Peritoneal Dialysis – State-of-the-Art 2012

Volume Editors

Claudio Ronco  Vicenza
Carlo Crepaldi  Vicenza

28 figures, 2 in color, and 30 tables, 2012
Contents

IX Preface
Ronco, C. (Vicenza)

XII The International Vicenza Course on Peritoneal Dialysis – 30 Year Anniversary
Nolph, K.D. (Columbia, Mo.)

Peritoneal Dialysis Solutions

1 Twenty Years of Bicarbonate Solutions
Feriani, M. (Venice)

6 Peritoneal Dialysis Solution and Nutrition
Verger, C. (Pontoise)

11 Alternative Dialysis Strategies with Icodextrin
Panzer, S.E.; Teitelbaum, I. (Aurora, Colo.)

16 Are Current Peritoneal Dialysis Solutions Adequate for Pediatric Use?
Verrina, E.E.; Cannavò, R. (Genoa); Schaefer, B.; Schmitt, C.P. (Heidelberg)

New Challenges for PD and Home Therapies

23 Brazilian Peritoneal Dialysis Multicenter Study (BRAZPD): From Conception to Execution of a National Peritoneal Dialysis Reality Check
Divino-Filho, J.C. (Stockholm/Lund); de Andrade Bastos, K. (Aracaju); Qureshi, A.R. (Stockholm); Riella, M.C.; Pecoits-Filho, R. (Curitiba); Fernandes, N. (Juiz de Fora) on behalf of the Brazilian Peritoneal Dialysis Multicenter Study (BRAZPD) Group

30 Comparing Outcomes of Hemodialysis and Peritoneal Dialysis Patients: Consider the Pitfalls
Mehrotra, R. (Torrance, Calif./Los Angeles, Calif.)

35 Hypogonadism in Males with Chronic Kidney Disease: Another Cause of Resistance to Erythropoiesis-Stimulating Agents?
Stenvinkel, P; Bárány, P. (Stockholm)

Practical Issues in Peritoneal Dialysis 1

40 Getting the Right Patient on the Right Renal Replacement Therapy
Pérez Fontán, M.; Rodríguez-Carmona, A.; López-Muñiz, A.; García-Falcón, T. (A Coruña)
47  Doubts on the Long-Term Survival of Peritoneal Dialysis Patients Are No Longer a Medical Barrier to Home Dialysis
Lameire, N.; Van Biesen, W. (Ghent)

53  How to Avoid Technique Failure in Peritoneal Dialysis Patients?
Lobbedez, T.; Boissinot, L.; Ficheux, M.; Castrale, C.; Ryckelynck, J.-P. (Caen)

58  Clinical Practice Guidelines: An Important Tool in Improving Dialysis Quality
Lameire, N.; Van Biesen, W. (Ghent)

Telemedicine and e-Health in PD

68  Remote Monitoring for Continuous Peritoneal Dialysis
Rosner, M.H. (Charlottesville, Va.); Ronco, C. (Vicenza)

74  e-Health: Remote Health Care Models in Peritoneal Dialysis
Struijk, D.G. (Amsterdam)

79  Remote Monitoring of Peritoneal Dialysis in Special Locations
Nayak, A. (Pilani); Antony, S.; Nayak, K.S. (Hyderabad)

Lipid Disorders, Inflammation and Anemia

83  Dialysis Modality Choice for the Elderly Patient with End-Stage Renal Disease
Rosner, M.H. (Charlottesville, Va.); Ronco, C. (Vicenza)

89  Anemia Management in Patients on Peritoneal Dialysis
Del Vecchio, L.; Cavalli, A.; Locatelli, F. (Lecco)

95  Maximizing the Erythropoietin Response: Iron Strategies
Prabhu, M.V.; Nayak, A.; Sridhar, G.; Subhramanyam, S.V.; Nayak, K.S. (Hyderabad)

