

# A Comparison of Laparoscopic and Conventional Methods in Peritoneal Dialysis Catheter Placement in Patients with End-Stage Renal Disease: Single Center Experience

## *Son Dönem Böbrek Hastalığı Hastalarında Peritoneal Diyaliz Kateteri Yerleştirilmesinde Laparoskopik ve Konvansiyonel Yöntemlerin Karşılaştırılması: Tek Merkez Deneyimi*

### ABSTRACT

**OBJECTIVE:** There is no consensus on superiority of peritoneal dialysis catheter placement methods to each other in the literature. Therefore, the aim of this study was to determine whether there were differences in complications between laparoscopic and percutaneous PD catheter placement methods performed in our hospital.

**MATERIAL and METHODS:** Forty patients with ESRD files were evaluated retrospectively. The patients were divided into two groups according to the placement method of PD catheters; namely, the Percutaneous Group (PG) and the Laparoscopic Group (LG).

**RESULTS:** Dialysate leakage was seen only in one patient in PG (3.33%) while it was not seen in LG (p= 0.75). Malposition was detected only in five patients in PG (16.7%) and it was not seen in LG (p= 0.22). Catheter dysfunction occurred in four patients in PG (13.3%) while it was not seen in LG (p= 0.30). Hemoperitoneum did not develop in PG while it appeared in one patient (10%) in LG (p=0.25). Early peritonitis was detected in four patients in PG (13.3%) and in one (10%) patient in LG (p = 0.78). Exit site infection developed only in 10 patients (33.3%) from PG; however, it did not develop in LG (p=0.04).

**CONCLUSION:** Percutaneous PD catheter placement was preferred in our center, and fewer complications were observed with laparoscopic methods. We recommend laparoscopic PD catheter placement in patients with morbid obesity, prior abdominal surgery, herniation or malposition developing due to the percutaneous method and where percutaneous fixation is not possible.

**KEY WORDS:** Catheter, Laparoscopic method, Peritoneal dialysis, Percutaneous method

### ÖZ

**AMAÇ:** Literatürde periton kateter yerleştirme yöntemlerinden herhangi birinin diğerine üstünlüğü ile ilgili görüş birliği yoktur. Bu çalışmada, laparoskopik ve perkütan yöntemler ile SAPD kateter yerleştirilmesinin komplikasyonları açısından fark araştırıldı.

**GEREÇ ve YÖNTEMLER:** 2007 ile 2012 yılları arasında ANEAH Nefroloji Kliniği takibinde olan SDBH tanılı 40 hastanın sonuçları retrospektif olarak değerlendirildi. Hastalar SAPD kateter yerleştirilmesi yöntemine göre iki gruba ayrıldı; perkütan grup (PG) ve laparoskopik grup (LG).

**BULGULAR:** PG de bir hastada (%3,33) diyalizat kaçağı ortaya çıktı, LG de ise diyalizat kaçağı görülmedi (p= 0,75). LG de malpozisyon bulunmazken, PG'deki 5 (%16,7) hastada malpozisyon saptandı (p= 0,22). PG de 4 (%13,3) hastada kateter fonksiyonel bozukluğu gelişirken, LG'de böyle bir komplikasyon oluşmadı (p= 0,30). Hemoperitoneum sadece LG'deki 1 (%10) hastada görüldü (p= 0,25). Erken peritonit PG'deki dört (%13,3) hastada görülürken LG'de bir (%10) hastada görüldü (p= 0,78). Çıkış yeri enfeksiyonu PG'de on (%33,3) hastada saptandı, LG'de ise gözlenmedi (p= 0,04).

**SONUÇ:** Merkezimizde periton diyalizi için öncelikle perkütan yöntemler tercih edilmek ile beraber laparoskopik yöntemlerle daha az komplikasyon geliştiği görülmektedir. Morbid obezite hastalarında, geçirilmiş abdominal cerrahi öyküsü olanlarda, eşlik eden fitik varlığında ve perkütan yöntem ile malpozisyon gelişip perkütan olarak düzeltilemeyen hastalarda laparoskopik yöntem ile periton kateteri yerleştirilmesini önermekteyiz.

**ANAHTAR SÖZCÜKLER:** Kateter, Laparoskopik yöntem, Periton diyalizi, Perkütan yöntem

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## INTRODUCTION

In patients with end-stage renal disease (ESRD) who do not have a suitable donor for preemptive renal transplantation, current treatment modalities include hemodialysis (HD) and peritoneal dialysis (PD). The choice between PD and HD depends on patients' preference, motivation, distance to a dialysis unit and level of education (1). PD has been known universally for nearly 30 years. Patients are more independent with PD because it is applicable at home with neither time restriction nor dependency on another person. It is less invasive when compared to HD, and does not require food and fluid restriction. It has also better survival rates, increased life quality and lower costs when compared to HD (2).

