GI tract may allow timely discontinuation of sevelamer and appropriate treatment of peritonitis before progression to severe complications.

## Introduction

Hyperphosphatemia is a common complication of end-stage kidney disease (ESKD) (1). Dietary phosphate restriction and phosphate binders are the mainstay of treatment for lowering serum phosphorus levels. Sevelamer, a non-calcium-containing phosphate binder, is one of the most commonly used phosphate binders in patients with ESKD (2).

Sevelamer is generally well tolerated, and its common adverse effects include mild gastrointestinal (GI) symptoms such as nausea, vomiting, constipation, and diarrhea. However, previous case reports have described sevelamer crystal-induced GI mucosal injury, including ulceration and GI bleeding (3–6).

In patients undergoing peritoneal dialysis (PD), GI mucosal injury may contribute to peritonitis caused by enteric organisms through disruption of the intestinal barrier. Here, we report a case of sevelamer-associated GI mucosal injury complicated by severe GI bleeding and *Enterococcus faecalis* peritonitis in a PD patient.

## Case Report

A 24-year-old woman with a past medical history of ESKD of unclear etiology on PD, as well as a history of hypertension, anxiety, depression, and coronary artery disease presented with abdominal pain, dark stool, and inability to perform PD. Two days before arrival, she developed sharp abdominal pain and could not perform PD. One day prior, she attempted PD again and noticed a marked decrease in the drain volume and cloudy PD fluid. The patient reported dark stool for one week. She presented to the emergency department (ED).

Her medications included sevelamer 800 mg three times daily, amlodipine, atorvastatin, calcitriol, carvedilol, cinacalcet, escitalopram, multivitamin, and sacubitril/valsartan. In the ED, she was afebrile, and her blood pressure was 100/65 mmHg, heart rate 96 beats/min, respiratory rate 18 breaths/min, and oxygen saturation was 100% on ambient air. Laboratory tests were notable for severe anemia with a hemoglobin level of 4.9 g/dL with a positive fecal occult blood test. Abdominal computed tomography (CT) without contrast revealed mild circumferential wall thickening from the cecum to the transverse colon. She was admitted for further management. Sevelamer was discontinued on the day of admission. The stool polymerase chain reaction was negative for Salmonella, Shigella, Campylobacter, Yersinia enterocolitica, Norovirus, or Rotavirus. The PD catheter was not functioning; hence, we could not send peritoneal fluid for cell counts or culture. We initiated empiric antibiotic treatment with vancomycin and cefepime intravenously. She required hemodialysis (HD) on days three and four via a temporary HD catheter. On day three, she had a colonoscopy that showed multiple shallow ulcerations in the cecum (Fig. 1A). Biopsy revealed focal neutrophilic inflammation in the colonic mucosa (Fig. 1B) and the broad, curved, and irregularly spaced "fish-scale" pattern and two-toned crystalline material consistent with sevelamer (Fig. 1C).

After the colonoscopy, her PD catheter became functional, allowing collection of PD fluid for cell count and culture. The PD fluid nucleated cell count was 692/mm³ with 56% polymorphonuclear (PMN) leukocytes on day three, which decreased to 123/mm³ with 28% PMN leukocytes on day seven. PD fluid culture sent on day three was positive for *Enterococcus faecalis*, and she was treated with intraperitoneal vancomycin. She was later switched to ferric citrate for phosphate control. She was discharged on day eight with intraperitoneal vancomycin for a total of three weeks.

## Discussion

Sevelamer is a calcium-free phosphate binder commonly used in patients with ESKD and is generally well tolerated. However, sevelamer crystals can rarely be associated with clinically significant GI mucosal injury, including ulceration, bleeding, and perforation (7, 8). In the present case, the clinical history and CT findings prompted early discontinuation of sevelamer and consultation with gastroenterology. Colonoscopy with biopsy established the diagnosis of sevelamer-associated GI mucosal injury complicated by GI bleeding. Although a large observational study did not show an increased risk of hospitalization for GI bleeding after sevelamer initiation compared with non-sevelamer phosphate binders in patients receiving hemodialysis (9), this case illustrates that rare but clinically important focal GI mucosal injury can still occur in individual patients receiving sevelamer.

