Experiences on Bedside Tenckhoff Catheter Implantation

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Objective: *To clarify the outcome of a bedside technique of peritoneal dialysis (PD) catheter implantation which is practiced differently from worldwide guidelines in some points.*

Material and Method: *This retrospective study was conducted in end stage renal diseases (ESRD) patients treated with chronic ambulatory peritoneal dialysis (CAPD). Catheter placement was initiated by the authors' bedside technique comprising no antibiotic prophylaxis, dry abdomen, and routinely right sided exit site as our protocol. All events within one month post-implantation, such as tip mal-position, malfunction, infection, and bleeding were analyzed.*

Results: *One hundred and fourteen cases were participated with age, ranged from 14 to 78 yrs. Of the participating subjects, 38.5% was female and 60.52% was diabetes mellitus (DM). After 1 month, 113 out of 114 cases (99.1 %) accomplished CAPD. Of these, 79.8 % had good tip position and function after the break-in period. Early mal-position and poor flow was detected in 21 cases (18.4 %); 9 of them responded to laxative bowel stimulation while 12 cases needed surgical correction. Exit-site infection and/or wound infection were found in 7.9%. The peritonitis rate was 2.63%. All cases with infection were cured. Coagulase positive Staphylococcus aureus was the major causative organism.*

Conclusion: *Bedside Tenckhoff catheter implantation without antibiotic prophylaxis in dry abdomen is a safe modality for selected ESRD patients.*

Keywords: *PD catheter implantation, Bedside catheter implantation, Out-patient PD catheter implantation, Tenckhoff catheter, Bedside implantation technique.*

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In the situation of growing end-stage renal disease (ESRD) population worldwide, peritoneal dialysis (PD) is a modality of renal replacement therapy (RRT) that is still underutilized. The key of success to increase the use of PD as a major therapy is uncomplicated access[1]. Good PD access may be the first thing we consider and the factors to define it are still debatable, such as long term reliability regarding flow, prevention of exit-site infection as well as peritonitis, and safe insertion[1]. As reported in a large cohort in 2006[2], it was found that peritonitis was a strong predictor of technical failure and was expressed as a hazard ratio of 2.34 (95% CI 1.44-3.80) indicating that PD catheters were the Archilles heel in the same way as the vascular access in hemodialysis.

Preferred catheter design or implantation methods are also inconclusive and depend on center facilities, interventionist familiarity, and type of reimbursement for each catheter design[3]. In Srinagarind Hospital, Khon Kaen University, the authors used two implantation techniques, a surgical technique by a surgeon and the bedside technique, the focus of this paper, by nephrologists or well-trained internists. With the escalating number of ESRD patients and limited number of PD service center in Thailand before year 2008, nephrologists were pressured to develop a bedside percutaneous technique that could be done in out-patient setting.

Bedside percutaneous PD catheter implantation could be performed best in well co-operated patients with no previous abdominal surgery. There were limited number of reported series of percutaneous implantation. The results from these reports showed that the procedure is well-tolerated[4-7], and rapidly inserted at the bedside or well cleaned room could provide a reliable access and rapid initiation of dialysis without the delay imposed in coordinating a surgeon, theatre time, and the anesthesiology team[6]. When comparing percutaneous technique by nephrologists

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with surgical placement by surgeons, it was found that the incision size and length of hospital stay were less in percutaneously placed group[7]. In addition, early initiation of PD exchanges and reduction in the expenses were others important advantages of this technique[7]. In the present study, a bedside technique without antibiotic prophylaxis in selected cases was performed and could provide good results.

Material and Method

Patients

From January 2000 to November 2006, 114 patients with ESRD who selected PD after they were educated about the RRT modality selection were included. The inclusion criteria included ESRD cases who agreed to receive bedside peel-away sheath Tenckhoff catheter implantation by nephrologists/ internists as out-patient cases with informed consent. The exclusion criteria included previous abdominal surgery, previous acute peritoneal dialysis catheter insertion, bleeding tendency, intra-abdominal lesions, and who had current intra-abdominal or abdominal wall infections before catheter implantation. These patients also had neither overt uremic symptoms nor severe de-compensated cardiac failure.

Methods

Catheter insertion

Every patient had a straight dual-cuff Tenckhoff catheter inserted percutaneously by nephrology staffs and well-trained internists using blind placement with a Seldinger guide wire and peel-away sheath.

Preparations were by nothing per oral after midnight from their home and coming to the PD unit in the morning for blood coagulogram. All were asked to empty their bladder before lying on the procedure bed. No antibiotic prophylaxis or tranquilizers were used but the procedures were carried out under strict aseptic technique in normal patient rooms that are regularly cleaned. Procedures were performed under local anesthesia and then progressed surgically as in the literature[8,9], but the techniques reported here had some differences.

