Peritoneal Dialysis International, Vol. 21, pp. 193–197
Printed in Canada. 0896-8608/00 $3.00 + .00

SHORT REPORTS

Fluoroscopic Manipulation Is Also Useful for Malfunctioning Swan-Neck Peritoneal Catheters

Dialysate outflow obstruction caused by displacement of the catheter tip is a common complication of peritoneal dialysis. Repositioning of the peritoneal catheter (PC) is sometimes accomplished by simple maneuvers such as the use of enemas or laxatives to stimulate peristalsis. When these methods have failed, more aggressive therapies such as fluoroscopically-guided catheter manipulation, surgical exploration, or laparoscopic surgery have been used. Wire manipulation under fluoroscopic control is the easiest technique: it presents few infectious complications when aseptic technique is used, and it is associated with minimal discomfort (1).

Malposition of the PC has proved to be associated with any catheter design available, although a significant reduction in dislocations has been observed with swan-neck type PCs (2–5). The physical characteristics of the classic Tenckhoff catheter make it easily accessible for interventional radiographic manipulation, but the permanently bent design of swan-neck catheters has been argued as an obstacle to wire manipulation. In fact, we have not found any previous experience with fluoroscopic repositioning of this kind of catheter. This study describes our experience with fluoroscopically-guided swan-neck PC manipulations.

PATIENTS AND METHODS

A retrospective review of hospital charts and patient registry (May 1986 to December 1999) was performed to obtain data. 140 PCs were inserted in 110 patients during that period; most were inserted by the same nephrology staff using the same method under local anesthesia (6). All catheters were Tenckhoff type catheters. Straight catheters (SPC) were used during the first 5 – 6 years (17.4%) and since then, the swan-neck type (SNPC) has been the most commonly used design (82.6%), usually with a coil tip (Table 1).

Catheter malposition was defined as poor outflow of dialysate with catheter tip displacement verified by x ray. All patients had received laxatives and/or enemas. From 1991, if malfunction persisted, catheter manipulation with a wire was performed under fluoroscopic control by the interventional radiology service, using a technique similar to previous reports (7–13). A brief description follows. The patient arrived for reposition with retained dialysis fluid in the abdominal cavity. The abdominal wall and the catheter were cleansed with povidone iodine solution; sterile technique was strictly followed. Routine prophylactic antibiotics were not administered and only a few patients needed sedation. The catheter was disconnected and a catheter guide (Amplatz super stiff, William Cook Europe; Bjaeverskov, Denmark) was advanced intraluminally under fluoroscopic control. The wire was manipulated until it was some centimeters from the tip of the catheter, then a

TABLE 1
Catheters and Migrations

	Catheters			
	Straight		Swan-neck	
	1 cuff	2 cuff	Straight tip	Coil tip
Implanted (*n*=140)	19	5	20	96
Displaced (*n*=49)	12	1	135	

gentle twisting action was used until the PC could be driven as close as possible into the true pelvis. The procedure may be repeated using a stiffer guide (Lunderquist 0.035i, William Cook Europe) when repeated attempts fail. If this maneuver failed, a stiffener from a biliary drainage or multipurpose catheter was placed over the catheter guide and rotated so that the distal tip would lie in another intraperitoneal location. In all of these instances, the subcutaneous tunnel was usually easily passed despite the swan-neck design. With persistence, the catheter can be accurately positioned in most patients using either the catheter guide or the stiffener. If these methods also failed to move the catheter, a malleable aluminum steel wire molded in a smooth curve, similar to the one used by Degesys *et al*. or Jaques *et al*. (7,8), was used. At the end of the procedure, a new sterile connector was re-placed and the patient performed one peritoneal exchange in the dialysis unit.

Immediate success was defined as free inflow and outflow through the repositioned catheter before transfer from the Radiology Department. Durable salvage was defined as a catheter functioning normally for at least 30 days after this procedure (13). Remanipulation was defined as a new attempt at repositioning after the initial manipulation failed. Catheters not repositioned or catheters that were displaced early after manipulation were either replaced or surgically repositioned.