Previously published reports are summarized in Table 1 (3–8, 10–18). Most patients were receiving dialysis and presented with abdominal pain, GI bleeding, or both, with hemodynamic instability occurring in severe cases. Endoscopic or operative evaluation demonstrated mucosal inflammation, ulceration, mass-like lesions, ischemia, necrosis, or perforation, while histopathological examination showed characteristic fish-scale sevelamer crystals. Although many patients improved after sevelamer discontinuation, some developed severe complications requiring surgery, and fatal outcomes were reported (8, 13, 18). The pathogenesis of sevelamer-associated GI mucosal injury remains incompletely understood. Possible contributors include direct mechanical irritation, local inflammation, constipation, impaired intestinal motility, intestinal ischemia, and pre-existing mucosal vulnerability in patients with ESKD (19, 20). In individual cases, it is difficult to determine whether sevelamer crystals directly initiate mucosal injury or accumulate at sites of pre-existing mucosal damage. Therefore, the diagnosis requires clinicopathological correlation, including medication history, endoscopic findings, exclusion of alternative causes, and histological identification of characteristic sevelamer crystals.

Table 1
Summary of published reports of sevelamer-associated gastrointestinal mucosal injury

| Reference | No. of patients | Age/sex | Kidney replacement therapy | Sevelamer dose (grams per day) | Clinical presentation | GI findings | Pathological findings |
|---|---|---|---|---|---|---|---|
| **Swanson et al., 2013** (6) | 7 | 38–81 years; 5 M/2 F | N/A | 2.4–9.6 | Upper-GI symptoms or rectal bleeding; some asymptomatic | Esophageal ulceration, small-bowel injury, and colonic polyps | Inflammation, polyps, ulceration, ischemia, or necrosis with fish-scale crystals |
| **Tieu et al., 2016** (3) | 1 | 74 F | HD | 4.8 | Rectal pain, constipation, blood-tinged stool | Circumferential rectal ulcers | Ulcer debris with sevelamer crystals |
| **Desai et al., 2016** (4) | 1 | 45 F | HD | 9.6 | Hematochezia and abdominal pain | Multifocal colonic ulcers and sigmoid stricture | Acute inflammation, ulceration, and granulation tissue with crystal material |
| **Yuste et al., 2017** (7) | 3 | 51–76 years; 1 M/2 F | HD (2), PD (1) | 0.8–8.8 | GI bleeding and anemia | Erosions, ulcers, and inflammatory polyps; predominantly colonic | Inflammation/ulceration or polyps with sevelamer crystals |
| **Magee et al., 2018** (14) | 1 | 81 M | N/A | N/A | Diarrhea, emesis, abdominal pain, fever | Multiple oozing duodenal ulcers, patchy erythematous mucosa in the ileum | Ulcerated duodenal mucosa with sevelamer crystals |
| **Uy et al., 2018** (17) | 1 | 33 M | HD | 7.2 | Hematochezia and abdominal pain | Continuous rectosigmoid ulceration | Ulceration with sevelamer crystals; no ischemia |
| **George et al., 2019** (12) | 8 | 45–77 years; 6 M/2 F | Non-dialysis CKD except 1 | N/A | Melena or perforation | Colonic polyp, ulcerations | Inflammatory polyp, ulcerations, perforation |
| **Keri et al., 2019** (13) | 1 | 35 F | HD | 4.8 | Hematochezia and acute abdominal pain | Ischemic right-colon necrosis with perforation | Transmural ischemic necrosis and fibrin thrombi with crystals |
| **Lai et al., 2020** (5) | 1 | 47 M | HD | N/A | Recurrent abdominal pain and nausea | Multifocal circumferential colonic ulcers; near obstruction | Colonic ulceration with sevelamer crystals |
| **Schoot et al., 2021** (15) | 1 | 67 F | Non-dialysis CKD | 6.4 | Lower GI bleeding and anemia | Multiple deep rectosigmoid ulcers | Ulcerated mucosa with sevelamer crystals |
| **Fistrek Prlic et al., 2023** (8) | 1 | 74 F | Non-dialysis CKD | 1.6 | Lower GI bleeding, abdominal pain, and shock | Pseudotumor-like colitis with transverse-colon perforation | Inflammation and focal necrosis with sevelamer crystals |
| **Wong et al., 2023** (18) | 1 | 60 F | PD | 4.8 | Fever, abdominal pain, and cloudy dialysate | Descending-colon ulcer with perforation | Full-thickness necrosis and suppurative inflammation with crystals |
| **Todd et al., 2024** (16) | 12 | 27–81 years; 4 M/8 F | N/A | 1.6–12.0 | Abdominal pain, diarrhea, nausea, and GI bleeding | Upper- and lower-GI ulcers/colitis; stricture, necrosis, or perforation in some | Inflammation/ulceration with crystals; necrosis or perforation in severe cases |
| **Doll et al., 2025** (10) | 1 | 40 F | HD | N/A | Anemia without overt GI bleeding | Ulcerated cecal mass-like lesion | Mild inflammation/regenerative change with crystals; no malignancy |

