A Single-Centre Experience: Peritoneal Dialysis-Related Infections in Patients on Long-Term Dialysis

Viravarn Luvira MD*, Bancha Satirapoj MD**,
Ouppatham Supasyndh MD**, Amnart Chaiprasert MD**,
Prajej Ruangkanchanasetr MD**, Naowanit Nata MD**,
Inseey Kanjanakul MD**, Thanom Supaporn MD**,
Panbuppa Choovichian MD**, Sutachard Bijaphala MD**,
Usana Luvira MD**, Danabhand Phiboonbanakit MD***

** Department of Clinical Tropical Medicine, Faculty of Tropical, Mahidol Univesity, Bangkok, Thailand*
*** Division of Nephrology, Department of Medicine, Phramongkutklao Hospital and College of Medicine, Bangkok, Thailand*
**** Division of Infectious Disease, Department of Medicine, Phramongkutklao Hospital and College of Medicine, Bangkok, Thailand*

Objective: *Peritoneal dialysis is a convenient way of maintaining patients with end stage renal disease (ESRD) and in the present days, the Thai government supports all payments for ESRD patients. Continuous ambulatory peritoneal dialysis-(CAPD) related infections are the major cause of morbidity and mortality. The present study was conducted to identify the incidence and epidemiological data of CAPD-related infection.*
Material and Method: *Medical records of 333 CAPD patients attending the Dialysis Unit of Phramongkutklao Hospital from January 1983 to June 2007 were reviewed. The historical cohort study was focused on the incidence of CAPD-related infections, causing pathogens, risk factors, and patient outcome.*
Results: *In total, 73.3% of episodes developed peritoneal infection. The incidences of peritonitis, exit site infection, and tunnel infection were 0.864, 0.213, and 0.034 episodes per patient per year, respectively. The most common infecting organisms were gram positive cocci (49.1%). The main pathogens were Coagulase-negative staphylococcus (15.9%), Staphylococcus aureus (15.2%) and Pseudomonas spp. (14.2%). CAPD-related infections increased in patients who had age > 60. A total of 81% of the infections responded to initial antibiotic therapy administered in the dialysis fluid. Overall, there were 10 episodes (1.9%) of the refractory group and 83 episodes (15.4%) of peritoneal catheter loss, with an overall mortality rate of 1.1%. Non-vancomycin based regimens were applied in 63.9% of peritoneal infected patients.*
Conclusion*: The authors' center's CAPD-related infection rate achieved the International Society for Peritoneal Dialysis (ISPD) recommendation. A significantly enhanced incidence of CAPD-related infection occurred in advanced age. Coagulase-negative staphylococcus is still a very common organism that generally responds well to antibiotic therapy.*

Keywords: *CAPD, Peritonitis, ISPD recommendation, Advanced age*

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Continuous ambulatory peritoneal dialysis (CAPD) is a successful maintenance dialysis technique for end stage renal disease (ESRD) patients. Catheter-related infections and peritonitis are major causes of technical failure in CAPD patients. Many studies indicate that infection is a strong predictor of morbidity and mortality in maintenance dialysis patients[1-3]. Although peritonitis rates appear to be decreasing since the more widespread use of disconnect devices for dialysis exchanges[4,5], catheter infections remain a significant problem[6,7]. The incidence of peritonitis varies, but a rate of between 1.1 and 1.3 patient-episodes per year has been reported[8]. Exit site infections also vary in incidence: a rate of 0.76 patient-episodes per year has been reported[9]. At present, the Thai government supports all payments for ESRD patients. In this retrospective study, the authors reviewed the

Correspondence to:
Satirapoj B, 315, Division of Nephrology, Department of Medicine, Phramongkutklao Hospital and College of Medicine, Bangkok 10400, Thailand.
Phone: 0-2644-4676, Fax: 0-2644-4676
E-mail: satirapoj@yahoo.com

authors experience with CAPD-related infection in long term dialysis patients.

