Comparison of Laparoscopic and Conventional Methods for Continuous Ambulatory Peritoneal Dialysis Catheter Insertion in Terms of Complications*

*Sürekli Ayaktan Peritoneal Diyaliz Kateteri Yerleştirilmesinde Uygulanan Laparoskopik ve Klasik Yöntemlerin Komplikasyonları Açısından Karşılaştırılması**

* This study was published as a poster at the National Surgery Congress, 28 May-1 June 2008, Antalya, TURKEY

Bülent DİNÇ
Ayhan DİNÇKAN
Hüseyin ÇİYİLTEPE
Ayhan MESCİ
Okan ERDOĞAN
Taner ÇOLAK

Akdeniz University Faculty of Medicine,
Department of General Surgery and
Organ Transplantation,
Antalya, Turkey

ABSTRACT

OBJECTIVE: There are various methods for inserting a peritoneal dialysis catheter. Conventional and laparoscopic methods are superior to each other in many different aspects. In this study, both methods were compared with each other in terms of complications.

MATERIAL and METHODS: Data from 54 patients with end stage renal diseases who were operated for peritoneal dialysis catheter insertion in between 2006 and 2008 at the Department of General Surgery, Faculty of Medicine and University of Akdeniz were analyzed retrospectively. The laparoscopic method was used for 37 patients and the conventional method was used for 17 patients for peritoneal dialysis catheter insertion. While the catheter was placed into pelvis with the aid of a guide wire in the conventional group (CG), it was placed into the pelvis by a camera through a tunnel, formed at preperitoneal field in laparoscopic group (LG).

RESULTS: Demographic characteristics of two groups were similar. Median follow up duration was 137 days (range 4 - 678). Functionality rate in one-year for catheters were 87 % in LG and 77 % in CG groups (log rank test p=0.341). Dialysate leakage rates were 19% and 29%, catheter infections rates were 11% and 12% in LG and CG, respectively (p>0.05). However for peritonitis complication, there were significant differences between two groups, 14% and 41% in LG and CG, respectively (p<0.05).

CONCLUSION: The complications of laparoscopic and conventional surgery methods were compared to place a peritoneal dialysis catheter in the present study. It was observed that among all the compared complications, only the frequency of peritonitis was lower in patients who were operated laparoscopically.

KEY WORDS: Peritoneal dialysis, Continuous ambulatory, Catheters, Laparoscopy, Postoperative complications

ÖZ

AMAÇ: Peritoneal diyaliz kateteri yerleştirilmesinde farklı yöntemler vardır. Geleneksel ve laparoskopik yöntemlerin birçok farklı yönleriyle birbirlerine üstünlükleri vardır. Bu çalışmada, bu iki yöntem komplikasyonları açısından birbiriyle karşılaştırılmıştır.

GEREÇ ve YÖNTEMLER: Akdeniz Üniversitesi Tıp Fakültesi Genel Cerrahi Anabilimdalı' nda 2006-2008 yılları arasında periton diyalizi kateteri yerleştirilmiş 54 hastaya ait veriler geriye dönük olarak analiz edilmiştir. Periton diyalizi katateri yerleştirilmesinde 37 hastada laparoskopik yöntem, 17 hastada ise geleneksel yöntem kullanılmıştır. Klasik yöntemin uygulandığı klasik grupta (KG) kateterin pelvise yerleştirilmesi kılavuz tel yardımı ile sağlanmış iken, laparoskopik yöntemin uygulandığı laparoskopik grupta (LG) ise preperitoneal alandan açılmış bir kanal boyunca ilerleyen kamera ile sağlanmıştır.

BULGULAR: Her iki gruba ait demografik veriler benzer bulunmuştur. Ortalama izlem süresi 8±7,2 ay olmuştur. LG'a ait kateterlerin % 91,9' u, KG' a ait olanların ise % 88,2' sinin çalışır halde olduğu

Received : 28.10.2011
Accepted : 07.12.2011

Correspondence Address:
Bülent DİNÇ
Akdeniz Üniversitesi Tıp Fakültesi,
Genel Cerrahi ve Organ Nakli,
Antalya, Turkey
Phone : +90 505 265 63 60
E-mail : bulent1999@yahoo.com

saptanmıştır (p > 0,05). Diyalizat kaçak oranları LG ve KG için sırasıyla % 18,9 ve % 29,4; kateter enfeksiyon oranları yine sırasıyla % 10.8 ve % 11,8 bulunmuştur (p > 0,05). Ancak, LG için % 13,5 ve KG için % 41,2 olarak saptanan peritonit sıklıkları açısından iki grup arasında anlamlı fark bulunmuştur (p < 0,05).