| Reference | No. of patients | Age/sex | Kidney replacement therapy | Sevelamer dose (grams per day) | Clinical presentation | GI findings | Pathological findings |
|---|---|---|---|---|---|---|---|
| **Elkalashy et al., 2025** (11) | 2 | 37–50 years; 2 M | HD | 4.8 | Hematochezia ± abdominal pain/fatigue; shock in one | Ulcerated transverse/descending or right colon | Ulcerated mucosa with fish-scale sevelamer crystals |

CKD, chronic kidney disease; GI, gastrointestinal; HD, hemodialysis; N/A, not available; PD, peritoneal dialysis.

This case was also complicated by *Enterococcus faecalis* peritonitis. *Enterococcus* species are part of the normal intestinal flora, and enterococcal peritonitis may suggest an enteric source in patients receiving PD (21). In the setting of sevelamer-associated GI mucosal injury, disruption of the intestinal barrier may have contributed to bacterial translocation and subsequent enteric organism peritonitis. However, causality cannot be proven in a single case, and other contributing factors cannot be excluded. The patient also developed transient PD catheter malfunction before colonoscopy. The exact etiology of catheter dysfunction was unclear. GI factors such as bowel distension, constipation, colitis, or bowel preparation before colonoscopy may have affected catheter drainage, but this remains speculative.

A prior case report described severe sevelamer crystal-associated peritonitis in a patient receiving continuous ambulatory PD, which was complicated by refractory peritonitis, colonic perforation, surgery, and death (18). In the present case, earlier recognition of GI bleeding and colitis prompted discontinuation of sevelamer, targeted evaluation of the GI tract, and treatment of enterococcal peritonitis before progression to severe complications. Our case highlights a diagnostic pitfall in the management of PD patients: abdominal pain and cloudy dialysate should not be attributed solely to PD-related peritonitis when signs of GI bleeding or colitis are present. In patients receiving sevelamer, such findings should prompt evaluation for sevelamer-associated GI mucosal injury in parallel with the evaluation and treatment of peritonitis. Recognizing this possibility may help prevent progression to refractory peritonitis, perforation, or other severe outcomes.

## Abbreviations

CT: computed tomography
ED: emergency department
ESKD: end-stage kidney disease
GI: gastrointestinal
HD: hemodialysis
PD: peritoneal dialysis
PMN: polymorphonuclear

## Declarations

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Author contributions

TY conceived the manuscript and drafted the initial manuscript. TY, AK, SS, and FB contributed to the original case presentation and interpretation of clinical and pathological findings. SS provided pathological images and interpretation. KI, KO, TA, YN, YO, YS, and TI contributed to manuscript revision, literature review, and interpretation of the clinical message. All authors reviewed and approved the final manuscript.

Declaration of conflicting interests

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Ethical approval

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Informed consent to publish

Informed consent was obtained from a legally authorized representative(s) for anonymized patient information to be published in this article.

