# Practical Guidelines for Automated Peritoneal Dialysis

Suchai Sritippayawan MD*,
Sukij Nilwarangkur MD*, Nipa Aiyasanon RN*,
Parnthip Jattanawanich RN*, Somkiat Vasuvattakul MD*

** Division of Nephrology, Department of Medicine, Faculty of Medicine, Siriraj Hospital, Mahidol University, Bangkok, Thailand*

*The development of APD technologies enables physician to customize PD treatment for optimal dialysis. Dialysis dose can be increased with APD alone or in conjunction with daytime dwells. Although there is no strong evidence of the advantage over CAPD, APD is generally recommended for patients having a high peritoneal transport, outflow problems or high intraperitoneal pressure (IPP) and those who depend on caregivers for their dialysis. The benefits of APD over CAPD depends on the problems and treatment results among dialysis centers. Before starting the APD, medical, psychosocial and financial aspects, catheter function, residual renal function (RRF), body surface area and peritoneal transport characteristic must be evaluated. The recommended starting prescription for APD is the dwell volume of 1,500 ml/$m^2$, 2 hours/cycle, and 5 cycles/session, which will provides 10-15 L of total volume and 10 hours per session. The IPP should be monitored and kept below 18 cm$H_2O$. NIPD is accepted for patients with significant RRF. Anuric patients usually require 15-20 L of total fill volume and may need 1-2 day-dwells of 2 L icodextrin or hypertonic glucose solutions. Small solute clearances and ultrafiltration depend on the peritoneal catheter function and dialysis schedule. The clinical outcomes and small solute clearances must be monitored and adjusted accordingly to meet the weekly total Kt/V urea $\geq$ 1.7 and in low peritoneal transporters, the weekly total CCr should be $\geq$ 45 L/1.73 $m^2$. The volume status must be normal. To diagnose the peritonitis in NIPD patients, 1 L of PDF should be infused and permitted to dwell for 2 hours before sending for analysis. The differential of white cell count may be more useful than the total cell counts. In Siriraj Hospital, APD patients had 1.5-3 times less peritonitis than CAPD patients and most of our anuric patients can achieve the weekly total Kt/Vurea target with 10 L of NIPD.*

***Keywords**: Automated peritoneal dialysis, Adequacy, Peritonitis, Intraperitoneal pressure, Nightly intermittent peritoneal dialysis*

***J Med Assoc Thai 2011; 94 (Suppl. 4): S167-S174***
***Full text. e-Journal:** http://www.mat.or.th/journal*

Automated peritoneal dialysis (APD) is generally defined as all types of peritoneal dialysis operated with the assist of a machine (cycler). It was first developed in the early 1960s to simplify the peritoneal dialysis (PD) delivery process[1]. The ideal APD machine should be easy to operate, portable, compatible with the new PD solutions and prescriptions and have a reasonable cost. The machine should have a software, a memory card or a modem for recording patient's data, treatment schedules, patient compliance and dialysis delivery. Furthermore, it should have built-in safety features to prevent any potential serious errors. The evolution of the technology enables the cycler to perform many PD modalities such as nightly intermittent PD (NIPD), continuous cycling PD (CCPD), tidal PD, and continuous flow PD. Some cycler can detect the breakpoint which is the timepoint that the drain flow is abruptly changed from the rapid flow phase (> 200 ml/min) to the slow flow phase (< 50 ml/min) that contributes very little clearance. By detecting the breakpoint, the cycler customizes each PD cycle, adjusts the drain profile of individual patient, and as a result optimizes the dialysis clearances. Despite the continuous development, the number of patients using the cyclers is still low in the developing countries. In Thailand, as of May 2011, there were 7,722 chronic peritoneal dialysis (CPD) patients, however, only 369 of these (4.78%) were using APD. In Siriraj Hospital, APD was first introduced in 1992 and now comprises 50% of all CPD patients. The most important barrier for the use of APD is the cost which is 3-4 times more expensive than chronic ambulatory peritoneal dialysis

***Correspondence to:***
*Sritippayawan S, Division of Nephrology, Department of Medicine, Faculty of Medicine, Siriraj Hospital, Mahidol University, Bangkoknoi, Bangkok 10700, Thailand.*
*Phone: 0-2419-8383*
*E-mail: sritippayawan@gmail.com*

(CAPD). Despite its high cost, APD remains beneficial for a selected group of CPD patients in Thailand.

