Peritoneal Dialysis and Cholecystectomy: An Experience with a Patient Complicated by Symptomatic Gallstone Disease

Tetsu Akimoto[1,2]*, Daisuke Nagata[2]

[1]Department of Chronic Kidney Disease Pathophysiology, Jichi Medical University, Shimotsuke, Tochigi, Japan.
[2]Division of Nephrology, Department of Internal Medicine, Jichi Medical University, Shimotsuke, Tochigi, Japan.
tetsu-a@jichi.ac.jp

*Corresponding Author: Tetsu Akimoto, Division of Nephrology, Department of Internal Medicine, Jichi Medical University, Yakushiji, Shimotsuke-Shi, Japan.

Abstract

Peritoneal dialysis (PD) is an accepted renal replacement option for managing end-stage kidney disease (ESKD). However, various surgical interventions during the pre-dialytic period that disturb the integrity of the abdominal cavity boundaries may disrupt its prompt indication. A 70-year-old man with ESKD who was waiting to start the procedure after a PD catheter was embedded in his abdomen was complicated by acute cholecystitis. Despite the need to defer its initiation, PD was successfully started after traditional open cholecystectomy. Several management concerns relevant to this disease condition are also discussed.

Keywords: *peritoneal dialysis, Moncrief-Popovich catheter technique, surgical intervention, cholecystectomy, symptomatic gallstone diseases.*

Introduction

Peritoneal dialysis (PD) offers a rational therapeutic approach for managing end-stage kidney disease (ESKD) in the broader context of overall health care. It is associated with reduced stress on the cardiovascular system, minimal variation in the intravascular volume status, better preservation of the residual renal function, and freedom from frequent hospital visits.[1-3]

Occasionally, patients with ESKD may be complicated by cholecystopathy, including cholelithiasis and/ or cholecystitis.[4,5] Surgical interventions for the disease that disturb the integrity of abdominal cavity boundaries can disrupt the regular PD schedule, and in certain instances, interim hemodialysis (HD) or even permanent transfer to HD has been indicated.[6-11] However, there may be some patients who receive cholecystectomy while they are awaiting the commencement of periodic PD after the placement of a PD catheter through the Moncrief-Popovich catheter technique, which involves burying the free end of the device under the skin and leaving it embedded until exteriorization—thereby allowing for favorable stabilization of the peri-catheter milieu mediated by timely tissue healing.[12,13]

In this report, we describe our experience with one such case in a male ESKD patient who was complicated by acute cholecystitis in this break-in period. He was successfully started on PD after undergoing conventional open cholecystectomy, despite the need to defer its prompt indication. Several management concerns relevant to the disease condition are also discussed.

Case Report

The patient was a 70-year-old man who opted for PD for the dialytic management of ESKD. At 60 years of age, he was found to have chronic renal failure, which was ascribed to hypertensive nephrosclerosis, and was subjected to contemporary and comprehensive renal care. Despite the favorable control of his blood pressure with telmisartan and amlodipine besylate, his renal function gradually but steadily worsened, and a double-cuff PD catheter was implanted through a classic transverse surgical incision. Then, the external portion was tunneled under the skin completely when

his blood urea nitrogen (BUN) and serum creatinine (sCr) levels increased to 49 and 6.58 mg/dL, respectively. We decided to delay the initiation of PD until the patient's condition warranted its initiation. His other medical history included hyperuricemia, which had been treated with allopurinol. Abdominal computed tomography (CT) performed approximately five weeks before catheter implantation incidentally revealed cholelithiasis without any findings of lymphadenopathy (**Figure 1A**). No personal history of cholecystitis was confirmed at this point; thus, we decided to monitor the disease state on a regular basis in accordance with current standard management recommendations.[14]
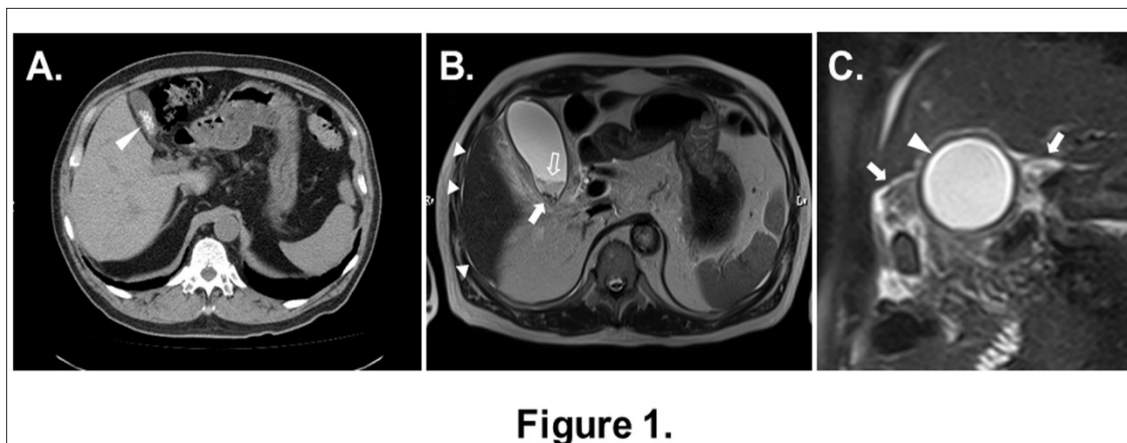
Figure 1.

