ASIA-PACIFIC CHAPTER NEWSLETTER
INTERNATIONAL SOCIETY FOR PERITONEAL DIALYSIS (ISPD)
VOLUME 14, ISSUE 1, SPRING 2016

Effects of a statewide protocol for the management of peritoneal dialysis-related peritonitis

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Peritoneal dialysis (PD) is the dialysis modality of choice for over 20% of Australian patients with end-stage renal disease. One of the major complications of PD is the development of peritonitis, which is associated with significant morbidity and costs, and can result in shortened modality survival or modality failure [1]. Peritonitis has also been suggested to be a contributing factor in the deaths of up to 27% of patients on PD [2]. Despite improvements in connectology and the introduction of biocompatible dialysate solutions, the incidence of PD peritonitis remains high and has a substantial impact on patients and health care systems.

Empirical antibiotic therapy is central to the initial management of patients presenting with peritonitis, but no consensus on agents or dosing exists, with current guidelines suggesting prescription as per local data [3]. Adequate coverage of Gram positive organisms (often penicillin resistant) and Gram negative organisms is a primary consideration.

A major concern over recent years has been appropriate antimicrobial stewardship, with worldwide efforts to reduce unnecessary prescriptions due to increases in antimicrobial resistance. Knowledge of common causative organisms and local antimicrobial susceptibility patterns is therefore essential when deciding upon appropriate therapy. Previous protocols incorporating quinolone antibiotics were demonstrated to drive resistance to these agents [4, 5] and the development of resistance to vancomycin has also been extensively reported [6-8]

In 2007, Western Australia (WA) changed the model of care for home dialysis to a corporatised model in partnership with a private dialysis company, establishing the WA Home Dialysis Program (WAHDiP). Statewide protocols were developed for the management of PD peritonitis with empirical treatment comprising intraperitoneal (IP) vancomycin and gentamicin. Patients weighing 60 kg or less received 2 g of vancomycin and 140 mg of gentamicin, while patients >60 kg received 2.5 g of vancomycin and 200 mg gentamicin. High dose IP gentamicin was used for empirical treatment (as opposed to the more common 0.6 mg/kg IP used for daily administration), as peak concentrations, rather than the AUC are most strongly associated with its bactericidal efficacy.

FROM THE EDITORIAL OFFICE

Dear All,

Welcome back from the ISPD 2016 meeting at Melbourne. It was a great success.

In this issue, we are delighted to have Dr. Aron Chakera from Australia to share the experience of managing PD peritonitis by a state-wide protocol. In addition, Dr. Na Jiang from China will discuss the dietary management of hyperphosphatemia, while Dr. EY Seong from Korea will discuss extracellular fluid overload in PD patients.

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Sincerely,
Dr. Cheuk-Chun SZETO
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We reviewed results of positive cultures from PD dialysate fluids and antibacterial resistance patterns for the 5-year period following the introduction of the statewide protocol for the initial management of PD peritonitis in 2007, with the goal of assessing the impact of our prescribing practice on antimicrobial resistance [9]. There were 1,319 culture-positive PD fluid samples processed through a central laboratory with an average culture negative rate of 16.8% (min. 13.7%, max. 19.6%). Each year the total number of PD peritonitis cases decreased, from 331 in 2009 to 127 in 2012.

The microorganisms cultured from the PD peritonitis episodes were 69.9% Gram positive, and 25.4% Gram negative, which is consistent with data worldwide [1, 3, 10]. Coagulase-negative staphylococci were responsible for the majority of the Gram positive infections (42.3% of all infections), followed by streptococci (8.5%), Staphylococcus aureus (6.7%) and Enterococcus spp. (4.2%). The predominant Gram negative organisms were Klebsiella spp. (5.4%), Escherichia coli (4.6%) and Pseudomonas spp. (4.1%). The approximate distribution of causative organisms did not change over time, despite a substantial decrease in the number of cases of PD peritonitis.

Current guidelines recommend PD peritonitis should occur less than once in every 18 patient months on treatment (0.67 episodes per year at risk) [3]. During the 5-year review period, the peritonitis rate fell from 1 in 16 patient months (0.75/year at risk) in 2008 to 1 in 29 patient months (0.41/year at risk) in 2013. There were 13 cases of refractory peritonitis, 28 cases of relapsing peritonitis, 23 cases of recurrent peritonitis and 41 cases of repeat peritonitis during the review period. Gentamicin resistance was present in 8% of Gram negative isolates (range: 3 – 14%) and vancomycin resistance was present in 2% of Gram positive isolates (range: 0 – 3%). There were no trends toward an increase in antimicrobial resistance to these agents over time, although an increase in resistance to oxacillin was noted along with high levels of resistance to cephalosporins throughout the study period. Despite the use of high doses of gentamicin, there were no cases of gentamicin-related ototoxicity.