**Who is suitable for automated peritoneal dialysis? (Table 1)**

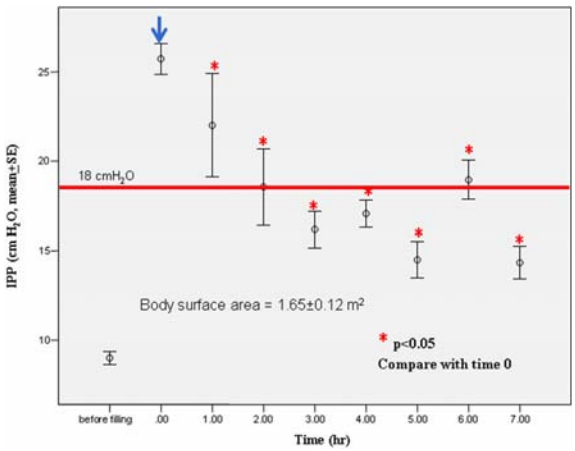
Automated PD allows physicians to adjust the dwell time and volume to match patient's peritoneal membrane and volume status. Due to the short dwell time, APD is suitable for the fast transporters who have inadequate dialysis or insufficient volume removal. In addition, patients who need high volume PD may achieve the adequate target with APD which also make it a viable option for mild to moderate hypercatabolic acute renal failure patients[2,3].

Dwell volume can affect intraperitoneal pressure (IPP) which is lowest in the supine position[4]. Patients who have complications from high IPP *e.g.* abdominal discomfort or hernia, may benefit from APD which can easily modify the dwell volume and IPP. This is useful to Thai patients who usually have the IPP higher than 18 $cmH_2O$ after 2-litr (L) infusion of 1.36% glucose PD fluid (PDF) up to 2 hours (Fig. 1). This IPP level will adversely affect patients' pulmonary vital capacity and their sleep[5].

Patient preference is also an important factor particularly in Siriraj Hospital. Ninety percent of our APD patients have no caregiver to perform PD exchanges during the daytime and decide to carry out NIPD by using an automated machine.

The other advantage of APD is its ability to deliver the technique called tidal peritoneal dialysis (TPD) which has been shown to reduce pain during PD exchange and lessen outflow problem from the catheter malposition. More studies are needed to verify whether TPD will improve the small solute clearances and patient outcomes.

Peritonitis remains an important problem in PD patients. In order to diagnose the peritonitis in NIPD patients having dry abdomen, 1 L of PDF should be infused and permitted to dwell for 1-2 hours and then, drained and sent for cell count with differential and culture[6]. Due to the shorter dwell time than CAPD, the differential of white blood cell count (WBC), %neutrophil count > 50% of total WBC, might be more helpful than total WBC count[6]. In the questionable case, the second exchange is required with a dwell time of at least 2 hours[6]. The pharmacokinetics of antibiotics during APD and CAPD are different[7]. The antibiotic clearances are greater and theirs half-life is shorter during the APD[7]. It is recommended that antibiotic containing dialysate should be dwell at least 6 hours during daytime to provide an adequate antibiotic level in the systemic circulation and peritoneal cavity[6]. The dosing recommendation of antibiotics for APD patients are listed in the new International Society for Peritoneal Dialysis (ISPD) guideline[6]. The incidence of peritonitis in APD has a trend toward lower than CAPD in many, but not all studies[8-11]. The number of connections of APD are generally less than CAPD. For example, using two 5-L bags of PDF per session of APD, patients have




*p-value<0.05 compared with IPP at the beginning (□)

**Fig. 1** Intraperitoneal pressure before and after 2-L infusion of 1.36%glucose PDF for 1 to 7 hours in 11 CPD patients

