

Two Port Laparoscopic Placement of Peritoneal Dialysis Catheter: Effective Technique

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ABSTRACT

Aim: Two port laparoscopic placement of peritoneal dialysis (PD) catheter is a new and promising technique which is reliable, efficient and with less complications.

Materials and methods: Data collection was done using the internet via Google search engine, Medscape, PubMed, SAGES, Springer, NCBI, Nefrologia and International journal of peritoneal dialysis. At least five study groups were analyzed who used two ports laparoscopy for PD catheter placement from 2004 to 2010.

Results: Mean operating time was between 32 and 52 minutes. No other technical intra or early postoperative complications related to technique were reported. Surgical revision was required in 6%, catheter survival was 94, 87 and 72% after 6 months, 1 and 2 years survival, catheter leakage was between 0 and 22.2%, catheter outflow failure was between 0 and 7.6%, catheter migration was between 2.6 and 4%, no life-threatening bleeding was noted, peritonitis was between 6.5 and 13% and exit site infection was seen in 3% of the patients. Mean follow-up was between 17 months and 2 years.

Conclusion: Two port laparoscopic PD catheter insertion is a safe, reproducible, and effective technique. It allows inspection of the abdominal cavity and adhesiolysis, omentectomy, or omentopexy when necessary. Due to its reliability, offers good catheter function outcome.

Keywords: Laparoscopy, Peritoneal dialysis, Catheter, Surgical revision, Catheter migration.

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INTRODUCTION

In 1959, peritoneal dialysis (PD) was used for the management of end-stage renal disease (ESRD).¹ Henry Tenckhoff developed the first indwelling peritoneal catheter in 1968, which was used for dialysis by an open surgical technique.²

Laparoscopic insertion (keyhole surgery)—is a way of inserting the catheter using a fine telescope to guide the catheter into the abdominal cavity. Laparoscopy is minimally-invasive, and also allows inspection of the peritoneal cavity with the feasibility of correcting any pathology inside the abdomen. Hence, diagnostic accuracy is improved.

Peritoneal dialysis is a good alternative for ESRD patients who are on hemodialysis. It involves infusing dialysis fluid into the peritoneal cavity through PD catheter and leaving it inside the abdomen to allow exchange of metabolic waste products between the body fluid and the dialysis fluid through the peritoneal membrane. In continuous ambulatory peritoneal dialysis (CAPD), the patient manually drains and replaces the dialysis fluid several times a day.

A PD catheter is conventionally placed through a small open incision, which may be carried out under local or general anesthesia. PD catheters according to Tenckhoff are traditionally implanted by a transrectus laparotomy. A small incision is made in the abdomen and peritoneal cavity is entered and the catheter is placed into the pelvic cavity. A tight purse-string suture is passed through the peritoneum and rectus sheath around the catheter. The other end of the catheter is taken out on to the abdomen after making a subcutaneous tunnel.

PD catheter can be placed via percutaneous techniques as well.

MATERIALS AND METHODS

Data collection was done using the internet via Google search engine, Medscape, PubMed, SAGES, Springer, NCBI, Nefrologia and International journal of peritoneal dialysis.

Laparoscopic PD catheter insertion is usually performed under general anesthesia. After the insufflation of abdomen small incisions are made. The catheter-tip is advanced through the abdominal cavity into the pelvic cavity. After making a subcutaneous tunnel, the other end of the catheter is taken out via an exit site incision in the abdomen. Laparoscopy allows complete visualization of the catheter's configuration, location, and facilitates more accurate placement of PD catheter within the pelvis.

TECHNIQUE

Patient is kept in supine position and a 1 to 1.5 cm supra-umbilical incision is made and pneumoperitoneum created using a Veress needle and insufflation of carbon dioxide is put at pressure of 12 to 14 mm Hg. A 10 mm port is then inserted, a laparoscopic camera is introduced and exploration carried out. A 5 mm port is then inserted through

an incision in the mid-clavicular line at the level of the umbilicus and passed toward a point 2 cm lateral to the midline, midway between the umbilicus and the pubic symphysis, to create a subcutaneous tunnel (Fig. 1). The patient is then placed in the in a 30° Trendlenburg position. PD catheter is then passed into the abdominal cavity through the supraumbilical 10 mm port after removal of the camera. The pig tail of the catheter is directed into the pouch of Douglas in females and the rectovesical pouch in male patients assisted by a Maryland forceps placed through the 5 mm port. The external end of the catheter is grasped and brought out through the 5 mm port up to the inner Teflon cuff, this step is done under laparoscopic guidance. The 10 mm port is closed with a purse-string suture using non-absorbable material such as 0-0 nylon. The catheter is then secured in the proper place with a 0-0 nylon stitch. The PD catheter is tested on table using normal saline.³