Firstly, transverse incisions were opened in the midline located below umbilicus to make a way through the abdominal cavity without thick muscle layers. Their peritoneal cavities were cannulated with an 18-gauge needle and filled with 20 milliliters of saline, if needles were in place, patients should not experience pain and nephrologists should not feel resistance to fill saline through peritoneal cavities. Secondly, navigated guide wires were freely cannulated. After 18-gauge needles were removed, dilators and peel-away sheaths were followed through over navigated guide wires without pseudo-ascites to avoid volume overload in ESRD patients if the inflow-outflow test have to be done at the end of operations (1 liter of peritoneal dialysis fluid for this test). In worse condition, if the catheters lacked immediate function, iatrogenic volume load at least 1.5 -2 liters in 30 minute could occurred due to pseudo-ascites. Thirdly, the sharp curved tunnelers (Quinton™, Tyco Healthcare Group LP, Mansfield, MA, USA) were used to create the subcutaneous tunnels and to open sharp margined exit sites to tightly fit the catheters for reason of avoiding exit site tissue tattering induced markedly necrosis and inflammation. Finally, direction of subcutaneous tunnels to exit sites were directed laterally and downward[10] to assist in attenuating bacterial accumulation at the exit site wound. Usually, the break in period was 7-14 days and the first dressing was routinely changed at 7th day post-operation except when wound complications were detected.

Data collection

Demographic data included age, sex, diabetic status, catheter-related infections, and mechanical complications.

Definition

Good position of catheter: tip of catheter should be located within pelvic cavity especially in the cul de sac region.

Mal-position of catheter: tip of catheter located outside pelvic brim, kinking or placed in the subcutaneous layer.

Mal-function of catheter: catheter could not work properly, including slowly draining in or out or with obstructed flow.

Leakage from wound or exit site: external fluid that appears at the wound or exit site[8].

Exit site infection: purulent and/or bloody drainage from the exit site which may be associated with erythema, tenderness, exuberant granulation, and edema. The area of erythema needs to be more than twice the catheter diameter to be included[11].

Tunnel infection: erythema, edema, and/or tenderness over the subcutaneous pathway, and may be characterized by intermittent or chronic, purulent, bloody, or gooey drainage which discharges spontaneously or after pressure on the cuff[11].

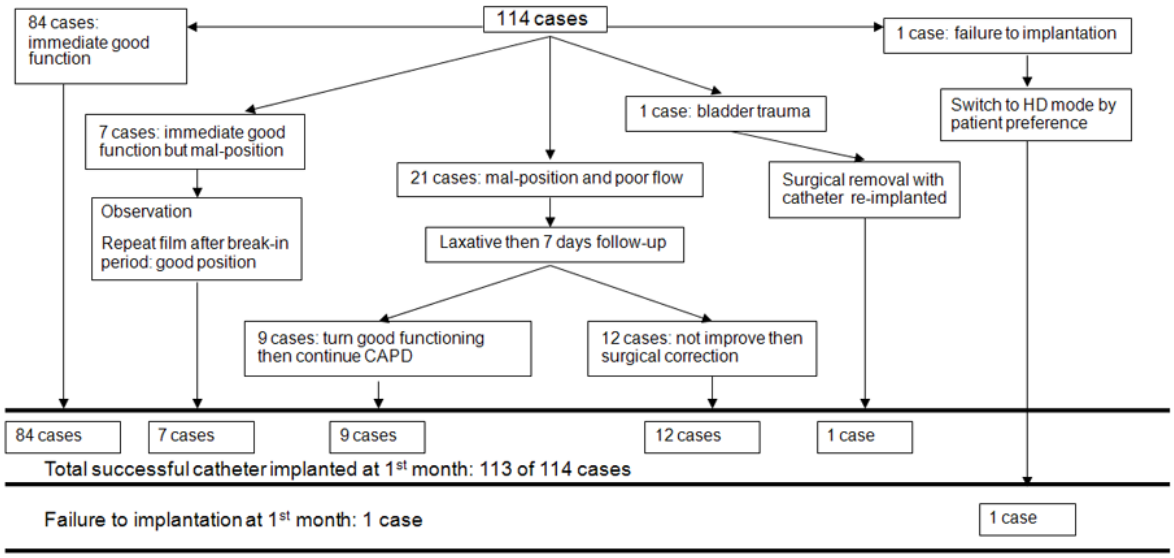

Fig. 1 Outcomes of bedside catheter implantation

Peritonitis: defined as two criteria present out of a possible four: 1) cloudy effluent; 2) abdominal pain; 3) leukocyte count above 100 x 10^6/ L with >50% neutrophils; 4) a positive culture[4].