**Table 1.** Indications for automated peritoneal dialysis treatment

| |
|---|
| Patients having inadequate dialysis and |
| having fast transport peritoneum |
| need high volume PD |
| having hyperv olemia |
| Patients having complications from high intraperitoneal pressure |
| Patients who need freedom or assistance during day time |
| Patients who need tidal PD because of drain problem or pain during exchange |
| Patients having frequent peritonitis |

to do 2 bag connections, 1 transfer set connection and 1 transfer set disconnection with 1 time flush before fill at the beginning. However, flush before fill technique can only prevent the contamination during transfer set connection and disconnection, not during the 2 new 5 L PDF connections. For four cycles of double bags CAPD, patients have to do 4 transfer set connections and 4 transfer set disconnections with 4 times of flush before fill. These may explain why there is no difference in peritonitis rate in both modalities after introducing the flush before fill system. From our data, the rate of peritonitis associated with APD is 1.5-3 times lower than that of CAPD (Table 2). Most of the causes of peritonitis in our CAPD patients is from the change of caregivers by patients' family without effective PD exchange training. This rarely occurs in APD patients because APD is more complicated than CAPD to self-training.

**How to start treatment with the automated peritoneal dialysis? (Table 3)**

Once patients decide to pursue APD as a mean for renal replacement therapy, they should be evaluated for catheter function, peritoneal transport characteristics, body surface area, residual renal function and planned for the initial dialysis prescription. The treatment plan should include the total dialysis volume and total treatment time, the type of PDF, the dwell volume, the dwell time and the number of cycle per session.

In general, most APD patients are dialyzed 9-10 hours per session. To maximize the ultrafiltration (UF), the dwell time which depend on cycles per session or per night must be appropriated. Shortening of dwell time by performing APD more than 5 cycles per session has been shown to reduce the net ultrafiltration due to increasing the inefficient time during fill/drain period[12]. Increasing a dwell volume will increase the small solute clearance[13,14] but it will also increase the IPP which will adversely affect the net UF[5]. In order to minimize this shortcoming and maximize the dialysis efficiency, the optimal dwell volume should be 1.5 L/$m^2$ of body surface area (BSA) or 2.5 L/1.73 $m^2$ or 40 ml/kg[13,15,16]. Increasing the cycle frequency while maintaining the dwell volume per cycle will also increase the small solute clearances due to the increase of total dialysate volume per session[17,18]. It has been reported that the highest small solute clearances can be achieved with 45 minute-cycle of 2 L dwell volume[19]. The total fill volume requirement depends on residual renal function, peritoneal transport characteristic and patient's size[20]. Data from the west countries demonstrated that anuric patients having low transport peritoneum and BSA $\geq$ 2.0 $m^2$ were not suitable for APD[21]. Patients who were high or high average transporters may need more than 15-20 L/day of NIPD to achieve the adequate target of small solute clearances[21]. Due to the intermittent technique, NIPD will impaired the middle molecular weight solute clearances. To enhance the solute clearances, both small and middle molecular solutes, a few daytime dwells are needed. Icodextrin is usually used for a long day-dwell but it is not commonly used in Thailand due to its high cost. Using 1.36%glucose solution in a long day-dwell will cause the positive fluid balance and may compromise the cardiac function. To avoid using hypertonic glucose solution, we modify the day-dwell schedule by adding only 4-8 hours of the 2 day-dwells of 1.36% glucose before or after the NIPD session and leave the peritoneal cavity dry for 6-10 hours. However, some patients may decide to switch to CAPD if they

**Table 3.** How to start treatment with APD

| | |
|---|---|
| hour/session | 10 hours |
| volume/session | 10-15 L* |
| volume/cycle | 1.5 L/$m^2$ or 2.5 L/1.73 $m^2$ or 40 mL/kg |
| time/cycle | 2 hours |
| cycles/session | 5 cycles |
| day-dwell (no RRF) | 2 litrs/dwell, 1-2 cycles |

* depend on residual renal function, body surface area and peritoneal transport characteristics

**Table 2.** Peritonitis rate in CAPD & APD patients at Siriraj Hospital

| | Before 2004 | | 2004-2007 | | 2008-2009 | | 2009-2010 | |
|---|---|---|---|---|---|---|---|---|
| | CAPD | APD | CAPD | APD | CAPD | APD | CAPD | APD |
| Patient-month | 10.4 | 25 | 19 | 43.6 | 40.4 | 75 | 46.8 | 66.4 |
| Episodes/year | 1.15 | 0.47 | 0.98 | 0.25 | 0.26 | 0.16 | 0.25 | 0.18 |

have to perform the other 2 daytime-exchanges in addition to the nighttime PD.

