The Outcome of Continuous Ambulatory Peritoneal Dialysis Therapy under the Universal Coverage Scheme in Maharat Nakhon Ratchasima Hospital: the First Year of Peritoneal Dialysis Policy

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Background: Since 2008, a government has subsidized the package to cover chronic ambulatory peritoneal dialysis (CAPD) for end stage renal disease (ESRD) patients under the universal coverage scheme (UCS) in Thailand. The aim of the program is to keep longer life in poor people instead of death due to inaccessibility to renal replacement therapy as usual. Maharat Nakhon Ratchasima Hospital has been the first hospital in Nakhon Ratchasima Province that began CAPD program under the UCS for ESRD patients. **Objective:** To evaluate the clinical outcome of the patients with CAPD therapy at Renal unit, Maharat Nakhon Ratchasima Hospital, during the first year under the Universal Coverage Health System (UC). **Patients & Methods:** Medical records of adults with newly diagnosed ESRD undergoing CAPD under UC in Maharat Nakhon Ratchasima Hospital during January 1-December 31, 2008 were reviewed. The collected data included demographic details, underlying diseases, body mass index (BMI), laboratory findings, peritonitis rate, death rate, technique failure and referral to other centers until December 31, 2008. The catheter survival analysis was also performed. **Results:** Fifty-five ESRD patients were recruited, mean age was 47.9$\pm$14.2 years (range 15.4-76.8 years) and mean BMI was 22.4$\pm$3.3 kg/m^2 (range 17.6-30.2 kg/m^2). The common causes of ESRD were hypertension in 27.3% and diabetes mellitus in 18.2%. Laboratory findings in CAPD patients were anemia (100%), hypoalbuminemia (72.5%) and hypokalemia (49%). Tenckhoff catheters were inserted by nephrologists in 63.6% and by surgeons in 36.4%. The complications of Tenckhoff catheter insertion occurred in 20% of patients including abdominal bleeding, bowel perforation, bladder perforation, and catheter malposition. In the follow up period, 41 patients continued the treatment over a total observation period of 276.5 patient-months (mean 5.1$\pm$3.9 months, median 3.8 months). The mean time for the first episode of peritonitis was 10.7 patient-months per episode. At the end of December 31, 2008, one patient was referred to another center, 74.5% continued on CAPD, 7.3% switched to hemodialysis, 16.4% died (7 from sepsis and 2 cases from abdominal bleeding). **Conclusion:** The results suggested

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that the patient survival rate was low in our CAPD unit so we need to gain more experience with Tenckhoff insertion technique and with management of peritonitis in CAPD patients to increase the survival rate of our CAPD patients

Keywords: Continuous ambulatory peritoneal dialysis, Universal coverage, PD first, Outcome, Thailand

บทคัดย่อ: ผลของโครงการล้างไตทางช่องท้องภายใต้ระบบประกันสุขภาพถ้วนหน้า ในโรงพยาบาลมหาราชนครราชสีมา; ผลการดำเนินการ 1 ปี