Statistical analysis

Values are expressed as mean ± standard deviation, or percentage.

Results

There were 70 male (61.4 %) and 44 female (38.6%) with age ranged between 14-78 years old. Sixty nine cases (60.5 %) were diabetic patients.

Catheter functional outcomes

From 114 cases, 84 cases (73.7%) had immediate good position and function. Seven cases had immediate good function but mal-position were seen by plain KUB x-ray performed immediately post-operation. These 7 patients were observed until passing the break-in period and the catheter tips were found in position without intervention. Twenty one cases had poor flow and mal-position and a laxative drug was prescribed to stimulate bowel movement and were re-evaluated to observe in and out flow again at the 7th day. It was found that 9 of the 21 cases had developed good functioning catheters and the patients could continue the CAPD mode. One case had bladder trauma, then, the catheter was surgically removed and re-implantation was done by the consultant surgeons. The original implantation was failed in one case.

At one month, as shown in Fig. 1, 100 from 114 cases could start PD treatment, of which 91 cases had good function at initial evaluation and 9 cases required modification of their catheter position with bowel stimulating medication. The other 12 of 114 cases who had mal-positioned catheters initially and failed to improve function by the medication were corrected by the surgical consultant. As such, 113 cases could continue PD treatment after 1 month. Leakage was found in 3 cases only in the immediate post-operative period. All were healed after the break-in period so that CAPD could be performed.

Infectious outcome

Nine from 114 cases had infectious complications. When divided into surgical wound or exit site infection with or without peritonitis, complete eradication in 6 cases occurred after antibiotics were prescribed and 3 cases had exit site infection with peritonitis (the peritonitis rate was 2.63%), 2 cases had resolution by antibiotics but the other one had to have the catheter removed.

The most common causative organism was Coagulase positive *Staphyllococcus aureus* which was identified in 6 cases. One of these 6 cases exhibited the Methicillin resistant strain. *Proteus mirabilis* was found in one case while negative cultures were observed in 2 cases.

Discussion

The present study has shown that this special

bedside Tenckhoff catheter implantation in selected cases by well-trained internists with strict aseptic technique can be used in a unique way such as access placement in out-patient cases, with dry abdomen and no antibiotic prophylaxis. This technique demonstrated good results when evaluated after the first month following implantation. Immediate good function was achieved in 79.8% of patients and 87.7% had a good function at 1 month without surgical correction.

Bedside percutaneous procedures give several benefits to ESRD patients; firstly, it helps them to avoid general anesthesia, time waiting for a surgical consultant, and scheduling of the operating room. Secondly, out-patient setting procedures are proper for the situation in a tertiary care hospital where complicated cases are referred from the largest region of Thailand that has insufficient free space for all admissions. If the patients have to wait for admission, uremic symptoms may be deteriorated and temporary hemodialysis catheters have to be inserted to avoid life-threatening conditions. It is then difficult to maintain patients on PD mode. Finally, catheter insertions by the nephrologists' team provide a platform for PD education and stimulate general interest in PD issues that were supported by Asif et al[12]. It was the present study in 2 academic medical centers and 1 in a private setting that represent the establishment of a program for PD catheter insertion by nephrologists in 2001, 1991 and, 1991. The number of PD patients increased from 16% of the total ESRD population to 32%, from 17% to 22%, and from 18% to 27% in these 3 places. Catheter insertions by nephrologists can yield a positive impact on the utilization of PD.

Regarding antibiotic prophylaxis, the evidence of prophylaxis antibiotic treatment was always favorable[13-15]. In the present study, antibiotic prophylaxis for uncomplicated bedside procedures were not used but the peritonitis rate was still relatively lower than other series with prophylaxis as shown in Table 1. These results came from the universal strict aseptic techniques employed. In selected cases and in clean wound operations, it is possible to withhold antibiotic prophylaxis as reported by Nielsen et al[4].

While overall results were very good, there were a few difficulties as seen in the case of bladder trauma and failure of original insertion.

Limitations of the present study may come from lack of long term catheter survival analysis and from retrospective design. Regarding the former, although early outcome, generally defined as the first month, is the most important success indicator of the implantation technique, multiple variables could affect the survival for a period longer than one month. Since there are a limited number of percutaneous studies and there were no data of percentage of peritonitis from these studies to compare. As such, the present study can only be compared with the studies utilizing surgical procedure (Table 1). Open surgery can make more tissue damage, more leakage, thus, the higher incidence of peritonitis is explainable. Until now, there are no either randomized control trial compared between percutaneous catheter implantation and conventional surgically catheter implantation or randomized control trial between with and without antibiotic prophylaxis administration on percutaneous catheter implantation[16]. To delineate this issue, further studies should be initiated.

