**Delayed Bowel Perforation in a Peritoneal
Dialysis Patient: A Case Report and
Literature Review**

Erosion of the peritoneal dialysis (PD) catheter into the bowel is very rare. Some patients experience serious

consequences such as peritonitis, difficulties in draining, and feculent dialysate effluent with watery diarrhea, but some patients develop no symptoms. Most cases have occurred upon insertion of a stylet-catheter. Perforation by a PD catheter is distinctly unusual. Here, we report a 72-year-old man who presented with a plastic tube protruding from the anus after defecating. We diagnosed the patient with delayed rectal perforation by a PD catheter. We compare our patient with similar patients identified by a search of the English-language literature indexed at PubMed (keywords: “perforation,” “erosion,” “peritoneal dialysis,” “catheter”) and a search for references within articles identified in the primary search.

CASE REPORT

The patient was a 72-year-old man who initially presented in February 2001 with proteinuria (1250 mg daily) and elevated serum creatinine (350 $\mu\text{mol/L}$). He initially took a Chinese herb to treat his symptoms, but started PD in October 2002 when his serum creatinine was 680 $\mu\text{mol/L}$. A double-cuffed, curled Tenckhoff PD catheter was inserted by open surgery.

The patient remained on PD without complications for 27 months and was then converted to hemodialysis because of peritoneal membrane failure in January 2006. The peritoneal catheter was not removed at that time. In August 2010, the patient was admitted to the local hospital complaining that he felt a plastic tube protruding from his anus after defecation. Examination indicated that he was afebrile and had a stable cardiovascular system and a soft, tender abdomen. Rectal examination revealed the tip of the PD catheter protruding through the anus. The local doctor pulled and cut part of the protruding catheter before discharging the patient.

The patient was admitted to our hospital because of a tunnel infection related to the peritoneal catheter. Abdominal computed tomography (CT) showed that the catheter tip had entered the sigmoid colon (Figure 1), and a subsequent colonoscopy revealed that the catheter tip had invaded the rectal lumen (Figure 2).

The patient was given a cleansing enema, and the catheter was then removed by open surgery without bowel resection and without closure of the hole in the rectum within the peritoneal cavity. Some discolored substances were observed in the catheter when it was removed. The patient recovered fully and was well at a 3-month follow-up.

DISCUSSION

Delayed perforation is an uncommon complication of PD and usually involves a dormant catheter. Our review of the literature indicated 28 cases, including the present case (Table 1). In 15 patients, PD had been suspended;

Figure 2 — Colonoscopy showing the peritoneal dialysis catheter tip inside the rectal lumen.

Figure 1 — Abdominal computed tomography images showing the peritoneal dialysis catheter tip inside the lumen of the rectum.

TABLE 1
Literature Reports of Delayed Bowel Perforation Caused by a Peritoneal Dialysis Catheter

Reference	Patient ID	Age (years)	Sex	Renal disease	Time on PD	Inactive use time	Catheter type	Clinical presentation	Methods of diagnosis	Site of perforation	Treatment	Risk factor
Watson and Thompson, 1980 (1)	1	71	Male	GN	9	0	NA	Peritonitis	EL	Sigmoid colon	NA	
Valles <i>et al.</i> , 1982 (2)	2	62	Female	PKD	0.5	0	NA	Peritonitis with watery blue diarrhea	Methylene blue injection	Transverse colon	Catheter removal, suture repair of perforation	
Volpe <i>et al.</i> , 1984 (3)	3	66	Female	CPN	7	6	NA	Asymptomatic	CF	Sigmoid colon	NA	
Parvin and Beaman, 1985 (4)	4	53	Female	DN	NA	8	NA	Watery diarrhea	CF	Ileum	Catheter removal, suture repair of perforation	
Brady <i>et al.</i> , 1988 (5)	5	66	Female	MN	2.25	1.75 ^a	NA	Peritonitis	Postmortem examination	Sigmoid colon	Catheter removal only	Immuno- suppression
	6	44	Male	MPG	28	4	NA	Appendicitis	EL	Appendix, ileum, ascending colon	Catheter removal, appendix and segment small bowel resection	Immuno- suppression
Jamison <i>et al.</i> , 1988 (6)	7	46	Male	PKD	NA	4	NA	Asymptomatic	Sonogram	Rectum	Catheter removal only	
Rambausek <i>et al.</i> , 1989 (7)	8	42	Male	GN	48	1.6	NA	Peritonitis	EL	Small bowel	Catheter removal, bowel segment resection	Immuno- suppression

TABLE 1 (cont'd)

