

# Rupture of Subcutaneous Peritoneal Dialysis Catheter by Stretching Exercise: A Case Report

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*Rupture of the peritoneal dialysis (PD) catheter is rare complication. Here, we report a case of catheter rupture that occurred because of exercise after partial catheter reimplantation.*

*A 66-year-old man with a history of end-stage kidney disease secondary to diabetic nephropathy experienced refractory exit-site and tunnel infection. After the infected parts of the catheter were excised, a partial catheter reimplantation was performed. At the time of that surgery, a presternal location was selected for the new exit site, and a titanium extender was used to connect the two catheters. The patient was discharged on postoperative day 3, but was readmitted for a pericatheter leak 5 days later. Fluoroscopy performed to investigate the cause demonstrated a pericatheter leak from the connecting portion between the titanium extender and the catheter.*

*Surgery performed to repair the leak revealed that the catheter had ruptured. We believe that the cause of the rupture was mechanical stress induced by the patient's stretching exercise program. The PD catheter was made of silicone rubber with high elasticity. Even when such resilient materials are used, we recommend that, to avoid PD catheter rupture after partial reimplantation, clinicians should discourage the patient from stretching excessively.*

## Key words

Catheters, complications

## Introduction

Catheter-related infections, such as exit-site and tunnel infection (ESTI), are still the most troublesome

problems in peritoneal dialysis (PD) in Japan (1). The effectiveness of partial reimplantation of the PD catheter for refractory ESTI has been reported in recent studies (2,3). In that procedure, the uninfected catheter portion is exposed and cut, and a titanium extender is used to connect that portion to a new catheter. The new catheter is typically externalized on the side opposite the infected tunnel through a new subcutaneous tunnel created using a tunneling tool.

Partial reimplantation is a less invasive surgery, with a short duration of hospitalization, and does not require catheter removal or interruption of PD. In addition, by using a long PD catheter, it is possible to change from an abdominal exit site to a presternal exit site. The presternal exit site has been reported to be better adapted for obese patients (4). However, we experienced a case of rupture of the PD catheter after changing from an abdominal to a presternal exit site in a partial reimplantation. To the best of our knowledge, reports of PD catheter rupture in subcutaneous tissue are few in number. Here, with the consent of the patient, we describe the rupture of a PD catheter in subcutaneous tissue induced by stretching exercise after partial catheter reimplantation.

## Case description

A 66-year-old man with a history of end-stage kidney disease caused by diabetic nephropathy began PD in April 2011. The original PD catheter, a JBS-2 slit-type semi-long catheter (Meditech, Tokyo, Japan), which is a three-cuffed, 65 cm-long, straight, flexible silicone rubber catheter, was inserted without surgical complications. Migration of the JBS-2 catheter is less likely because the front and rear of the deep cuff is reinforced. The PD catheter was placed using an open surgical technique. The exit site was created in the upper abdomen because the patient was obese (body mass index: 30.5 kg/m<sup>2</sup>). The modality used

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was automated PD (three 1.5-L exchanges of 1.5% glucose solution) without a daytime dwell. Daily exit-site care was performed using soap. Application of mupirocin and gentamycin, and disinfection with povidone iodine were never performed as prophylaxis.

No episodes of peritonitis and ESTI had occurred with this patient in the past. The PD catheter was immobilized with several layers of gauze to prevent trauma to the exit-site.

The patient experienced ESTI with *Corynebacterium* species in May 2013. Although he was initially treated with an oral antibiotic (levofloxacin), the infection was not controlled. We therefore decided to perform partial reimplantation of the PD catheter. At 3 months after the start of the ESTI, the infected part of the catheter was removed, and partial reimplantation of a new catheter was performed. A titanium extender (Hayashidera K.K., Ishikawa, Japan) was used to connect the two catheters. At the time of surgery, a presternal exit site was selected to facilitate exit-site care.

The patient was discharged on postoperative day 3. However, he was readmitted 5 days later because of a leak of dialysate from the presternal exit site. On admission, he was not complaining of abdominal pain. No trauma to the subcutaneous catheter had occurred. In addition, swelling and redness were not observed at the subcutaneous tunnel. Fluoroscopy performed to investigate the cause of the pericatheter leak demonstrated leakage from the area at which the titanium extender and the catheter connected (Figure 1). Surgery to repair the leak was performed.

Initially, we thought that the cause of the leak was detachment of the titanium extender from the catheter. However, we found that the PD catheter had ruptured at the site of the leak (Figure 2). We believed that the cause of the rupture was mechanical stress induced by the patient's stretching exercise program (dorsiflexion of the trunk). We removed the remaining part of the catheter and created a new exit site in the upper abdomen by connecting a new catheter. Since then, the patient has been undergoing regular PD without pericatheter leakage.