Conclusion

Bedside Tenckhoff catheter implantation with peel-away sheathes by nephrologists or well-trained internists in this facility was shown to be a safe choice for selected ESRD patients and had a low complication rate and high success rate.

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Potential conflicts of interest

None.

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Table 1. Peritonitis rate in cases with and without antibiotic prophylaxis in the literature

Tenckhoff implantation studies	Without antibioticprophylaxis	With antibiotic prophylaxis
Bennet-Jones et al 1998(surgery)[13]	46%	8% (gentamycin)
Gadellah et al 2000 (surgery)[14]	12%	7% (cephazolin) 1% (vancomycin)
The present study (bedside)	2.63%	-

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การศึกษาผลการผ่าตัดวางสายล้างไตทางช่องท้องชนิดถาวรโดยอายุรแพทย์

ทวี ศิริวงศ์, ลักษมณ ประเดิม, จิตรานนท์ จันทร์อ่อน

วัตถุประสงค์*: เพื่อศึกษาผลสำเร็จและภาวะแทรกซ้อนของการผ่าตัดวางสายล้างไตทางช่องท้องชนิดถาวรโดยอายุรแพทย์ โรงพยาบาลศรีนครินทร์ซึ่งมีเทคนิคเฉพาะ แตกต่างจากแนวทางที่กำหนดไว้ในเวชปฏิบัติ*

วัสดุและวิธีการ*: เป็นการศึกษาแบบพรรณนา เก็บข้อมูลย้อนหลังในผู้ป่วยไตวายเรื้อรังระยะสุดท้ายรายใหม่ ที่ได้รับการผ่าตัดวางสายล้างไตทางช่องท้องชนิดถาวรโดยอายุรแพทย์ ไม่ต้องดมยาสลบ ไม่ต้องให้ยาปฏิชีวนะแบบป้องกันการติดเชื้อ ไม่ต้องใส่น้ำยาเข้าไปในช่องท้องก่อนใส่สาย และให้ช่องทางออกของสายอยู่ทางด้านขวาของผู้ป่วยเสมอ แล้วประเมินผลหลังการผ่าตัด 1 เดือน*

ผลการศึกษา*: ผู้ป่วยมีทั้งสิ้น 114 ราย อายุอยู่ในช่วง 14-78 ปี เป็นเพศหญิงร้อยละ 38.5 มีโรคประจำตัวเป็นเบาหวานร้อยละ 60.52 การประเมินผลที่ 1 เดือนหลังผ่าตัด ผู้ป่วย 113 ราย จากทั้งหมด 114 ราย สามารถเข้าสู่การล้างไตทางช่องท้องได้สำเร็จ ผลการทดสอบสายล้างไตหลังผ่าตัดสองสัปดาห์ สายใช้งานได้ 91 ราย (ร้อยละ 79.8) ใช้งานไม่ได้ 21 ราย (ร้อยละ 18.4) ผลการถ่ายภาพรังสี พบว่าปลายสายอยู่ผิดตำแหน่ง ซึ่ง 9 ราย กลับมาใช้งานได้ปกติภายหลังการให้ยาระบายกระตุ้นลำไส้ อีก 12 ราย ที่เหลือต้องได้รับการผ่าตัดแก้ไขตำแหน่งสาย โดยศัลยแพทย์ พบการติดเชื้อที่แผลผ่าตัดหรือที่ทางออกของสายร้อยละ 7.9 การติดเชื้อในช่องท้องร้อยละ 2.63 ทุกรายตอบสนองต่อการยาปฏิชีวนะเชื้อก่อโรคที่พบบ่อยที่สุดคือ สแต๊ปไฟโลคอคคัส ออเรียส โคแอกกูเลสชนิดลบ*

สรุป*: การผ่าตัดวางสายล้างไตทางช่องท้องชนิดถาวรโดยอายุรแพทย์ โดยไม่ต้องให้ยาปฏิชีวนะแบบป้องกันการติดเชื้อและไม่ได้ใส่น้ำยาเข้าไปในช่องท้องก่อนใส่สาย สามารถทำได้อย่างปลอดภัย และได้ผลดีในผู้ป่วยไตวายเรื้อรังระยะสุดท้ายที่มีความเหมาะสม*