



Congress Service

9th EuroPD Meeting

October 9-12, 2009
Strasbourg, France



Fresenius Medical Care

Protect Preserve Prolong

Upgrade to Comprehensive PD



P³ is a comprehensive Peritoneal Dialysis programme specifically designed to improve your patients' quality of life while safely extending their time on PD

Protect	Preserve
P ³	Prolong

P³ allows you to prescribe individual therapy programmes, monitor patient conditions, and precisely adjust therapy when needed – in an efficient and optimised way.

- **Protect:** extra safe and easy-to-understand PD systems
- **Preserve:** ultra-low GDP fluids with neutral or physiological pH
- **Prolong:** individual state-of-the-art therapies for fluid balance control and guided prescription modelling



Fresenius Medical Care

Fresenius Medical Care Deutschland GmbH · 61346 Bad Homburg · Germany
Phone: +49 (0) 6172-609-0 · Fax: +49 (0) 6172-609-2191 · www.fmc-ag.com

Contents

1. Biocompatibility, Inflammation and Toxicity	5
2. Encapsulating Peritoneal Sclerosis	9
3. Peritoneal Dialysis Modality-related Topics	13
4. Nutritional and Fluid Status Monitoring	17
5. Clinical Issues in Peritoneal Dialysis	20

Selected Abstracts of the
9th EuroPD Meeting
Strasbourg, France
October 9-12, 2009

Editors:
Fresenius Medical Care
International Marketing & Medicine

Cristina Lage, MD
Ilona Weber-Fürsicht

Printing Office:
mt druck, Neu-Isenburg
Germany

1. Biocompatibility, Inflammation and Toxicity

Inflammatory Cytokine Profile in Baseline Dialysate and Plasma Samples from Incident and Prevalent Patients in the Global Fluid Study

M. Lambie¹, J. Chess², K. Huckvale¹,
N. Topley², S. Davies¹

¹ Keele University, Stoke on Trent,
United Kingdom

² Cardiff University, Cardiff,
United Kingdom

Introduction: There is accumulating evidence from small, single centre studies of the importance of inflammatory cytokines in peritoneal dialysis, both systemically and intra-peritoneally. The Global Fluid Study was set up in 2002 to establish the value of systemic and intraperitoneal biomarkers as predictors of clinical endpoints, including membrane injury. We report the first analysis of inflammatory cytokines from this study.

Methods: 941 incident and prevalent patients from 10 centres in the UK, Canada and Korea were included. The initial plasma and 4-hour dialysate samples were assayed by electrochemiluminescence using a commercial kit (Meso Scale Discovery Pro-Inflammatory Multiplex I). Clinical data stored in an Access database was combined with cytokine levels and extracted to SPSS. As some cytokines had a substantial number of values below the limit of detection, 1 was added prior to log transformation, obtaining a normal distribution for plasma γ -IFN, TNF- α and IL-6 and dialysate IL-6. IL-1 β remained significantly skewed.

Results: To test for the effect of cytokine dilution in dialysate, levels were correlated with input volume, but the association was weak, or insignificant ($R = -0.040$ to -0.145 , $p = 0.012$ to 0.488). All dialysate samples auto-correlated ($R = 0.295$ to 0.826 , $p < 0.001$), as did plasma samples ($R = 0.136$ to 0.510 , $p \leq 0.001$). IL-6 had the weakest correlations within dialysate or plasma, but was the only cytokine to correlate between dialysate and plasma ($R = 0.259$, $p < 0.001$). Generally dialysate concentrations were much lower than plasma, but ranged up to 35882 times that of plasma. IL-6 had the highest dialysate to plasma ratio, with a median of 3.49.

Conclusions: Plasma and dialysate cytokines vary independently, but auto-correlate within dialysate or plasma compartments. Dialysate IL-6 correlates with plasma, but concentrations despite dilution are far higher. Intraperitoneal and systemic inflammation is uncoupled with evidence of local production within the peritoneal cavity.

Effluent Fibrin Degradation Products (FDP) is a Useful Marker for the Peritoneal Damage

A. Fujimori¹, T. Tomo², M. Yamanaka³,
A. Numata³, K. Tsuchida⁴,
J. Minakuchi⁴, H. Kawanishi⁵,
I. Masakane⁶, Y. Takemoto⁷,
H. Naito⁸

¹ Konan Hospital, Kobe, Japan

² Oita University, Oita, Japan

³ Takamatsu Red Cross Hospital,
Takamatsu, Japan

⁴ Kawashima Hospital, Tokushima,
Japan

⁵ Tsuchiya General Hospital,
Hiroshima, Japan

⁶ Yabuki Hospital, Yamagata, Japan

⁷ Osaka Municipal University,
Osaka, Japan

⁸ Naito Medical Research Institute,
Kobe, Japan

Introduction: It is quite important to find a useful marker to evaluate the peritoneal damage.

Methods: Twenty-five patients (male 17: female 8) were enrolled in this study. The average age was 63.0 years and the average duration of peritoneal dialysis was 18.0 months. Thirteen patients with chronic glomerulonephritis, three with nephrosclerosis, one with diabetes, and eight with others were comprised. FDP and interleukin-6 (IL-6) concentrations in the effluent were measured. Indices of the peritoneal permeability such as D/P Cr, D/P albumin, D/P IgG, D/P alpha2-macroglobulin (MG) were also measured.

