# Comparison of the Seldinger Technique and Surgical Technique in Tenckhoff Catheter Insertion in CAPD Patients: A Single Center Experience

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***Objective:*** *To compare clinical outcomes of catheter placement between surgical technique and Seldinger technique, including catheter survival and early post-operative complications.*
***Material and Method:*** *This retrospective study was conducted in Maharaj Nakhon Si Thammarat Hospital, a tertiary-center hospital in southern part of Thailand. Three-year data, during October 2007-2010, were retrieved from medical records and hospital database. Early post-operative complications, including major bleeding, peritoneal leakage, and peritonitis rate, and long-term outcome were assessed.*
***Results:*** *One hundred forty-nine and 56 out of 205 patients were inserted Tenckhoff catheter by surgical technique and Seldinger technique, accordingly. The average age was 49.8 years old. Sixty percent of them were male. Neither of early post-operative complication and long-term outcome was found to have significant difference. However, patients with surgical technique received more topical antibiotic [15 (10.0%) vs. 0 (0%), p = 0.014] and trended to have more episode of early post-operative peritonitis [15 (10.1%) vs. 3 (5.4%) p = 0.288].*
***Conclusion:*** *Although Seldinger technique is more feasible for practical nephrologists and less time consumption; the success, early post-operative complications, and long term outcome are comparable with surgical technique. The surgeons or nephrologists who perform catheter placement should be aware of catheter-related infection, especially in the first few weeks.*

***Keywords:*** *Dialysis catheter insertion, Tenckhoff catheter insertion, Catheter Implantation, Seldinger method*

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The "PD-First" Policy was launched by the National Health Security Office (NHSO) and Ministry of Public Health since 1st November 2008 shifted the tide of renal replacement therapy in Thailand to peritoneal dialysis (PD). Maharaj Nakonsrithammarat Hospital is one of the 23 pilot hospitals involved in peritoneal dialysis (PD) program.

A safe, reliable, correctly positioned and functioning peritoneal catheter is a prerequisite to the technical success of long-term PD[1-3]. There are two most popular peritoneal catheter insertion techniques, the surgical mini-laparotomy technique conducted mainly by surgeon, and the Seldinger technique, a blind placement using a guide-wire, frequently performed by the nephrologist[4]. However, the best method for peritoneal catheter insertion was debatable[5]. In Thailand, peritoneal catheter is primarily placed by surgeon in the operating room. However, in Maharaj Nakhon Si Thammarat Hospital, the peritoneal catheter is also inserted by nephrologist with the assistance of dedicated nursing who were well trained in peritoneal catheter placement skill.

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## Material and Method

All patients that received peritoneal catheter placement from 1st October 2007 to 31st October 2010, at

Maharaj Nakhon Si Thammarat Hospital were included in the present study. The medical records of the patients were reviewed and the data of each patient were extracted according to the present study protocol. The 2 methods of peritoneal catheter placement, surgical (mini-laparotomy) technique and Seldinger technique, were compared. The outcomes were evaluated at 2 weeks and 1 year after the catheter placement. The catheters used in both groups were double-cuffed, coiled Tenckhoff catheters[6] provided by the National Health Society Organization (NHSO).

Catheter placements under mini-laparotomy technique were performed by surgeons in operating theater at the operation day of surgery while catheter placements under Seldinger technique were performed by nephrologist on every Wednesday at hemodialysis room. The authors routinely used 1 gram cefazolin prophylaxis at 1 hour before catheter insertion. The catheter placements using both techniques were performed under local anesthesia. On the completion of the procedure, the catheter was flushed with 0.9% saline to ensure catheter patency and assess for intraperitoneal bleeding. In the majority of cases, catheters were rested and used only after 2 weeks.

### *Statistical analysis*

Log-rank test was used to compare continuous data between the two groups while Chi-square test was performed to compare categorical data between the two groups. Catheter survival was analyzed using Kaplan-Meier survival analysis. The p-value of less than 0.05 was considered statistical significant.

## Results

The present study included 205 end stage renal disease patients, 107 were male and 98 were female. The average age was 49.8 years old. Surgical technique was used in 149 cases while Seldinger technique was utilized in 56 cases.