There are other methods like Quinton percutaneous catheter placement,⁴ the Moncrief-Popovich catheter technique and extended dialysis catheters.⁵

COMPLICATIONS

The complications of PD catheter are divided into early (within <30 days) and late (within >30 days).⁶

Early: Bowel perforation, bleeding, wound infection, outflow failure, leakage and peritonitis.

Late: Exit-site infection, tunnel infection, cuff-protrusion, catheter migration, outflow failure and dialysate leaks or hernias.

AIMS AND OBJECTIVES

Two port laparoscopic placement of PD catheter is a new and promising technique which is reliable, efficient and with less complications.

REVIEW OF LITERATURE

Rapid review of literature was done using the abstracts and at times full review of the article was done.

1. Eduard García-cruz¹ et al evaluated about 51 patients for PD catheter insertion. Mean operating time was 32 minutes (range 15-55 minutes). One patient suffered an immediate postoperative catheter obstruction that required surgical repositioning. No other technical intra or early postoperative complications related to technique were reported. Mean time to discharge 1.02 ± 2.2 days. Catheter outflow failure rate was 7.6%. Conversion to hemodialysis due to peritonitis was 13%. Peritonitis per patient/year was 0.27. Catheter 6 months, 1 and 2 years survival rate was 94, 87 and 72%. Catheter migration

rate was 4%. There was no peritoneal dialysis liquid leakage. The two ports technique described is an easy and rapid procedure, with few complications and early discharge. Due to its reliability, offers good catheter function outcome.⁷

- Jincheul KO et al evaluated about 38 patients. After follow-up of 21.5 months (range 6-34), all catheters were working properly, although tip migrations were found in the iliac fossa in three patients and in the right upper quadrant in one patient. A port site hernia developed in one patient and peritonitis developed in two patients. Only one remote migration (2.6%) occurred during the study period. Thus, our method of laparoscopic catheter insertion might be a feasible option.⁸
- Arnoud Peppelenbosch et al despite the similar outcomes of open surgical vs laparoscopic techniques from randomized studies, the laparoscopic insertion has the major advantage of correct catheter positioning in the lower abdomen, with the possibility of adhesiolysis. The minimal invasive percutaneous insertion bears the risk of bowel perforation and catheter malpositioning, and the outcome of this technique is strongly related to the experience of the surgeon. The major complications of these implantation techniques, like bleeding, dialysate leakage and catheter malpositioning, and their management are discussed in our study. Late peritonitis remains the major drawback of PD treatment, with the need of temporary or permanent change over to the HD treatment in 10% of the patients. Enrichment of the physician's interest and experience, along with a multidisciplinary approach to outline the optimal strategy of PD-catheter insertion and complication of the treatment, may improve the patients' survival and decrease the morbidity.⁶
- Stephen P Haggerty et al evaluated about 31 patients. The mean operating time was 52 minutes. Adhesiolysis was required in 9 (29%) and omentectomy or

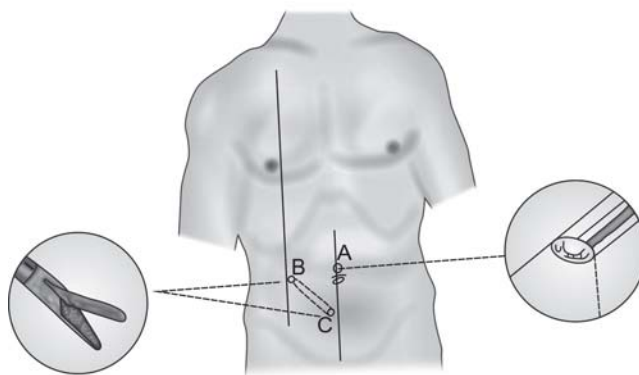


Fig. 1: Two ports laparoscopic catheter placement with a subcutaneous tunnel

omentopexy in 3 (10%) cases. Late complications included catheter dysfunction in two patients (6.5%), debilitating abdominal pain requiring catheter removal in one patient, and one trocar-site hernia. The mean follow-up was 17 months. Laparoscopic PD catheter insertion is safe, reproducible and effective. It facilitates placement of the catheter tip into the pelvis and allows adhesiolysis, omentectomy or omentopexy when necessary. Utilization of this technique results in a low rate of PD catheter dysfunction.⁴

