Needleoscopic Placement of Tenckhoff Catheters

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ABSTRACT

Background: Minimally invasive techniques are being developed for the placement of peritoneal dialysis catheters. A needleoscopic technique that utilizes only two punctures is described.

Methods: Twelve patients underwent 13 needleoscopic Tenckhoff catheter placement procedures between November 1995 and May 1998. An additional six patients underwent the same procedure using a standard 10 mm laparoscope. The patients were followed prospectively for type of anesthesia and operative time for the procedure, whether the procedure was performed as an inpatient or an outpatient, and for any complications or leakage following the procedure.

Results: The needleoscopic procedure was able to be performed with an average operative time of 12 minutes. Twenty-three percent (23%) were performed under local anesthesia and thirty-eight (38%) were treated as outpatients.

Conclusion: Needleoscopic Tenckhoff catheter placement is very simple to perform and can be performed under local anesthesia with minimal discomfort, secure catheter placement, and no leakage.

Key Words: Needleoscopy, Peritoneal dialysis, Ascites.

INTRODUCTION

Traditionally, peritoneal dialysis catheters have been placed using mini-laparotomy. With the advances in minimally invasive surgery, techniques have been described for the placement and management of these catheters using less invasive techniques. Blind catheter placement after peritoneoscopic exploration of the abdomen has been utilized. This technique uses a peritoneoscope for identification of a clear site for placement, and then a modified Seldinger technique for introduction of the catheter. Laparoscopic techniques using three or four port sites also have been described, which have the advantage of direct visualization while the catheter is positioned. A two-puncture laparoscopic technique has been described that has simplified the laparoscopic approach somewhat, but this still requires dissection of the catheter entrance site with suturing of the catheter to the anterior rectus sheath and creation of a subcutaneous tunnel. Laparoscopy is also being used to salvage nonfunctioning catheters with good success rates and low morbidity.

Laparoscopy is also being used to salvage nonfunctioning catheters with good success rates and low morbidity. A new laparoscopic approach for placement of peritoneal catheters, which can be performed under local anesthesia with brief operative times, is described in this report. This technique was performed using a 3 mm needleoscopic port and 2.9 mm laparoscope, or with a standard 10 mm port and 10 mm laparoscope.

METHODS

The patients were followed prospectively for type of anesthesia and operative time for the procedure, whether the procedure was performed as an inpatient or an outpatient, and for any complications or leakage that occurred following the procedure.

A total of 12 patients underwent placement of 13 needleoscopic peritoneal catheters between November 1995 and May 1998. Six patients were male and seven were female. Seven catheters were placed for peritoneal dialysis, and six catheters were placed for palliation of malignant ascites.
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Six patients underwent laparoscopic placement of a peritoneal catheter utilizing a 10 mm laparoscope, and additional 5 mm ports in some cases. These patients had an average age of 72 years. Two were male and four were female. Two patients underwent catheter placement for peritoneal dialysis and four for malignant ascites.

**OPERATIVE TECHNIQUE**

The patient is placed in the supine position and undergoes either general anesthesia or IV sedation and local anesthesia. The abdomen is steriley prepped and draped in the usual fashion. A small skin nick is made in the superior midline (Figure 1), and a 3 mm needleoscopic port (LifeQuest - Atlanta, GA) is inserted into the abdomen over a Veress needle. The abdomen is insufflated with carbon dioxide to a maximum pressure of 12 mm of Mercury. The Veress needle is removed, and a 2.9 mm laparoscope is then inserted into the abdomen. For the standard laparoscopic technique, the abdomen is insufflated using a Veress needle, and a 10 mm port is inserted for a 10 mm laparoscope. The abdomen is

![Figure 1. Port Placement.](image)

**Table 1. Needleoscopic Patients.**

| Patient | Sex | Age | Reason | Anesthesia | Operative Time | IP/OP | Complications/Leakage/Infection |
|---------|-----|-----|--------|------------|----------------|-------|---------------------------------|
| 1       | M   | 52  | PD     | Local      | 10 minutes    | Outpatient |                                |
| 2       | F   | 51  | PD     | General    | 8 minutes     | Inpatient  |                                |
| 3       | M   | 59  | PD     | Local      | 20 minutes    | Outpatient |                                |
| 4       | F   | 76  | PD     | Local      | 15 minutes    | Inpatient  |                                |
| 5*      | M   | 44  | PD     | General    | 10 minutes    | Outpatient | Fibrin sheath cleared laparoscopically |
| 5*      | M   | 46  | PD     | General    | 14 minutes    | Outpatient | Removed for chronic peritonitis |
| 6       | F   | 81  | PD     | General    | 15 minutes    | Inpatient  | Clogged at 2 months             |
| 7       | F   | 57  | MA     | General    | 15 minutes    | Inpatient  |                                |
| 8       | F   | 76  | MA     | General    | 45 minutes    | Inpatient  | Converted to 10 mm for adhesions |
| 9       | M   | 70  | MA     | General    | 7 minutes     | Inpatient  |                                |
| 10      | F   | 61  | MA     | General    | 130 minutes   | Inpatient  | Converted to open for enterotomy |
| 11      | F   | 77  | MA     | General    | 15 minutes    | Inpatient  |                                |
| 12      | M   | 75  | MA     | General    | 10 minutes    | Outpatient | Mild site infection             |

| Averages | F = 7 | 63 yr | PD = 7 | L = 3 | 24 min w/conversion | I = 8 |
|-----------|-------|--------|--------|-------|---------------------|-------|
|           | M = 6 | MA = 6 | G = 10 | 12 min w/o conversion | O = 5 |

