SHORT REPORTS

Re-Embedding Catheter Technique at the Discontinuation of Peritoneal Dialysis

KEY WORDS: Peritoneal dialysis; re-embedding catheter technique; catheter removal.

The removal of a peritoneal dialysis catheter (PDC) is an important procedure, much like the placement of a PDC. In our institution, the removal of a PDC was always performed under spinal or general anesthesia. However, we might hesitate to remove a PDC in some patients under such anesthesia when their general condition is too poor due to severe cerebrovascular and/or cardiac disease. Therefore, we attempted a re-embedding catheter technique in 4 patients. In this report, we review the advantages and disadvantages of this technique and compare it with traditional techniques.

MATERIALS AND METHODS

We used the Swan Neck Sendai Catheters, JB-5(A) (Hayashidera Co. Ltd., Ishikawa, Japan) for all patients. The intraperitoneal PDC configurations were straight. The PDCs have 2 cuffs, the deep cuff placed within the rectus sheath, anterior to the peritoneum and the subcutaneous cuff placed in fat tissues. None of the patients had an exit-site infection at the time of the re-embedding catheter technique. Informed consent was obtained from all patients before the procedure. The patients' sex, age at the time of surgery, primary disease causing end-stage kidney disease, duration of catheter implantation, duration of peritoneal dialysis (PD), duration of hospitalization after the re-embedding catheter technique, reasons for embedding catheter technique, and complications

after this procedure were collected from medical records. The re-embedding catheter techniques were performed between December 2011 and November 2013.

In this technique, the patient was placed in the supine position in the operating room. After antiseptic skin preparation using sterile technique, a small skin incision (approx. 3 cm) was made near the PDC placement scar under local anesthesia. After fat tissue was exfoliated by blunt dissection, the subcutaneous catheter was exposed. The PDC was cut in the abdominal cavity side of the subcutaneous cuff. The residual catheter of the intraperitoneal side was filled with unfractionated heparin (2,000 units), capped with a BioHole Plug (Nipro Co. Ltd., Osaka, Japan), and completely embedded under the skin. Then the subcutaneous cuff was separated from the surrounding tissue using Metzenbaum scissors and a scalpel as needed, and the external catheter was removed. The exit site was closed after wedge resection of the skin. Finally, the subcutaneous tunnel at the entry point was sutured with an absorbable material such as Polysobe (Covidien Japan, Inc., Tokyo, Japan), and skin was sutured with 3-0 nylon yarn (Akiyama Medical Mfg. Co. Ltd., Tokyo, Japan).

RESULTS

All procedures were performed by nephrologists. The characteristics of the 4 patients are shown in Table 1. All of the patients were switched to hemodialysis before the re-embedding catheter technique. There were no surgical complications after the embedding catheter techniques. All subcutaneous cuffs were cultured, and they were all negative. In addition, there were no episodes of peritonitis after the procedure. Duration of hospitalization after the re-embedding catheter technique was longer in 1 patient because we took

TABLE 1
The Characteristics of the 4 Patients Who Underwent the Re-embedding Catheter Technique

	Case 1	Case 2	Case 3	Case 4
Age (years)	70	81	87	76
Sex	Female	Female	Female	Male
Primary disease	Diabetic nephropathy	Nephrosclerosis	Unknown	Diabetic nephropathy
Duration of catheter implantation (months)	64	80	13	70
Duration of peritoneal dialysis (months)	61	73	7	62
Duration of hospitalization after the re-embedding catheter technique (days)	62	2	2	4
Reasons for surgery	Self-care limitations	Inadequate dialysis	Caregiver burden	Self-care limitations
Complications	None	None	None	None

the time to change hospitals. Two of the 4 patients were followed for 2 years after PDC removal, but none showed any complications such as late subcutaneous cuff-related infection, gastrointestinal symptom due to the residual catheter, and encapsulating peritoneal sclerosis (EPS).

DISCUSSION

Massive bleeding, residual cuff, intra-abdominal injury, and abdominal incisional hernia have been reported as complications following the removal of PDC (1,2). In general, PDC removal procedures have been performed according to the method described by Ash (3). This method may damage intra-abdominal organs due to cutting around a wide area of surrounding tissue. The pull technique has been reported as another surgical approach for low-risk removal of PDC (4). However, there is concern that local infection develops in the retaining cuff postoperatively (5). According to a Japanese report published in 2010, the mean age of patients who newly started dialysis is approximately 68 years (6). Furthermore, dialysis patients with nephrosclerosis due to hypertension and/or aging are also gradually increasing in number with the aging society. Therefore, many patients have several complications before starting dialysis. For such high-risk patients, low-risk surgery is required under local anesthesia instead of general anesthesia. Recently, the cases in which nephrologists have inserted PDC are increasing and good outcomes have been reported worldwide in these cases (7–9). However, nephrologists who are not surgeons should not perform high-risk operations.

The advantages of the re-embedding PDC technique are that it is less invasive, is performed at lower cost, is not associated with any major complications (such as intra-abdominal injury and abdominal incisional hernia), and does not need spinal or general anesthesia. It is easy to restart PD for patients with this technique. Compared with conventional open surgery, this technique saves \$300 per patient. In contrast, there are concerns about local infection and/or peritonitis due to the residual catheter and the effect of the residual catheter on the development of EPS. As a precaution against infection, it is most important to check for exit-site and/or tunnel infection by using ultrasonography. However, the catheter must be removed immediately if it causes peritonitis. Pollock *et al.* reported that PDC is a risk factor for EPS (10). In this procedure, it is possible to perform peritoneal lavage by externalization of the PDC if the patient develops EPS with massive ascites.

The main limitations of this study are the small number of patients, the short observational period, and the retrospective cohort design. Further studies with more patients for comparison of this re-embedding PDC technique with the conventional removal of PDC are necessary to confirm the value of this technique.

In conclusion, the re-embedding catheter technique appears to be a valid option for patients who are at high risk for the removal of PDC or who hope to spend the end of life at home on PD again.

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