Use of Laparoscopy in the Management of Malfunctioning Peritoneal Dialysis Catheters

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The proper function of peritonea/ dia/ysis (PD) catheters can be compromised by catheter ma/position, fibrin c/ot, or omenta/ wrapping. The purpose of this study was to determine the efficacy of /aparoscopy in the treatment of malfunctioning PD catheters.

All patients undergoing /aparoscopy for catheter dysfunction at MetroHea/th Medica/ Center in C/eve/and; Ohio, .from 1991 to 1995, were reviewed. Twenty-six /aparoscopies were performed in 22 patients, for malfunction occurring an average of 3.9 months following insertion (range 0.5 -18 months). Omenta/ and/or sma// bowe/ wrapping was present in all but three cases. Lysis of adhesions was required in 19 of26 cases, with repositioning on/y in seven. Eight patients had fai/ed attempts at stiff wire manipu/ation prior to /aparoscopy. Perioperative comp/ications occurred in seven cases, consisting of temporary dia/ysate /eakage (2), enterotomy (1), and ear/y reocc/usion (4). Repeat /aparoscopy was successfu/ in three of these four reocc/usions. The overall success rate (catheter function >30 days after /aparoscopy) was 21/22 (96%).

Laparoscopy is high/y accurate and effective in the management of peritonea/ dia/ysis catheter dysfunction and resu/ts in pr%ngation of catheter /ife.

Key words

Catheter malfunction, laparoscopy

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Introduction

Successful chronic peritoneal dialysis (PD) requires the presence of a functioning catheter with unrestricted inflow and outflow of dialysate solution. Catheter malfunction is one of the most common complications of PD and can result from catheter migration or kinking, constipation, fibrin deposition, omental wrapping, or obstruction secondary to intraperitoneal adhesions. Options for management of malfunctioning catheters include urokinase administration, stiff wire manipulation, laparoscopy, and catheter replacement, and each salvage method has been associated with variable rates of success. The purpose of this study was to determine the safety and efficacy of laparoscopy in the management of malfunctioning peritoneal dialysis catheters.

Material and methods

A retrospective review of the records of all patients undergoing laparoscopy for evaluation and management ofPD catheter dysfunction from 1991 through 1995 was performed. Recorded data included patient demographics, catheter insertion date, date of malfunction, cause of obstruction, procedure performed, complications, and catheter outcome. During the study period a straight Toront0--Westem catheter (Accurate Surgical, Toronto, Canada) was predominantly used.

The laparoscopic procedures were performed in the outpatient operating room. Early in the series general anesthesia was used, however, over the past two years intravenous sedation alone has been utilized.

Carbon dioxide pneumoperitoneum to 10 12 mm of mercury pressure was achieved by irisufflation via the existing PD catheter if possible, otherwise through placement of a Verress needle. A 5mrn trocar was placed away from the catheter insertion site, and a diagnostic laparoscopy was performed to determine the source of obstruction. Accessory 5-mm trocars were placed as needed for cath(;ter manipulation and to perform adhesiolysis or division of omentum, if needed {Figure I a and I b). Once satisfactory catheter flow and position were achieved, pneumoperitoneum was released and the trocar fascial and skin incisions were closed with absorbable suture. Then, peritoneal dialysis was resumed within one to ten days following surgery. A successful outcome was defmed ~ normal catheter function 30 days following laparoscopy.

FIGURE 1a Laparoscopic view of peritoneal dialysis catheter obstructed by omental wrapping around distal portion of catheter.

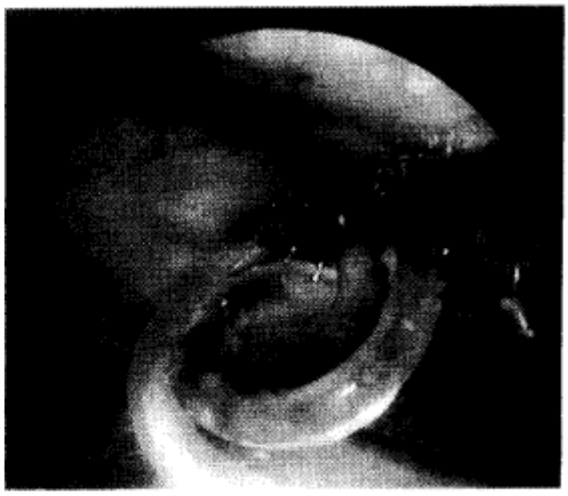

FIGURE 1b Placement of freed catheter into pelvis with laparoscopic forceps.