*Patient 5 had procedure done twice.
PD = peritoneal dialysis
MA = malignant ascites
inspected for adhesions or other pathology. A small incision is made over the lateral portion of the rectus sheath on either the left or right side of the abdomen. An 8 mm trocar is inserted into the incision and is advanced until it passes through the anterior rectus sheath. Pressure on the trocar is released so that the shield is deployed covering the trocar tip. The port is passed bluntly through a submuscular tunnel to the lower abdomen. The trocar shield is reset so that the trocar can penetrate the peritoneum and enter the peritoneal space. A double-cuffed, pigtail peritoneal dialysis catheter (Tenckhoff catheter) is placed over a stylette, inserted through the 8 mm port and into the pelvis. The port is removed, leaving the catheter in place. The interior cuff on the catheter is positioned just exterior to the peritoneum with the external cuff in the subcutaneous space (Figure 2). The stylette is removed, and the catheter is secured to the skin with suture.

Pneumoperitoneum is released, the 3 mm trocar is removed, and its small skin nick is closed with an adhesive strip.

RESULTS

Out of the 13 patients undergoing needleoscopic peritoneal catheter placement, three (23%) were placed under local anesthesia, and ten (77%) under general anesthesia (Table 1). Five patients (38%) were treated as outpatients and eight (62%) were treated as inpatients. The operative time for the procedure averaged 24 minutes. Two patients were converted to either laparoscopic or open procedure. Excluding these two patients, the operative time averaged 12 minutes. One patient had additional ports placed and the procedure converted to standard laparoscopy while having a catheter placed for malignant ascites in order to clear adhesions for catheter placement. A second patient, who also had the procedure performed for malignant ascites, had previously undergone an omentectomy and had dense adhesions of the small intestine to the underside of the anterior abdominal wall, which resulted in an enterotomy made by the Veress needle. This patient's procedure was converted to an open procedure. The needle hole in the small intestine was sutured and the catheter placed in a different location using open technique.

Additional complications included a mild catheter site infection, which resolved with oral antibiotics. One catheter had to be removed for chronic peritonitis over a year after its placement. After clearing of the infection, a catheter was replaced. Two catheters developed late occlusion due to fibrin, one of which was able to be cleared laparoscopically. There was no leakage from any of the catheters, and there was no resistance to flow of dialysate instillation.

Of the six patients who underwent laparoscopic peritoneal catheter placement, two (33%) were carried out using local anesthesia and four (67%) general anesthesia (Table 2). No patients were treated as an outpatient. All of the patients undergoing catheter placement for malignant ascites also required biopsy of intraperitoneal tumor at the time of their catheter placement. Operative time averaged 41 minutes. There were no complications or catheter leakage.

DISCUSSION

It was previously believed that peritoneal catheter placement requires purse string suturing and/or tunnel creation to prevent leakage. This report shows that catheter placement through a tunnel created by the tangential insertion of a laparoscopic port is sufficient for a secure catheter placement without leakage. A standard 10 mm laparoscopic approach was chosen if biopsy of intraperitoneal tumor was required, so that a 10 mm operative laparoscope could be used, which allowed passage of a biopsy forceps through the same port. If adhesiolysis was required, the wider field of view of the 10 mm laparoscope was desirable. Peritoneal inflation with carbon dioxide was well tolerated in awake patients with local anesthesia, largely due to the fact that the proce-
Table 2.
Laparoscopic Patients.

| Patient | Sex | Age | Reason | Anesthesia  | Operative Time | IP/OP  | Complications/Leakage/Infection |
|---------|-----|-----|--------|-------------|---------------|--------|--------------------------------|
| 1       | M   | 63  | PD     | Local       | 50 minutes    | Inpatient |                                |
| 2       | F   | 59  | PD     | General     | 8 minutes     | Inpatient |                                |
| 3       | F   | 67  | MA     | General     | 30 minutes    | Inpatient | Plus biopsy of peritoneal tumor |
| 4       | F   | 81  | MA     | Local       | 90 minutes    | Inpatient | Plus biopsy of peritoneal tumor |
| 5       | F   | 85  | MA     | General     | 85 minutes    | Inpatient | Plus biopsy of peritoneal tumor |
| 6       | M   | 74  | MA     | General     | 35 minutes    | Inpatient | Plus biopsy of peritoneal tumor |

Averages: M = 2 F = 4 Age = 72 yr PD = 2 MA = 4 L = 2 G = 4 Operative Time = 50 minutes IP/OP = 1 = 6

PD = peritoneal dialysis
MA = malignant ascites

Dure can be performed with short operative times and minimal dissection of the abdominal wall. This was useful in patients who presented a significant medical risk for general anesthesia.

Advantages of the technique include that the catheters are placed under direct visualization so optimal placement of the catheter in the pelvis is assured. The catheter traverses a straight path through the abdominal wall so there is minimal chance of kinking, which may contribute to catheter occlusion. The 8 mm trocar creates a tract primarily by dilation, which allows for a snug fit for the catheter. This, along with the incorporation of the catheter cuffs into the surrounding tissue, produces a very secure catheter placement with no leaking.

The needleoscopic technique described here is very simple to perform. It requires no special peel-away sheaths or other specialized instruments. There is no dissection of the abdominal wall required. It can be performed under local anesthesia with minimal discomfort. The patient recovery has been very good with no operative mortality, minimal morbidity, and no catheter problems related to the technique.

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