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ภูมิหลัง: ตั้งแต่ต้นปีพ.ศ. 2551 เป็นต้นมา รัฐบาลอนุมัติให้ผู้ป่วยโรคไตเรื้อรังระยะสุดท้ายภายใต้โครงการประกันสุขภาพถ้วนหน้าสามารถเข้าถึงการรักษาด้วยวิธีการล้างไตทางหน้าท้องโดยไม่เสียค่าใช้จ่าย โดยหวังให้ผู้ป่วยมีอายุยืนยาวขึ้น โรงพยาบาลมหาราชนครราชสีมาเป็นโรงพยาบาลแรกในจังหวัดนครราชสีมาที่ได้เข้าร่วมโครงการล้างไตทางช่องท้องภายใต้ระบบประกันสุขภาพถ้วนหน้า **วัตถุประสงค์:** เพื่อติดตามผลการดำเนินงานและประเมินผลการรักษาของผู้ป่วยไตวายระยะสุดท้ายที่เข้าร่วมโครงการล้างไตทางช่องท้องภายใต้ระบบประกันสุขภาพถ้วนหน้าที่หน่วยไต โรงพยาบาลมหาราชนครราชสีมา ระยะเวลา 1 ปี **ผู้ป่วยและวิธีการ:** ศึกษาข้อมูลผู้ป่วยไตวายเรื้อรังระยะสุดท้ายที่ล้างไตทางช่องท้องรายใหม่ภายใต้ระบบประกันสุขภาพถ้วนหน้าที่หน่วยไต โรงพยาบาลมหาราชนครราชสีมา ระหว่างวันที่ 1 มกราคม พ.ศ. 2551-วันที่ 31 ธันวาคม พ.ศ. 2551 โดยเก็บข้อมูลพื้นฐาน, โรคประจำตัว, ดัชนีมวลกาย, ผลตรวจทางห้องปฏิบัติการ, อัตราการติดเชื้อในช่องท้อง, อัตราตาย, ความล้มเหลวทางเทคนิค, รวมไปถึงอัตรารอดชีวิตของผู้ป่วย **ผลการศึกษา:** พบผู้ป่วย 55 ราย อายุเฉลี่ย47.9±14.2 ปี (พิสัย15.4-76.8 ปี) ดัชนีมวลกาย22.4±3.3 กิโลกรัมต่อตารางเมตร (พิสัย 17.6-30.2 กิโลกรัมต่อตารางเมตร) สาเหตุของโรคไตที่พบบ่อยได้แก่ โรคความดันโลหิตสูง ร้อยละ 27.3 และโรคเบาหวาน ร้อยละ 18.2 พบว่าผู้ป่วยมีความผิดปกติดังนี้ มีภาวะซีด ร้อยละ 100, มีระดับอัลบูมินในเลือดต่ำ ร้อยละ 72.5, มีระดับโปแตสเซียมในเลือดต่ำ ร้อยละ 49 ผู้ป่วยได้รับการวางสายล้างไตโดยอายุรแพทย์โรคไต ร้อยละ 63.6 และศัลยแพทย์ ร้อยละ 36.4 มีภาวะแทรกซ้อนจากการวางสายล้างไตทางช่องท้องร้อยละ 20 (ได้แก่ เลือดออกในช่องท้อง, ลำไส้ทะลุ, กระเพาะปัสสาวะทะลุและสายผิดตำแหน่ง) มีผู้ป่วย 41 รายที่ได้รับการติดตามการรักษาตลอดระยะเวลาในการศึกษาทั้งหมด 276.5 ผู้ป่วย-เดือน (เฉลี่ย 5.1±3.9 เดือน, ค่ามัธยฐาน 3.8 เดือน) ค่าเฉลี่ยระยะเวลาปลอดจากการติดเชื้อในช่องท้องเท่ากับ 10.7 ผู้ป่วย-เดือน เมื่อสิ้นสุดการศึกษาอัตรารอดชีวิตของผู้ป่วยเป็นร้อยละ 83.3 และมี ผู้ป่วยที่รักษาด้วยการล้างไตทางช่องท้องร้อยละ 75.9, เปลี่ยนไปฟอกเลือดร้อยละ 16.4, เสียชีวิตร้อยละ 16.4 (จากการติดเชื้อ 7 รายและเลือดออกในช่องท้อง 2 ราย) **สรุป:** ผลการศึกษาพบว่าอัตรารอดชีวิตของผู้ป่วยล้างไตทางช่องท้องใน โรงพยาบาลมหาราชนครราชสีมาค่อนข้างต่ำ ดังนั้นแพทย์จำเป็นต้องได้รับประสบการณ์การวางสายช่องท้องและการดูแลการติดเชื้อในช่องท้องอย่างเหมาะสมเพิ่มเติมเพื่อเพิ่มอัตรารอดชีวิตของผู้ป่วยล้างไตทางช่องท้องต่อไป

คำสำคัญ: แนวทางการดูแลผู้ป่วยล้างไต, การล้างไตทางหน้าท้อง, อัตรารอดชีวิต, ปัจจัยที่มีผลต่ออัตรารอดชีวิต

The end stage renal disease (ESRD) has increased prevalence every year[1,2]. Many ESRD patients have suffered from uremia. The standard treatment of ESRD is renal replacement therapy (RRT) including hemodialysis (HD), continuous ambulatory peritoneal dialysis (CAPD) and kidney transplantation[3-5]. In the first 2 years, survival rate for peritoneal dialysis is better than HD and then they are similar in long term survival[6]. All modalities of RRT are the high-cost medical treatments.