Materials and Method

Study population

A retrospective review of the medical records of 374 CAPD patients (820 episodes of CAPD-related infection) was followed-up from 1983 through 2007. Patients on various forms of automated peritoneal dialysis and intermittent dialysis were excluded. The institutional review board of Phramongkutklao Hospital and College of Medicine approved the present study protocol. Adult patients who had been trained and received home peritoneal dialysis for at least one month were considered eligible for the present study. Data were retrieved from patient charts and infection records. Age (years), sex, months on CAPD, cause of ESRD, comorbid disease, serum albumin, and residual urine volume were recorded for all subjects.

For the initial periods of the present study, the standard spike system was used by CAPD patients and then a disconnect system (the Y-set without disinfectant) was introduced in the authors program and has subsequently been used by most CAPD patients. Double cuff Tenckhoff straight or Swan-neck catheters were used for all patients. The single cuff was generally placed deep in the subcutaneous area above the rectus muscle in an infra umbilical paramedian location. The second cuff of double-cuff catheters was placed in a lateral subcutaneous track approximately 2.5-5 cm from the exit site. Catheters were placed by surgeons.

Peritonitis was defined as a peritoneal effluent containing greater than 100 WBC/ml, with at least 50% neutrophils. An exit site infection was defined by the presence of purulent drainage, with or without erythema of the skin at the catheter epidermal interface, and culture. A tunnel infection was defined as erythema, edema, and/or tenderness over the subcutaneous catheter pathway. Relapse was defined as the occurrence of peritonitis with the same organisms or no growth on culture within four weeks after stopping antibiotics. Recurrent infections were defined as those that occurred within four weeks after cessation of antibiotic treatment with different organisms. Repeated infections were defined as those that occurred more than four weeks after cessation of antibiotic treatment. Refractory infections were defined as those that showed no clinical response to antibiotic treatment within five days. Clinical data relating to infection history (peritonitis and exit-site infection episodes) and treatment by individual decision of the attending physician were recorded. Infection rates were calculated as episodes/patient/year

Statistical analysis

Continuous data were described as mean and standard deviations (SD). Categorical variables were described as percentages. Chi-square test was used to compare the differences between groups with infection and non-infection. All analyses were performed using statistical software for Windows (SPSS version 12.0, Chicago, IL). The difference was considered significant when the p-value was less than 0.05.

Results

A total of 374 consecutive patients starting CAPD underwent initial assessment. The authors excluded from the study 41 patients who had either loss follow-up, incomplete medical record or died within one month of CAPD therapy. The remaining 333 patients were reviewed. Their mean age was 57.2 $\pm$ 15.4 years and median duration of dialysis was 26.2 months. Two-hundred and three patients were male. Of the 224 patients that presented primary renal disease, diabetic nephropathy was the cause of ESRD in 52.6% of patients. The main characteristics were reported in Table 1.

Peritonitis with or without exit site and/or tunnel infection was the most common catheter-related complication (77.3%) with an incidence of 0.864 episodes per patient per year. The incidences of exit site infection and tunnel infection were 0.213 and 0.034 episodes per patient per year, respectively (Table 2). A comparison of initial variables between patients with

Table 1. Characteristics of study population (n = 333)

Age (yrs) (mean $\pm$ SD)	57.2 $\pm$ 15.4
Male	203 (61.5%)
Median duration of dialysis (months)	26.2
Underlying renal disease (n = 224)	
Diabetes	142 (52.6%)
Hypertension	49 (18.1%)
Chronic glomerulonephritis	42 (15.6%)
Others	27 (10.0%)
Co-morbid disease	
Diabetes	142 (42.8%)
Cardiovascular disease	74 (22.3%)
Serum albumin < 3 g/dl	141 (42.6%)
Received immunosuppressive agents	7 (2.1%)
Residual urine volume < 100 ml/day	34 (21.4%)

Table 2. Incidence of CAPD-related infection

Type of infection	Number of infection		Incidence (episode/patient year)
	Number (episode)	Percent	
Exit-site infection	156	19	0.213
Tunnel infection	25	3	0.034
Exit-site & tunnel infection	6	0.7	0.008
Peritonitis alone	589	72	0.804
Peritonitis & exit-site infection	32	3.9	0.044
Peritonitis & tunnel infection	11	1.3	0.015
Peritonitis & exit-site and tunnel	1	0.1	0.001
All peritonitis	633	77.3	0.864
Total	820	100	1.119