Fig 1. A select CT image at the level of the gallbladder (A) shows cholelithiasis (arrowhead) with a well-defined gallbladder wall. An axial T2-weighted half-fourier-acquired single-shot turbo spin echo (HASTE) MR image at the corresponding level (B) demonstrates multiple signal-void calculi (solid arrow) and a layer with a reduced signal intensity relative to the normal bile, suggestive of sludge (open arrow). The small amount of ascites around the liver is also shown (arrowheads). A select coronal T2-weighted HASTE with fat suppression MR image (C) demonstrates pericholecystic fluid collections (arrows) as well as acute inflammation of the gallbladder manifested by a thickened gallbladder wall (arrowhead).

Three weeks later, he started to complain of upper abdominal pain that had persisted for a few days and visited a local physician who empirically administered ceftriaxone (1 g in a single intravenous dose). The patient was then referred to our hospital for a further workup. Examinations showed a soft, non-distended abdomen with right hypochondriac tenderness. The patient's temperature was 38.5°C with mild leukocytosis (11,600/μL) and an elevated serum C-reactive protein level (3.42 mg/dL). The serum levels of liver and pancreatic enzymes were unremarkable, but abdominal sonography and magnetic resonance (MR) imaging revealed circumferential thickening of the gallbladder wall with some dependent sludge (**Figure 1B and 1C**). We made a diagnosis of acute cholecystitis, and his symptoms were successfully and promptly relieved by therapeutic management consisting of intravenous cefoperazone/sulbactam (1 g each, daily) combined with bowel rest and fluid infusion.

After thorough discussion with multidisciplinary specialists, including nephrologists, gastroentero-logists, and digestive surgeons, the patient ultimately decided to receive surgical treatment, and elective open cholecystectomy was performed 1 month after referral through a right subcostal incision of approximately 20 cm in length. The abdomen was explored, and extensive adhesion of the mesentery and bowel to the region of the white fibrotic gallbladder was noted. The adventitial and peritoneal attachments were carefully mobilized, and the gallbladder was completely excised. Finally, the wounds were closed with absorbable sutures and skin staples, and a closed-suction drain was placed. The pathological survey revealed diffuse fibrosis and infiltration of inflammatory cells—but not malignant cells—within the gallbladder wall. The postoperative course was uneventful, and HD treatment was commenced 10 days after cholecystectomy through a right internal jugular dialysis catheter when his serum Cr level increased to 10.31 mg/dL. After 2 weeks, during which time HD was exclusively performed twice a week, his serum Cr levels settled at approximately 7 mg/dL. Finally, the PD catheter was exteriorized under local anesthetic

through a small incision using sterile technique. The transfer set was then attached, and PD was initiated with three daily low-volume exchanges (0.5 L of 1.35% glucose dialysate×3) with a total dwell time of 9 h the same day. At the 6-month follow-up examination, the patient's daily urine output remained approximately 600–900 ml, and he is still doing well with PD using four daily exchanges (2 L of 1.35% glucose dialysate×4) with a total dwell time of 15 h, bringing his serum Cr levels to approximately 8 mg/dL.

DISCUSSION

The clinical scenario of the current case, which was characterized by a set of conditions, including ESKD requiring renal replacement therapy, cholelithiasis, and cholecystitis, may not be surprising.[4,5,7,10] However, the significance of this case should be carefully evaluated, as the present patient was successfully started on PD treatment after conventional open cholecystectomy and a favorable clinical course was achieved. Our experience implies that open cholecystectomy can still be regarded as a therapeutic option for symptomatic cholecystopathy, even when the candidate has recently had a PD catheter embedded in their abdomen, although laparoscopic intervention has become the treatment of choice for symptomatic gallstone diseases because of its minimally invasive nature.[7,10,15] Our experience further supports the notion that comorbidities that necessitate abdominal surgery in ESKD patients do not necessarily constitute a contraindication of PD.