Reference	Patient Age (years)	ID	Sex	Renal disease	Time on PD	Inactive use time	Catheter type	Clinical presentation	Methods of diagnosis	Site of perforation	Treatment	Risk factor
Korzets <i>et al.</i> , 1992 (8)	78	16	Male	HN	24	0	Straight	Peritonitis	Contrast enema	Proximal jejunum	Catheter removal, jejunal loop resection	
Rotellar <i>et al.</i> , 1992 (9)	22	9	Male	PSG	NA	NA		Peritonitis	EL	Sigmoid	Surgery	
	69	10	Female	PKD	NA	NA		Peritonitis	EL	Sigmoid	Left hemicolectomy	
	36	11	Male	IgAN	NA	NA	5 straight,	Peritonitis	EL	Right colon	Surgery	6 with diverticulitis
	80	12	Male	HN	NA	NA	2	Peritonitis	CF	Sigmoid	Surgery	
	54	13	Male	RT+HP	NA	NA	coiled	Peritonitis	EL	Sigmoid	Surgery	
	54	14	Female	DN	NA	NA		Peritonitis	EL	Ileum/cecum	Surgery	
	53	15	Female	IN	NA	NA		Peritonitis	EL	Sigmoid	Surgery	
Jansen <i>et al.</i> , 1994 (10)	43	17	Male	MPG	5	26	Coiled	Catheter protrusion (anus)	Clinical manifestation	NA	Catheter removal; abdominal part extracted via the regular exit site; the rest, via the anus	Immuno- suppression
Balaji <i>et al.</i> , 1996 (11)	46	18	Male	GN	21	0	Coiled	Rectal hemorrhage	Colonoscopy	Cecum	Catheter removal, limited right hemicolectomy	Paraumbilical hernia repair 10 days earlier
Borazan <i>et al.</i> , 2003 (12)	36	19	Male	NA	54	6	NA	Foul smell (feces-like)	Colonoscopy	NA	NA	
Shrestha <i>et al.</i> , 2003 (13)	74	20	Male	NA	10	8	Straight	Watery diarrhea	CF	Sigmoid colon	Catheter removal, bowel segment resection	

TABLE 1 (cont'd)

Reference	Patient ID	Age (years)	Sex	Renal disease	Time on PD	Inactive use time	Catheter type	Clinical presentation	Methods of diagnosis	Site of perforation	Treatment	Risk factor
Grzegorzewska, 2004 (14)	21	62	Female	NA	3	3 ^b	Straight	Abdominal distension, diarrhea, feculent effluent	CF	Transverse colon	Catheter removal only	
Finkle, 2005 (15)	23	73	Male	MGUS, HN	NA	NA	Coiled	Watery diarrhea	CF	Rectum	Catheter removal, colostomy	Colonic amyloidosis
Saweirs and Casey, 2005 (16)	22	4	Male	MN	10	4	Coiled	Catheter protrusion (anus)	Clinical manifestation	Rectosigmoid junction	Catheter removal, suture repair of perforation	Immuno-suppression
Askenazi <i>et al.</i> , 2007 (17)	24	2	Male infant	PKD	1.5	1.5	Coiled	Fluid instilled, not draining	CF	Small intestine	Catheter removal, bowel segment resection	
George <i>et al.</i> , 2008 (18)	25	54	Male	DN	6.5	0	Straight	Watery diarrhea	CT	Appendix	NA	
Trivedi <i>et al.</i> , 2010 (19)	26	31	Male	PN	24	8	Coiled	Catheter protrusion (anus)	CT	Sigmoid colon	Catheter removal, bowel segment resection	Immuno-suppression
Baek <i>et al.</i> , 2011 (20)	27	50	Male	DN	NA	6	Straight	Watery diarrhea	CT and colonoscopy	Rectum	Endoscopic closure, catheter removal	
Present case	28	72	Male	GN	27	48	Coiled	Catheter protrusion (anus)	CT and colonoscopy	Rectum	Catheter removal only	

PD = peritoneal dialysis; GN = glomerulonephritis; NA = not available; EL = exploratory laparotomy; PKD = polycystic kidney disease; CPN = chronic pyelonephritis; DN = diabetic nephropathy; CF = contrast fluoroscopy; MN = membranous nephropathy; MPG = membranoproliferative glomerulonephritis; HN = hypertensive nephrosclerosis; PSG = post-streptococcal glomerulonephritis; IgAN = immunoglobulin A nephropathy; RT = renal tuberculosis; HP = hypertension; IN = interstitial nephritis; MGUS = monoclonal gammopathy of uncertain significance; CT = computed tomography; PN = pyelonephritis nodosa.

