

# Role of Laparoscopy in The Management of Malfunctioning Peritoneal Dialysis Catheters

Muhammad Masood Riaz, Shabeer Ahmad Wani, Ghiath Alsaied

## ABSTRACT

*Objective* To document the results of laparoscopic management of peritoneal catheter dysfunction.

*Study design* Descriptive case series.

*Place & Duration of study* Department of Surgery King Fahad Medical City Riyadh KSA, from January 2009 to October 2011.

*Methodology* A retrospective review of the records of all the patients who underwent laparoscopy for evaluation and management of peritoneal dialysis (PD) catheter dysfunction was performed. Three trocars (one 10mm and two 5 mm) were used. Recorded data included patient demographics, catheter implantation method, and date of malfunction, cause of dysfunction, procedure performed and complications.

*Results* A total of 16 patients underwent laparoscopic evaluation and management for PD catheter dysfunction. The primary etiology of dysfunction was omentum and / or small bowel wrapping around the catheter with adhesions (n=8), malposition of catheter (n=5) and infection (n=2). Adhesiolysis was performed in eight cases with partial omentectomy. In five cases with malposition of catheter but no adhesions, the catheters were repositioned in the pelvic cavity. Two catheters were withdrawn because of infection (peritonitis). In one case with tunnel infection the catheters were exchanged simultaneously making another tunnel.

*Conclusion* Laparoscopy is highly effective and successful method for evaluation and management of peritoneal dialysis catheter dysfunction.

*Key words* Catheter malfunction, Laparoscopy, Peritoneal dialysis.

## INTRODUCTION:

Continuous ambulatory peritoneal dialysis (CAPD) is an established alternative method to hemodialysis for treating end-stage renal disease patients. Peritoneal dialysis has now become an established and increasingly popular form of renal replacement therapy. CAPD offers advantages in terms of quality

of life, but is still associated with a significant number of complications, such as mechanical problems and infections.<sup>1</sup>

Successful chronic peritoneal dialysis 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, 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,

## Correspondence:

Dr. Muhammad Masood Riaz  
Department of Surgery  
King Fahad Medical City  
Riyadh (KSA) 11525  
E-Mail: masoodriaz2001@yahoo.com

and each salvage method has been associated with variable rates of success.

The purpose of this study was to determine the efficacy of laparoscopy in the treatment of malfunctioning CAPD catheters.

#### METHODOLOGY:

We reviewed records of patients with PD who underwent laparoscopy for the evaluation and management of PD catheter dysfunction in the Department of Surgery, King Fahad Medical City, between January 2009 and October 2011. Recorded data included patient demographics, catheter implantation method, and date of malfunction, cause of dysfunction, procedure performed, complications, and catheter outcome.

The laparoscopic procedures were performed under general anesthesia. Hassan technique was used in all patients. Three trocars were used. First, a 10-mm trocar was placed away from the catheter insertion site, around the umbilicus almost all the times and a diagnostic laparoscopy was performed to determine the source of the malfunction. Accessory 5-mm trocars were placed as needed, for catheter manipulation and to perform adhesiolysis or division / resection of omentum, if needed. Once satisfactory catheter flow and position were achieved, pneumoperitoneum was released and the closure of the wound done.

After the procedure, peritoneum was allowed to dry over night and peritoneal dialysis was resumed with low volumes next day following surgery. Regular CAPD was resumed on 3<sup>rd</sup> postoperative day. A successful outcome was defined as normal catheter function 30 days following laparoscopy. The Tenckhoff catheter (Coiled Peritoneal Silicone Catheter, double cuffed, 56.5 cm, 14.7 FR; Horizon Medical Products®, Manchester, GA, USA) was used for all procedures.

#### RESULTS:

During the study period a total of 90 PD double-cuffed straight Tenckhoff catheters were implanted. A total of 20 laparoscopies for catheter malfunction were performed in 16 patients. There were 6 men and 10 women with a mean age of 35.2 year (range 13 – 69 year). All of them had chronic renal failure (table I).

The catheters had initially been implanted using either an open surgical technique (n=10) or via a laparoscopic procedure (n=6). Malfunction occurred on an average of 5.1 months following catheter

**Table I: Patient Characteristics**

Age: mean ± (SD)	35 ± 3.5 year
Sex: M/F	6/10
Hypertension	65.2%
Ischemic heart disease	27.1%
Diabetes mellitus	63.7%
Hepatitis carrier	3.68%

insertion (range 0.5 – 20 months). The primary etiology of dysfunction was omentum and / or small bowel wrapping with adhesions in 8 cases, malposition in 4 cases, fibrin deposition in one and infection in remaining 2 cases (Table II).

Lysis of adhesions was performed in 8 of 16 cases. In six cases, only repositioning and/or fibrin clearance without adhesiolysis was required. The mean operative time was 45 minutes (range 27 -160 minutes). Two catheters had to be withdrawn because of infection (peritonitis). The catheters were exchanged simultaneously in one case with tunnel infection.