Data from Western Australia have shown that the empirical treatment of PD peritonitis with intraperitoneal vancomycin and gentamicin remains efficacious, with no evidence that the introduction of a statewide protocol is driving resistance to these agents at this time. Despite improvements in culture-independent assays for the identification of infecting organisms, routine clinical practice continues to rely on standard bacterial culture techniques, and consequently results are often not available for 48 hours or more. As outcomes from infections worsen with delays in the delivery of appropriate antimicrobial therapy, choice of empirical agents remains critical. Regular review of the antimicrobial resistance profiles is essential to ensure that current prescribing policies remain appropriate for the region.

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Impact of extracellular volume expansion in peritoneal dialysis patients

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Volume control has been an undetermined issue to the peritoneal dialysis patients. Some researchers claim that hypervolemic state of the patients might be beneficial to the preservation of residual renal function [1-2] while others argue that volume overload is harmful to the patient survival and increases cardiovascular mortality [3-4]. This issue has not been resolved likely due to the fact that there is a lack of the adequate equipment to measure the patient's volume objectively.

Multifrequency bioimpedence analysis (MFBIA) is a non-invasive method to measure body water objectively [5]. It can also detect the body fluid in the extracellular compartment in which the majority of the excess water is accumulated

We recently conducted a retrospective study to examine the effect of extracellular volume expansion in the peritoneal dialysis in Korean adult peritoneal dialysis patients using MFBIA [6]. In this study, we compared patient outcomes between the relatively euvolemic and the relatively hypervolemic group, which was defined by mean value of MFBIA derived extracellular water per total body water (ECW/TBW). The key findings observed in the study included:

1. The associations between extracellular volume expansion and residual renal function: During the median follow up period of 25.47 ± 6.86 months, both the amount of urine output and the weekly urine Kt/V decreased significantly. Additionally, the changing rates of them were not different between the relatively euvolemic group (ECW/TBW<0.396) and the hypervolemic group (ECW/TBW>0.396).

2. The associations between extracellular volume expansion and patient survival: During the median follow up period of 49.14±19.02 months, 11.6% of the patients were dead. In the multivariable analysis, initial hypervolemia was a significant factor for the prediction of patient mortality (HR 1.001, 95%CI 1.001-1.086, p=0.047).

3. The associations between extracellular volume expansion and technical survival: During the median follow up period of 49.14±19.02 months, technical failure was observed in the 24.7% of the patients. In the multivariable analysis, initial hypervolemia was a significant factor for the prediction of technical failure (HR 1.024, 95%CI 1.001-1.048, p=0.042).

From these results, we could define that volume overload was not beneficial to the preservation of residual renal function, and it was even more harmful for both the patient and technical survival at least in the Korean peritoneal dialysis patients. However, we did not investigate the cause and effect relationships between extracellular volume expansion and the patient outcome, thus further study is needed to investigate this issue.

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Effective dietary intervention for hyperphosphatemia management in peritoneal dialysis patients: food recipe and cooking methods

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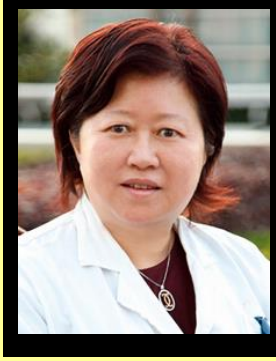

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Hyperphosphatemia is a common complication in patients with end-stage renal disease, which cannot be corrected by dialysis treatment solely. It is well known that hyperphosphatemia is associated with elevated incidence of cardiovascular event as well as increased patient mortality [1]. In addition to adequate dialysis and use of phosphorus binders, dietary phosphorus restriction is generally recommended for hyperphosphatemia prevention and treatment in patients undergoing peritoneal dialysis (PD). However, limited studies which have quantitated the efficiency of dietary intervention on lowering serum phosphorus concentration in PD patients.

There are two different types of phosphorus containing in food, including the organic form and inorganic form. Organic phosphorus is mainly bound to protein, whereas inorganic phosphorus normally exists in food additives and condiments, as well as in soft drink [2]. With this background in mind, we recently conducted an interventional and controlled clinical trial in PD patients with the objective of treating hyperphosphatemia through dietary intervention [3]. Ninety-seven prevalent patients with hyperphosphatemia were allocated to intervention (n=48) or control (n=49) group and were followed for 1 year. Patients in the intervention group were educated to reduce the ingestion of high phosphate containing food. Moreover, they were asked to cook in proper methods, i.e. boil or stew the food, or soak food in water before cooking. We demonstrated that a combination of lowering phosphorus rich food intake and improving cooking methods decreased dietary phosphorus intake effectively in PD patients (13.03 ± 3.39 to 10.82 ± 3.00 mg/kg ideal body weight/day, $p = 0.001$). Moreover, it significantly attenuated hyperphosphatemia, shown as reduced serum phosphate concentration (1.98 ± 0.28 to 1.65 ± 0.33 mmol/l, $p = 0.015$) as well as less need to use phosphorus binders.