Table 3. Comparison of the baseline characteristics between CAPD-related infection group and non-infection group

Factors	Number (%)		p-value
	Infection	Non-infection	
Age > 60 years	46 (53.5)	85 (38.3)	0.022
Diabetes	47 (50)	95 (39.9)	0.121
Serum albumin < 3 g/dl	43 (45.7)	98 (41.4)	0.545
Anuric	6 (13)	28 (25)	0.148
Type of catheter			
Straight	18 (64.3)	18 (81.8)	0.292
Swan-neck	10 (35.7)	4 (18.2)	

CAPD-related infection and those without infection at the start of CAPD was shown in Table 3. Significant differences in age between the two groups, especially catheter-related infections, were increased in patients aged > 60 yr.

The most common infecting organisms were gram positive organism (49.1%). The main pathogens were *Coagulase-negative staphylococcus* (15.9%), *Staphylococcus aureus* (15.2%) and *Pseudomonas spp.* (14.2%) (Table 4). In all, 523 new episodes of peritonitis were observed during the present study period (Table 5). An additional 61 episodes of recurrent peritonitis were observed over four weeks. The common empirical antibiotic regimens were cloxacillin and aminogly-cosides (23.9%), cefazolin and 3rd generation cephalos-porin (23.9%), and cefazolin and aminogly-cosides (15.5%) in the setting of new episode of peritonitis. Non-vancomycin based regimens were applied in 63.9% of patients.

Infection was the leading cause of catheter removal in each patient group. Of interest, catheter infection was the most common infectious-related reason for catheter removal. A total of 113 peritoneal catheters were removed during the observation period; the reasons for catheter removal related infection were common in refractory peritonitis (36.3%), refractory exit site and tunnel infection (15.9%), and fungal peritonitis (13.3%) (Table 6).

The patient outcomes of peritonitis were shown in Fig. 1. A total of 440 (81.6%) episodes of the peritoneal infections responded to initial antibiotic therapy administered in the dialysis fluid. Overall, there were 10 episodes (1.9%) of refractory group and 83 episodes (15.4%) of peritoneal catheter loss, with an overall mortality rate of 1.1%. Of 440 patients with an initial response to treatment, 384 patients (71.2%) were in the resolved group, 28 patients (5.2%) were in the relapsed group, 14 patients (2.6%) were in the recurrent group, and 14 patients (2.6%) were in the repeated group.

Discussion

Peritoneal dialysis has served an increasing

patient population in Thailand, and decreasing rates of peritonitis have improved peritoneal dialysis-related morbidity. However, peritonitis and catheter-related infections still remain major obstacles to technique survival as well as reduction of hospitalization rates and morbidity. The authors' results indicated that incidence of peritoneal infection (0.86/year at risk) is compatible to the International Society for Peritoneal Dialysis's (ISPD) suggestion that the center's peritonitis rate should be no more than 1 episode every 18 months (0.67/year at risk)[10]. A significantly enhanced incidence of CAPD-related infection occurred in advanced age. Gram positive organisms are very common pathogens that generally responds well to initial antibiotic therapy Peritonitis has a significant impact upon morbidity and mortality of peritoneal dialysis patients. In the present study, the most common infection related to CAPD during follow-up was gram positive organisms (49.1%). This has also been noted in previous studies that gram-positive organisms account for over 80% of CAPD-associated peritonitis[11]. *Staphylococcus epidermidis* and other *coagulase-negative staphylococci* account for the majority of infections and vancomycin is a cost effective broad-spectrum antimicrobial treatment for

Table 4. Types of organisms and frequency of infection in peritonitis

Organisms	n (%)
Gram-positive organisms	
Staphylococcus coagulase negative	46 (15.9)
Staphylococcus aureus	44 (15.2)
Staphylococcus epidermidis	8 (2.8)
Streptococccus spp.	12 (4.2)
Enterococcus spp.	10 (3.4)
Corynebacterium spp.	8 (2.8)
Others	14 (4.8)
Gram-negative organisms	
Pseudomonas spp.	41 (14.2)
Acinetobacter spp.	23 (8.0)
Escherichia coli	20 (6.9)
Klebsiella pneumoniae	16 (5.5)
Enterobactor spp.	17 (5.9)
Others	12 (4.7)
Anaerobe organsims	2 (0.7)
Fungal organsims	
Candida spp.	12 (4.2)
Non-candida spp.	3 (1.0)
Mycobacterium	1 (0.3)