Given the stretching and/or tractive nature of PD, which results from the increased intra-abdominal pressure accompanying peritoneal dialysate infusion,[3,6,8,16,17] postoperative leakage of dialysate through wounds is a grave concern that must be dealt with carefully in patients who undergo operations that disturb the integrity of the abdominal wall.[3,6,8] It is unlikely that anyone would argue against the need to suspend the procedure after such an intervention, at least until the wounds stabilize enough to overcome the increased tension associated with the dialysate dwells.[3,6,8,16] In this context, laparoscopic techniques have received focus as attractive modes of surgery in certain subsets of patients with PD-dependent ESKD.[7,10,18] Indeed, in the literature, several empirical reports have described the temporary interruption of PD for laparoscopic cholecystectomy, with the resumption of PD within one week after the procedure.[7,8] Furthermore, the feasibility of restarting PD immediately or on the second postoperative day with or without low-volume exchange has been anecdotally shown.[10,18-21]

On the other hand, conventional open cholecystectomy, which involves a large abdominal incision, may force ESKD patients with symptomatic gallstone disease to hold off the initiation or resumption of PD for a long time in order to prevent dialysate leakage.[6,10,18] During this period, the temporary HD may be required, especially for subjects with a minimal residual renal function.[22] Consequently, our management strategy in the present case, which was determined under multidisciplinary collaboration, may invite some degree of criticism. However, systemic studies on this topic are lacking;[6,8] thus, we strongly recommend the accumulation of similar cases, as this will help to more precisely clarify the feasibility and safety of abdominal surgery in the field of PD. Of note, laparoscopic techniques may not necessarily be free from serious complications, including dialysate leakage and hemoperitoneum.[23] Furthermore, technical difficulties can lead to conversion to open surgery in some cases, thereby negating the numerous advantages of this procedure.[15]

The optimal surgical approach in the treatment of symptomatic gallstone diseases in ESKD patients who require PD remains to be standardized, and we believe that thoroughly weighing all options and risks of complications as well as the disease severity on a case-by-case basis is necessary. Although the policies applied in nephrology centers, including our own facility, for selecting conventional open surgery or laparoscopic cholecystectomy may depend on each facility's experience and availability, the establishment of selection criteria for these surgical regimens is a major concern that should be addressed carefully. Our approach with the present patient is not substantially different from traditional practice patterns, wherein open cholecystectomy is performed several weeks after the acute episode to allow the inflammatory process to resolve before intervention.[24] While urgent surgery is indicated for patients who appear to have serious conditions, such as gangrene or gallbladder perforation, we must also determine the appropriate timing of surgery for cholecystitis without such conditions—something that has been hotly debated

in the general population[24,25]—among ESKD patients requiring PD treatment, although this will likely be a significant challenge in the current clinical setting.

REFERENCES

[1] Chaudhary K, Sangha H, Khanna R. Peritoneal dialysis first: rationale. Clin J Am Soc Nephrol. 2011; 6 (2): 447-456.

[2] Ohara K, Akimoto T, Miki T, Otani N, Sugase T, Masuda T, Murakami T, Imai T, Takeda S, Ando Y, Muto S, Nagata D. Therapeutic challenges to end-stage kidney disease in a patient with Tetralogy of Fallot. Clin Med Insights Case Rep. 2015; 8: 97-100.

[3] Imai R, Akimoto T, Kimura T, Kohara M, Shimizu T, Oka K, Shuto M, Asakura M, Nagayama I, Takeda SI, Yagisawa T, Muto S, Nagata D. Peritoneal dialysis and retroperitoneal laparoscopic radical nephrectomy: A favorable experience with apatient complicated by renal cell carcinoma. Clin Med Insights Case Rep. 2017; 10: 1179547617746362.

[4] Korzets Z, Golan E, Ben-Chitrit S, Schneider N, Chagnac A, Carel R, BernheimJ. Prevalence of cholelithiasis in non-diabetic haemodialysis and continuous ambulatory peritoneal dialysis patients. Nephron. 1998; 78 (1): 44-47.

[5] Chen YT, Ou SM, Chao PW, Li SY, Chen TJ, Tsai LW, Chen TW. Acute cholecystitis in end-stage renal disease patients: a nation-wide longitudinal study. Dig Liver Dis. 2013; 45 (2): 142-146.

[6] Moffat FL, Deitel M, Thompson DA. Abdominal surgery in patients undergoing long-term peritoneal dialysis. Surgery. 1982; 92 (4): 598-604.