SONUÇ: Geleneksel ve laparoskopik yöntemlerin komplikasyonları, peritoneal diyaliz kateterinin yerleştirilmesi açısından karşılaştırılmıştır. Karşılaştırılan tüm komplikasyonlar arasında sadece peritonit sıklığının laparoskopi uygulananlarda daha az olduğu gözlemlenmiştir.

ANAHTAR SÖZCÜKLER: Sürekli ayaktan periton diyalizi, Kateterler, Laparoskopi, Postoperatif komplikasyonlar

INTRODUCTION

Patients with end stage renal disease (ESRD) must be treated with replacement therapies such as hemodialysis (HD) or continuous ambulatory peritoneal dialysis (CAPD) (1,2).

Peritoneal dialysis is a replacement method under patient's control, increasing quality of life (3,4) There are different methods for inserting peritoneal dialysis catheters (5). In the traditional or conventional method of peritoneal catheter placement, insertion of the catheter is performed blindly by a guide. In the peritoneoscopic or laparoscopic method, catheter is inserted under direct vision by various ports and incisions (6). There are risks of CAPD catheter insertions such as dysfunction due to malposition, peritoneal or exit site infection, leakage around catheter, intraabdominal injury and bleeding (7,8). In the present study, laparoscopic and conventional methods were compared with each other in terms of complications in patients who were operated for CAPD catheter insertion. It is a retrospective study.

METHODS

Data from 54 patients with ESRD who were operated for peritoneal dialysis catheter insertion between 2006 and 2008 at the Department of General Surgery, Faculty of Medicine and University of Akdeniz, were analyzed retrospectively. Patients were divided into two groups according to the method applied; conventional group (CG) and laparoscopic group (LG). There were 37 patients in laparoscopic group and 17 patients in conventional group. Twenty eight of the patients were male and 26 were female. The mean age was 50 ± 13.9 years. The median follow up duration was 137 day (range 4-678)(Table I) . Patients in the LG group were operated under general anaesthesia and patients in the CG group were operated under local anaesthesia (Prilocaine ®). The study is retrospective and the method to be used was selected according to patients' requests and to the availability of laparoscopic equipment and laparoscopic operation room on the day of surgery. Patients of higher socioeconomic levels preferred laparoscopy for catheter placement in general. A single dose of cephalosporin was administered to all patients preoperatively. Two-cuffed catheters were used in both groups. In CG, catheter was inserted into pelvis by the help of a catheter guide after a small lower abdominal incision. Position was confirmed by catheter irrigation and fluid return. One of the cuffs was placed into rectus muscle and the other one was placed into subcutaneous tissue. In LG, 10-mm camera port was placed through the left lower abdomen. Laparoscopic grasper was used by means of 5-mm port placed to the right lower abdomen. Layers were passed by the help of a small abdominal incision under the umbilicus, and the preperitoneal area was approached. The catheter was inserted into pelvis under direct vision with a laparoscopic grasper through the preperitoneal tunnel. After that, the anterior fascia layers were closed and the operation was finished. The position of the catheter was confirmed by catheter irrigation and fluid return. No suture was placed to the exit of catheter in any patient. The operations were performed by surgeons having the same levels of experience.

Data were analyzed by Fisher exact test and Kaplan-Meier curve, and the differences between the two study groups were compared by the log-rank test. Significance was set at $p < 0.05$.

RESULTS

All the operations were performed in between 25 to 60 minutes, and there was no perioperative complication or mortality observed. Low-volume irrigation was performed to all patients on the first postoperative day and all patients were discharged from the hospital within 1 or 2 days.

During the follow up, a total of 7 patients died. Four of the deaths were due to myocardial infarction, 1 due to cerebrovascular event, 1 due to congestive heart failure, and 1 due to malnutrition. Four patients were transferred to hemodialysis due to malposition, 4 due to peritonitis, 1 due to leakage around catheter and 1 due to ileus (Table I).