## References

1. Palmer SC, Hayen A, Macaskill P, Pellegrini F, Craig JC, Elder GJ, et al. Serum levels of phosphorus, parathyroid hormone, and calcium and risks of death and cardiovascular disease in individuals with chronic kidney disease: a systematic review and meta-analysis. JAMA. 2011;305(11):1119–27.
2. Gallieni M, Cozzolino M, Carpani P, Zoni U, Brancaccio D. Sevelamer reduces calcium load and maintains a low calcium-phosphorus ion product in dialysis patients. J Nephrol. 2001;14(3):176–83.
3. Tieu C, Moreira RK, Song LM, Majumder S, Papadakis KA, Hogan MC. A case report of sevelamer-associated recto-sigmoid ulcers. BMC Gastroenterol. 2016;16:20.
4. Desai M, Reiprich A, Khov N, Yang Z, Mathew A, Levenick J. Crystal-Associated Colitis with Ulceration Leading to Hematochezia and Abdominal Pain. Case Rep Gastroenterol. 2016;10(2):332–7.
5. Lai T, Frugoli A, Barrows B, Salehpour M. Sevelamer Carbonate Crystal-Induced Colitis. Case Rep Gastrointest Med. 2020;2020:4646732.
6. Swanson BJ, Limketkai BN, Liu TC, Montgomery E, Nazari K, Park JY, et al. Sevelamer crystals in the gastrointestinal tract (GIT): a new entity associated with mucosal injury. Am J Surg Pathol. 2013;37(11):1686–93.
7. Yuste C, Merida E, Hernandez E, Garcia-Santiago A, Rodriguez Y, Munoz T, et al. Gastrointestinal complications induced by sevelamer crystals. Clin Kidney J. 2017;10(4):539–44.
8. Fistrek Prlic M, Jelakovic M, Brinar M, Grgic D, Romic I, Marusic Z, et al. Case report: Sevelamer-associated colitis-a cause of pseudotumor formation with colon perforation and life-threatening bleeding. Front Med (Lausanne). 2023;10:1097469.
9. Le D, Crews DC, Grams ME, Coresh J, Shin JI. Association of Sevelamer Initiation with Gastrointestinal Bleeding Hospitalization in Individuals Requiring Hemodialysis. Am J Nephrol. 2024;55(4):450–62.
10. Doll B, Shapiro C, Post Z, Al-Sabti R, Shariati F. Sevelamer-Associated Colitis as a Colon Cancer Mimicker. Gastro Hep Adv. 2025;4(9):100715.
11. Elkalashy A, Rainwater RR, Ali U, Elbahnasawy E, Singh M, Karakala N. Gastrointestinal Mucosal Cell Injury Caused by Sevelamer Crystals: Case Series and Literature Review. J Ren Nutr. 2025;35(5):628–35.
12. George SA, Francis I. Pathology of Resin-Induced Gastrointestinal Damage: Report of 15 Cases and Review of Literature. Turk Patoloji Derg. 2019;35(3):221–7.
13. Keri KC, Veitla V, Samji NS. Ischemic Colitis in Association with Sevelamer Crystals. Indian J Nephrol. 2019;29(3):191–3.
14. Magee J, Robles M, Dunaway P. Sevelamer-Induced Gastrointestinal Injury Presenting as Gastroenteritis. Case Rep Gastroenterol. 2018;12(1):41–5.
15. Schoot TS, Romkens TE, Hoogeveen EK. Lower gastrointestinal bleeding in a patient receiving sevelamer: Case report. SAGE Open Med Case Rep. 2021;9:2050313X211000488.
16. Todd J, Saboori S, Zeidan J, Ahrens W, Jacobs C, Moshiree B. Sevelamer-Induced Gastrointestinal Disease in 12 Patients with End-Stage Renal Disease: A Case Series. Clin Transl Gastroenterol. 2024;15(3):e00679.
17. Uy PP, Vinsard DG, Hafeez S. Sevelamer-Associated Rectosigmoid Ulcers in an End-Stage Renal Disease Patient. ACG Case Rep J. 2018;5:e83.
18. Wong YH, Li SM, Pak WWL, Chan KL, Chan Z, Law WP, et al. Sevelamer crystal-associated peritonitis in a patient on continuous ambulatory peritoneal dialysis: a case report. Hong Kong Med J. 2023;29(4):349–50.
19. Bathobakae L, Phuu P, Yasin S, Bashir R, Escobar J, Yuridullah R, et al. Sevelamer-induced Gastrointestinal Mucosal Injury: A Critical Review for Clinicians. J Community Hosp Intern Med Perspect. 2024;14(6):58–65.
20. Wang IK, Lai HC, Yu CJ, Liang CC, Chang CT, Kuo HL, et al. Real-time PCR analysis of the intestinal microbiotas in peritoneal dialysis patients. Appl Environ Microbiol. 2012;78(4):1107–12.
21. Li PK, Chow KM, Cho Y, Fan S, Figueiredo AE, Harris T, et al. ISPD peritonitis guideline recommendations: 2022 update on prevention and treatment. Perit Dial Int. 2022;42(2):110–53.