PD patients in the surgical technique group used more topical antibiotic for exit site infection than the Seldinger technique group (Table 1). This may be due to more tissue trauma in the surgical technique than the Seldinger technique. There was no statistical significant difference in age, sex and other baseline patient characteristics. In addition, early post-operative complications, including peritonitis, significant hemorrhage, and peritoneal leakage as well as 1-year technique (PD) and catheter survivals were comparable in both groups (Table 1). Peritoneal catheter survival after surgical placement and Seldinger placement were shown in Fig. 1.

## Discussion

PD is still a standard renal replacement therapy option for ESRD patients. In Thailand, it is the first option for patients under universal healthcare coverage. Maintaining the high quality of PD despite the limited resource is a challenging task, hence it highly depends on an initial success of catheter placement. Here, the authors' results demonstrated that both Seldinger and surgical catheter insertion techniques were comparable in early and late post-operative outcomes except exit-site infection in early post operation. There was greater prevalence of exit-site infection in the surgical technique. The possible explanation may lean behind a more frequent wound dressing immediately after catheter insertion since the surgical procedure caused higher mechanical trauma to the exit site with larger raw skin surface. The more frequent wound manipulation immediately after catheter placement, the higher possibility of exit-site infection occurs. Therefore, the European best practice guidelines (EBPG)[1] recommend leaving un-necessary touch the catheter at least 2 weeks after the implantation. This interval of resting catheter and abdomen is called as the "break-in" period. Of note,

**Table 1.** Comparison of surgical technique and Seldinger technique for peritoneal catheter insertion

| | Surgical technique (n = 149) | Seldinger technique (n = 56) | p-value |
|---|---|---|---|
| Early post-operative exit-site infection and utilization of topical antibiotic | 15 (10.06%) | 0 (0%) | 0.014 |
| Early post-operative peritonitis | 15 (10.06%) | 3 (5.35%) | 0.288 |
| Significant hemorrhage | 2 (1.34%) | 1 (1.78%) | 0.814 |
| Peritoneal leakage | 4 (21.05%) | 2 (3.57%) | 0.837 |
| 1st year technique survival | 100 (67.11%) | 41 (73.21%) | 0.401 |
| 1st year catheter survival | 96 (46.30%) | 39 (69.64%) | 0.483 |

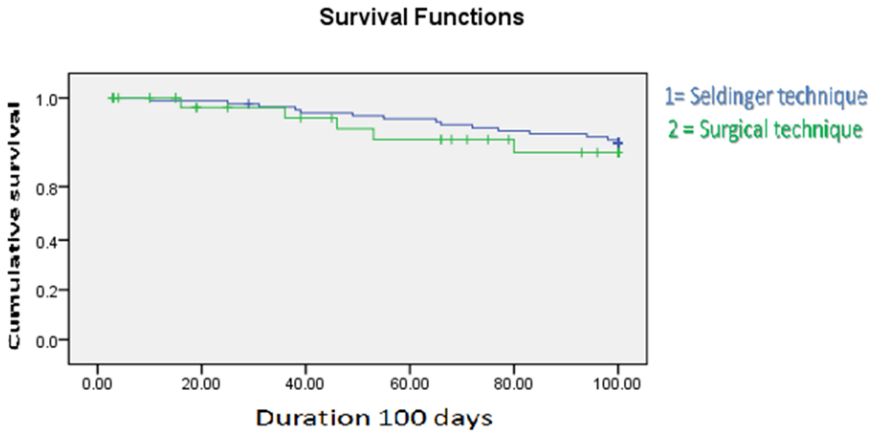


**Fig. 1** Catheter survival at first 100 days. (1) Seldinger technique, (2) Surgical technique

the surgical technique yielded higher post-operative exit-site infection and peritonitis above the threshold levels (lower than 5%) of the International Society for Peritoneal Dialysis (ISPD): Clinical Practice Guidelines for Peritoneal Access 2010[2].

