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Sedation anesthesia technique using carbon dioxide for the laparoscopic placement of a peritoneal dialysis catheter

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ABSTRACT

Introduction: Chronic ambulatory peritoneal dialysis (CAPD) is a cost-effective treatment for patients with end-stage renal disease (ESRD), and several advantages to CAPD have been reported in comparison with hemodialysis. Several techniques have been described for placing the catheter in the abdominal cavity in CAPD. Use of a laparoscopically fixed CAPD catheter is popular, but this technique often requires general anesthesia (GA). Most ESRD patients with concomitant diseases, such as hypertension, diabetes mellitus, and coronary artery disease, are at high risk to undergo GA, which may preclude catheter insertion. Sedation plus local anesthesia (SA) may be an alternative in these patients. To the best of our knowledge, the use of SA with carbon dioxide (CO_2) insufflation has not been previously reported with laparoscopic fixation of a CAPD catheter. In this study, the use of SA and GA were compared with CO2 insufflation in the laparoscopic fixation of a CAPD catheter in 18 patients.

Materials and Methods: Between January 2016 and February 2017, 18 patients (GA: n=13; SA: n=5) underwent laparoscopic CAPD catheterization. All of the GA patients were intubated. Intraabdominal pressure was fixed at 14 mmHg. Patients who underwent SA were administered fentanyl in the operation room and midazolam in the preoperative patient room. Prilocaine hydrochloride and lidocaine hydrochloride were used to provide local anesthesia at all identified incision points. Intraabdominal pressure was fixed at 7 mmHg in all patients. There was no need to convert to GA in any patient. The patients were evaluated in terms of demographic data, perioperative parameters, and postoperative complications.

Results: There were no statistically significant differences between the groups in terms of demographic, perioperative, or postoperative complications ($p>0.05$).

Conclusion: We think that SA is a factor of tolerability in laparoscopic surgery and low pressure. SA may be preferred to GA in high-risk ESRD patients with systemic diseases for laparoscopic CAPD catheter placement.

Keywords: Chronic ambulatory peritoneal dialysis; laparoscopic fixated peritoneal dialysis catheter insertion; laparoscopy; sedation anesthesia.

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Introduction

Chronic ambulatry peritoneal dialysis (CAPD) is a modality of bridging procedure in the treatment of End-Stage Renal Disease (ESRD) patients. Peritoneal dialysis catheter implantation can be performed by various techniques such as Seldinger, conventional, laparoscopic and fluoroscopic methods. Furthermore; there are various anesthesia methods during the application such as LA, SA or GA.[1]

Various complications have been reported with the implantation of the peritoneal dialysis catheter which are mostly catheter related complications such as migration, fibrin plug and omental coverage of the catheter.[1]

Laparoscopic implantation of the catheter under direct vision have been shown to be associated in shorter operative duration, preoperative pain and complications.[2,3] Therefore; laparoscopic implantation of the catheter have been popularized.[4–7] Unfortunately; laparoscopic procedures in general require application of the GA and majority of the patients with ESRD have concomitant systemic disease such as hypertension, diabetes mellitus, congestive heart failure and coronary artery disease that creates risk factors and limits the use GA. Recently; in order to prevent catheter malpositioning following laparoscopic catheter insertion certain fixation methods have been employed. Until now use of SA has not been previously reported in laparoscopic fixated peritoneal dialysis catheter insertion.

In the present study we retrospectively analyzed 5 cases of laparoscopic peritoneal catheter insertion under SA compared with 13 laparoscopic peritoneal dialysis catheter insertion in whom GA had been used.

Materials and Methods

Patient Selection

Between January 2016 and February 2017 18 patients with ESRD who required CAPD and evaluated in the department of Nephrology in Adana Research and Training Hospital were included in the study (Table 1).

All the patients were evaluated for peritoneal catheter insertion by the department of the surgery by the same surgical team and operation was scheduled to employ standard cuffed peritoneal dialysis catheters; i.e Tenckhoff catheter (Argyle, Covidien; Monsfield, USA). GA was performed in 13 patients and 5 patients received SA+LA reinforced with sedation. In none of the SA patients required GA during the procedure. The study ethics approval for the entire project was obtained from the Adana Numune Research and Training Ethics Committee (25.01.2017/8).