## Discussion

Breakage of the external part of the PD catheter has generally been reported to occur at the site of connection of the titanium adapter to the radiopaque strip (5). Some cases of spontaneous rupture have also been reported. Previous reports of rupture of the PD catheter are shown

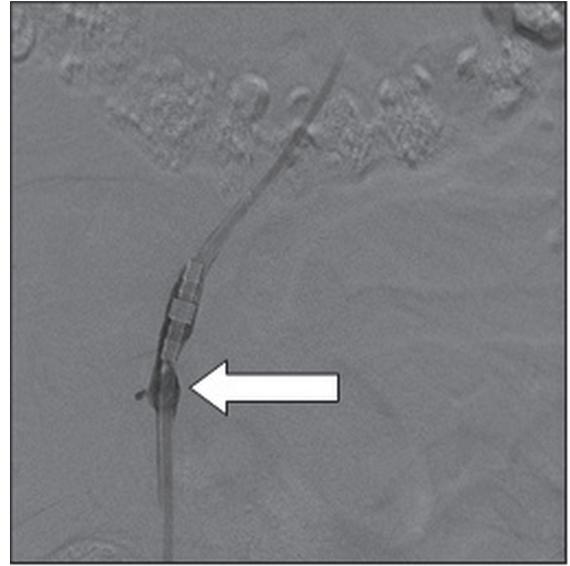


FIGURE 1 Leakage at the point at which the titanium extender and the extended peritoneal dialysis catheter meet (arrow) was confirmed by fluoroscopy.

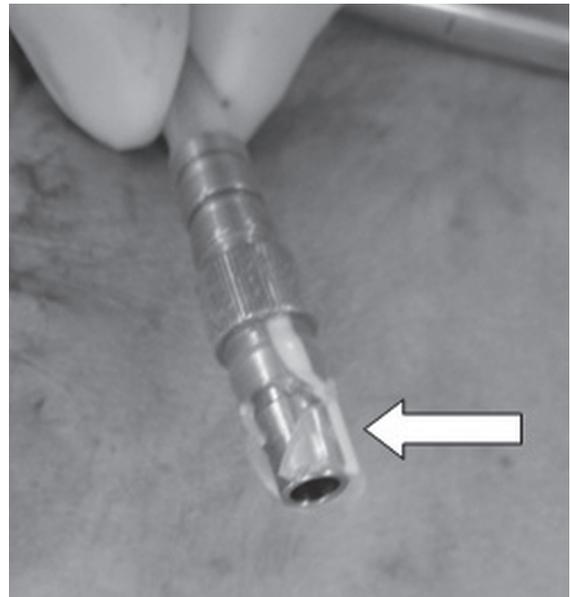


FIGURE 2 Rupture between the titanium extender and the peritoneal dialysis catheter (arrow).

in Table I. In those reports, most of the catheters were made of silicone rubber, which, because of good biocompatibility, is the standard material for PD catheters.

TABLE 1 Previous reports of peritoneal dialysis catheter rupture

Reference	Location of rupture	Catheter material	Cause of rupture (including suspicion)
Closkey and Zappacosta, 1992 (6)	Subcutaneous catheter	Silicone rubber	Unclear
Guiserix, 1997 (7)	External catheter	Silicone rubber	Disinfection by povidone iodine
Kushihata <i>et al.</i> , 1998 (8)	External catheter	Silicone rubber	Mechanical damage
Panuccio <i>et al.</i> , 1998 (9)	External catheter	Silicone rubber	Product defects
Riu <i>et al.</i> , 1998 (10)	External catheter	Polyurethane	Mupirocin ointment
Khandelwal <i>et al.</i> , 2003 (11)	External catheter	Silicone rubber	Unclear
Lee <i>et al.</i> , 2006 (12)	Abdominal cavity	Polyurethane	Aging, two radiopaque strips Composition of catheter Disinfection by povidone iodine
Agarwal <i>et al.</i> , 2011 (13)	Subcutaneous catheter	Silicone rubber	Unclear
Kim <i>et al.</i> , 2013 (14)	Subcutaneous catheter	Silicone rubber	Product defects
Knehtl <i>et al.</i> , 2015 (15)	Subcutaneous catheter	Silicone rubber	Unclear
Mineo <i>et al.</i> , 2015 (16)	Abdominal cavity	Silicone rubber	Unclear
Present report	Subcutaneous catheter	Silicone rubber	Mechanical stress

Disinfection with povidone iodine (7), manufacturing defects (9,14), mupirocin application (10), mechanical damage (8), and aging of the catheter (12) have all been reported as causes of rupture.

Although reports of the rupture of external PD catheters were numerous before 2003, catheter rupture in the subcutaneous tissue has been reported more often in recent years. The reason for the reduced incidence of rupture of the external catheter is believed to be related to a decline in routine disinfection with povidone iodine and in application of mupirocin at the exit site during daily care. Interestingly, breakage of the catheter in the abdominal cavity has been reported in 2 patients; in those patients, manufacturing defects were suspected, although the cause was not clear (12,16).

Rupture of the PD catheter can present as inflow or outflow failure (or both), exit-site infection, and peritonitis (13); however, our patient presented with a large-volume pericatheter leak. The reason for the leak was that the subcutaneous cuff had not had sufficient time to adhere adequately to the subcutaneous tissue. To the best of our knowledge, only 4 cases of PD catheter rupture that resulted in the catheter breaking and separating in the subcutaneous tissue have been reported. Kim *et al.* reported that defective silicone catheters might lead to reduced resistance to mechanical strain (14). However, the cause of catheter rupture was unclear in the other reports. In our case, the PD

catheter was made of silicone with high elasticity. However, mechanical stress induced by the patient's recent stretching exercise program was considered the cause of the rupture. A defect in the catheter could also have been a possible cause of the catheter rupture, despite the strong tensile strength of silicone.

## Conclusions

We experienced a rare case of subcutaneous rupture of a PD catheter by exercise. In our opinion, to avoid PD catheter rupture, clinicians should discourage excessive stretching for patients whose catheter exit site is changed from an abdominal to presternal position during partial reimplantation.

## Disclosures

The authors have no conflicts of interest to declare.

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