In Thailand, there are three main health care schemes pursuing or providing health care to population. They are the universal coverage scheme (UCS), the social security scheme (SSS), and the civil service medical benefits scheme (CSMBS). The management of ESRD including RRT had not been covered by UCS before January 1, 2008.

Since 2008, Ministry of Public Health of Thailand was strongly supported by the National Health Security Office (NHSO) to extend a benefit package to cover CAPD for ESRD patients under UCS. ESRD patients who decided to choose CAPD were registered at each center. In Nakhon Ratchasima province, our unit has been the first hospital that began CAPD program under UCS for ESRD patients. To determine therapeutic results, this study was performed.

Patients and Methods

Medical records of fifty-five adults with newly diagnosed ESRD who underwent CAPD under UCS in Maharat Nakhon Ratchasima Hospital during January 1, 2008-December 31, 2008 were reviewed.

Inclusion criteria: All of adult-ESRD patients who received CAPD under UCS since January 1, 2008 in Maharat Nakhon Ratchasima Hospital and followed up until death, technique failure, referral to other centers or until December 31, 2008. Technique failure was defined by changing the treatment to hemodialysis or remove Tenchkoff catheter.

Exclusion criteria: Patient's age below 15 years, patients who started CAPD before January 1, 2008.

The data collection consisted of demographic details, underlying diseases, body mass index (BMI), laboratory findings containing hemoglobin, hematocrit, blood urea nitrogen, serum creatinine, serum electrolyte, serum calcium, serum phosphate, serum albumin, parathyroid hormone (PTH), and peritonitis rate.

Statistical analysis with Kaplan-Meier analysis for Tenckhoff catheter and patient survival were performed.

Results

Fifty-five ESRD patients fulfilled the inclusion criteria. The baseline clinical characteristics were shown in Table 1. Thirty males (54.5%) and twenty-five females (45.5%) had mean age 47.9$\pm$14.2 years (range 15.4-76.8 years) and mean body mass index 22.4$\pm$3.3 kg/m^2 (range 17.6-30.2 kg/m^2). The causes of ESRD were hypertension 15 cases (27.3%), diabetes mellitus 10 cases (18.2%), chronic glomerulonephritis 10 cases (18.2%), renal calculi 5 cases (9.1%), and lupus nephritis 2 cases (3.6%) while the rest were unclassified in 10 cases (18.2%). Three cases (5.5%) had infection (2 cases were hepatitis B carriers and 1 case had positive serology for HIV antibody). Only 22 cases (40%) performed peritoneal equilibrium test.

The laboratory findings of the 55 CAPD patients had been followed and recorded during dialysis period. Mean hemoglobin was 8.5$\pm$1.2 g/dL (5.9-10.9). Mean

serum potassium was 3.6±0.7 mEq/L (2.0-5.9). Twenty-five patients (49%) had serum potassium less than 3.5 mEq/L. Mean serum albumin was 3.2±0.5 g/dL (1.9-4.2) whereas 37 patients (72.5%) had level of serum albumin below 3.5 g/dL. Only 14 patients (27.5%) had serum albumin level equal or above 3.5 g/dL. Mean PTH level was 344.5±472.3 pg/dL (5.1-2,724.1), 10 patients (25.6%) had parathyroid hormone level below a certain level, 8 patients (20.5%) had parathyroid hormone level above 500 pg/dL and one of them had parathyroid mass and parathyroidectomy was done. (Table 2)

Table 1 Baseline clinical characteristics of CAPD patients

Baseline clinical characteristics	Cases (%) n=55
Gender	
male	30 (54.5%)
female	25 (45.5%)
Mean age (±SD)-year (range)	47.9±14.2 (15.4-76.8)
Underlying disease	
Hypertension	15 (27.3%)
Diabetic kidney disease	10 (18.2%)
Chronic glomerulonephritis	10 (18.2%)
Renal calculi	5 (9.1%)
Lupus nephritis	2 (3.6%)
Infection	3 (5.5%)
- Hepatitis B carrier	2
- HIV infection	1
Unclassified renal disease	10 (18.2%)
Mean weight (±SD)- kg	58.0±9.8
Mean body mass index (±SD)-kg/m^2 (range)	22.4±3.3 (17.6- 30.2)
< 18.5	3 (6.5%)
18.5-25	34 (73.9%)
> 25	9 (19.6%)