100 Lipid Disorders in Uremia and Dialysis
Bakris, G.L. (Chicago, Ill.)

106  Statins and Lipid-Lowering Strategies in PD
Heimbürger, O. (Stockholm)

111  Statin Therapy Is Associated with Decreased Small, Dense Low-Density Lipoprotein Levels in Patients Undergoing Peritoneal Dialysis
Clementi, A. (Vicenza/Cagliari); Kim, J.C. (Vicenza/Seoul); Floris, M. (Vicenza/Cagliari); Cruz, D.N.; Garzotto, F.; Zanella, M.; Nalessco, F.; Brendolan, A.; Giavarina, D.; Soffiati, G.; Ronco, C. (Vicenza)

CKD-MBD and Inflammation Management in PD

116  Phosphate Control in Peritoneal Dialysis
Cozzolino, M.; Stucchi, A.; Rizzo, M.A.; Brenna, I.; Elli, F.; Ciceri, P. (Milan); Bover, J. (Barcelona); Cusi, D.; Gallieni, M. (Milan)

124  Role of Vitamin D Receptor Activators in Peritoneal Dialysis
Bover, J.; Lloret, M.J.; DaSilva, I.; Furlano, M.; Díaz, M.; Herreros, A. (Barcelona); Cozzolino, M. (Milan); Ballarín, J. (Barcelona)

143  Calcimimetics in Peritoneal Dialysis Patients
Messa, P.; Castelnovo, C.; Scalamogna, A. (Milan)
<table>
<thead>
<tr>
<th>Page</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>150</td>
<td>Factors Affecting Loss of Residual Renal Function(s) in Dialysis</td>
<td>Raimann, J.G. (New York, N.Y.); Kitzler, T.M. (Montreal, Que.); Levin, N.W. (New York, N.Y.)</td>
</tr>
<tr>
<td>157</td>
<td>Prospective Safety Study of Bardoxolone Methyl in Patients with Type 2 Diabetes Mellitus, End-Stage Renal Disease and Peritoneal Dialysis</td>
<td>Warnock, D.G. (Birmingham, Ala.); Hebbar, S. (Irving, Tex.); Bargman, J. (Toronto, Ont.); Burkart, J. (Winston Salem, N.C.); Davies, S. (Stoke-on-Trent); Finkelstein, F.O. (New Haven, Conn.); Mehrrota, R. (Torrance, Calif.); Ronco, C. (Vicenza); Teitelbaum, I. (Aurora, Colo.); Urakpo, K. (Irving, Tex.); Chertow, G.M. (Palo Alto, Calif.)</td>
</tr>
<tr>
<td>164</td>
<td>Assessment of Fluid Status in Peritoneal Dialysis</td>
<td>Woodrow, G. (Leeds); Ronco, C. (Vicenza)</td>
</tr>
<tr>
<td>169</td>
<td>Fluid Transport and Homeostasis in Peritoneal Dialysis</td>
<td>Teixidó Planas, J. (Badalona)</td>
</tr>
<tr>
<td>174</td>
<td>Bioimpedance and Brain Natriuretic Peptide in Peritoneal Dialysis Patients</td>
<td>Crepaldi, C.; Lamas, E.I.; Martino, F.K.; Rodighiero, M.P.; Scalzotto, E.; Wojewodzka-Zelezniakowicz, M. (Vicenza); Rosner, M.H. (Charlottesville, Va.); Ronco, C. (Vicenza)</td>
</tr>
<tr>
<td>182</td>
<td>Role of Peritoneal Dialysis as a Chronic Renal Replacement Therapy in Cardiorenal Patients</td>
<td>Pego, C.; Rodrigues, A. (Porto); Ronco, C. (Vicenza)</td>
</tr>
<tr>
<td>200</td>
<td>Setting Up Research in Peritoneal Dialysis</td>
<td>Witowski, J. (Poznan)</td>
</tr>
<tr>
<td>228</td>
<td>Time between Peritoneal Dialysis Catheter Insertion and Use</td>
<td>Elhassan, E. (Khartoum); Teitelbaum, I. (Aurora, Colo.)</td>
</tr>
<tr>
<td>232</td>
<td>Peritoneal Dialysis Membrane Evaluation in Clinical Practice</td>
<td>Krediet, R.T.; Struijk, D.G. (Amsterdam)</td>
</tr>
</tbody>
</table>
Bioelectrical Impedance Analysis in the Assessment of Hydration Status in Peritoneal Dialysis Patients
Haapio, M. (Vicenza/Helsinki); Lentini, P. (Vicenza/Bassano del Grappa); House, A.A. (Vicenza/London, Ont.); de Cal, M.; Cruz, D.N.; Gong, D.; Rodighiero, M.P. (Vicenza); Dell’Aquila, R. (Vicenza/Bassano del Grappa); Ronco, C. (Vicenza)