Table 6. Infectious causes of peritoneal catheter removal

Indication	n (%)
Refractory peritonitis	41 (36.3)
Relapsing peritonitis	14 (12.4)
Refractory exit site & tunnel infection	18 (15.9)
Fungal peritonitis	15 (13.3)
No response to treatment	
Mycobacterium peritonitis	1 (0.9)
Multiple enteric organism	1 (0.9)
Others	23 (20.4)
Total	113 (100)

Table 5. Antibiotic prescription in infected peritonitis

Antibiotic	New episode of peritonitis (n = 523)	Recurrent peritonitis within 4 weeks (n = 61)
	n (%)	n (%)
Monotherapy		
Cefazolin	11 (2.1)	1 (1.6)
3rd generation cephalosporin	12 (2.3)	6 (9.8)
Aminoglycosides	3 (0.6)	2 (3.3)
Vancomycin	57 (10.9)	3 (4.9)
Combination therapy		
Cloxacillin/aminoglycosides	125 (23.9)	10 (16.5)
Cefazolin/3rd generation cephalosporin	125 (23.9)	14 (23.0)
Cefazolin/aminoglycosides	81 (15.5)	6 (9.8)
Vancomycin/aminoglycoside	51 (9.8)	6 (9.8)
Vancomycin/3rd generation cephalosporin	16 (3.0)	2 (3.3)
Ceftazidime/aminoglycosides	19 (3.6)	6 (9.8)

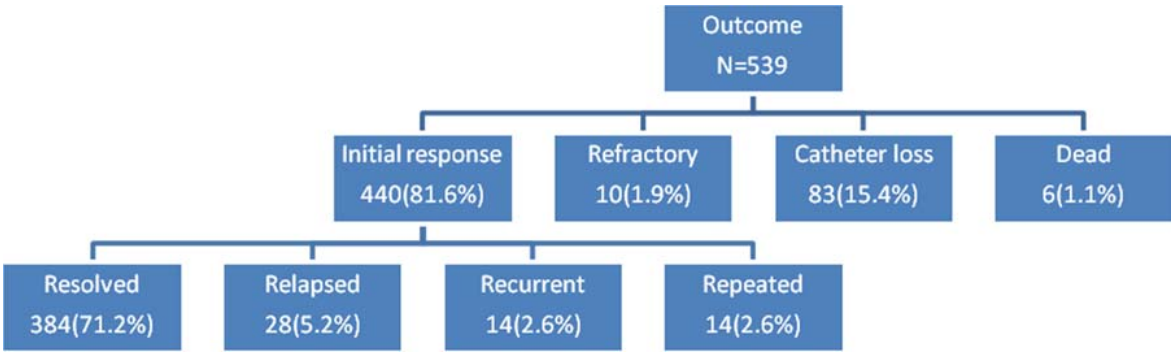

Fig. 1 Patient outcomes after treatment of peritoneal infection

peritonitis, but this may lead to the emergence of multiple antibiotic-resistant organisms. The CAPD-related infection in the present study had good response to initial antibiotic therapy with non-vancomycin based regimens that were applied in 63.9% of patients. Inconsistent with previous studies, initial treatment of CAPD peritonitis with non-vancomycin based therapy similar efficacy[12] and similar outcomes were achieved with both the vancomycin and cephalosporin regimens[13]. Recent recommendations have suggested that empirical antibiotics must cover both gram-positive and gram-negative organisms. The committee recommends center-specific selection of empirical therapy, dependent on the local history of sensitivities of organisms causing peritonitis. Gram-positive organisms may be covered by vancomycin or a cephalosporin, and gram-negative organisms by a third generation cephalosporin or aminoglycoside[10]. The suggested regimen of a cephalosporin seems to represent a suitable alternative for gram positive organisms. However, current evidence found that the incidence of peritonitis due to a single gram-negative organism and *methicillin-resistant coagulase-negative staphylococci* increased[14]. The result was consistent with the authors finding. Therefore, the selection of empirical antibiotics must be made in light of both the patient's and the program's history of micro-organisms and sensitivities. It is important that the protocol should cover all serious pathogens that are likely to be present.