Functionality rate in a year for catheters was found to be 87 % in LG and 77 % in CG groups (log rank test p=0.341) (Figure 1). Of all functionality defects, 66.7% were due to malposition. Leakage of dialysate around the catheter, catheter infection, non-functioning and peritonitis were the postoperative complications and were compared between laparoscopic and conventional groups. Rates of dialysate leakage was 19% (n=7) in LG and 29% (n=5) in CG, respectively. The difference was not statistically significant. Rates of catheter infection were 11% (n=4) in LG and 12% (n=2) in CG and the difference was not statistically significant. Rates of peritonitis were 14% (n=5) in LG and 41% (n=7) in CG and the difference was statistically significant (Table II).

Table I: Demographical characteristics and results of patients who were operated for peritoneal dialysis catheter insertion.

	Laparoscopic Group n=37	**Conventional Group n=17**	***Total (LG+CG) Group n=54***
Age (years)	47±14	57±10	***50 ± 13.9***
Sex (male/female)	19M/ 18F	9M/ 8F	***28M/26F***
Median follow-up period (days)	201 (16- 678)	68 (4- 651)	***137 (4-678)***
Outcomes			
Still on CAPD	27	6	***33***
Exitus	2	5	***7***
Kidney Transplantation	4	0	***4***
Transfer to HD	4	6	***10***

CAPD: Continuous ambulatory peritoneal dialysis;
HD: Hemodialysis

Table II: Comparison of laparoscopic and conventional methods in terms of complications.

	LG	**CG**	***p***
Number of Patient (n)	37	17	-
Non-function	3 (8%)	2 (12%)	.507
Dialysate Leak	7 (19%)	5 (29%)	.300
Catheter Infection	4 (11%)	2 (12%)	.623
Peritonitis	5 (13%)	7 (41%)	**.030**

LG: Laparoscopic group
CG: Conventional group

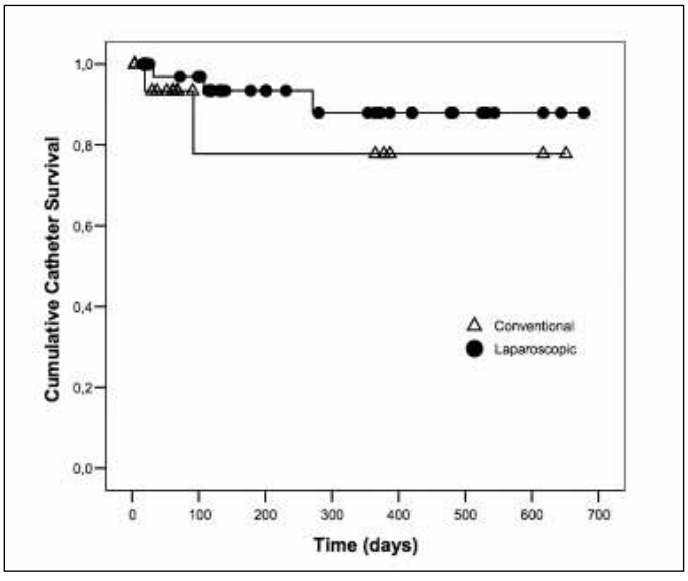

Figure 1: *Kaplan-Meier plot of catheter survival for laparoscopy versus conventional surgery techiques.*

DISCUSSION

Patients with ESRD must be treated with replacement therapies such as HD or CAPD (3,9). CAPD increases the quality of life as is easily applicable, cheaper and less invasive. For this reason, there are approximately 120.000 patients having replacement with CAPD worldwide (10,11).

There are many studies comparing laparoscopic or conventional methods for CAPD catheter applications (6). For patients with a history of peritonitis or abdominal operation, CAPD catheter insertion under direct vision with laparoscopy is advised (9). Complication rates were assessed to be lower in these patients (6). The requirement of general anesthesia in the laparoscopic method is the disadvantage of this method (9,12). In this study, general anaesthesia was given to LG patients.