Today’s Approaches to Prevent Peritonitis
Piraino, B. (Pittsburgh, Pa.)

Transplant Outcomes and Dialysis Modality
Fuquay, R.; Teitelbaum, I. (Aurora, Colo.)

Neutrophil Gelatinase-Associated Lipocalin in the Early Diagnosis of Peritonitis: The Case of Neutrophil Gelatinase-Associated Lipocalin
Martino, F.K.; Filippi, I.; Giavarina, D.; Kaushik, M.; Rodighiero, M.P.; Crepaldi, C.; Teixeira, C.; Ferrer Nadal, A. (Vicenza); Rosner, M.H. (Charlottesville, Va.); Ronco, C. (Vicenza)

Prognostic Factors for Peritonitis Outcome
van Esch, S.; Krediet, R.T.; Struijk, D.G. (Amsterdam)

Improving the Care of Diabetic Patients on Peritoneal Dialysis
Dalal, P.; Misra, M. (Columbia, Mo.)

How to Select among Dialysis Options
Mooney, A. (Leeds)

Author Index

Subject Index
Thirty years ago, the first International Course on Peritoneal Dialysis took place in Vicenza, Italy, under the auspices of the International Society of Peritoneal Dialysis and under the guidance of Professor La Greca. Many courses were subsequently held in Vicenza always characterized by a common denominator: quality of the educational programme.

‘The family is back.’ That phrase is the one we always use to start the opening ceremony of the Vicenza International Course on Peritoneal Dialysis. There has been a special feeling and a particular environment in which the course has grown, making it clear why we call it ‘the family’. In the early 1970s peritoneal dialysis (PD) was performed by repeated abdominal puncture using simple infusion sets and 2-liter bottles of PD solutions. The renal ward founded at San Bortolo Hospital in Vicenza by Giuseppe La Greca in 1970 had two rooms dedicated to PD since its beginnings. PD was performed intermittently, three times a week, and PD solution was delivered by gravity from the new 10-liter plastic containers. In those years, various schedules were prescribed, customized PD catheters were made in house and ultrafiltration was monitored by bed scales. When I joined the department’s medical team in 1977, I was impressed by the enormous amount of experience that had matured in the group. I immediately understood how much could be learned in that environment and I decided to start my research in PD, where new developments were still very much needed. My first research work dealt with PD clearances at various dialysate flow rates and dwell times. A few months later, the first paper that included my name among the members of the team was published. I still remember late evenings in the office of Professor La Greca, all of us struggling with the difficult undertaking of writing in English. A few months later, continuous ambulatory peritoneal dialysis (CAPD) appeared on the scene and interest in PD skyrocketed. In those days the idea matured to write a book on PD; The ‘yellow book’ was the ideal academic completion of a huge body of clinical work. At the same time we decided to organize the first international course on PD in Vicenza.