Patients in our study showed good adherence to the two components of dietary intervention, namely restriction of phosphorus rich food and improving thermal processing methods. It suggests that long-term dietary intervention is feasible in PD patients. For the selection of food, we used phosphorus to protein ratio as a metric to balance phosphorus and protein intake in diet, because lower phosphorus intake often results in a decrease in protein intake, and the latter is potentially essential for the maintenance of long-term patient survival [4, 5]. Patients were instructed to choose food with a low phosphorus to protein ratio, including egg white, fish, chicken breast, etc., rather than those with a high ratio such as fast and processed food, seeds, etc. [2].

News from the ISPD

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This is a scholarship to support up to 3 months training in clinical PD for doctors and nurses from Asia-Pacific region. Deadline for application for each round: twice a year at 30 June or 31 December. **The next deadline is 30 June 2016.** Details and application procedures can be found under the Regional Chapters – Asia-Pacific Chapter, at the ISPD website.

Upcoming Meetings

53rd Congress ERA-EDTA
21-24 May 2016
Vienna, Austria
Web site: http://www.era-edta2016.org/

The 8th Asia Pacific Chapter Meeting,
International Society for Peritoneal Dialysis
22-25 March 2017
Baiyun International Convention Center
Guangzhou, China

ISN World Congress of Nephrology
21-25 April 2017
Mexico City, Mexico
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Apart from this, inorganic phosphorus is readily absorped and it significantly increases serum phosphorus load [2, 6], thus inorganic phosphorus rich food were avoided in our study including soft drink, snacks, fast and processed food. Similarly, other food with high intestinal phosphorus absorption rate such as dairy product and meat were also restricted.

Compared to food selection, less attention has been drawn to cooking methods. Previous studies demonstrated that different food processing methods could change the final phosphorus containing in foodstuffs. Cooking by boiling or stewing, rather than the Chinese traditional food thermal processing method of frying, significantly reduce phosphate content without affecting the property of protein [7, 8]. What's more, soaking food in water for 1 hour before cooking could leach phosphorus mineral into the medium, and this skill is even more effective to reduce phosphorus amount in processed food [7, 9]. More recently, Ando et al. supplemented that boiling food with soft water, cutting food into small pieces, or using a pressure cooker allows for a further reduction of the phosphorus content in meat while preserving protein content [10].

Modifying diet recipe and improving cooking methods demonstrated synergic effect on reducing phosphorus concentration in the current study, whilst patients who only changed the cooking methods showed a marginal reduction of serum phosphate concentration. Thus we recommend the application of both dietary intervention strategies in PD patients with hyperphosphatemia.

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2017 ISPD Asian Pacific Chapter Meeting in Guangzhou, China

The Chinese Society of Nephrology is privileged to win the bid for 2017 Asian Pacific Chapter Meeting of International Society for Peritoneal Dialysis to be held from March 22 – 25, 2017. The host city is Guangzhou, a Capital City of Guangdong Province with splendid history and time-honored culture. Known as the “City of Flower” as well as the “City of Ram”, Guangzhou enjoys a reputation for its world-renowned cuisine.

PD as a well-accepted modality of dialysis for ESRD patients has been used and developed for more than 30 years in China. The number of patients on PD nationwide was around 7,000 in 2003, 16,000 in mid-2008 and exceeded 50,000 at the end of 2014, with an annual growth rate exceeding 20%. It is believed that the improved expertise of PD nationwide will expand the utilization of PD, particularly in countryside and remote areas.

CSN was founded in 1980 as a non-profit organization, with a mission to improve the medical care and prevention of kidney diseases, to strengthen scientific research on nephrology, to promote Sino-international academic exchange and collaboration, to disseminate healthcare knowledge of kidney diseases to the public, and ultimately to develop nephrology in China. There are more 670 of kidney centers and 31 local and regional societies. The number of nephrology professionals has increased to over 10,000. The CSN will, as always, do its utmost to improve kidney health for the 1.3 billion people in China.

We are looking forward to welcoming you to Guangzhou!

Xueqing Yu, MD, PhD
President, Chinese Society of Nephrology
Chairman, Congress of ISPD APCM 2017

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