Once patients have started on APD, they should be monitored for small solute clearances and clinical parameters. The dialysis prescription should be adjusted accordingly to the results. The authors do not routinely measure the peritoneal equilibration test (PET) in our CPD patients except in patients having solute clearances or UF problems. Our data showed no difference in urea and creatinine (Cr) removal up to 7 hours between each type of peritoneal transport although there is a trend toward lower Cr removal in the low transport group (Fig. 2). The time that patients have maximal UF and Na removal depended on the transport types, 3 - 4 hours in high (H), high average (HA) transporters and 4 - 6 hours in low average (LA), and low (L) transporters, but they seem to overlap at 4 hours. The UF and Na removal at 1-2 hours are not different between peritoneal transport types. Most of our patients have small body built and their BSA (1.58-1.81 $m^2$) are similar between each transport group.

**Adequacy targets and outcomes (Table 4)**

Assessment of PD adequacy should include small solute clearances, volume status or ultrafiltration, and clinical parameters, *e.g.* patients' well being, physical measurements and impact of treatment on the individual's life[22] A large prospective observational study (EAPOS) in anuric APD patients suggested that survival benefit was demonstrated in patients with ultrafiltration greater than 750 ml[23]. This survival benefit is not seen with small solute clearance[23]. The adequacy targets for APD have not been specifically set. Most guidelines currently use small solute clearance target of CAPD for APD (Table 4). The European Best Practice Guideline (EBPG 2005)[24] suggests that anuric APD and CAPD patients should have the weekly peritoneal Kt/Vurea (pKt/Vurea) $\geq$ 1.7 with the net UF $\geq$ 1 L/day and APD patients with low transport peritoneum should also have weekly normalized peritoneal creatinine clearance (pCCr) $\geq$ 45 L/1.73 $m^2$, the same as The ISPD guidelines (ISPD 2006)[25]. Residual renal function (RRF) can be a part of the total small solute clearances. This weekly total Kt/Vurea (tKt/Vurea) target ($\geq$ 1.7) is also recommended by The UK Renal Association (UK 2010)[26] and The Canadian Society of Nephrology (CSN 2011)[27]. The Caring for Australians with Renal Impairment (CARI)[22] 2006 sets the minimal target of weekly pKt/V to 1.6 for both CAPD and APD patients. Patients with H or HA transport peritoneum should have weekly pCCr $\geq$ 60 L/1.73 $m^2$ while the L and LA transporters should have weekly