Results: Effluent IL-6 significantly correlated with D/P Cr ($r^2=0.052$, $p=0.0388$), D/P albumin ($r^2=0.014$, $p<0.0001$), D/P IgG ($r^2=0.321$, $p<0.0001$), and D/P alpha2-MG ($r^2=0.349$, $p<0.0001$). Effluent FDP

significantly correlated with effluent IL-6 ($r^2=0.392$, $p<0.0001$), D/P albumin ($r^2=0.017$, $p=0.0004$), D/P IgG ($r^2=0.477$, $p<0.0001$), and D/P alpha2-MG ($r^2=0.579$, $p<0.0001$). The correlation between effluent FDP and D/P Cr was not significant ($r^2=0.093$, $p=0.059$).

Discussion: Both FDP and IL-6 increased with the elevation of the peritoneal permeability. The stronger correlation was observed with the larger molecular weight of the solute. FDP can be determined at a smaller cost than IL-6. Therefore, it would be clinically relevant to monitor FDP as a marker for the peritoneal inflammation and permeability.

Effects of Bicavera[®] Dialysate for Peritoneal Dialysis on the Epithelial-to-Mesenchymal Transition (EMT) of the Mesothelial Cell (MC)

J.A. Sanchez-Tomero¹,
A. Fernandez-Perpen¹, M.A. Bajo²,
M.L. Perez-Lozano¹, G. Del Peso²,
P. Albar², A. Aguilera¹, A. Cirugeda³,
M. Lopez-Cabrera¹, R. Selgas²

¹ Hospital de la Princesa,
Madrid, Spain

² Hospital de la Paz, Madrid, Spain

³ Hospital Infanta Leonor,
Madrid, Spain

BicaVera[®] has less impact on EMT of mesothelial cells in vitro. We have hypothesized that BicaVera[®] may also reduce the manifestations of EMT of MC from peritoneal effluents grown ex vivo.

Patients and Methods: After being randomly selected, patients were treated with conventional peritoneal dialysis fluid (C; n=20) or BicaVera[®] (BV; n=11; both solutions from Fresenius Medical Care on CAPD). C vs. BV follow up: baseline 20/11, 6 months 20/11, 12 months 18/11, 18 months 11/11, 24 months 3/5. Small solute and water transport capacities were determined during a 4-hour dwell (4.25% glucose dialysate). Mesothelial cells from overnight effluent were seeded and grown ex vivo until confluence was reached. VEGF, IL-8 and TGF- β levels in the supernatant (pg/mg cell protein) and fibronectin and procollagen levels (ng/mg cell protein) in cell extracts were measured by ELISA. ICAM-1 expression was used as a marker for mesothelial nature of cells. EMT of mesothelial cells was defined by non-epitheloid morphology and higher content of fibronectin.

Results: BV was associated with increased small solute transport ($p<0.0001$) and lower initial UF ($p<0.0001$). Furthermore, BV use was associated with a trend to better preservation of residual renal function (only first semester). The frequency of non-epitheloid phenotype at long-term (18-24 months) was significantly lower in BV ($p<0.0001$). Non-epitheloid phenotype was associated with higher VEGF ($p<0.04$) and fibronectin ($p<0.001$) levels. C but not BV showed a progressive increase of VEGF ($p<0.001$) and IL-8 ($p<0.0001$) over time. MC-EMT parameter (phenotype) and IL-8 levels were favorably different for BV fluid relative to C at medium-term. There was no difference in procollagen, fibronectin and TGF- β levels between groups.

Conclusion: BicaVera[®] showed better biocompatibility than high-GDPs fluid ex vivo in terms of EMT of mesothelial cells, consistent with data obtained previously in vitro.

Further studies including more patients are required to confirm these results.

Glucose Degradation Products Mediate Systemic Toxicity in Peritoneal Dialysis

S. Muller-Krebs¹, L.P. Kihm¹, B. Zeier¹,
M.L. Gross², A. Wieslander³,
U. Haug⁴, M. Zeier¹, V. Schwenger¹

¹ Department of Nephrology,
Medical University of Heidelberg,
Heidelberg, Germany,

² Department of Pathology,
Medical University of Heidelberg,
Heidelberg, Germany

³ Gambro Corporate Research,
Lund, Sweden

⁴ Gambro Corporate Research,
Hechingen, Germany

Introduction: It is known that glucose degradation products (GDP) impair the peritoneal membrane locally and are moreover resorbed by the peritoneum into the systemic circulation. Here we examined in subtotaly nephrectomized (SNX) rats whether GDP affect the remnant kidney and cardiovascular system, too.

Methods: Sprague-Dawley rats were randomly assigned to a two-stage SNX or sham operation and were left untreated for 3 weeks. SNX+GDP group received chemically defined GDP by an osmotic mini-pump intravenously for 4 weeks; the SNX and the sham operated groups remained without GDP. The complete follow-up for all groups was 7 weeks post-operatively.

Results: In SNX+GDP group the expression of carboxymethyllysine in the kidney and the cardiovascular system was significantly higher compared to the SNX rats. The same was true for apoptosis marker Caspase 3 where a pronounced increase in the SNX+GDP animals could be observed in the kidney and the

cardiovascular system. Higher serum levels of oxidative stress markers, namely reactive oxygen species and advanced oxidation protein products could be observed in the SNX+GDP animals, moreover we found a more pronounced expression of oxidative stress shown by measurement of endothelial nitric oxide synthase in the aorta. The SNX+GDP animals revealed a significantly higher index of glomerulosclerosis and tubulointerstitial damage, as well as significantly higher levels of albumin excretion. In this context we observed an increased expression of the podocyte damage marker desmin in the SNX+GDP group in comparison to the SNX animals.