None of the patients had any previous history of peritonitis.

Surgical Technique

All patients who received GA (n=13) were intubated. Veress needle was used for CO2 insufflation and the intraabdominal pressure was set to 14 mmHg and 5 mm trocars were used.

In the the SA applied patients (n=5) preoperatively all pa-

Table 1. Demographic characteristics and operative characteristics of the study groups are given

Patient demographics	General anesthesia group (n=13)	Sedation anesthesia (n=5)	p
Age	50.2 (25–71)	56.2 (47–72)	0.44
Gender			
Male	5 (38%)	1 (20%)	0.56
Female	8 (62%)	4 (80%)	
Body mass index (kg/m^2)	26.6 (22.4–37.5)	26.6 (20–41.2)	0.805
Co-morbidities	10 (77%)	5 (100%)	0.503
Anesthesia Time (min)	33 (25–42)	32 (25–40)	0.65

Mann-Whitney U test.

tients received sedation with 2 mg midazolam (Dormicum, Roche, Turkey) in the preoperative preparation room and it was continued with Fentanyl (Talinat, Vem, Turkey/ maximum dose did not exceed 100 micrograms) in the operating room. Local anesthesia with prilocain HCl (Priloc, Vem, Turkey/ maximum dose 600 mg) and lidocain HCl (Jetokain, Adeka, Turkey/ 40 mg) was infiltrated to all determined incision points. CO_2 insufflation was performed by Hasson's technique and 10 mm trocar was used from the umblical entry point. Intraabdominal pressure of 7 mmHg was achieved in all patients. During the insufflation patient toleration was evaluated by compliants-confort of the patient and patient vital signs such as cardiac rhythm, arterial pressure, oxygen saturation. As the scope was inserted if the preitoneal distance to the visceral surface was enough and patient confort enabled the continuation of the operation; procedure continued with the continuation of the sedation.

Preoperative 1 g intravenous cefazolin sodium premedication was administered as an antibiotic.

In both anesthesia types 5 mm tracer was inserted from the right lower quadrant and a grasper was used to position the catheter to the suitable pelvic position. Catheter position under the peritoneum was visualized and the catheter was fixed to the anterior abdominal wall. Furthermore; catheter was advanced through a tunnel and after the positioning was performed irrigation of the catheter was performed and after ruling out the blockage of the catheter flow procedure was terminated (Fig. 1).

In one patient who received sedation and local anesthesia intraabdominal pressure was raised to 9 mmHg in order to increase the surgical safety during the 5 mm trocar insertion and patient tolerability did not change. A single fascia suture was placed in the umbilical region after the operation rather than the trocar entrance.

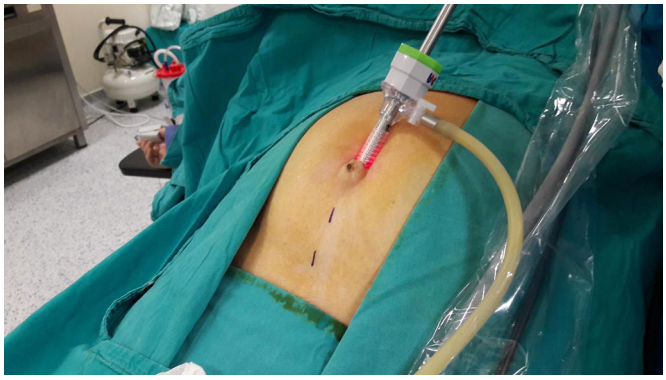

Figure 1. The placement of the trocars, insertion of the catheters in the patient. Preparing a tunnel for the catheter and passing the catheter through the tunnel and termination of the procedure.

Statistical Analysis

The results are expressed as mean (Range). Since the number of patients were 18. We used non-parametric tests (Mann-Whitney U test) to compare the study variables distributed according to the anesthesia types performed in the study. The p value less than 0.05 was considered to be statistically significant.