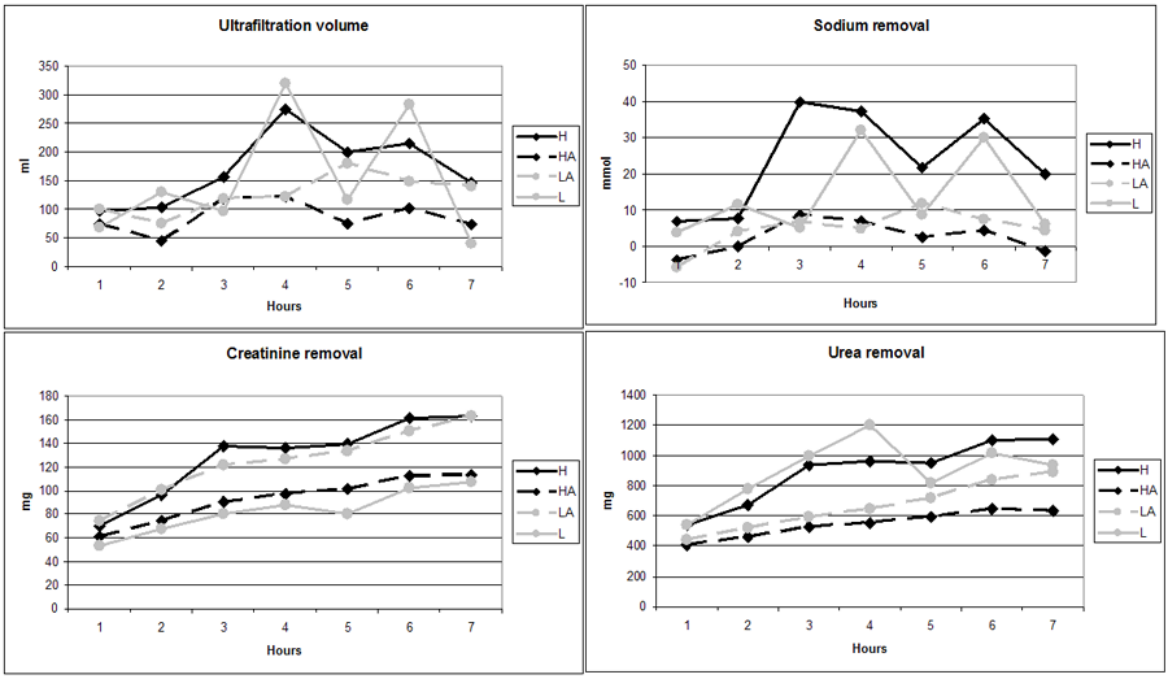



**Fig. 2** Urea, creatinine, sodium and fluid removal in different types of peritoneal transport

pCCr ≥ 50 L/1.73 m$^2$. No specific targets for APD patients are provided by The Kidney Disease Outcomes Quality Initiative guideline (KDOQI 2006)[28]. When APD was compared to CAPD, the meta-analysis of 3 randomized controlled trials did not show any different in clinical outcomes as defined by dialysis adequacy, survival of patient, technique, and catheter, PD-related infections and complications, hospitalization, deterioration of RRF, and quality of life[9].

In Siriraj PD program, the small solute clearances are not different between CAPD and APD groups (Table 5). The weekly total Kt/Vurea (tKt/Vurea) of CAPD and APD are 2.15 and 2.25 repectively. Eighty-seven percent of CAPD and 88% of APD patients can achieve the adequate target of weekly tKt/Vurea (≥ 1.7). These numbers are reduced in anuric patients (85% for CAPD and 76.5% for APD, Table 6). Overall, most of our anuric APD patients dialyzed with 10 L NIPD are able to meet the minimal tKt/Vurea target. Weekly normalized total CCr (tCCr) is also similar between the two modalities (65 L/1.73 m$^2$ for CAPD and 61 L/1.73 m$^2$ for APD). However, APD group has higher weekly normalized glomerular filtration rate (nGFR) but lower weekly pCCr than CAPD group. Ninety percent of CAPD and 76% of APD patients have tCCr ≥ 45 L/week. In contrast to the Kt/Vurea, 92% of anuric CAPD patients and only 50% of anuric APD patients still have weekly pCCr ≥ 45 L/week (Table 6). Before the year 2007, only fifty percent of both APD and CAPD patients survive up to 2 years (Fig. 3). Most of our CPD patients are elderly (average age = 68 ± 13 year-old) and have many comorbidities at the starting time (demonstrated by the Age adjusted Charlson Comorbidity Index (CCI)

**Table 5.** Small solute clearances and nutritional status of Siriraj's CPD patients

| | CAPD(30) | APD(42) |
|---|---|---|
| Age (year) | 64.3* | 71.5* |
| Age adjusted CCI score | 7.8 | 8.0 |
| Weekly renal Kt/Vurea | 0.29 | 0.49 |
| Weekly pKt/Vurea | 1.92 | 1.76 |
| Weekly tKt/Vurea | 2.15 | 2.25 |
| Weekly nGFR | 16.28 | 25.57 |
| Weekly pCCr | 50.56* | 35.72* |
| Weekly tCCr | 65.15 | 61.29 |
| nPNA (g/kg) | 0.89* | 1.05* |
| Serum albumin (g/dL) | 3.17 | 3.08 |