The mean follow-up was 9.6 months (range 2 -18 months). There were no mechanical or infectious problems. The overall success of catheter function (at > 30 days after laparoscopy) was noted in fourteen patients. Two catheters had to be withdrawn. Regular CAPD was resumed on 3<sup>rd</sup> postoperative day with any complications.

#### 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 due 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 and is a common cause of catheter loss.<sup>1-7</sup> Although the frequency of catheter failure varies from center to center, it is the reason for dropout from CAPD in about 25% of patients.

A variety of treatment modalities have been

**Table II: Causes and laparoscopic Management of Catheter Dysfunction**

Cause	Number	Management
Omental and/or small bowel wrapping with adhesions	8	Adhesiolysis
Malposition	5	Repositioning in the pelvic cavity
Tunnel infection (adhesion)	2	Simultaneous exchange
Fibrin deposition	1	Flushing with saline

described for management of nonfunctioning PD catheters. Stone et al reported a small series of pediatric patients with occluded catheters treated successfully with the use of urokinase installation and Fogarty catheter manipulation.<sup>8</sup> However, this technique would likely be less successful in adults, where the omentum is much more developed. Peritoneoscopic placement has the lowest incidence of catheter complications and the longest duration of catheter survival of all the methods.<sup>1</sup> Currently, this method has met with great success.<sup>6-9</sup> Catheter malfunction is common and often occurs shortly after insertion. It has been reported to occur in 2-30% of patients.<sup>6</sup> The causes of catheter malfunction include malposition of the catheter tip, catheter migration or kinking, and obstruction of the lumen by a fibrin clot. Catheters sometimes migrate into suboptimal locations, such as the right upper quadrant against the liver.

Since catheters drain best when the tip is in the pelvic cavity, they often need to be repositioned. Correction of these complications has been limited to thrombolytic therapy or radiologic manipulation.<sup>10</sup> Failure of these methods inevitably results in surgical replacement. Our laparoscopic repositioning technique was successful in all cases with malposition. Therefore, we recommend that patients with catheter malfunction be treated primarily with a laparoscopic procedure, even though some patients in this group tolerate anesthesia poorly.

Several recent studies reported that omental wrapping, particularly around the distal portion of the catheter, was the most common cause of the catheter malfunction.<sup>3,5,11</sup> Laparoscopic omentectomy has been used for the management of nonfunctioning PD catheters with omental wrapping.<sup>11</sup> On the other hand, Ogun CG technique which consists of omental fixation onto the peritoneum during laparoscopic CAPD catheter placement, may permit the salvage of peritoneal catheters in cases of omental wrapping.<sup>12</sup> The most common cause of catheter dysfunction in our series was also omental wrapping

and adhesions. Brandt and Ricanati reported a success rate of 96 % when laparoscopy was used for the management of malfunctioning catheters.<sup>3</sup> This figure is similar to our own results.

Catheter-related infections result in a high rate of patient morbidity, the need for temporary hemodialysis, and substantial costs. Posthuma et al<sup>13</sup> reported that the simultaneous insertion and removal of a peritoneal dialysis catheter without interruption of peritoneal dialysis was a safe procedure in patients with catheter-related infections. In our one case with tunnel infection, the old catheter was removed after the new catheter inserted laparoscopically in the opposite abdominal region. However, in two cases, the catheters had to be removed because of peritonitis. Laparoscopic rescue for malposition was effective in all cases, despite the two catheters that had to be removed for infectious complications unrelated to the laparoscopic procedure.

When a malfunctioning PD catheter is removed, there is frequently little evidence to show why the device failed. Laparoscopy offers the opportunity to evaluate the etiology of catheter failure, which may then lead to appropriate modifications of technique to avoid recurrent errors in catheter placement.<sup>6,10,14</sup> In addition, some authors have suggested that laparoscopy is a safe method for the placement of catheters in patients with prior abdominal surgery.<sup>9,15</sup> However, like any other laparoscopic procedure, it is associated with potential risks. In our series, there were no serious complications. In agreement with Brandt and Ricanati, we also believe that continuing with peritoneal dialysis in the immediate postoperative period helps to decrease the chance of catheter re occlusion, while also avoiding the need for temporary periods of hemodialysis, which can be expensive.<sup>3</sup> Thus, it is debatable whether laparoscopy leads to higher costs or not. In our study the use of laparoscopic technique resulted in lower rates of complications, a high rate of catheter salvage, and prolongation of catheter life.

**CONCLUSIONS:**

Laparoscopy was found to be a highly effective method for the evaluation and management of peritoneal dialysis catheter dysfunction. Laparoscopy can be used for the diagnosis and treatment of peritoneal catheter malfunction when conventional maneuvers, such as the primary salvage method, fail to solve this common problem in patients with end-stage renal disease.

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