There are four different methods for peritoneal dialysis catheter placement; i.e. open surgery, percutaneous, peritonoscopic, and laparoscopic placement. Percutaneous peritoneal dialysis catheter placement is done blindly with a guide; however, laparoscopic catheter placement is performed under direct visual imaging and through one or multiple incisions and ports (3).

Common complications of PD catheter placement are malposition, exit site infection, dialysate leakage, intra-abdominal organ injury during the process, hemoperitoneum and peritonitis (4). There is no consensus on superiority of catheter placement methods to each other in the literature (5,6). Therefore, the aim of this study was to determine whether there were differences in complications between laparoscopic and percutaneous catheter placement methods performed in our hospital.

## MATERIAL and METHOD

Forty patients with ESRD, followed in the Department of Nephrology at Ankara Numune Training and Research Hospital, Turkey, between 2007 and 2012 were enrolled in the study and patient records were evaluated retrospectively. We did not obtain ethical approval since the study had a retrospective design and data were collected from patient records. The patients were divided into two groups according to the placement method of PD catheters; namely, the Percutaneous Group (PG) and the Laparoscopic Group (LG). There were 10 patients in LG and 30 patients in PG. The catheter was placed under local anesthesia by a nephrologist in PG and under general anesthesia by the same general surgeon in LG. Standard double seals Tenckhoff catheter was used in all patients. Before the procedure, cefazoline sodium 1 g was administered intravenously to all patients. Patients with morbid obesity, a history of previous abdominal surgery, umbilical or incisional hernia, malposition after percutaneous placement of PD and those who could not tolerate local anesthesia were included in LG.

For statistical analyses, the Statistical Package Program for Social Sciences (SPSS) for Windows 13.0 was used. The Mann-Whitney U test and chi-square tests were used for statistical analysis.  $p < 0.05$  was considered as significant for all tests.

## RESULTS

Five patients in LG and 16 patients in PG were male. The mean age of the patients was 41.6 years (20-74) and 42 years (17-68) in LG and PG respectively ( $p > 0.05$  Mann Whitney U test), without a significant difference. The mean follow-up was 16.6 months (1-72) and 2.6 months (1-6) in PG and LG respectively ( $p < 0.05$  Mann Whitney U test). This significant difference in the follow-up period resulted from the fact that we started to use laparoscopic method in our hospital six months ago. Due to this difference, we could not compare the groups in terms of late complications. However, early complications including dialysate leakage, malposition, catheter dysfunction, hemoperitoneum, early peritonitis and exit site infection were compared. There was no herniation at the site of entrance and no intra-abdominal organ injury in the patients. Dialysate leakage was seen only in one patient in PG (3.33%) while it was not seen in LG (Table I) ( $p = 0.75$ ). Malposition was detected only in five patients in PG (16.7%) and it was not seen in LG ( $p = 0.22$ ). Malposition of the catheter was fixed through laparoscopy in three patients and percutaneously in two patients. Catheter dysfunction occurred in four patients in PG (13.3%) while it was not seen in LG ( $p = 0.30$ ). The functionality rate was 90% in PG and 100% in LG. Malposition was the cause of catheter dysfunction in four patients. It was corrected percutaneously in one patient. The catheters were removed and new peritoneal dialysis catheters were placed laparoscopically in the same procedure in 3 patients, all of whom were from LG. Hemoperitoneum did not develop in PG while it appeared in one patient (10%) in LG ( $p = 0.25$ ). This patient was not found to have bleeding foci on diagnostic laparoscopy on the first postoperative day and did not require transfusion of any blood products in the follow-up period. Early peritonitis, defined as peritonitis that appeared in the first two weeks after the procedure in this study, was detected in four patients in PG (13.3%) and in one (10%) patient in LG ( $p = 0.78$ ).

Late peritonitis was defined as peritonitis occurring in the first two weeks after the procedure and it was diagnosed 26 times in 14 patients in PG, but only two times in one patient in

**Table I:** Comparison of methods in peritoneal dialysis catheter placement.

Complications	PG (n:30)	LG (n:10)	p
Dialysate leakage	1 (3.3%)	0	0.75
Malposition	5 (16.7%)	0	0.22
Catheter dysfunction	4 (13.3%)	0	0.30
Hemoperitoneum	0	1 (%10)	0.25
Early peritonitis	4 (13.3%)	1 (%10)	0.78
Exit site infection	10 (33.3%)	0	<b>0.04</b>

The datas of the two groups were compared with chi-square test.  $p < 0.05$  was considered as significant for all tests.

LG during the follow-up. Because of the difference in follow-up periods between the groups, statistical analyses could not be performed. After initiation of appropriate antibiotic treatment for microbiologic agents, clinical improvement was observed. An exit site infection developed only in 10 patients (33.3%) from PG; however, it did not develop in LG ( $p=0.04$ ).