[7] Magnuson TH, Bender JS, Campbell KA, Ratner LE. Cholecystectomy in theperitoneal dialysis patient. Unique advantages to the laparoscopic approach. Surg Endosc. 1995; 9 (8): 908-909.

[8] Kleinpeter MA, Krane NK. Perioperative management of peritoneal dialysis patients: review of abdominal surgery. Adv Perit Dial. 2006; 22: 119-123.

[9] Babin J, Langlois S, Friede J, Guay G, Agharazii M. Green dialysate: asymptomatic perforated cholecystitis without peritonitis. Nephrol Dial Transplant. 2006; 21 (4): 1121-1122.

[10] Ha JF, Chandraratna H. Laparoscopic cholecystectomy in chronic ambulatory peritoneal dialysis. Ochsner J. 2009; 9 (1): 17-19.

[11] Chen YT, Huang CC, Kuo CC, Chen HW, Wu MS. Green dialysate. Kidney Int. 2010; 77 (4): 369.

[12] Moncrief JW, Popovich RP, Broadrick LJ, He ZZ, Simmons EE, Tate RA. The Moncrief-Popovich catheter. A new peritoneal access technique for patients on peritoneal dialysis. ASAIO J. 1993; 39 (1): 62-65.

[13] Dahlan R, Bargman JM, Biyani M, Lavoie S, McCormick BB. Asymptomatic peritoneal leukocytosis after exteriorization of buried peritoneal dialysis catheters: a case series. Perit Dial Int. 2015; 35 (1): 103-105.

[14] Supe A. Asymptomatic gall stones--revisited. Trop Gastroenterol. 2011; 32 (3): 196-203.

[15] Simopoulos C, Botaitis S, Polychronidis A, Tripsianis G, Karayiannakis AJ. Risk factors for conversion of laparoscopic cholecystectomy to open cholecystectomy. Surg Endosc. 2005; 19 (7): 905-9.

[16] Del Peso G, Bajo MA, Costero O, Hevia C, Gil F, Díaz C, Aguilera A, Selgas R. Risk factors for abdominal wall complications in peritoneal dialysis patients. Perit Dial Int. 2003; 23 (3): 249-254.

[17] Otani-Takei N, Akimoto T, Sadatomo A, Saito O, Muto S, Kusano E, Nagata D. Bowel Obstruction and Peritoneal Dialysis: A case report of a patient with complications from a broad ligament hernia. Clin Med Insights Case Rep. 2016; 9: 57-60.

[18] Mutter D, Marichal JF, Heibel F, Marescaux J, Hannedouche T. Laparoscopy: an alternative to surgery in patients treated with continuous ambulatory peritoneal dialysis. Nephron. 1994; 68 (3): 334-337.

[19] Speck R, Glättli A, Czerniak A, Uehlinger D, Horber FF. Laparoscopic cholecystectomy in a patient on continuous ambulatory peritoneal dialysis. Clin Nephrol. 1992; 38 (4): 238.

[20] Breyer JA, Chaudhry A. Laparoscopic cholecystectomy in a continuous ambulatory peritoneal

dialysis patient: a case report. Perit Dial Int. 1992; 12 (1): 73-5.

[21] Lale AM, Wheatley TJ, Nicholson ML. Laparoscopic cholecystectomy in a patient receiving continuous ambulatory peritoneal dialysis. Br J Surg. 1996; 83 (11): 1543.

[22] Akimoto T, Yamazaki T, Kohara M, Nakagawa S, Kanai Y, Izawa S, Yamamoto H, Nakazawa E, Masuda T, Kobayashi T, Saito O, Muto S, Kusano E, Nagata D. Pleuroperitoneal Communication and Ovarian Cancer Complicating Peritoneal Dialysis: A Case Report of a Patient with End-Stage Kidney Disease. Clin Med Insights Case Rep. 2017; 10: 1179547617735818.

[23] Lutes R, Holley JL. Dialysate leak and hemo-peritoneum after laparoscopic cholecy stectomy in a CAPD patient. Perit Dial Int. 1993; 13 (4): 318-319.

[24] Indar AA, Beckingham IJ. Acute cholecystitis. BMJ. 2002; 325 (7365): 639-643.

[25] Sánchez-Carrasco M, Rodríguez-Sanjuán JC, Martín-Acebes F, Llorca-Díaz FJ, Gómez-Fleitas M, Zambrano Muñoz R, Sánchez-Manuel FJ. Evaluation of Early Cholecystectomy versus Delayed Cholecystectomy in the Treatment of Acute Cholecystitis. HPB Surg. 2016; 2016: 4614096.