Conclusion: Besides local toxic effects GDP cause systemic toxicity. Here we showed that in SNX rats the administration of GDP increased kidney and cardiovascular damage; in particular we found increased levels of AGE, apoptosis, oxidative, and podocyte damage. Whether these findings are of clinical relevance has to be further investigated.

2. Encapsulating Peritoneal Sclerosis

Markers in Peritoneal Effluent for Predicting Encapsulating Peritoneal Sclerosis – A Report from the Japan Fluid Study

Y. Obata, M. Miyazaki, H. Kawanishi,
M. Nakayama, H. Nakamoto,
T. Nishitani, K. Kasai, H. Hasegawa,
M. Hiramatsu, K. Arizono, C. Hamada,
Y. Akai, N. Itami, Y. Ito, H. Sugiyama,
T. Takeda, K. Yokoyama, S. Ohira,
Y. Kawaguchi

Japan Fluid Study Group,
Nagasaki, Japan

Encapsulating peritoneal sclerosis (EPS) is one of the most serious complications in peritoneal dialysis (PD) patients. It is reported that long-term PD leads to the deterioration of the peritoneum, resulting in peritoneal fibrosis and increased permeability because of neoangiogenesis. However, there is no suitable marker for predicting the change in peritoneum and the development of EPS.

The Japan Fluid Study (JFS) examines PD effluents and plasma collected from patients over a period of more than 4 years to identify markers for EPS. One hundred ninety six patients (mean age \pm SD of 55.7 ± 11.3) who had been on CAPD for 9.8 ± 3.8 years were included in the study. Plasma and PD effluent samples were collected from the patients every 6 months. Interleukin-6 (IL-6), soluble interleukin-6 receptor (IL-6R), interferon-beta (IFN β), monocyte chemotactic protein-1 (MCP-1), and vascular endothelial growth

factor (VEGF) that are thought to be associated with peritoneal sclerosis were analyzed by ELISA. IL-6 in the PD effluents significantly correlated with IL-6R, IFN β , MCP-1 and VEGF in the PD effluents. In addition, the dialysate concentrations of IL-6, IL-6R, IFN β , and VEGF positively correlated with the D/P creatinine ratio, indicating that these markers were associated with peritoneal hyperpermeability.

It is concluded that IL-6, IL-6R, IFN β , and VEGF in PD effluent are closely linked with peritoneal function and measurement of these markers may help predict the deterioration of peritoneum and development of EPS.

Are Peritoneal Calcifications related to Aortic Calcifications and Calcium Phosphorus Products?

A. Vlijm¹, S.S.K.S. Phoa¹,
A.M. Spijkerboer¹, M. Noordzij¹,
J. van Schuppen¹, D.G. Struijk²,
J. Stoker¹, R.T. Krediet¹

¹ Academic Medical Center,
Amsterdam, Netherlands

² Dianet Foundation,
Amsterdam-Utrecht,
Netherlands

Introduction: Long-term peritoneal dialysis can lead to encapsulating peritoneal sclerosis (EPS). A previous study showed that peritoneal calcifications, seen at abdominal CT scans, are more often present in EPS patients than in long-term peritoneal dialysis patients without EPS. The aim of the present study was to investigate whether there is a relation between peritoneal calcifications and aortic calcifications and calcium phosphorus products.

Methods: We included all EPS patients in our center from 1996 until 2008 with a CT scan at the time of diagnosis, and all other long-term peritoneal dialysis patients (dialysis duration > 4 years) without EPS who underwent a CT scan for different reasons. The CT scans were reviewed by 2 experienced abdominal radiologists. The presence of peritoneal calcifications was scored as yes or no. The following scoring system for abdominal aortic calcifications was used: 1=none, 2=mild, 3=moderate, 4=severe and 5=very severe. Calcium phosphorus products of each patient were calculated every 6 months up to five years prior to the CT scan.

Results: We included 31 patients: 15 EPS patients (mean age 43 years, mean peritoneal dialysis duration 98 months, 57% men) and 16 long-term peritoneal dialysis patients without EPS (mean age 54 years, mean peritoneal dialysis duration 62 months, 44% men). Eight EPS patients had peritoneal calcifications against four long-term peritoneal dialysis patients without EPS. Aortic calcifications were more often present and more severe in the long-term peritoneal dialysis patients without EPS ($p=0.02$). No relation was present between peritoneal calcifications and aortic calcifications or calcium phosphorus products.

Conclusion: Peritoneal calcifications are more often seen in EPS. Aortic calcifications were more often present in patients without EPS, probably due to their higher age. The presence of peritoneal calcifications in long-term peritoneal dialysis patients with and without EPS cannot be explained by the presence of aortic calcifications or high calcium phosphorus products.

Does Peritoneal Thickness Predict Technical Failure in Peritoneal Dialysis Patients?

H. Dheir¹, D. Bozkurt¹, E. Hur¹,
S.S. Ozbek², F. Akcicek¹, S. Duman¹

¹ Nephrology Department,
Ege University,
Izmir, Turkey

² Radiology Department,
Ege University,
Izmir, Turkey

Introduction: Prolonged peritoneal dialysis time and frequent episodes of peritonitis lead to structural changes, thickening of the peritoneum and ultimately to technical failure. Early detection of morphological changes is not only important for estimation of technical failure but also for encapsulated peritoneal sclerosis which carries high mortality and morbidity rates in long-term peritoneal dialysis patients. Ultrasonographic investigations of peritoneal membrane may provide the opportunity to detect morphological changes early. The aim of this study is to evaluate the association between functional parameters of peritoneum and ultrasonographically measured peritoneal thickness.