Results

A total of 26 laparoscopies for catheter malfunction were performed in 22 patients with a mean age of 47 years {range 27 -75 years). Malfunction occurred an average of 3.9 months following insertion {range 0.5 18 months). Eight patients had failed attempts at stiff wire manipulation prio~ to laparoscopy. The primary etiology of dysfu11ction was fibrin deposition in one, catheter displacement in two, and omentum and/or small bowel wrapping with adhesions in the remaining 23 cases. Lysis of adhesions was performed in 19 of26 cases. In seven cases, only repositioning and/or fibrin clearance without adhesiolysis was required. The mean operative time was 45 minutes {range 27 -160 minutes). Perioperative complications occurred in seven cases {27%) consisting of temporary dialysate leakage in two, enterotomy in one, and early reocclusion in four. The enterotomy occurred in a patient with multiple, previous abdominal surgeries and extensive small bowel wrapping around the catheter, and was immediately recognized and repaired through a minilaparotomy incision. Repeat laparoscopy was successful in three of the four reocclusions. Thirtyday catheter function was therefore achieved in 82% of initial laparoscopies and 75% of repeat laparoscopies, with an overall success rate of 21 of 22 {96%). No exit-site infections or peritonitis attributable to the procedure occurred.

Discussion

Chronic peritoneal dialysis is a well-established and effective method of therapy in chronic renal failure but can be compromised by dysfunction of the intraperitoneal catheter. This may occur early after placement, which may be related to technical problems with insertion or in a delayed fashion. Catheter obstruction will manifest as sluggish inflow and/or poor outflow and may be accompanied by abdominal pain. While obstruction may occur with fibrin deposition or catheter migration, in our experience with an adult patient population the most common cause has been wrapping of omentum around the distal portion

of the catheter. The incidence of catheter malfunction is not insignificant, occurring in 15% -30% of patients, by previous reports {1-6), and is a common cause of catheter loss.

A variety of treatment modalities have been described for management for nonfunctioning PD catheters. Stringel et al. (7) reported a small series of pediatric patients with occluded catheters treated successfully with use of urokinase installation and F ogarty catheter manipulation. However, this technique would likely be less successful in adults, where the omentum is much more developed.

A more frequently described technique is the use of stiff guidewire manipulation of the catheter under fluoroscopic guidance. Reported success rates with this technique have been variable, ranging from 27% -67% (5,6,8,9). Advantages of this method include relative ease and safety , general availability in radiology suites, capability for remanipulation, no requirement for anesthetic, and a relatively lower cost compared to laparoscopy. Disadvantages include a lower success rate and inapplicability or difficulty with certain catheter designs, for example, coiled catheters, Cruz, Swan neck, and those with long subcutaneous tunnels. We have significantly decreased the use of the stiff wire technique in our unit, secondary to low success rates in our hands and a change to a coiled catheter.

Utilization oflaparoscopy in the management of patients on peritoneal dialysis is becoming more frequent. We have previously reported on its use in the placement of catheters in patients who have undergone prior abdominal surgery (10), and smaller series have been reported on laparoscopy for management of malfunctioning catheters, with success rates of greater than 80% (11,12), which are similar to our results. Other advantages of this technique include direct visualization of the cause of obstruction and ability to lyse adhesions, or even resect omentum ifnecessary. It is, however, associated with a higher initial cost, and, as with any invasive procedure, there are potential risks involved. Our technique has evolved over time in attempts at minimizing complications. We presently use relatively low intra-abdominal pressures, allowing for use of intravenous sedation in lieu of general anesthesia. We also feel that continuing with peritoneal dialysis in the immediate postoperative period will help decrease the chance of catheter reocclusion and, additionally, avoid the need for temporary periods of hemodialysis. In order to minimize the risk of dialysate leakage we insufflate the carbon dioxide for pneumoperitoneum through the existing catheter, if possible, and use only 5-mm trocars for instrumentation. Also, direct closure of any fascial defects created by the trocar is performed. Use of these techniques have resulted in lower rates of complications in addition to the high rate of catheter salvage.

In conclusion, we feel that laparoscopy is highly accurate and effective in the evaluation and management of peritoneal dialysis catheter dysfunction and results in prolongation of catheter life. Laparoscopy can be used as the primary salvage method when there is persistent obstruction of catheters not amenable to stiff wire manipulation or with failure of alternative techniques.

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