A Novel Technique for Correcting Peritoneal Dialysis Catheter Malposition and Blockage

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Abstract

Methods  To investigate the safety and clinical significance of the method described in this study, we focused on 16 peritoneal dialysis patients with peritoneal dialysis (PD) catheter malposition and blockage in whom nonsurgical reposition was ineffective, who received a local incision about 5 cm below hypogastrium PD catheter insertions under local anesthesia. Tissues were separated layer by layer, 1-cm incisions were performed on the peritoneum vertically and conventionally, and then the PD catheters were pulled. Adherent mesentery was separated and the PD catheters were freed and removed sufficiently. PD catheters were introduced into the Dow cavity using large introducing forceps, were loop-ligated and fixed using 3# silk thread, and then the ligation line was sutured to the peritoneum. The tissues were managed layer by layer and the skin was sutured. All patients were followed up for half a year.

Results  Sixteen cases of refractory PD catheter malposition and blockage were managed successfully, with an operative incision of 3 cm and an operation time of 40±13 minutes. The localized anesthesia was well tolerated, and there were five cases in which lidocaine at 5 mg was added during the operation; postoperative pain was slight and only three patients used analgesics at night. All patients were treated with coagulation hemostasis, and there was no transfusion. No malposition, leakage or blockage was found at follow-up at more than six months.

Conclusion  It is safe, simple, inexpensive and associated with fewer complications to correct refractory PD catheter malposition and blockage by loop ligature and fixation through a minilaparotomy of inserted hypogastrum PD catheters promptly.

Key words: End-stage renal disease (ESRD), peritoneal dialysis, peritoneal dialysis catheter malposition and blockage

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Introduction

Peritoneal dialysis (PD) is an important means of renal replacement therapy for end-stage renal disease (ESRD) with a simple operation, and there is no need for systemic heparinization or special equipment. PD has good results in scavenging intermediate molecules and less influence on the hemodynamics. Moreover, the costs of PD are relatively low, so it has been used in large-scale clinical trials in ESRD patients. The most common complications after the implantation of a peritoneal catheter were reported to be peritoneal dialysis catheter malposition and blockage, the main reason for which is greater omental adhesion encapsulation (1). Once inadequate drainage or perfusion develops, peritoneal dialysis catheter malposition and blockage inevitably occur. Currently, laparoscopic repair, which is more complicated and expensive, is usually adopted if nonsurgical treatment modalities (such as motion, local massage and guidewire intervention) do not work. In this paper, we present a novel surgical technique and investigate its safety and clinical significance for correcting refractory PD catheter malposition and blockage by loop ligature and fixation through minilaparotomy of inserted hypogastrum peritoneal dialysis catheters.
Patients

From June 2009 to June 2014, a total of 16 PD patients with PD catheter malposition and blockage in whom nonsurgical treatment modalities (such as motion, local massage and guidewire intervention) had failed at our hospital were selected. All patients were suffering from Chronic Kidney Disease (CKD) stage 5 (seven men, nine women; mean age 33.4±12.6). Chronic nephritic syndrome was present in eight cases, diabetic nephropathy in four cases, polycystic kidney in one case and other conditions in three cases. The clinical features of all patients were as follows: (1) diagnosed with CKD stage 5, renal replacement treatment indicated, age < 53; (2) no history of severe chest diseases and lung ailments; (3) body mass index (BMI): 20-30 kg/m²; (4) normal coagulation functions; (5) no tumor, or psychological or drug problems; (6) patients and their families accepted the PD and agreed to the operative correction; and (7) sudden inadequate or obstructed drainage occurred during PD, and conventional non-surgical treatment modalities did not work in one week, as well as PD catheter malposition and blockage being confirmed by X-ray, and corrective surgery being accepted. The exclusion criteria were as follows: (1) patients who were not in a condition to undergo a reoperation; and (2) patients who refused PD and a reoperation.

Methods

Operative methods

Patients were maintained in a supine position with routine sterilization and draping. The original PD catheter was localized in the abdomen, and then the lower 5 cm was indicated as the incision center (Figure). Patients were given local infiltration anesthesia with 0.5% lidocaine hydrochloride (20 mL of 2% lidocaine dilution). Vertical incisions approximately 3 cm long were made, blunt separation of the adipose layer using vessel forceps was performed up to the rectus abdominis sheath and an incision was made. This was followed by blunt separation of the muscular layer, cutting of the anterior sheath of the rectus muscles, blunt separation of the diastasis recti abdominis and full exposure of the peritoneum, after which vertical incisions approximately 1 cm long were made. By using a dynamic radiograph, the PD catheter was slowly drawn from the abdomen through a blunt-edged hook, followed by routine isolation, ligaturing and removal of the adhesive omentum majus step by step, full exposure of the PD catheter in the abdomen, and quick rinsing and removal of omental tissue in the PD catheter and ostium using 20 mL of heparin saline. PD catheters were introduced into the Dow cavity using large introducing forceps, then loop-ligated and fixed with 3# silk thread, after which the ligation line was sutured to the peritoneum and the medial border of the extraperitoneal posterior sheath; the distance between the fixed PD catheters and the suture was 1.5 cm. Tests showed unobstructed drainage, after which the peritoneum was sutured and conventional surgical treatment was adopted. Finally, the skin was sutured.