Method: Fifty-three prevalent peritoneal dialysis patients, who were on peritoneal dialysis for at least 12 months, were included in the study. All demographical characteristics and peritoneal equilibration test results were recorded. Parietal peritoneal thickness was measured by the same radiologist from three abdominal quadrants except one of the lower quadrant in which peritoneal catheter has taken place at the mid-clavicular line. The mean of three measurements were calculated as peritoneal thickness.

Results: Twenty-three patients were female (43%) and five of study patients were diabetic (9%). The mean age was 50±13 years. The mean duration of peritoneal dialysis was 36±17 months. The median peritoneal thickness was 466 µm (IQR:366-633) and was significantly correlated with body weight (r: 0.31,p< 0.05), height (r: 0.31,p< 0.05), D/D0 glucose (r: -0.32,p< 0.02), D/P creatinine (r: 0.29, p<0.03) and peritoneal dialysis duration (r: 0.40,p<0.01).

Discussion: Peritoneal thickness measurement showed a positive correlation with time on dialysis; progressing from a median of 400 µm (IQR: 275-525) in patients who have been on peritoneal dialysis for less than 24 months up to 1035 µm (IQR: 725-1316) in patients who have undergone peritoneal dialysis for more than six years. Cox regression analysis showed that peritoneal thickness was an independent risk factor for technical failure (OR: 1.0039, p<0.001)

In conclusion, ultrasound examination is a simple and non-invasive method to measure the peritoneal thickness that may predict technical failure and even encapsulating sclerosing peritonitis.

Long-Term Survival after Diagnosis of Encapsulating Peritoneal Sclerosis is Possible

J. Caballero², P. Gallar¹, J.C. Herrero¹,
O. Ortega¹, I. Bengoa², M. Sanchez¹,
I. Rodriguez¹, A. Vigil¹

¹ Hospital Severo Ochoa,
Madrid, Spain

² Hospital 12 de Octubre,
Madrid, Spain

Encapsulating peritoneal sclerosis is a serious, life-threatening complication in patients on long-term peritoneal dialysis. As the prognosis of established EPS is poor, early recognition of preceding symptoms is essential. However, the diagnosis is usually made only when the patient has an established EPS with symptoms of partial or complete intestinal obstruction. Discontinuation of peritoneal dialysis is the mandatory first step of therapy. Additional treatment options include immunosuppressive therapy, tamoxifen, enteric rest with total parenteral nutrition and, if needed, surgical treatment.

Subject and Results: We report five patients, 2 males and 3 females ranging in age from 36 to 63 years (mean, 48.2 years), who had achieved a long survival after the scheduled start of treatment or carrying surgery. The first patient developed EPS after 2 years on peritoneal dialysis, two episodes of peritonitis and a combined transplantation of pancreas and kidney; the other four patients developed EPS after 6, 9, 11 and 12 years on

peritoneal dialysis and several episodes of bacterial peritonitis (5, 3, 7 and 5, respectively). Two patients underwent surgical enterolysis, one with complete relief, and the other patient maintained mild symptoms that could be successfully controlled by treatment with low dose steroid (monitoring 5 and 7 years). The remaining 3 patients received treatment with steroids plus tamoxifen, associated with enteral nutritional support; they showed gradual recovery of the symptoms until their disappearance, and maintained acceptable nutritional parameters, after 1, 3 and 8 years of follow-up.

Conclusion: (1) Long-term survival of patients with EPS is possible if it is suspected, and treatment started early.

(2) The surgical treatment (release of intestinal adhesions) can be considered when symptoms of EPS are not improved by immunosuppressive treatment, being ideal done early, before it is presented an emergency situation, in which the prognosis is worse.

3. Peritoneal Dialysis Modality-related Topics

Residual Renal Function in Automated and Continuous Ambulatory Peritoneal Dialysis

W. Michels¹, M. Verduijn²,
E. Boeschoten³, F. Dekker²,
R. Krediet¹

¹ Academic Medical Center,
Amsterdam, Netherlands

² Leiden University Medical Center,
Leiden, Netherlands

³ Hans Mak Institute,
Naarden, Netherlands

Automated peritoneal dialysis (APD) is increasingly being used. One possible disadvantage of APD might be a more rapid decline in residual renal function (RRF) compared to continuous ambulatory peritoneal dialysis (CAPD). The study question was whether patients on APD lose their RRF more rapidly than those on CAPD?

Incident APD and CAPD patients with RRF at the start of dialysis in the prospective, multicentre cohort study of the NECOSAD were included. RRF was measured as GFR (mean urea and creatinine clearances). Time until complete loss of RRF was compared using Hazard ratio's (HR) for APD compared to CAPD. Mean GFR over time was compared with Linear Mixed Models. Both analyses were done in an intention-to-treat and an as-treated design, and were corrected for age, sex and comorbidity at baseline. Maximum follow-up was 4 years.