In subgroup univariate analysis for serum albumin; Mean serum albumin was 3.2±0.5 g/dL; (72.5% of patients had hypoalbuminemia), but in this study the technique failure survival in group of serum albumin <3.5 g/dL was similar to that of group of serum albumin ≥3.5 g/dL (3.28 per 100 patient-month vs. 1.57 per 100 patient-month; p=0.42). Tenckhoff catheters were inserted by nephrologists in 63.6% and by surgeons in 36.4%. During the follow up period, 41 incidents of CAPD patients occurred over total observation period of 276.5 patient-months. Mean of Tenckhoff catheter survival time was 5.1±3.9 months, median time was 3.8 months. At December 31, 2008, Tenckhoff catheter survival was 75.9% (Figure 1) and patient survival was 83.3%. (Figure 2) Mean peritonitis rate was one episode per 10.7 patient-months. Technique failure was 25.5%. Eleven patients (20.0%) had complications from Tenckhoff catheter implantation. Two patients (3.6%) had serious abdominal bleeding that caused death, one

Table 2 Mean of laboratory findings

	Mean±SD (range)
Hemoglobin (g/dL)	8.5±1.2 (5.9-10.9)
Hematocrit (vol%)	25.5±3.6 (17.7-32.0)
Blood urea nitrogen (mg/dL)	52.9±29.9 (8.0-185.4)
Serum creatinine (mg/dL)	9.9±4.2 (1.7-22.7)
Serum electrolyte (mEq/L)	
- Sodium	136.4±4.2 (121.2-141.9)
- Potassium	3.6±0.7 (2.0-5.9)
- Bicarbonate	27.3±3.2 (16.0-34.1)
Serum calcium (mg/dL)	9.1±0.9 (7.5-11.1)
Serum phosphate (mg/L)	4.6±1.6 (1.7-8.5)
Serum albumin (g/dL)	3.2±0.5 (1.9-4.2)
Parathyroid hormone (pg/ml)	344.5±472.3 (5.1-2724.1)

patient (1.8%) had bowel perforation and needed change to receive hemodialysis, one patient (1.8%) had bladder perforation but still continued on CAPD. Later on, six patients (10.9%) had mal-position of Tenckhoff catheter that needed catheter revision. (Table 3)

There were 26 peritonitis episodes. The mean duration from starting CAPD to the first episode of peritonitis was 10.7 patient-months per episode. The peritonitis free survival was shown in the figure 3. Forty-one patients (74.5%) had no peritonitis, six patients (10.9%) had 1 episode, six patients (10.9%) had 2 episodes, and two patients (3.6%) had 4 episodes. Regarding causative organisms, 21 episodes of peritonitis (80.8%) had negative culture. Four episodes (15.4%) had positive culture for *Staphylococcus aureus (S aureus)*. *Escherichia coli* was found in one episode (3.8%). The relapsed peritonitis had been found in 8 patients (14.5%), only one patient had relapsed peritonitis which was caused by *S aureus* and needed to change to hemodialysis. (Table 4)

Fifty-five ESRD patients were followed up during one year. At the end of the period, 1 patient was referred to another center, 41 patients (74.5%) continued on CAPD, 4 patients (7.3%) had switched to hemodialysis, 9 patients (16.4%) died (7 from sepsis and 2 from abdominal bleeding.

Table 3 Complications of Tenckhoff catheter insertion

Complications	Cases (%) n=55
- malformation	6 (10.9)
- Abdominal bleeding	2 (3.6)
- Bowel perforation	1 (1.8)
- Bladder perforation	1 (1.8)
- Exit site infection	1 (1.8)
Total	11 (20.0)

Discussion

The standard guidelines for management in ESRD is RRT[3-6]. Huang CC et al showed that survival rate of PD was better than that of HD in the first two years, but no significant difference in long term follow up[6]. CAPD mode needs less resource as compared with hemodialysis[7]. In Thailand, a large cohort study of Thai CAPD patients showed that CAPD patients had patient survival rate at 1 year of 84% which was lower than that in Taiwan (89.8%)[6,8]. The risk factors that increased mortality rate were diabetes mellitus, old age, hypoalbuminemia[8,9]. Stack AG et al presented that BMI<20.9 kg/m^2 could increase relative risk of death in CAPD patients[10] which the obese patients had equivalent survival to the patients with normal BMI[11]. In the past, peritonitis was a leading cause of mortality (about 0.8%-12.5%) while technique failure was 30-40% in CAPD patients[12]. The factors that associated with increased risk of peritonitis were low baseline serum albumin[13,14] and anemia[15].