^a Catheter was flushed every week by a trained peritoneal dialysis nurse.

^b Two 24-hour dialysis sessions per week with hour dwell time for 3 months.

the other 13 patients were on intermittent PD. Of the 28 patients affected, 10 had a straight PD catheter and 9 had a coiled catheter. The clinical course of the perforations was heterogeneous and included peritonitis, watery diarrhea, and catheter protrusion from the anus, among other manifestations. The diagnoses were confirmed by CT, contrast fluoroscopy, colonoscopy, or exploratory laparotomy. The risk factors in the 28 patients included use of immunosuppressants and the presence of diverticulitis or colonic amyloidosis.

In our patient, bowel perforation occurred more than 4 years after cessation of PD. Review of the other cases in the literature indicated that half were attributable to an unused PD catheter, typically 1.6 – 48 months after use had ceased. Lack of fluid in the peritoneal cavity after cessation of continuous ambulatory PD increases the risk for pressure-induced necrosis by the immobile catheter. Apparently, the peritoneal fluid that bathes the bowel loops acts as a barrier that prevents adhesion of the catheter to the bowel wall. However, in the Moncrief–Popovich technique, catheters are routinely implanted for several months without use, and regular flushing is not performed (21,22). For patients who suspend PD for more than 1 month, catheter removal might be the better choice to avoid severe complications such as bowel perforation. If the patient or doctor decides not to remove the catheter, then the catheter could be flushed regularly.

The continuous presence of fluid in the peritoneum of patients actively engaged in a continuous ambulatory PD program does not totally preclude the possibility of catheter adhesion. In fact, PD patients with diverticulitis might have an increased risk of catheter perforation (8,9). A patient with a history of diverticulitis should therefore be more carefully observed upon cessation of PD. Gastrointestinal pathology, including amyloidosis, might also increase the risk of catheter perforation (15). Although no general guidelines have been formulated concerning the timing of PD catheter removal after renal transplantation, the presence of a normally functioning allograft is the main indication for catheter removal. It might therefore be necessary to remove the catheter much sooner after transplantation or to flush the catheter regularly after cessation of PD.

The diagnosis of bowel perforation is definite when the catheter protrudes through the anus. Based on our literature review, we suggest that watery diarrhea during fluid instillation into the cavity, with or without peritonitis, could indicate bowel perforation. When clinical examination indicates peritonitis, it might be difficult to determine whether the cause is related to PD or is

an acute problem arising from bowel perforation. Our review also indicates that bowel perforation might not be diagnosed even after death (5). Indeed, some patients remain asymptomatic (3,6). We therefore suggest routine abdominal CT imaging if a patient with peritonitis is treated with antibiotics for more than 3 days without resolution of symptoms.

The low incidence of bowel perforation makes establishing a standard management plan difficult, but surgery is the usual treatment. Successful endoscopic repair using clips (20) or endoscopic closure of the colonic perforation (23,24) after colonoscopy has also been reported. In addition, perforations could be self-curing, and so a conservative approach, with removal of the catheter, might be tried before consideration of surgical exploration. Favorable outcomes were reported in patients without signs of peritonitis or sepsis (6,14) or after conservative management with only catheter removal. In our view, if a patient presents with no signs of peritonitis or sepsis, but has formation of a sinus around the catheter, then simple catheter removal might be feasible if the patient can be carefully followed over time.

CONCLUSIONS

We want to emphasize several points with respect to the diagnosis and treatment of bowel perforation by a catheter in PD patients. First, the signs and symptoms of perforation are extremely variable. A high index of suspicion is required when the patient has watery diarrhea or peritonitis, and routine abdominal CT imaging should be performed if the patient has peritonitis and if antibiotic treatment for more than 3 days has not resulted in significant amelioration of symptoms. Second, patients discontinuing PD for more than 1 month could potentially benefit from catheter removal. Third, PD patients undergoing renal transplantation should have their catheters withdrawn or regularly flushed after the transplantation procedure. Finally, for a patient with no signs of peritonitis or sepsis, but with the formation of a sinus around the catheter, removal might be feasible if the patient can be followed over time.

DISCLOSURES

The authors have no financial conflicts of interest to declare.