At the start of dialysis 516 CAPD and 81 APD patients had RRF. In the APD group 79% were men, mean (SD) age was 51.1 (16.4) years. In the CAPD group 66% were men, mean age was 53.2 (14.4) years. Mean GFR was 5.7 mL/min in both groups. The crude HR in the intention-to-treat design was 1.10 (CI95%: 0.86 to 1.41), and adjusted 1.13 (0.88 to 1.45). In the as-treated design the crude HR was 1.13 (0.77 to 1.66), adjusted it was 1.24 (0.83 to 1.84). In the intention-to-treat design GFR was 0.27 (CI95%: -0.74 to 0.19) lower in the APD group over time in the as-treated design it was 0.33 (-0.78 to 0.18) lower. Adjustment did not change the results. Time until complete loss of RRF and mean GFR over time, were not significantly different over time, although patients on CAPD tended to have a longer time until complete loss of RRF and a higher GFR during follow-up.

No Major Differences in Quality of Life over Time on Automated Peritoneal Dialysis Compared to Continuous Ambulatory Peritoneal Dialysis

W. Michels¹, S. van Dijk², M. Verduijn²,
S. le Cessie², E. Boeschoten³,
F. Dekker², R. Krediet¹

¹ Academic Medical Center,
Amsterdam, Netherlands

² Leiden University Medical Center,
Leiden, Netherlands

³ Hans Mak Institute,
Naarden, Netherlands

Dialysis provides a substantial burden in the life of patients with renal failure. Automated peritoneal dialysis (APD) is often prescribed because of an expected better quality of life (QoL) compared to continuous ambulatory peritoneal dialysis (CAPD). The aim of this study was to analyze the differences in QoL over time in incident APD and CAPD patients.

Adult patients on CAPD or APD at 3 months after the start of dialysis in the NECOSAD were included. In this cohort of incident dialysis patients, data were collected at the start of dialysis, at a 3 month interval and every 6 months thereafter until death or transplantation. For QoL measurements the Short-Form 36 (SF-36) questionnaire was administered from start; the KDQOL was administered from the 3rd month visit onward. In both questionnaires, a higher score implicates a better QoL. Mean differences over time on QoL dimensions were calculated for APD compared to CAPD using Linear Mixed Models. Analyses were adjusted for age, sex, comorbidity and GFR at baseline. Patients were followed until their first

switch to any other dialysis modality. Maximal follow-up was 3 years.

No major differences were present in physical or social parameters for the 561 patients treated with CAPD and the 86 with APD. For CAPD the mean (SD) age was 54 (15) years and 66% were men. For the APD group mean age was 52 (16) and 77% were men. In the SF-36 no differences were found on mental and physical summary scores. In the KDQOL the dimensions "dialysis-staff-encouragement" (β : -5.24 (CI95%: -9.02 to -1.46)) and "sexual-function" (β : 9.89 (CI95%: 2.03 to 17.75)) were different between both therapies. After adjustment the difference on "dialysis-staff-encouragement" remained. In contrast to expectation, sleep was not worse on APD.

No major differences in quality of life were present between APD and CAPD in incident dialysis patients.

Personalisation of Automated Peritoneal Dialysis (APD) Treatment using a Computer Modeling System

C. Taietti, E.G. Galli, M. Borghi

Azienda Ospedaliera di Treviglio,
Treviglio, Italy

Introduction: The availability of new cyclers and management software for patients on Automated Peritoneal Dialysis (APD) enables individual cycle differentiation both for dwell time and load and drainage volumes in addition to a reduced glucose load. Considering that there are various peritoneal transport capacities, it is possible to personalise the final treatment to improve dialysis adequacy or its maintenance by reducing the duration and volumes of the total load per session and by using solutions containing low glucose concentrations, thereby prolonging the survival of the technique itself.

Methods: Fifteen clinically stable patients in APD treatment with a standard treatment profile for at least six months. After performing PET scans and measuring clearances, the dialysis programme was modified by individualising it according to the characteristics of peritoneal membrane transport and by taking into account the amount of residual diuresis and the

patient's need for ultrafiltration; this was implemented by means of the PatientOnLine software created by Fresenius Medical Care.

Results: After a month of personalised dialysis treatment, the weekly peritoneal Kt/V increased from 1.02 ± 0.37 to 1.47 ± 0.61 , $P=0.001$. The total Kt/V reached levels of optimum dialysis adequacy (from 1.62 ± 0.33 to 2.21 ± 0.28 , $P=0.0001$). The weekly peritoneal creatinine clearance also increased from 22.27 ± 9.16 to 32.86 ± 16.94 ($P=0.005$), with total weekly clearance increasing from 53.51 ± 16.86 to 67.58 ± 14.52 ($P < 0.0001$). The improvements obtained in terms of dialysis adequacy involved no statistically significant differences regarding the total infused volume, ultrafiltration and the duration of dialysis treatment. It should also be noted that no changes in residual diuresis occurred. No hypertonic solutions were used in the personalised prescriptions and the 2.5% solutions were also reduced from 23% to 2% in favour of isotonic solutions (97%).

Continuous Flow Peritoneal Dialysis (CFPD) in Children: A new Technique for Acute Renal Failure in the Intensive Care Unit

R. Raaijmakers¹, A. Argent², P. Gajjar²,
C. Schroder³, P. Nourse²

¹ Radboud University Nijmegen
Medical Centre, Nijmegen,
Netherlands

² Red Cross Children's Hospital,
Cape Town, South Africa

³ Gelre Hospital, Apeldoorn,
Netherlands

Introduction: Acute renal failure can be treated with different dialysis modalities, depending on patient characteristics and hospital resources. Peritoneal dialysis can be first choice in clinical situations like hypotension, coagulation difficulties or difficult venous access. The main disadvantage of peritoneal dialysis is the relatively limited efficacy. With continuous flow peritoneal dialysis (CFPD) higher clearances and ultrafiltration could be achieved.