*p < 0.05, CCI: Charlson Comorbidity Index

**Table 6.** Small solute clearances and nutritional status of Siriraj's anuric CPD patients

| | CAPD(14) | APD(17) |
|---|---|---|
| Age (years) | 59.8 | 71.8 |
| Age adjusted CCI score | 7.43 | 8.47 |
| Weekly pKt/Vurea | 2.08 | 2.13 |
| Weekly pCCr | 55.83* | 43.77* |
| nPNA (g/kg) | 0.87* | 1.07* |
| Serum albumin (g/dL) | 3.23 | 2.68 |

*p < 0.05

**Table 4.** Adequacy targets of automated peritoneal dialysis

| Guidelines | Modalities | Weekly targets |
|---|---|---|
| EBPG 2005 | CAPD, APD | pKt/Vurea ≥ 1.7, APD pCCr ≥ 45, UF ≥ 1L |
| ISPD 2006 | CAPD, APD | tKt/Vurea ≥ 1.7, APD tCCr ≥ 45 euvolemia |
| CARI 2006 | CAPD, APD | pKt/Vurea ≥ 1.6,<br>H,HA pCCr ≥ 60,<br>L,LA pCCr ≥ 50 |
| KDOQI 2006 | CAPD | urine > 100, tKt/Vurea ≥ 1.7<br>urine ≤ 100, pKt/Vurea ≥ 1.7<br>euvolemia |
| UK 2010 | CAPD, APD | tKt/Vurea ≥ 1.7, tCCr ≥ 50 |
| CSN 2011 | CAPD, APD | pKt/Vurea ≥ 1.7<br>euvolemia |

The unit of CCr is L/1.73 m$^2$, p: peritoneal, t: total

Score = 8, Table 5). Twenty five and 40% of the patients died within 3 and 6 months respectively. This high mortality rate might be from the delay of dialysis treatment. Most of our patients, refused to initiate dialysis unless they had serious complications such as congestive heart failure or severe metabolic derangements. The authors have acknowledged this situation and have set up the prePD clinic within the CPD clinic to educate patients about the risk and benefit of proper timing of initiation of dialysis. Currently, the mortality rate dramatically decreases from 35% to 11% at the first year and 50% to 15% at the second year (Table 7). The catheter survival is 95% at 1 year in both modalities. The 1-year technique survival of APD patients is significantly better than CAPD patients (93% vs. 84%, $p < 0.05$, Fig. 4). The normalized protein nitrogen appearance (nPNA) of APD patients is significantly higher than CAPD patients, both who have significant RRF and anuric patients (Table 5 and 6).

## Conclusion

The development of the APD technology enables physician to customize PD treatment for optimal dialysis. Dialysis dose can be increased with APD alone or in conjunction with daytime dwells. Although there is no strong evidence of the advantage over CAPD, APD is generally recommended for patients having a high peritoneal transport, outflow problems or high intraperitoneal pressure and those who depend on the caregivers to do their dialysis. The benefits of APD over CAPD depends on the problems and treatment results among dialysis centers. The recommended starting prescription for APD is the dwell volume of 1,500 ml/m$^2$, 2 hours/cycle, and 5 cycles/session, which will provide 10-15 L of total volume and 10 hours per session. Small solute clearances and ultrafiltration depend on the peritoneal catheter function and dialysis schedule. The clinical parameters and small solute clearances must be monitored and adjust accordingly to meet the guidelines targets. The authors experiences suggest that NIPD performed at 10 L can achieve the tKt/Vurea target in the majority of our CPD patients and the incidence of peritonitis is significantly reduced with APD.