RESULTS

Catheter migration caused 49 episodes of drainage failure in 33 catheters in 31 patients during the study period. All but three catheters were inserted through the rectus abdominus muscle in infraumbilical localization. The frequency of migration was 54% (13/24) for straight catheters and 31% (36/116) for swan-neck catheters. About 60% of the catheters were displaced to the right upper quadrant of the abdomen, suggesting a relationship to bowel peristalsis.

Enemas and laxatives were successful in 22 episodes (all but 1 with SNPC). Surgical reposition or catheter replacement was performed directly for 11 catheters, and 1 patient refused to continue peritoneal dialysis. Guide manipulation was performed on 17 occasions with 14 catheters (3 SPC and 11 SNPC) (Figure 1). Fifty percent of the catheters were displaced within 4 weeks after their placement. The period between catheter insertion and manipulation varied between 1 day and 12 months. Three patients required catheter manipulation on more than one occasion: 1 due to several episodes of

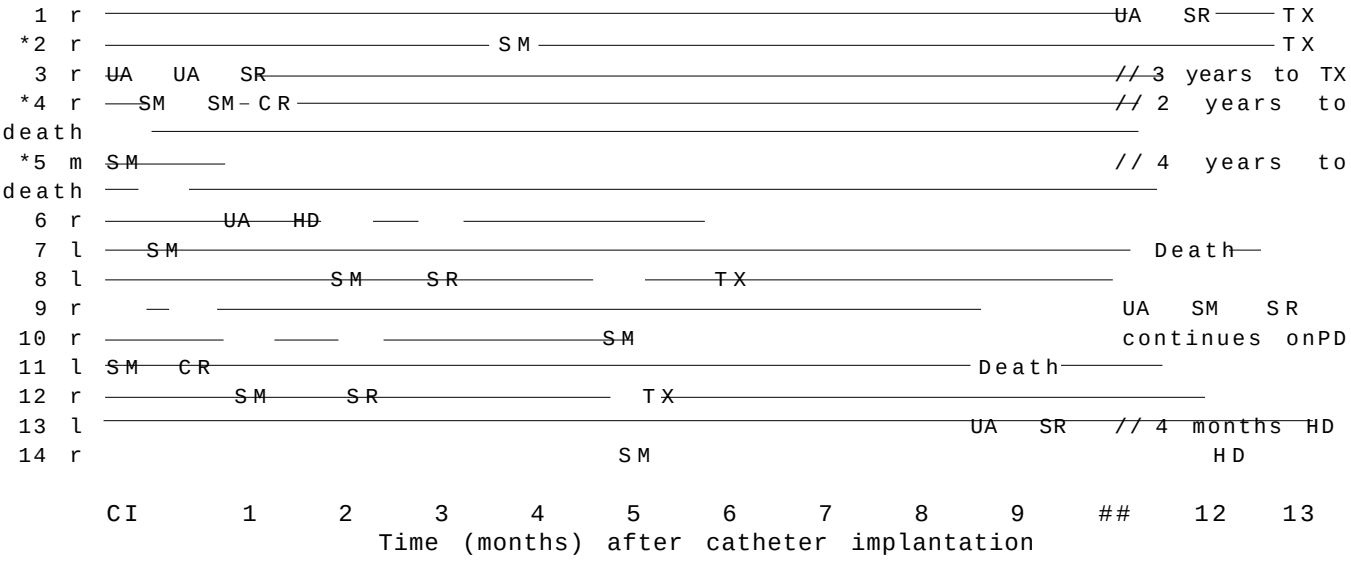

Figure 1 — Peritoneal dialysis catheter manipulations. [All but those marked with an asterisk were swan-neck peritoneal catheters (PC) with coiled tip.] r/l = right or left transrectal localization; UA = unsuccessful attempt; SR = surgical reposition; TX = transplantation; * = straight PC; SM = successful manipulation; CR = catheter replacement; m = medial localization; HD = hemodialysis; CI = catheter insertion.

malposition, and the other 2 patients due to a failed initial manipulation. Remanipulation was attempted on the following day only in these two cases, proving successful in one.