- Ahmed M Al-Hashemy et al evaluated nine patients. The mean operating time was 41 minutes (range 30-75 min). The mean postoperative hospital stay was 4.5 days (range 2-15 days). Two patients (22.2%) developed leakage of dialysate from the 5 mm port and one patient (11.1%) had migration of the PDC. Our study suggests that this new modified technique appears to be safe and simple and is associated with rapid postoperative recovery.³

RESULTS

- Mean operative time:* In three of our study groups the mean operative time was ranging from 32 to 52 minute.^{3,4,7}
 - Surgical revision:* The conversion to laparotomy was about 6% (2/33) in one of the trials.⁶
 - Catheter survival:* In one of the randomized controlled trials catheter 6 months, 1 and 2 years survival rate was 94, 87 and 72%.⁷
 - Catheter leakage:* Four studies reported the rate of catheter leakage ranging from 0% (0/51) to 22.2% (2/9).^{3,7,8}
 - Catheter outflow failure:* Two studies reported catheter outflow failure rates between 0% (0/38) and 7.6% (4/51) of procedures.^{7,8}
- Another study showed malfunction of catheter in 6.5% (2/31) of patients after a mean follow-up of 17 months.⁴
- Catheter migration:* The three randomized controlled trials reported that the catheter migration occurred between 2.6% (1/38) and 4% (2/51) of the patients.^{7,8}
 - Hemorrhage:* All the studies did not report any catastrophic bleeding related to the two ports laparoscopic procedure.¹⁻⁸
 - Infection:* Two randomized controlled trials reported that peritonitis occurred between 6.5% (2/33) and 13% (7/51) of patients.^{4,7}

One nonrandomized controlled trial reported exit site infection in 3% (1/33) of laparoscopic procedures.⁴

- Mean follow-up:* In three of our study groups the mean follow-up was between 17 months and 2 years.^{4,7,8}

DISCUSSION

Peritoneal dialysis is a safe and effective alternative for the patients with ESRD, especially children.⁹ The preservation of residual renal function when compared with hemodialysis is much better with PD.^{10,11} The laparoscopic approach has been widely accepted as an effective alternative to open surgery.¹²⁻¹⁴ The open method requires a painful incision followed by blind insertion and carries a high potential for adhesions, incisional hernia and delay in instituting full volume peritoneal dialysis.¹⁵ The technique of two port laparoscopic placement of PD catheter is gaining wide acceptance in terms of reliability, efficacy and long-term usage, with minimal complications. The conversion to open in 6% of patients compares favorably with a 5.2% conversion rate for laparoscopic cholecystectomy and 21% conversion rate for laparoscopic colectomy.^{16,17} Catheter malfunction can be caused by kinking, catheter displacement, omental wrapping, catheter-fibrin coating and adhesions caused by abdominal infections. Besides exit-site and subcutaneous tract infections, peritonitis is a feared complication responsible for the catheter failures. Peritonitis can be recurrent, with a rate of relapse of ± 0.27 episodes/patient/year.⁷

Catheter migration is a common complication associated with all techniques of catheter placement.¹⁸ In one of the series, one patient required laparoscopic insertion of a new catheter due to migration. Dialysate leak remains a problem with catheter placement for continuous ambulatory peritoneal dialysis. The leakage rate following placement of the PD catheter through an abdominal incision has been reported to be between 13 and 27%, especially with institution of early peritoneal dialysis.^{15,19,20}

None of the patients in our series had any catastrophic hemorrhage.

CONCLUSION

Two port laparoscopic PD catheter insertion is a safe, reproducible, and effective technique. It allows inspection of the abdominal cavity and adhesiolysis, omentectomy, or omentopexy when necessary. It facilitates exact placement of the catheter tip into the pelvis where it functions best. This technique is a simple and rapid procedure with few complications due to its reliability and excellent results in terms of catheter function.

A successful PD program depends on the knowledge of the placement techniques and complications. A multi-disciplinary approach with great enthusiasm from the health care team will improve the catheter outcome and long-term results.

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