**Table 7.** Patient and technique survival of Siriraj's CPD patients

| | 2004-2007 | 2007-2008 | 2009-2010 |
|---|---|---|---|
| | Patient survival | | |
| 1 year | 65% | 70% | 89% |
| 2 year | 50% | 65% | 85% |
| | Technique survival | | |
| 1 year | 86% | 86% | 97.3% |

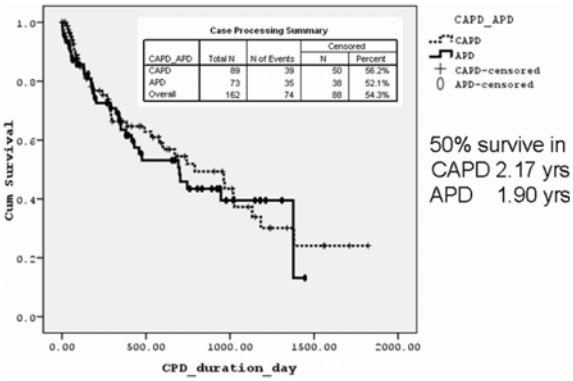



**Fig. 3** Survival of Siriraj's CAPD & APD patients before the year 2007

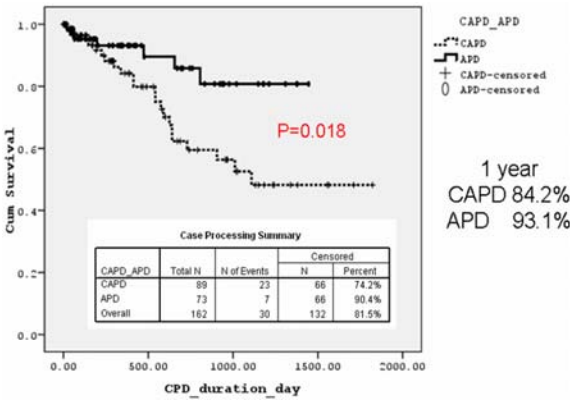



**Fig. 4** Survival of CAPD & APD techniques in Siriraj Hospital


## Acknowledgment

Special thanks to Dr. Nalinee Premasathian for her invaluable database design and development, Miss Pongpen Boonkleang and Miss Nattaporn Jitsuwantaya for all database collection. I want to thank Dr. Krairerk Athirakul who looked closely at the final version of this work for English style and grammar, correcting both and offering suggestions for improvement.


## Potential conflicts of interest

None.

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## แนวทางการปฏิบัติและการรักษาผู้ป่วยโดยวิธีการล้างไตทางช่องท้องด้วยเครื่องอัตโนมัติ