Outcome measures

In principle, the dressing was changed every other day for all patients, and wounds were kept clean and dry; patients received peritoneal dialysis solutions at 1,000 mL once a day on postoperative day 7 (Baxter, Shanghai, China, 1.5% or 2.5% glucose low-calcium lactate peritoneal dialysis solution, duplex system). The peritoneal dialysis solutions were maintained for two to three hours, and a standard dose (2,000 mL once) was applied instead after seven days. All patients were followed up for more than half a year, in terms of the situation of the catheterization, the position of the PD catheters and the success in terms of the PD outcome.

Results

Sixteen cases of refractory PD catheter malposition and blockage were managed successfully, with an operative incision of 3 cm and an operation time of 40±13 minutes. The localized anesthesia was well tolerated, and there were five cases in which lidocaine at 5 mg was added during the operation; postoperative pain was slight and only three cases used analgesics at night. All patients were treated with coagulation hemostasis, and there was no transfusion. Reddish PD solutions could be observed two days after the operation, but no leakage of ascites was found. All patients were followed up for more than half a year, and there was no PD catheter malposition, blockage, leakage or other complications. PD-related peritonitis was found in only one case and no withdrawal cases. For all 16 cases, incisions were on the left of the abdominal medial line, including deviation to the left rear in 10 cases and deviation to the right rear in six cases, all of which were caused by omental adhesion encapsulation.
Conclusion

With the development of PD technology, more and more patients are now deciding to undergo PD treatment. The disadvantage of open catheterization, which is currently the conventional method of catheterization for PD, is that the specific conditions in the abdominal cavity of patients cannot be observed. Some related complications, such as fungal peritonitis and PD catheter malposition and blockage, are often causative of peritoneal dialysis termination. PD complications are usually divided into mechanical complications and infectious complications (outlet and tunnel complications). Mechanical complications, which are divided into elevated intra-abdominal pressure-related complications and catheter-related complications, refer to the inadequate drainage of peritoneal dialysis solution, which is caused by peritoneal dialysis catheter cacoethes, malposition, blockage or wrapping, as well as abdominal cavity structural abnormality, peritoneal dialysis solution leakage and hernia, among others. PD catheter malposition and blockage are the most common catheter-related complications. The curling up of a catheter and its transfer above the true pelvis and into the epigastrum, causing restricted or no access of the peritoneal dialysis solution into the abdominal cavity, can be examined by an abdominal X-ray, celiography and an ultrasound. During the initial period, intestinal laxative can be used to promote alvine peristalsis; at the same time, patients should undergo appropriate procedures and position changes. When there is catheter dysfunction but spontaneous reduction is impossible, the combination of manual reduction (bimanual massage) and wire-guided reduction (guided by a C-arm) can be adopted. However, the treatment of refractory peritoneal dialysis catheter malposition and blockage, seen most frequently in greater omental encapsulation adhesion and PD catheter obstruction, is unsatisfactory through the methods mentioned above.

Once there is greater omental encapsulation adhesion, exubation intubation should be performed again, but there is a serious risk if PD catheter malposition and blockage develop again. In recent years, a laparoscopic technique has been used in the intubation of a PD catheter or the correction of PD catheter malposition and blockage (2-6). This technique usually involves two to four puncture channels (4-6), which increases the risk of bleeding and leakage (7); there is also a need to establish pneumoperitoneum under general anesthesia, which is associated with its own disadvantages of a complex operation, the requirement for special equipment, high cost and being unsuitable for high-risk uremic patients with intolerance to general anesthesia. The fixation of the catheter to the back surface of the bladder or uterus and omentopexy or omentectomy should be performed under laparoscopic guidance.

For a successful operation of PD, the holding position and lack of obstruction of the PD catheter should be considered as the prerequisite and guarantee, and catheter-related complications can markedly affect the success of PD. The lack of recurrence of PD catheter malposition and blockage caused by omental encapsulation is very promising. At present, there is a tendency to accept that the location on the body surface of an operative incision is marked by the pubic symphysis, and the site of insertion is often 10-15 cm above the pubic symphysis. At our center, we chose a location 5-10 cm above the pubic symphysis for incision in reoperation due to the following two considerations: one is concerned with the distribution range of the greater omentum in the abdominal cavity anatomically (8): the lower the site of catheter fixation, the less chance of contact with the greater omentum, including even adhesion encapsulation; the other consideration is that, the lower the site of catheter fixation, the lower the passage of the catheter and the lower the likelihood that it will be affected by peristalsis; as a result, the incidence of PD catheter malposition and blockage will be very small.

At our center, the incidence of omental adhesion encapsulation is 7.8%, which is seen most frequently in the young. When fixing a PD catheter to the peritoneal wall using this technique at the time of PD catheter insertion before starting PD in patients aged under 45, it is possible to prevent PD catheter malposition after PD initiation, although this requires further study.

We started to apply the above-mentioned operation in June 2009. Its gradual nature and relatively easy approach minimize the risk of malposition and blockage again and it is easily accepted by patients given its lower cost and good clinical operability. With the advantages of good tolerance of local anesthesia, less trauma and a short operative time, the observation of PD catheter adhesion under direct vision makes it easy to conduct appropriate procedures. The correction of refractory PD catheter malposition and blockage by loop ligature and fixation through minilaparotomy of inserted hypogastrium PD catheters, which can minimize complications, warrants wide dissemination in a clinical context.

The authors state that they have no Conflict of Interest (COI).

References

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