The increasing number of elderly ESRD patients presses the renal team to find an appropriate management plan. CAPD provides many advantages to elderly patients; however, the clinical outcome varies for elderly CAPD patients. Several lines of evidence indicated a higher rate of peritonitis in elderly CAPD patients[15,16]. In the present study, the rate of CAPD-related infection in elderly patients was also high. However, other studies noted a similar risk of peritonitis in older patients compared to younger patients[17,18]. Differences in patient population, CAPD connection devices, and infecting organisms might be the cause of this discrepant result. Thus, the present study results are difficult to compare.

In contrast to several reports, the presence of diabetes was not associated with CAPD-related infection in the present study (Table 3). Previous studies documented that the presence of diabetes is another risk factor of mortality in CAPD and diabetics had significantly higher infective peritonitis, and diabetics on CAPD had a lower actuarial survival and technique success rates than non-diabetic patients of comparable age[19-21]. In this regard, several studies showed that CAPD-related problems including infection caused hospitalization in a similar way in the both diabetic and non-diabetic patients[22,23].

Catheter loss is recognized as a major adverse outcome, and the main reason for catheter removal is infection[24]. The authors findings documented that the main problem of catheter loss-associated infection was refractory infection. The reason of catheter loss due to refractory infection was confirmed by previous studies[25]. Persistence of the causative organisms in the inner cuff is a likely explanation for persistent infection due to *Staphyloccocus aureus* or *Pseudomonas aeruginosa*, after treatment[25].

In conclusion, the authors historical retrospective analysis compared the recent recommendations for peritonitis treatment in CAPD and showed that the incidence of CAPD related infection was equally good under the guidelines suggested by the ISPD's Advisory Committee on Peritonitis Management. Advanced age at the initial treatment is associated with increase rate of infection. *Coagulase-negative staphylococcus* is still a very common

organism that generally responds well to non-vancomycin antibiotic therapy.

Acknowledgment

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Potential conflicts of interest

None.