Complications such as functionality defects, peritonitis, catheter infection and dialysate leakage were compared between two groups. Mechanical obstructions impairing functionality of CAPD catheter are omental wrap, adhesions or migration of catheter out of pelvis (5). Fixation of the catheter to the omentum with laparoscopic method may decrease the risk of this complication (10, 13). Gadallah et al. found the survival rates of catheters to be 77.5 % and 62.5 % respectively in peritoneoscopic and open groups and reported the laparoscopic group to be better (14). Likewise, in a series of 213 patients, Crabtree et al. determined the one-year survival of catheters in LG and CG as 87.4 % and 75.5 % respectively and stated the difference to be significant (15). Gajjar et al. showed that the functionality rate of catheters inserted with laparoscopic method was 97.8%, whereas it was 80% for conventional method, and the difference was not assessed to be statistically significant (3). In this study, one-year survival for catheters were 87 % in LG group and 77 % in CG group, and there was no significant difference.

According to the studies comparing two methods in terms of dialysate leakage, laparoscopic method causes this complication less frequently (3,16). The postoperative dialysate leakage rate varies between 4% and 12% (10,17). Jwo et al. found dialysate leakage of 15 % in the conventional group and 18.9 % in the laparoscopic group and stated no significant difference (18) In our study, the rates were 19% for the laparoscopic group and 29% for the conventional group and likewise the difference was not statistically significant. The reason for the lower rates of dialysate leakage in the LG group is thought to be the placement of the catheter via preperitoneal tunnel instead of purse suturation of the peritoneum.

Öğünç et al. analysed 42 patients undergoing CAPD catheter insertion surgery laparoscopically or by open surgery and reported exit site infection in 19% in the LG group and 38% in the conventional group that showed a significant difference (13) On the other hand, in a series of 77 patients, Jwo et al. reported exit site infections as 16.2% in the LG group and 12.5% in the CG group and mentioned of no statistically difference (18) The results of Jwo et al. were similar to our study as the rates were 11% and 12% for LG and CG respectively in our study. The difference was not statistically significant. In this study, catheter exit site infections were lower in both of the groups compared to the studies reported in literature. The reason for this is thought to be due to prophylactic antibiotic use and not suturing the catheter exit sites.

Vargemezis et al. reported 15-35% hospital admission, 40-45% transfer to haemodialysis and 7-10% mortality in CAPD patients with peritonitis. They stated the reasons for peritonitis as exit site contaminations, tunnel infections, catheters that pass through intestinal walls and infections via ascending and hematogenous ways. They also express that childhood, lower socioeconomic levels, lower levels of personal hygiene, immunosupression, HIV infection, long-term antibiotic and gastric acid suppression therapies increase the risk of peritonitis (19), Gajjar et al., reported that the rates of peritonitis were 17.8% and 20% for laparoscopic and open method, respectively (3). According to Soontrapornchai et al., the rates were 32% for the laparoscopic group and 25% for the open method group (5) The difference was not statistically significant in both studies. In a series of 148 patients in which peritoneoscopic and conventional surgical approaches were compared, Gadallah et al. found that incidence of peritonitis were 12.5% in the conventional group and 2.6 % in the laparoscopic group and determined the difference to be significant (14). As for our study, the rates were 14% for LG and 41% for CG. The difference was assessed as statistically significant. The reason for the higher risks of peritonitis according to reports published in literature may be due to lower socioeconomic and personal hygiene levels. Preference of laparoscopic approach in patients having higher socioeconomic levels reduces the risk of peritonitis in the laparoscopic group respectively. Intra-abdominal adhesions that occur after peritonitis, hemodialysis increases the return.

Attaluri et al. report the comparison of the conventional and the laparoscopic technique; peritoneal leak, peritonitis, port-site hernia, and bleeding were significantly lower than the laparoscopic method. (Traditional group 31 of 68 (45.6%) and laparoscopic group 21 of 129 (16.28%) ($p < 0.0001$)) (20).

In conclusion, function, dialysate leakage, catheter infection and peritonitis in the two groups were compared and only the incidence of peritonitis was found to be less than the LG whereas there was no difference between the others.