***สุชาย ศรีทิพยวรรณ, สุกิจ นิลวรางกูร, นิภา อัยยสานนท์, ปานทิพย์ เจตนาวณิชย์, สมเกียรติ วสุวัฏฏกุล***

*ปัจจุบันการล้างไตทางช่องท้องด้วยเครื่องอัตโนมัติ (automated peritoneal dialysis, APD) มีการพัฒนาก้าวหน้าอย่างมาก ทำให้สามารถเพิ่มและปรับเปลี่ยนการรักษาให้เหมาะสมกับผู้ป่วยได้ดียิ่งขึ้น แม้ว่ายังไม่มีหลักฐานที่แน่ชัดว่าการรักษาด้วยวิธี APD จะดีกว่าวิธี continuous ambulatory peritoneal dialysis (CAPD) แต่ผู้ป่วยที่น่าจะได้ประโยชน์จากการรักษาด้วยวิธี APD ได้แก่ ผู้ป่วยที่มีเยื่อบุช่องท้องชนิด high transport ผู้ป่วยที่มีปัญหาในการปล่อยน้ำยาออกจากช่องท้องหรือมีความเจ็บปวดระหว่างการปล่อยน้ำยาเข้าออก ผู้ป่วยที่มีผลแทรกซ้อนจากความดันในช่องท้องสูง ได้แก่ ไส้เลื่อน และผู้ป่วยที่ต้องอาศัยญาติในการล้างไตทางช่องท้องให้แต่ญาติต้องทำงานในเวลากลางวัน (เป็นข้อบ่งชี้ที่พบบ่อยที่สุดในโรงพยาบาลศิริราช) ข้อดีของ APD เมื่อเทียบกับ CAPD ขึ้นกับปัญหาและผลการรักษาในแต่ละสถานที่ ก่อนเริ่มการรักษาด้วยวิธี APD ควรประเมินสภาพร่างกาย จิตใจ และฐานะการเงินของผู้ป่วย, การทำงานของไตที่เหลือ, ลักษณะของเยื่อบุช่องท้อง, พื้นที่ผิวของร่างกายผู้ป่วย และความสะดวกของการไหลเข้าออกช่องท้องของน้ำยา ผู้ป่วยที่มีขนาดรูปร่างปานกลาง มีเยื่อบุช่องท้องที่ไม่ใช่ low transport และยังมีการทำงานของไตเหลืออยู่ ควรเริ่มการรักษาโดยใช้ปริมาตรของน้ำยาล้างไตทั้งหมด 10 ลิตร ใช้เวลา 10 ชั่วโมงต่อคืน คืนละ 5 รอบ, ปริมาตรของน้ำยาล้างไตต่อรอบประมาณ 1,500 มิลลิลิตร ต่อ ตารางเมตรของพื้นที่ผิวร่างกายต่อรอบ โดยตรวจวัดให้มีค่าความดันในช่องท้องไม่เกิน 18 เซนติเมตรน้ำ และอาจล้างไตเฉพาะเวลากลางคืนได้ข้อมูลจากประเทศทางตะวันตกพบว่าผู้ป่วยที่ไม่มีการทำงานของไตเหลืออยู่ควรปรับปริมาตรของน้ำยาล้างไตทั้งหมดเป็น 15-20 ลิตร และควรล้างไตเพิ่มในเวลากลางวันด้วยน้ำยาไอโคเด็กซตริน 2 ลิตร 1 รอบ หรือน้ำยาชนิดที่มีกลูโคส 1-2 รอบ โดยปรับเพิ่มการรักษาให้ได้ค่า weekly total Kt/V urea ≥ 1.7 ในรายที่มีเยื่อบุช่องท้องแบบ low transport ควรมีค่า weekly normalized total creatinine clearance ≥ 45 ลิตร/พื้นที่ผิวร่างกาย 1.73 ตารางเมตร และควรมีปริมาตรของสารน้ำและโซเดียมในร่างกายที่ปกติ ทั้งนี้ต้องพิจารณาอาการทางคลินิกอื่นๆและคุณภาพชีวิตของผู้ป่วยร่วมด้วยเสมอ ผู้ป่วยที่ไม่เหมาะต่อการรักษาด้วยวิธี APD ได้แก่ ผู้ป่วยที่ไม่มีการทำงานของไตเหลืออยู่ ร่วมกับมีพื้นที่ผิวร่างกายมากกว่า 2 ตารางเมตร และมีเยื่อบุช่องท้องแบบ low transport การวินิจฉัยการติดเชื้อในช่องท้องในผู้ป่วย APD ที่ทำเฉพาะในเวลากลางคืน ทำได้โดยการใส่น้ำยาเข้าช่องท้อง 1 ลิตร และค้างไว้นาน 2 ชั่วโมง ก่อนปล่อยน้ำยาออกมาส่งตรวจ ร้อยละของเซลล์นิวโตรฟิลที่มากกว่า 50 มีความสำคัญกว่าจำนวนเซลล์ทั้งหมดในน้ำยาล้างไตในการวินิจฉัยภาวะติดเชื้อในช่องท้อง ข้อมูลผู้ป่วยในโรงพยาบาลศิริราชพบว่าผู้ป่วย APD มีการติดเชื้อในช่องท้องน้อยกว่าผู้ป่วย CAPD 1.5-3 เท่า และผู้ป่วยที่ไม่มีการทำงานของไตเหลืออยู่เมื่อรักษาด้วยวิธี APD เฉพาะเวลากลางคืน 10 ลิตรต่อคืน ส่วนใหญ่จะมีค่า weekly total Kt/Vurea ≥ 1.7 ตามเป้าหมาย*