Results

Patient Demographics

Mean patient age was 50.70 years. Female to male ratio was 12/6. Mean BMI of the patients was 26.44 kg/m^2. 83.3% of the patients had concomitant systemic illness. Mean anesthesia time in the general anesthesia group was 33 (25–42) minutes; on the other hand mean operative time in the sedation and local anesthesia was 32 (25–40) minutes. No mortality had been observed in any patient groups. The two study groups did not any statistically significant difference in termsof preoperative and perioperative parameters ($p<0.05$; Table 1).

Perioperative Follow Up of the Patients

In the general anesthesia group 1 patient had been previously operated with Seldinger method and a malposition catheter had developed. Again 1 of these patients had an obstructed catheter flow due to mental patch formation and this patient was revised with extraction and reinsertion of the catheter. Two of the patient had fluid leak around the peritoneal catheter dialysis. 1 patient had a grocer site bleeding which was conservatively managed; however the hospitalization period was elongated to 15 days.

Postoperative Follow Up of the Patients

All the patients were followed for postoperative 2 months for catheter function, infection and tracer site complications. At the end of the follow-up period all the patients still have a functioning peritoneal dialysis catheter.

Discussion

Peritoneal dialysis is a method of renal replacement therapy in ESRD which has a low cost and increased patient confer, ease of blood pressure control, ease of return to

daily activities and therefore considered as a safe and frequently used modality.[8–13] Different methods of peritoneal dialysis catheter insertion have been described. Among these techniques laparoscopic peritoneal dialysis catheter insertion had been reported to be the method of choice with low visceral injury, bleeding, incisional hernia and catheter disfunction risks.[14,15] On the other hand various meta-analysis have shown that all insertion methods have been comparable and there were no significant differences among different methods.[16–18] Currently; laparoscopic insertion of the peritoneal dialysis catheter is prefered due to better evaluation of the intraabdominal region, catheter fixation capability and availability of adhesiolysis upon observation.[19,20] However catheter migration is still a big problem in peritoneal dialysis catheter insertion and therefore in recent years catheter fixation to the abdominal wall have been developed to prevent this complication.[21–23] In various studies disadvantages of laparoscopic peritoenal dialysis catheter insertion was reported to be; long operative time, increased costs and risks due to need of general anesthesia.[24,25] Sedation, local anesthesia, general anesthesia and regional block have been the methods used during insertion.[4,6,7,13,16,17] Studies including local, sedation and regional blocks are very limitted and they have frequently used helium and nitrous oxide insufflation agents.[12,26–28] Limitted use of other inter gases such as nitrous oxide and helium with respect to carbondioxde is a limitting factor in the use of sedation and local anesthesia techniques in laparoscopic peritoenal dialysis insertion modality.

Wright et al.[2] have reported that there had been no difference in terms of procedure related complication, catheter survival, pain scores and duration of hospitalization among the open and laparoscopic assisted peritoneal dialysis catheter insertions. Therefore; they concluded that if costs and anesthesia related morbidity is not relevantt laparoscopic procedures can be preferred as a method of choice for peritoneal catheter insertions. In patients with ESRD; hypertension, inflammation, metabolic problems and co-morbiditeis such as diabetes produce a great risk for application of general anesthesia and should be avoided in these subgroup of patients if possible.

In the present study we used sedation and local anesthesia for patients with co-morbidities and have used conventional general anesthesia techniques for low risk patients during the laparoscopic insertion of fixated peritoneal dialysis catheter. We did not find any significant difference in terms of surgical site complications, postoperative and catheter functions among the two groups.

SA can be a method of preference in high risk patients to reduce the perioperative morbidity. As the number of cases increase in sedoanalgesia mediated catheter insertions this modality will enter in to routine use in selected subgroup of patients.

Conclusion

Experience of the surgeon plays a very important role in the mode of insertion of peritoneal dialysis catheter. As the fixated laparoscopic peritoneal dialysis catheter insertion is being popularized SA will replace GA in high risk ESRD patients that have co-morbidities and we believe this will increase the application of CAPD in these patients.

Disclosures

Ethichs Committee Approval: The study was approved by the Local Ethics Committee.

Peer-review: Externally peer-reviewed.

Conflict of Interest: None declared.

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