## DISCUSSION

In patients with end-stage renal failure who undergo peritoneal dialysis, the replacement treatment of choice in our center is the percutaneous method. However, we experienced fewer complications with the laparoscopic technique.

Peritoneal dialysis is a safe and effective method of renal replacement therapy, especially in younger patients with residual renal function. Peritoneal dialysis patients are more likely to be affected by morbidity and mortality occurring during invasive procedures for dialysis compared to hemodialysis patients. Providing a suitable entrance site and maintenance of hemodialysis can be challenging in many ways. The need for long-term central venous catheter can be avoided in peritoneal dialysis; therefore, the quality of life improves. Results of large cohort studies showed that the first and second year survival in peritoneal dialysis group was significantly more favourable compared with hemodialysis (7,8).

In our hospital the first choice is percutaneous method for peritoneal dialysis. A laparoscopic method was used in patients with morbid obesity, history of prior abdominal surgery, herniation or malposition that can not be corrected via the percutaneous method.

Complications of peritoneal dialysis catheters can be terminated through removal of the catheter. Survival of the catheter is approximately 88% in the first year, regardless of the type of catheter, and the catheter removal rate is approximately 15% (9). The functionality rate in our patient population was 90% in PG and 100% in LG ( $p=0.411$ ). The functional defect in PG (10%) was due to malposition.

Several retrospective and prospective studies have reported peritonitis as a direct cause of mortality (10). Contact contamination is the most frequent cause of peritonitis in peritoneal dialysis. Peritonitis may also occur via hematogenous spread, transmigration from the bowel wall, bowel perforation or ascending through the gynecological canal and rarely as a surgical complication (11). Five out of 40 patients (12.5%) in our study had early peritonitis and 13.3% of these patients ( $n = 4$ ) was in PG and 10% ( $n = 1$ ) was in LG ( $p = 0.78$ ). Fifteen out of 40 patients (37.5%) were hospitalized for peritonitis for a total of twenty-five times. The rate of peritonitis was 46.7% ( $n = 14$ ) in PG, but it was only 10% ( $n = 1$ ) in LG. Although there seems to be a relation, we could not perform any statistical analyses because the follow-up periods were not similar.

Dinç et al. reported that the peritonitis rate was 41% in the percutaneous group and 14% in the laparoscopic group ( $p=0.03$ ) (5). However, Gajjar et al. found peritonitis rates to be 17.8% and 20% in the percutaneous and laparoscopic groups respectively, but it was not statistically significant (6).

Sutures placed at the catheter exit site and poor hemostasis control in patients with peritoneal catheters can cause exit site infection and afterwards peritoneal spread may occur. The risk of early infection of the catheter can be reduced by a more careful and standardized technique (12).

It is suggested that prophylactic antibiotics should be used for prevention of exit site infections. Randomized controlled trials showed that prophylactic use of antibiotics reduces both exit site infections and peritonitis (13). In our study 10 out of 40 patients (25%) had exit site infections and all of these patients were in the percutaneous group 33.3% ( $n = 10$ ) ( $p=0.04$ ).

Gajjar et al. reported that the exit site infection rate was 10% in PG and 4.4% in LG (6). Rehman et al. reported that exit site infection rate was 30% in the percutaneously placed peritoneal dialysis catheter group (14). Wright and his colleagues found exit site infection rate to be 16% in PG and 24% in LG, without a significant difference (15).

One study showed that there was not a difference between curved and flat tip catheters in terms of malposition and malfunction in peritoneal dialysis patients (16). However, several studies revealed that malposition more frequently appears in conventional catheters compared to weighted type catheters (17,18). In the present study, malposition was detected in 5 of 40 patients. Although malposition was observed in 16.7% of the patients in PG ( $n = 5$ ) patients, there was no malposition in LG ( $p = 0.22$ ). Two of them were fixed percutaneously and three were fixed laparoscopically.

Gajjar et al. found malposition 20% of the patients in PG and 4% of the patients in LG, with a significant difference ( $p = 0.035$ ) (6). However, Atapour et al. reported the frequency of malposition to be 5.8% in PG and 6.6% in LG ( $p = 0.36$ ) (19). Malposition rates in a study by Wright et al. were 0% in both open and percutaneous peritoneal catheter groups. Laparoscopy was recommended for reposition of replaced catheters and clearing of pelvic adhesions (15).

In conclusion, peritoneal dialysis is a safe and effective method of renal replacement therapy in young patients with residual renal function. There is no agreement on the superiority of placement methods on each other. Although percutaneous peritoneal dialysis catheter was preferred in our center, fewer complications were observed with laparoscopic methods. We recommend laparoscopic peritoneal catheter placement in patients with morbid obesity, prior abdominal surgery, herniation or malposition developing due to percutaneous method and where percutaneous fixation is not possible.

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