Aim: To investigate whether CFPD is more effective than conventional PD in acute renal failure.

Methods: A pilot study was performed in the intensive care unit in The Red Cross University Hospital in Cape Town in three patients. Two patients first received CFPD for 8-12 hours and afterwards conventional peritoneal dialysis. The 3rd patient only received CFPD. CFPD was performed with two bedside placed catheters; the first conventionally placed in the midline, the second one placed midway between the superior iliac crest and the umbilicus. After initial filling, dialysate flow rate (100 ml/1.73m²/min) was maintained

with an adapted CVVH (continuous venovenous hemofiltration) machine, and ultrafiltration flow rate was set at 2.5 ml/1.73m²/min. Every 4 hours ultrafiltration was adjusted if needed.

Results: In patient 1 clearances for urea and creatinine on CFPD versus conventional PD were 11.9 versus 3.5 and 18.0 versus 3.5 ml/1.73m²/min. Ultrafiltration was 1.8 ml/kg/hr versus negative. In patient 2 urea and creatinine clearances were 10.1 versus 6.1 and 16.7 versus 5.1 ml/1.73m²/min. Ultrafiltration was 2.5 versus 1.3 ml/kg/hr. In patient 3 (only CFPD) urea and creatinine clearances were 10.3 and 3.0 ml/1.73m²/min. Ultrafiltration was 4.1 ml/kg/hr. No complications of dialysis occurred. Patient 1 and 2 had recovery of renal function, patient 3 died of ongoing sepsis.

Conclusions: In this first report of CFPD in 3 pediatric patients with acute renal failure, CFPD has been shown to be more effective for urea and creatinine clearance and ultrafiltration than conventional peritoneal dialysis, without complications of dialysis observed.

4. Nutritional and Fluid Status Monitoring

Nutritional Assessment using Body Composition Monitoring in Peritoneal Dialysis Patients. Variables Determining Body Mass, Fat Tissue and Lean Tissue Index

A. Covic¹, W. Van Biesen²,
S. Fan³, K. Claes⁴,
M. Lichodziejewska-Niemierko⁵,
C. Verger⁶, J. Steiger⁷, V. Schoder⁸,
A. Gauly⁸, R. Himmele⁸

¹ Dialysis Center NephroCare,
Iasi, Romania

² University Hospital Ghent,
Ghent, Belgium

³ The Royal London Hospital,
London, United Kingdom

⁴ University Hospital Leuven,
Leuven, Belgium

⁵ Dialysis Center NephroCare,
Gdansk, Poland

⁶ University Hospital René Dubos,
Pontoise, France

⁷ University Hospital Basel,
Basel, Switzerland

⁸ Fresenius Medical Care
Deutschland GmbH,
Bad Homburg, Germany

Objective: Apart from adequate management of the fluid status in peritoneal dialysis patients the nutritional aspect of the therapy is equally important for the patient's morbidity and mortality. However, the effects of different therapy modalities and dialysis prescriptions on lean tissue mass and fat tissue mass are rarely measured and even less monitored in every day practice. In this cross-sectional study body composition data was obtained with the Body Composition Monitor (BCM, Fresenius Medical Care) to identify relevant variables for optimized nutritional outcomes.

Methods: We screened 973 peritoneal dialysis patients from 28 centers in 6 European countries. 639 patients met the inclusion/exclusion criteria. Body composition, blood pressure, dialysis modality and prescription, pre-existing diseases, comorbidities, and antihypertensive medication were documented and analyzed.

Results: Mean body mass index (26.3 ± 5.1 kg/m²) and fat tissue index (12.6 ± 6.0 kg/m²) were slightly above the normal range whereas mean lean tissue index (13.4 ± 3.4 kg/m²) was within normal range at a mean weight

of 72.2 ± 15.4 kg and height of 166 ± 9.6 cm. Patients on glucose peritoneal dialysis solutions alone had a statistically significantly better outcome than those on polyglucose or amino acid solutions in regard of nutritional parameters like lean tissue index. Further, age, sex, peritoneal dialysis solution, hemoglobin, NYHA stage, stage of hypertension, diabetes, urine output, and body mass index had significantly beneficial or adverse influence on lean tissue index in the multivariate analysis, whereas ultrafiltration, transport status, glucose concentration, liver disease, and months on peritoneal dialysis did not show any relevance in the model.

Conclusions: The study provides essential information on nutritional status in a large representative cohort of European peritoneal dialysis patients. It identifies patient inherent and treatment dependent nutritional outcome predictors. BCM measurement enables clinicians to obtain objective data on patient's body composition regarding fat tissue, lean tissue, and fluid status in routine clinical practice to optimize peritoneal dialysis therapy and patient outcomes.