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REFERENCES

1. Watson LC, Thompson JC. Erosion of the colon by a long-dwelling peritoneal dialysis catheter. *JAMA* 1980; 243:2156–7.
2. Valles M, Cantarell C, Vila J, Tovar JL. Delayed perforation of the colon by a Tenckhoff catheter. *Perit Dial Bull* 1982; 2:190.
3. Volpe MD, Iberti M, Ortensia A, Vernonesi GV. Erosion of the sigmoid by a permanent peritoneal catheter. *Perit Dial Int* 1984; 4:108.
4. Parvin SD, Beaman M. Ileal erosion by the Tenckhoff catheter. *Perit Dial Int* 1985; 5:82–3.
5. Brady HR, Abraham G, Oreopoulos DG, Cardella CJ. Bowel erosion due to a dormant peritoneal catheter in immunosuppressed renal transplant recipients. *Perit Dial Int* 1988; 8:163–5.
6. Jamison MH, Fleming SJ, Ackrill P, Schofield PF. Erosion of rectum by Tenckhoff catheter. *Br J Surg* 1988; 75:360.
7. Rambausek M, Zeier M, Weinreich T, Ritz E, Rau J, Pomer S. Bowel perforation with unused Tenckhoff catheters. *Perit Dial Int* 1989; 9:82.
8. Korzets Z, Golan E, Ben-Dahan J, Neufeld D, Bernheim J. Decubitus small-bowel perforation in ongoing continuous ambulatory peritoneal dialysis. *Nephrol Dial Transplant* 1992; 7:79–81.
9. Rotellar C, Sivarajan S, Mazzoni MJ, Aminrazavi M, Mosher WF, Rakowski TA, et al. Bowel perforation in CAPD patients. *Perit Dial Int* 1992; 12:396–8.
10. Jansen GP, Gerlag PG, Bruyninckx BC. Unusual presentation of bowel perforation by a CAPD catheter. *Perit Dial Int* 1994; 14:180–2.
11. Balaji V, Digard N, Wise MH. Delayed bowel erosion due to functioning chronic ambulatory peritoneal dialysis catheter. *Nephrol Dial Transplant* 1996; 11:368–9.
12. Borazan A, Ustün H, Akkaş M, Ozbay O, Yilmaz A. Bowel perforation during catheter removal after the sixth month of peritoneal dialysis termination. *Acta Medica (Hradec Kralove)* 2003; 46:77–8.
13. Shrestha BM, Wilkie M, Raftery AT. Delayed colonic perforation caused by an unused CAPD catheter in a patient presenting with diarrhea. *Perit Dial Int* 2003; 23:610–11.
14. Grzegorzewska AE. Perforation of the transverse colon caused by a permanent peritoneal dialysis catheter. *Perit Dial Int* 2004; 24:298.
15. Finkle SN. Peritoneal dialysis catheter erosion into bowel: amyloidosis may be a risk factor. *Perit Dial Int* 2005; 25:296–7.
16. Saweirs WW, Casey J. Asymptomatic bowel perforation by a Tenckhoff catheter. *Perit Dial Int* 2005; 25:195–6.
17. Askenazi D, Katz A, Tenney F, Benfield M, Barnhart D. An unusual case of peritoneal dialysis malfunction. *Kidney Int* 2007; 72:524.
18. George J, Varma S, Gopi SP, Ramachandran S, Thampi M, Kunjukunju M, et al. Quiz page. Perforation of a functioning Tenckhoff catheter through the appendix. *Am J Kidney Dis* 2008; 52:A47–8.
19. Trivedi H, Tan HP, Morgan C, Shapiro R, Basu A. Colonic perforation by a dormant peritoneal dialysis catheter post renal transplantation. *Am Surg* 2010; 76:908–9.
20. Baek SK, Bae OS, Jang K. Endoscopic management of delayed perforation of the rectum caused by a peritoneal dialysis catheter. *Surg Laparosc Endosc Percutan Tech* 2011; 21:e44–7.
21. Elhassan E, McNair B, Quinn M, Teitelbaum I. Prolonged duration of peritoneal dialysis catheter embedment does not lower the catheter success rate. *Perit Dial Int* 2011; 31:558–64.
22. Brown PA, McCormick BB, Knoll G, Su Y, Doucette S, Fergusson D, et al. Complications and catheter survival with prolonged embedding of peritoneal dialysis catheters. *Nephrol Dial Transplant* 2008; 23:2299–303.
23. Magdeburg R, Collet P, Post S, Kaehler G. Endoclippping of iatrogenic colonic perforation to avoid surgery. *Surg Endosc* 2008; 22:1500–4.
24. Mana F, De Vogelaere K, Urban D. Iatrogenic perforation of the colon during diagnostic colonoscopy: endoscopic treatment with clips. *Gastrointest Endosc* 2001; 54:258–9.

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