The Seldinger technique also provides greater benefit beyond our exploration. It can be performed in patients with high tendency of bleeding or who cannot well tolerate general anaesthesia[7]. Furthermore, the Seldinger provides cheaper operative expense (3,000 bath vs. 6,500 bath) and lower time consumption [15-20 min vs. 60 min (data not shown)][8]. However, in some patients such as previous abdominal surgery, this technique may not be suitable due to the risk of bowel perforation. Additional procedures, including hernia repair, omentectomy, omentopexy, adhesiolysis, and tissue biopsy are not possible to conduct during the placement procedure.

In conclusion, blind catheter placement by skilled nephrologists using Seldinger technique could provide safe, effective, and similar outcome to the surgical placement. Decision of the technique should rely on the local expertise at individual center. Non-skillful operator shall not be allowed to insert the catheter without supervisor.

**Potential conflicts of interest**

None.

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## *ผลการศึกษาเปรียบเทียบผลการวางสายล้างไตทางหน้าท้องระหว่างการผ่าตัดแบบเดิม และการใช้ขดลวดนำในโรงพยาบาลมหาราช นครศรีธรรมราช*

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***วัตถุประสงค์:*** *เพื่อเป็นการศึกษาเปรียบเทียบผลทางคลินิกของการวางสายล้างไตทางช่องท้อง อายุการใช้งานของสาย รวมถึงภาวะแทรกซ้อนหลังจากการผ่าตัดวางสาย ระหว่างการผ่าตัดวางสายด้วยวิธีผ่าตัด กับการผ่าตัดวางสายด้วยการใช้ขดลวดนำ*

***วัสดุและวิธีการ:*** *ทำการศึกษาแบบย้อนหลังในผู้ป่วยโรคไตวายเรื้อรังระยะสุดท้าย ที่ได้รับการล้างไตทางช่องท้องจากโรงพยาบาลมหาราช นครศรีธรรมราช ซึ่งเป็นโรงพยาบาลศูนย์ระดับตติยภูมิ โดยใช้ข้อมูลจากประวัติผู้ป่วยและฐานข้อมูลของหน่วยงานในการเรียกข้อมูลย้อนหลัง ทำการวิเคราะห์ภาวะแทรกซ้อนหลังผ่าตัดรวมถึงภาวะเลือดออก การมีน้ำยารั่วออกจากหน้าท้อง การติดเชื้อภายในช่องท้อง และประเมินผลสัมฤทธิ์ในระยะยาว*

***ผลการศึกษา:*** *มีจำนวนผู้ป่วยที่ใส่สายล้างไตทางหน้าท้องรวม 205 ราย แบ่งเป็นการผ่าตัด 149 รายและการใส่สายโดยใช้ขดลวดนำ 56 ราย กลุ่มผู้ป่วยมีอายุเฉลี่ย 48.6 ปี คิดเป็นเพศชายร้อยละ 60 ผลการศึกษาไม่พบความแตกต่างของภาวะแทรกซ้อนหลังการวางสาย และผลสัมฤทธิ์ในระยะยาว อย่างไรก็ตามผู้ป่วยที่ได้รับการผ่าตัดมีการใช้ยาปฏิชีวนะภายนอกมากกว่าแบบขดลวดนำ [15 (ร้อยละ 10.0) เทียบกับ 0 (ร้อยละ 0) p = 0.014] และมีแนวโน้มพบอุบัติการณ์ของการติดเชื้อในช่องท้องหลังผ่าตัดมากกว่าพบ 15 ราย (ร้อยละ 10.1) เทียบกับ 3 ราย (ร้อยละ 5.4)*

***สรุป:*** *การผ่าตัดวางสายโดยใช้ขดลวดนำ สามารถทำได้โดยอายุรแพทย์โรคไต ซึ่งใช้เวลาน้อยกว่าการผ่าตัด แต่ไม่พบความแตกต่างกันในด้านผลสัมฤทธิ์ของการวางสาย อายุการใช้งานของสาย การเกิดภาวะแทรกซ้อนหลังการวาง อายุรแพทย์โรคไตผู้ที่จะวางสายด้วยวิธีนี้ ควรให้เฝ้าระวังอย่างใกล้ชิดถึงภาวะแทรกซ้อนจากการติดเชื้อที่สัมพันธ์กับสาย โดยเฉพาะในสัปดาห์แรกๆ ของการวางสาย*