References

1. Fried LF, Bernardini J, Johnston JR, Piraino B. Peritonitis influences mortality in peritoneal dialysis patients. J Am Soc Nephrol 1996; 7: 2176-82.
2. Digenis GE, Abraham G, Savin E, Blake P, Dombros N, Sombolos K, et al. Peritonitis-related deaths in continuous ambulatory peritoneal dialysis (CAPD) patients. Perit Dial Int 1990; 10: 45-7.
3. Tzamaloukas AH, Murata GH, Fox L. Peritoneal catheter loss and death in continuous ambulatory peritoneal dialysis peritonitis: correlation with clinical and biochemical parameters. Perit Dial Int 1993; 13 (Suppl 2): S338-40.
4. Swartz R, Reynolds J, Lees P, Rocher L. Disconnect during continuous ambulatory peritoneal dialysis (CAPD): retrospective experience with three different systems. Perit Dial Int 1989; 9: 175-8.
5. Canadian CAPD Clinical Trials Group. Peritonitis in continuous ambulatory peritoneal dialysis (CAPD): a multi-centre randomized clinical trial comparing the Y connector disinfectant system to standard systems. Perit Dial Int 1989; 9: 159-63.
6. Pratt O. An integrated critique of the efficacy of topical mupirocin in preventing catheter-related Staphylococcus aureus infections in peritoneal dialysis clients. CANNT J 2002; 12: 20-8.
7. Piraino B, Bernardini J, Sorkin M. The influence of peritoneal catheter exit-site infections on peritonitis, tunnel infections, and catheter loss in patients on continuous ambulatory peritoneal dialysis. Am J Kidney Dis 1986; 8: 436-40.
8. Keane WF, Alexander SR, Bailie GR, Boeschoten E, Gokal R, Golper TA, et al. Peritoneal dialysis-related peritonitis treatment recommendations: 1996 update. Perit Dial Int 1996; 16: 557-73.
9. Hasbargen BJ, Rodgers DJ, Hasbargen JA, Quinn MJ, James MK. Exit-site care-is it time for a change? Perit Dial Int 1993; 13 (Suppl 2): S313-5.
10. Li PK, Szeto CC, Piraino B, Bernardini J, Figueiredo AE, Gupta A, et al. Peritoneal dialysis-related infections recommendations: 2010 update. Perit Dial Int 2010; 30: 393-423.
11. Khairullah Q, Provenzano R, Tayeb J, Ahmad A, Balakrishnan R, Morrison L. Comparison of vancomycin versus cefazolin as initial therapy for peritonitis in peritoneal dialysis patients. Perit Dial Int 2002; 22: 339-44.
12. Toussaint N, Mullins K, Snider J, Murphy B, Langham R, Gock H. Efficacy of a non-vancomycin-based peritoneal dialysis peritonitis protocol. Nephrology (Carlton) 2005; 10: 142-6.
13. Kent JR, Almond MK. A survey of CAPD peritonitis management and outcomes in North and South Thames NHS regions (U.K.): support for the ISPD guidelines. International Society for Peritoneal Dialysis. Perit Dial Int 2000; 20: 301-5.
14. Kim DK, Yoo TH, Ryu DR, Xu ZG, Kim HJ, Choi KH, et al. Changes in causative organisms and their antimicrobial susceptibilities in CAPD peritonitis: a single center's experience over one decade. Perit Dial Int 2004; 24: 424-32.
15. Valente J, Rappaport W. Continuous ambulatory peritoneal dialysis associated with peritonitis in older patients. Am J Surg 1990; 159: 579-81.
16. Holley JL, Foulks CJ. The utility of a structured evaluation of elderly patients for continuous peritoneal dialysis. Perit Dial Int 1991; 11: 162-5.
17. Li PK, Law MC, Chow KM, Leung CB, Kwan BC, Chung KY, et al. Good patient and technique survival in elderly patients on continuous ambulatory peritoneal dialysis. Perit Dial Int 2007; 27 (Suppl 2): S196-201.
18. Baek MY, Kwon TH, Kim YL, Cho DK. CAPD, an acceptable form of therapy in elderly ESRD patients: a comparative study. Adv Perit Dial 1997; 13: 158-61.
19. Prasad N, Gupta A, Sinha A, Singh A, Sharma RK, Kumar A, et al. A comparison of outcomes between diabetic and nondiabetic CAPD patients in India. Perit Dial Int 2008; 28: 468-76.
20. Lye WC, Leong SO, van der Straaten JC, Lee EJ. A prospective study of peritoneal dialysis-related infections in CAPD patients with diabetes mellitus. Adv Perit Dial 1993; 9: 195-7.
21. Passadakis P, Thodis E, Vargemezis V, Oreopoulos D. Long-term survival with peritoneal dialysis in ESRD due to diabetes. Clin Nephrol 2001; 56: 257-70.
22. Viglino G, Cancarini GC, Catizone L, Cocchi R, De Vecchi A, Lupo A, et al. Ten years experience of CAPD in diabetics: comparison of results with non-

diabetics. Italian Cooperative Peritoneal Dialysis Study Group. Nephrol Dial Transplant 1994; 9: 1443-8.
23. Viglino G, Cancarini G, Catizone L, Cocchi R, de Vecchi A, Lupo A, et al. The impact of peritonitis on CAPD results. Adv Perit Dial 1992; 8: 269-75.
24. Choi P, Nemati E, Banerjee A, Preston E, Levy J, Brown E. Peritoneal dialysis catheter removal for acute peritonitis: a retrospective analysis of factors associated with catheter removal and prolonged postoperative hospitalization. Am J Kidney Dis 2004; 43: 103-11.
25. Bayston R, Andrews M, Rigg K, Shelton A. Recurrent infection and catheter loss in patients on continuous ambulatory peritoneal dialysis. Perit Dial Int 1999; 19: 550-5.