REFERENCES

1. Ur-Rehman K, Housawi A, Al-Jifri A, Kielar M, Al-Ghamdi SM: Peritoneal dialysis for chronic kidney disease patients: A single-center experience in Saudi Arabia. Saudi J Kidney Dis Transpl 201; 22 (3): 581-586
2. Al Wakeel JS, Mitwalli AH, Tarif N, Hammad D, Abu-Aisha H, Memon N, Alam A, Suliman F, Askar A, Qudsi A: Complications of CAPD: A single center experience. Saudi J Kidney Dis Transpl 2005; 16 (1): 29-32
3. Gajjar AH, Rhoden DH, Kathuria P, Kaul R, Udupa AD, Jennings WC: Peritoneal dialysis catheters: Laparoscopic versus traditional placement techniques and outcomes. Am J Surg 2007; 194 (6): 872-875
4. Lu CT, Watson DI, Elias TJ, Faull RJ, Clarkson AR, Bannister KM: Laparoscopic placement of peritoneal dialysis catheters: 7 years experience. ANZ J Surg 2003; 73 (3): 109-111
5. Soontrapornchai P, Simapatanapong T: Comparison of open and laparoscopic secure placement of peritoneal dialysis catheters. Surg Endosc 2005; 19 (1): 137-139
6. Wright MJ, Bel'eed K, Johnson BF, Eadington DW, Sellars L, Farr MJ: Randomized prospective comparison of laparoscopic and open peritoneal dialysis catheter insertion. Perit Dial Int 1999; 19 (4): 372-375
7. Elsürer R, Seze S: Peritoneal dialysis: Noninfectious complications. Turkiye Klinikleri J Int Med Sci 2006; 2 (4): 41-47
8. Prakash J, Singh LK, Shreeniwas S, Ghosh B, Singh TB: Non-infectious complications of continuous ambulatory peritoneal dialysis and their impact on technique survival. Indian J Nephrol 2011; 21 (2): 112-125
9. Dalgıç A, Ersoy E, Engin A: A novel minimal invasive technique for insertion of the peritoneal dialysis catheter in patients with end stage renal disease. Turk Neph Dial Transpl 2001; 10 (1): 37-40
10. Harissis HV, Katsios CS, Koliousi EL, Ikonomou MG, Siamopoulos KC, Fatouros M, Kappas AM: A new simplified one port laparoscopic technique of peritoneal dialysis catheter placement with intra-abdominal fixation. Am J Surg 2006; 192 (1): 125-129
11. Çinar Y, Sezer S, Özdemir FH: Clinic practice of peritoneal dialysis. Turkiye Klinikleri J Int Med Sci 2006; 2 (4): 30-34

12. Koç Y, Ünsal A, Yetkin G, Yılmaz M, Baştürk T, Uludağ M, Yıldırım M, Sakacı T, Ahbap E: İki farklı periton diyaliz kateter yerleştirme tekniğinin erken dönem komplikasyonlarının karşılaştırılması. Turk Neph Dial Transpl 2010; 19 (1): 23-28
13. Ogunc G, Tuncer M, Oğünç D, Yardimsever M, Ersoy F: Laparoscopic omental fixation technique versus open surgical placement of peritoneal dialysis catheters. Surg Endosc 2003; 17 (11): 1749-1755
14. Gadallah MF, Pervez A, el-Shahawy MA, Sorrells D, Zibari G, McDonald J, Work J: Peritoneoscopic versus surgical placement of peritoneal dialysis catheters: A prospective randomized study on outcome. Am J Kidney Dis 1999; 33 (1): 118-122
15. Crabtree JH, Fishman A: A laparoscopic approach under local anesthesia for peritoneal dialysis access. Perit Dial Int 2000; 20 (6): 757-765
16. Tsimoyiannis EC, Siakas P, Glantzounis G, Toli C, Sferopoulos G, Pappas M, Manataki A: Laparoscopic placement of the Tenckhoff catheter for peritoneal dialysis. Surg Laparosc Endosc Percutan Tech 2000; 10 (4): 218-221
17. Leblanc M, Ouimet D, Pichette V: Dialysate leaks in peritoneal dialysis. Semin Dial 2001; 14 (1): 50-54
18. Jwo SC, Chen KS, Lee CC, Chen HY: Prospective Randomized study for comparison of open surgery with laparoscopic-assisted placement of tenckhoff peritoneal dialysis catheter-A single center experience and literature review. J Surg Res 2010; 159 (1): 489-496
19. Vargemezis V, Thodis E: Prevention and management of peritonitis and exit-site infection in patients on continuous ambulatory peritoneal dialysis. Nephrol Dial Transplant 2001; 16 Suppl 6: 106-108
20. Attaluri V, Lebeis C, Brethauer S, Rosenblatt S: Advanced laparoscopic techniques significantly improve function of peritoneal dialysis catheters. J Am Coll Surg 2010; 211 (6): 699-704