The immediate technical success rate was 9/14, plus a later case that was successfully remanipulated in a second attempt (10/16). Catheters not successfully manipulated were surgically revised, but 1 patient refused to continue on peritoneal dialysis. A new malposition occurred within 30 days after initial manipulation in 5 catheters: 1 was replaced, laparoscopic surgery was used in 3, and a new successful manipulation was performed in the last case (which was finally replaced due to a new migration). Despite the high immediate success rate after manipulation (11/17), only 5 of 17 (29%) manipulations could be classified as long-term salvage. For SNPC, manipulation was attempted in 13 instances, with immediate success in 7 (54%). Long-term success was achieved in 4 of 13 manipulations (31%).

There were no episodes of peritonitis attributable to manipulation. No other complications, such as a catheter rupture or a bowel perforation, were registered.

DISCUSSION

Malfunction of PCs, manifested as the inability to drain dialysate, is a common complication of peritoneal dialysis. This condition is frequently related to migration of the catheter from its ideal position in the pelvis. The straight, dual- or single-cuff Tenckhoff catheter, placed blindly or surgically, has an important incidence of migration (2). The tendency of the catheter to return to a stretched position (“shape memory”) influences this frequency of dislocation; it is also influenced by bowel peristalsis, where the catheter was implanted, and a subcutaneous tunnel direction above the horizontal line (11).

In 1985, Twardowski developed the swan-neck catheter with a permanent arcuate tunnel that makes this type of PC less prone to migration (14). We and other investigators (4,5) had previously noted a reduction in the dislocation rate using swan-neck catheters (15). Our current higher rate of migration of SNPC compared to other series may result from the high number of such PCs used. Interestingly, we have found an elevated success rate using enemas or laxatives on SNPC (21/35) versus SPC migrations (1/13).

Twenty-two percent (31/140) of the catheters in 28% (31/110) of the patients in our population developed PC malfunction with radiological evidence of malposition. We have not found a relationship between insertion mode and the rate of catheter migration. Moreover, our findings are in agreement with Moss (13), that is, there appears to be no relationship between the length of time a catheter functioned properly prior to migration and clinical success of manipulation.

A recent review (1) reported an incidence of PC malfunction of between 5.5% and 55%. In this review, only a few series reported swan-neck type catheters, and data about manipulation under fluoroscopy is not available among them. Avoidance of any angulation of the PC at the subcutaneous tunnel has been argued as essential for successful manipulation (16). The manufactured arcuated design of SNPCs is probably considered an obstacle to this procedure. However, we have not found significant complications related to the manipulation in our population, and our success rate with SNPCs is similar to the reported success rate on SPC series, quoting 25% – 67% (11–13). According to this, when we consider all our manipulations, our immediate success was 64% and permanent success was 29%. Considering only manipulations on SNPCs, the same rates were 53% and 31%, respectively.

Patients with relapsing catheter displacement represent a great problem. Until now, we usually routinely repositioned the PC once, and if this attempt failed or malposition recurred, we chose laparoscopic repositioning or we replaced the catheter. However, different authors suggest that the procedure often requires multiple attempts for success, and that it can be readily repeated should subsequent migrations recur (1,12,16). When considering the options in case of manipulation failure, more than one manipulation could be attempted before declaring failure. In most patients, the problem resolved after numerous repositions (9,10).

In summary, fluoroscopic manipulation using a stiff wire has been described as a method of prolonging PC life and remains a desirable alternative to surgical repositioning or placement of a new catheter. Our results show that this procedure can also be effective in swan-neck peritoneal catheters.

Mercedes Moreiras Plaza*
Moisés Casal Rivas[1]
Luis Domínguez–Viguera[1]

Department of Nephrology
Department of Interventional Radiology[1]
Xeral-Cíes Hospital
Vigo, Spain

*email: mmoreir@unicies.cesga.es

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