Body Composition Monitoring and Fluid Assessment in Peritoneal Dialysis Patients. Variables Determining Overhydration and Blood Pressure

W. Van Biesen¹, A. Covic²,
S. Fan³, K. Claes⁴,
M. Lichodziejewska-Niemierko⁵,
C. Verger⁶, J. Steiger⁷, P. Wabel⁸,
A. Gauly⁸, R. Himmele⁸

¹ University Hospital Ghent,
Ghent, Belgium

² Dialysis Center NephroCare,
Iasi, Romania

³ The Royal London Hospital,
London, United Kingdom

⁴ University Hospital Leuven,
Leuven, Belgium

⁵ Dialysis Center NephroCare,
Gdansk, Poland

⁶ University Hospital René Dubos,
Pontoise, France

⁷ University Hospital Basel,
Basel, Switzerland

⁸ Fresenius Medical Care
Deutschland GmbH,
Bad Homburg, Germany

Objective: Adequate management of fluid status is a pivotal factor for long-term outcomes of peritoneal dialysis patients. Despite its importance, body composition is rarely determined by objective methods. With the Body Composition Monitor (BCM, Fresenius Medical Care) a precise direct measurement has been developed for every day practice. The purpose of this cross-sectional study was to evaluate body composition and to identify relevant variables for optimized fluid balance and patient outcomes.

Methods: We screened 973 peritoneal dialysis patients from 28 centers in 6 European countries. 639 patients met the inclusion/exclusion criteria. Body composition, blood pressure, dialysis modality and prescription, pre-existing diseases, comorbidities, and antihypertensive medication were documented and analyzed.

Results: Overhydration was commonly seen in peritoneal dialysis patients (53%). Mean overhydration was 1.67 ± 2.3 liters (range: -4.7 to $+19.7$ L). Mean blood pressure was 137 ± 25.6 mmHg systolic and 80 ± 14.3 mmHg diastolic with 85.4% of the patients being on antihypertensive medication. Less than half of the patients were

normohydrated (40%). Regarding overhydration and blood pressure 27% were in the optimal range, 26% with overhydration and high blood pressure, 28% with overhydration and normal blood pressure, 14% with high blood pressure but without overhydration. Patients on biocompatible glucose solutions alone or polyglucose had a significantly better outcome regarding overhydration than those on standard glucose or amino acid solutions. Further age, sex, modality, peritoneal dialysis solution, glucose concentration, transport status, hemoglobin, NYHA stage, diabetes, and body mass index had significant beneficial or adverse influence on overhydration in the multivariate analysis, whereas ultrafiltration, urine output, and months on peritoneal dialysis did not show any relevance in the model.

Conclusions: The results show that common assessment of clinical parameters such as weight, blood pressure, urine output, and ultrafiltration does not give a reliable estimate for the patient's fluid status. The BCM measurement provides essential information to identify patients at risk, supporting clinicians to optimize peritoneal dialysis therapy and patient outcomes.

Cross-Sectional Assessment of Hydration Status in Pediatric Peritoneal Dialysis Patients with Bio-Impedance Spectroscopy

S. Eerens, A. Bael, D. Trouet,
K. Van Hoeck

University Hospital Antwerp, Edegem,
Antwerp, Belgium

Background: Dialysis aims to keep water and solute balance within physiologic boundaries. The hydration status of a patient results from sodium and fluid intake, dialysis and residual renal clearance and medication; is not easy to measure. A strong relationship of hydration status with blood pressure is suspected.

The Body Composition Monitor (BMC, Fresenius Medical Care) is a bioimpedance spectroscopy device that measures overhydration, Total Body Water, Lean Tissue Mass and FAT mass. It has been validated for children and offers an age-dependent normal range for overhydration.

Methods: Cross-sectional measurement and comparison with age-dependent normal range of overhydration in 9 pediatric peritoneal dialysis patients aged 2 to 16 years, 3 girls.

Results: Overhydration ranged from -0.5 liters to + 0.7 liters. All values were within normal limits. There was no correlation of overhydration with systolic blood pressure. While overhydration was normal in all children, systolic blood pressure was higher than p95 in 6 children (range 103 - 134% of p95, average 120%) and below p95 in 3 children (range 85-94% of p95, average 90%)

Conclusion: While all patients are within the reference ranges for overhydration, 66% of the population suffer from hypertension.

5. Clinical Issues in Peritoneal Dialysis

Serum Albumin during Peritonitis

E. Ladanyi¹, J. Montenegro²,
T. De los Rios³

¹ Nephrology Centre Miskolc,
Miskolc, Hungary

² Service of Nephrology,
Hospital de Galdakao,
Galdácano, Spain

³ Fresenius Medical Care
Deutschland GmbH,
Bad Homburg, Germany

Introduction: In peritoneal dialysis peritonitis episodes are associated with decreasing serum protein, due to protein loss caused by increased permeability of the peritoneum and the inflammatory response. However, there is little information about the natural course of serum protein during peritonitis. The purpose of this study was to observe the serum albumin behaviour during acute inflammation.

Methods: In this observational study seven stable peritoneal dialysis patients diagnosed with peritonitis were included. Peritonitis was defined as the presence of two of the following criteria: cloudy effluent, symptoms (e.g. fever, abdominal pain) and positive culture on Gram-stain or subsequent culture of dialysate. The patients were controlled in seven visits during the “peritonitis phase” (days 1 to 28 after diagnosis of peritonitis) and once at the end of the “recovery phase” which lasted further four weeks. Pre-peritonitis data were retrospectively documented.