Table 4 Causative organisms of peritonitis/episode

Causative organisms	Peritonitis episodes (%)
Staphylocoocus aureus	4 (15.4)
Esherichia coli	1 (3.8)
No growth	21 (80.8)

This study reported CAPD patients from a general hospital in the northeast of Thailand. Before 2008, there were only 9 patients receiving CAPD in Maharat Nakhon Ratchasima Hospital. Since January 1, 2008, many ESRD patients were registered to CAPD program under UCS,

the numbers of CAPD patient increased so fast. This study recruited the ESRD patients under UCS who received CAPD mode in one year follow up in our facility. The limitation of the study was small sample size and short follow up. Fifty-five patients were studied. Mean age of the patients was 47.9±14.2 years. Underlying causes of ESRD were hypertension 27.3%, diabetic kidney disease 18.2%, and chronic glomerulonephritis 18.2%. At the end of study, patient survival rate was 83.3% and there were 41 patients continuing CAPD therapy (75.9%). Mean Tenckhoff catheter survival time was 5.1±3.9 months, median time was 3.8 months, technical failure was 25.5%, and mean peritonitis rate was one episode per 10.7 patient-months. This rate was very high, because the PD policy was in early phase and CAPD therapy mode needed more experience and our study had short duration of follow up period, so we needed long term follow up to show better data in the future. Peritonitis was common in our CAPD patients but the causative organism could not be cultured in majority of cases (80.8%). According to a guideline for catheter insertion, all of ESRD patients would be administered intravenous antibiotics before catheter insertion and intraperitoneal antibiotics after catheter insertion. For the method of PDF collection for culture, we had collected in sterile hemoculture bottle. These were the reasons why the rate of negative culture of peritonitis was so high in this study. Two patients had relapsed peritonitis that were caused by *S aureus* and needed the catheter removal. Furthermore, we needed to find out the source of *S aureus* eg. nasal cavity, and the care giver needed to be trained about PD technique and dressing care for patients. Chow et al observed a significant increase in risk of developing peritonitis in cases of decreased baseline serum albumin in a Chinese population[13]. In this study, 72.5% of patients had hypoalbuminemia, technical failure was 25.5%. Due to small sample size and short follow up period, the result of technical failure survival had no significant difference in subgroup analysis between groups of serum albumin <3.5 g/dL vs.≥3.5 g/dL (p=0.42) and Sirivongs D et al showed that a 1% increase in the level of hematocrit decreased the risk of developing peritonitis by 3% and if the level of baseline serum albumin was increased by 1 g/dL, the risk of peritonitis would decrease by 27%[15]. In this study, all cases were anemic despite receiving erythropoietin therapy, so subgroup analysis for anemia and peritonitis risk were not performed.

The catheters were inserted by nephrologists (63.6%) and by surgeons (36.4%). The most common cause of catheter failure in other study was infection, but there were frequent complications from catheter implantation (20%) in this study such as severe abdominal bleeding that caused death and hollow viscus perforation. For PD First Policy in Thailand, the CAPD patients were increased too fast, NHSO should encourage the nephrologist and surgeons to be trained about implant technique and the CAPD nurse for training program. The most common cause of catheter failure in other study was infection. The common cause of death was infection that we didn't know whether it related to peritonitis or other conditions.

Finally, even the sample size was small and the follow up period was quite short, it represented our early experience on the first year of CAPD treatment performed in UCS patients that we would like to share. The obstacle and pitfall should be overcome to strengthen the PD first policy in Thailand.

Conclusion

The CAPD policy for ERSD patients under UCS have launched since January 1, 2008. The outcome in our facility was rather poor due to high morbidity and mortality. To improve patient and technique survivals, catheter implantation technique should be improved, early detection and treatment of complications should also be ensured.

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