ประสบการณ์การรักษาภาวะติดเชื้อจากการล้างไตทางหน้าท้องในผู้ป่วยล้างไตทางหน้าท้องแบบถาวร

วีระวรรณ ลุวีระ, บัญชา สถิระพจน์, อุปถัมภ์ ศุภสินธุ์, อำนาจ ชัยประเสริฐ, ประเจษฎ์ เรืองกาญจนเศรษฐ์, เนาวนิตย์ นาทา, อินทรีย์ กาญจนุกูล, ถนอม สุภาพร, พรรณบุปผา ชูวิเชียร, สุทธชาติ พีชผล, อุษณา ลุวีระ, ธนะพันธ์ พิบูลย์บรรณกิจ

วัตถุประสงค์*: การล้างไตทางหน้าท้องเป็นหนึ่งในการรักษาหลักของผู้ป่วยโรคไตเรื้อรังระยะสุดท้าย ปัจจุบันรัฐบาลไทยสนับสนุนค่ารักษาพยาบาลในผู้ป่วยโรคไตเรื้อรังระยะสุดท้าย ขณะที่การติดเชื้อจากการล้างไตทางหน้าท้องเป็นสาเหตุสำคัญของการเจ็บป่วยและการเสียชีวิต การศึกษานี้เป็นการหาความชุก และระบาดวิทยาของการติดเชื้อจากการล้างไตทางหน้าท้อง*

วัสดุและวิธีการ*: จากการทบทวนข้อมูลเวชระเบียนของผู้ป่วยล้างไตทางหน้าท้องจำนวน 333 ราย ณ หน่วยไตเทียม โรงพยาบาลพระมงกุฎเกล้า ระหว่างเดือนมกราคม พ.ศ. 2526 ถึง มิถุนายน พ.ศ. 2550 เพื่อศึกษาถึงเชื้อก่อโรค ปัจจัยเสี่ยง และผลการรักษาภาวะติดเชื้อจากการล้างไตทางหน้าท้อง*

ผลการศึกษา*: อัตราการติดเชื้อภายในช่องท้องพบสูงถึงร้อยละ 73.3 ของจำนวนการติดเชื้อทั้งหมดในผู้ป่วยล้างไตทางหน้าท้อง โดยคำนวณความชุกของการติดเชื้อในช่องท้อง การติดเชื้อบริเวณช่องทางออกของสายสวน และการติดเชื้อในอุโมงค์ใต้ผิวหนัง เท่ากับ 0.864, 0.213 และ 0.034 ครั้ง ต่อผู้ป่วยต่อปีตามลำดับ เชื้อก่อโรคส่วนใหญ่ เกิดจากเชื้อแกรมบวกร้อยละ 49.1 โดยพบเชื้อเป็น Coagulase-negative Staphylococcus ร้อยละ 15.9, Staphylococcus aureus ร้อยละ 15.2 และ Pseudomonas spp. ร้อยละ 14.2 ภาวะติดเชื้อจากการล้างไตทางหน้าท้องพบมากขึ้นในกลุ่มผู้ป่วย อายุมากกว่า 60 ปี ผลการรักษาพบว่า ร้อยละ 81 ของการติดเชื้อภายในช่องท้องตอบสนองต่อการรักษาด้วยยาปฏิชีวนะในช่วงแรก มีเพียงร้อยละ 1.9 ของการติดเชื้อภายในช่องท้องดื้อต่อการรักษา และร้อยละ 15.4 ของการติดเชื้อภายในช่องท้องต้องผ่าตัดเอาสายสวนล้างไตทางหน้าท้องออก และร้อยละ 1.1 ของผู้ป่วยเสียชีวิตจากการติดเชื้อภายในช่องท้อง ผู้ป่วยส่วนใหญ่ร้อยละ 63.9 ตอบสนองต่อการรักษาด้วยยาปฏิชีวนะกลุ่มที่ไม่ใช้ vancomycin*

สรุป*: จากการศึกษานี้พบอัตราการติดเชื้อจากการล้างไตทางหน้าท้องใกล้เคียงตามคำแนะนำของสมาคมล้างไตทางหน้าท้องนานาชาติ โดยพบอัตราการติดเชื้อมากขึ้นในกลุ่มผู้ป่วยสูงอายุ และเชื้อส่วนใหญ่เกิดจาก Coagulase-negative Staphylococcus ซึ่งผลการรักษาโดยรวมตอบสนองต่อยาปฏิชีวนะเป็นอย่างดี*