Results: The mean serum albumin values reduced to 33.9 ± 3.8 g/L at day 1 reaching the lowest value (32.2 ± 3.1 g/L) at day 2. After that the serum albumin recovered to 33.6 ± 3.8 g/L at day 7 and 34.4 ± 3.3 g/L at day 10. After 8 weeks (35.4 ± 28 d/L) the values were similar to the pre-peritonitis values (35.2 ± 3.4 g/L). Albumin loss to the dialysate was the highest at day 1 (10.2 ± 2.0 g), reduced to 7.3 ± 1.7 g at day 2 and reached with 5.6 ± 1.4 g after 18 days similar levels as at the end of the study (6.1 ± 1.6 g). At day 1 the mean C-reactive protein (CRP) values were 28.5 ± 25.4 mg/L and increased to 67.5 ± 62.3 mg/L at day 2, after this the CRP reduced, reaching similar values as pre-peritonitis (6.1 ± 4.2 mg/L) at day 10 (5.8 ± 4.9 mg/L).

Conclusions: An association between albumin levels in serum and loss into dialysate and inflammation was observed. Serum albumin, as well as CRP recovered usually within few days to pre-peritonitis.

Symptom Burden in Peritoneal Dialysis Patients

C. Goodlad, M. Clemenger,
J. McGrory, S.S. Haddoub, N. Hisole,
I.C. Horpos, K. Pryde, E. Tonkin,
E. Brown

Hammersmith Hospital,
London, United Kingdom

Background: Relatively little data exists on the nature and frequency of physical symptoms in peritoneal dialysis patients. We wish to document the symptoms experienced by our peritoneal dialysis population and investigate prospectively any correlations with dialysis parameters and patient outcomes. We report our initial cross-sectional findings.

Methods: Questionnaire with 8 abdominal symptoms and 13 non-abdominal symptoms. Each symptom is scored as 0, 1, 2 or 3 for both severity and frequency and added to produce a total score (range 0-126). We also collected PET and adequacy data including residual renal function, comorbidity data (Stoke-Davies score) and medication burden.

Results: 34 patients mean age 61.8 (range 28-90) years, on peritoneal dialysis (19 CAPD, 15 APD) for median of 1.4 (range 0.1-9.3) years. They were generally well dialysed (median Kt/V 2.31 and total fluid removal/24 hours 1353 mls). Median Stoke co-morbidity category=2 and number of medications taken=10.

Median total symptom score was 29.5 (range 6-61). Median abdominal symptom score was 6 (range 0-20). Highest scores were seen for "lack of energy" (median 3/6) followed by "joint pains", "cold hands", "cramps", "dry mouth", "poor sleep" and "itch"(all median 2/6). Abdominal symptoms were neither particularly frequent nor severe.

No correlations were seen with dialysis adequacy parameters or transporter status, age, time on peritoneal dialysis, residual renal function or co-morbidity score. Follow-up questionnaires at a median interval of 6 months in 10 patients showed a similar pattern of scores across each category with no change in the median total scores.

Conclusions: Although clinicians may focus on dialysis issues and abdominal symptoms, patients report general and non-specific symptoms as more troublesome. Further investigation is required in a larger group to determine any predictive value of such symptoms in terms of patient outcomes and whether adjustment of medications or dialysis regime can reduce this considerable symptom burden.

Peritoneal Dialysis Patients' Experience of the PD "Coffee Morning" as a Form of Peer Group Support

K. Pryde, S.S. Haddoub,
M. Clemenger, N. Hisole, J. McGrory,
E. Tonkin, I.C. Horpos, S. Newbury,
E. Brown

Imperial College NHS Trust,
London, United Kingdom

There are many physical, psychological and social problems associated with chronic illness. Government guidelines have highlighted the merits of peer support groups for people who have experienced life-changing events. Such groups have been shown to help patients with chronic disease cope with their treatment/illness. Patients on peritoneal dialysis can often feel socially isolated as they do not have many opportunities to meet other patients. We therefore decided to set up a peer support group in the form of an informal coffee morning, held every two months. Invitations are sent to all patients. The meeting takes place on the PD unit. One nurse acts as a facilitator to introduce patients to one another and prompt discussion. Guest speakers are invited to discuss relevant issues such as transplantation, social support, and counselling. Between 7 and 15 patients attend and the age range is between 45-80 years. Some of the older patients find it difficult to

attend because of transport problems.

After the meeting, questionnaires are given to patients asking for feedback regarding usefulness of the discussion, relevance of such an event to their situation and the impact it might have on their general attitude to their treatment.

Patients expressed that they are more confident and had learned some new coping strategies. By not letting their dialysis take over their lives they are more empowered. Patients shared their own experiences regarding diet and fluid balance e.g. by exchanging recipes. Some patients have even found the courage to go on holiday after attending and talking to other patients.

This new initiative has received positive feedback. The next step is to invite predialysis patients who are interested in peritoneal dialysis as it has been shown that patient choice is often enhanced by meeting patients on different treatments.

stay•safe[®]/sleep•safe

Delivering PD therapy in a safe and convenient way



Safe and convenient systems go hand in hand with the beneficial effects of ultra-low GDP fluids with neutral pH



Fresenius Medical Care

Fresenius Medical Care Deutschland GmbH · 61346 Bad Homburg · Germany
Phone: +49 (0) 6172-609-0 · Fax: +49 (0) 6172-609-2191 · www.fmc-ag.com



Fresenius Medical Care

Fresenius Medical Care Deutschland GmbH · 61346 Bad Homburg v. d. H. · Germany · Phone: +49 (0) 6172-609-0 · Fax: +49 (0) 6172-609-2191
www.fmc-ag.com · Head office: Else-Kröner-Straße 1 · 61352 Bad Homburg v. d. H.