## Figures

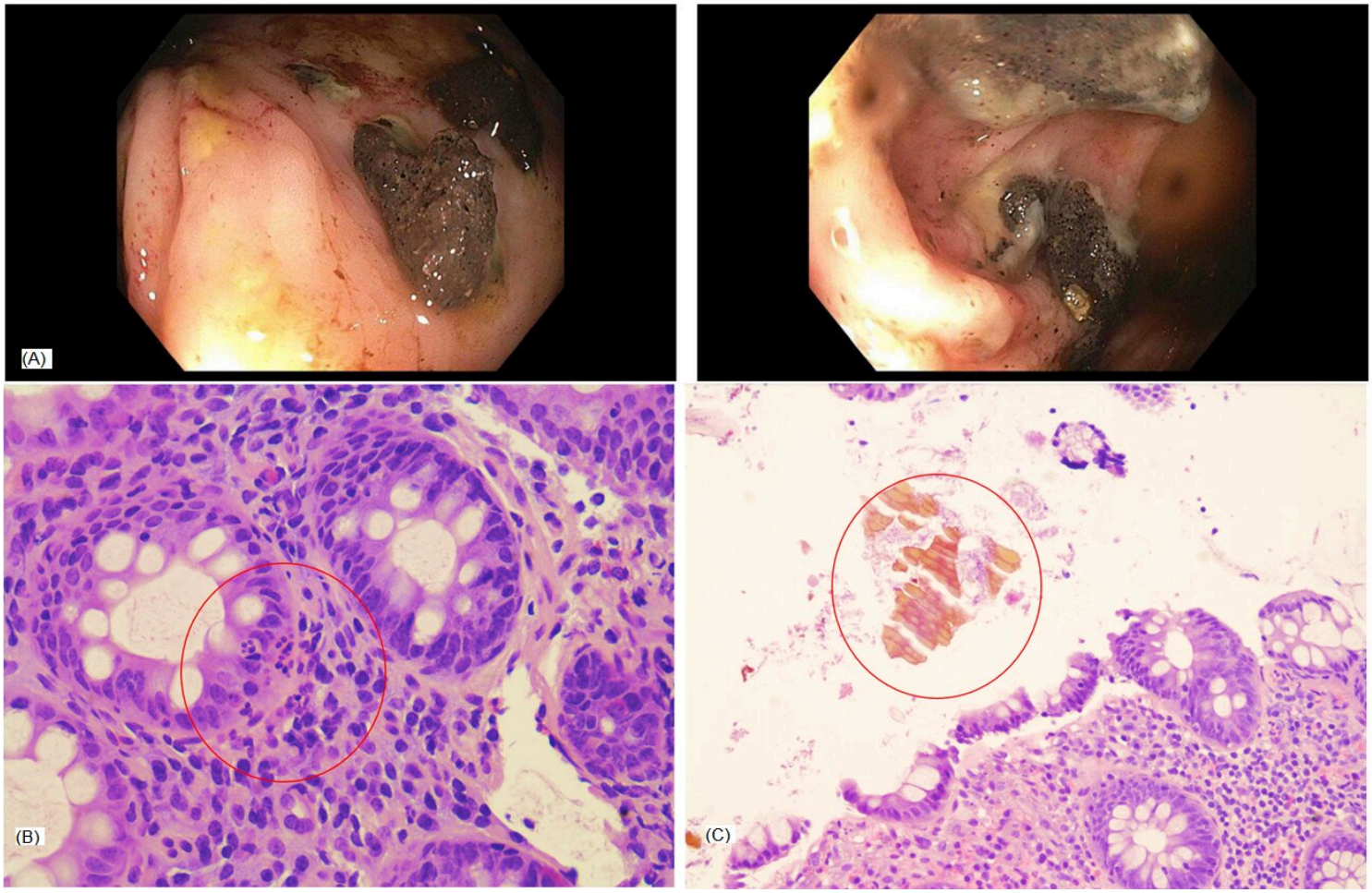



**Figure 1**

(A) Representative colonoscopic images showing multiple shallow ulcers in the cecum with adherent old blood clot and stool.
(B) Colonic mucosal biopsy showing focal neutrophilic inflammation (circle) on hematoxylin and eosin staining.
(C) Colonic mucosal biopsy showing sevelamer fragments with the characteristic “fish-scale” pattern and two-toned color, consisting of bright pink linear accentuations and a rusty yellow background (circle), on hematoxylin and eosin staining.