We then started planning topics and speakers for the program. The first telephone calls...
overseas to invite Popovich, Moncrief, Nolph, and other experts in the field were difficult. Nobody knew who we were or where Vicenza was, but in the end we gathered a series of positive answers and a general consensus. The first Vicenza International Course on Peritoneal Dialysis was announced in 1981. As a logo for the course, we decided to use one of the most important architectural jewels of Vicenza: the Villa Capra detta ‘la Rotonda’ di Andrea Palladio. We felt that this logo gave a local trademark to the course, while at the same time being internationally recognizable. With the years, this has become the logo of our department. The congress center, located at the Ente Fiera of Vicenza, was just a big room without amenities or services. We were kept very busy preparing the screen and the audiovisuals, all the signage (including those pointing the way to the restrooms), and the congress kits. For the first course, we prepared picture-ID badges in advance, and all delegates were immediately recognized and welcomed when they arrived at the registration desk. The opening ceremony was held at the Teatro Olimpico, another masterpiece by Andrea Palladio. These appealing special events and the quality of the scientific program made the first International course a real success. The most important experts in the field gathered in Vicenza in 1982, and the faculty of the course included the top experts of the day in PD. Fred Boen, Lazaro Gotloib, Robert Popovich, Jack Moncrief, Charles Mion, Karl Nolph, Steven Vas and Jack Maher were just a few names of the friends who honored the Vicenza course with their presence. The Course became a mixture of high scientific quality and cheerful Mediterranean environment. The scientific programs of the Vicenza Course have always been up to date. At later courses, the most important topics of the moment were always included in the program. Main themes have been the kinetics of ultrafiltration, the reduction of peritonitis, the effects of diabetes and metabolism, and new catheters for chronic PD. Morphological modifications of the peritoneal membrane and the role of the immune response to bacterial invasion of the peritoneal cavity were also discussed.

In 1988, the first industry panel was organized including companies interested in PD such as Bieffe, Braun, Fresenius, Pierrel, Sifra and Baxter. The initial experience of PD registries in various regions of the world was reported by Nolph and Oreopoulos. The important issue of comparing PD outcomes with those of hemodialysis was also debated. In 1991, the course focused on the prescription and delivery of PD and on new criteria to assess the adequacy of therapy. New trends in PD solutions were presented at following meetings and they are even discussed in this latest edition. Cytokine production by peritoneal macrophages and the clinical application of erythropoietin were presented by Jörres, Gahl and Winchester in subsequent editions. The optimization of the Y-set for CAPD was described by Buoncristiani in 1994. Until 1991, the course proceedings were always published in time for the meeting, so that delegates always had the book in their course bag. The books were published by Wichtig Editore as standalone publications, and the number of literature citations for these books were increasing progressively. In 1994, we decided to continue the tradition of timely publication of the proceedings, but the papers were collected in a special issue of *Peritoneal Dialysis International*. Dr. LaGreca was president of the International Society of Peritoneal Dialysis at the time, and we felt it important to publish the proceedings of our course in the official journal of the society. In the 1994 proceedings, specific papers were dedicated to new osmotic agents and new PD solutions. In 1997, the interest in new PD solutions continued, and new, vital issues such as automated PD, the importance of residual renal function, and the importance of computers and the Internet in the management of PD programs were discussed. Another important topic first discussed at the Vicenza Course was the integration of PD with hemodialysis and transplantation in active uremia treatment. Subsequent editions were dedicated to the most actual topics of PD and the programs can be found at the website www.vicenzanephrocourses.com or in the index of the several books containing the proceedings and published by Karger in the book.
series Contributions to Nephrology. In 1991, the International Vicenza Award was instituted and given to a distinguished scientist in the field of PD. The late John F. Maher was the first winner. Subsequent winners were Karl D. Nolph and Dimitri Oreopoulos, Ram Gokal and Lazaro Gotloib, and Jonas Bergstrom. As we gather today, we are celebrating 30 years of science and education in the field of PD. The Vicenza International Course has indeed represented a cornerstone in the education and practice of PD. The design of the course itself is unchanged and will remain so. We are indebted to all the people who have made possible the progressive growth and the remarkable success of the course. Our audience has expanded, and we now have delegates from around the world, including Africa and Asia. We hope that our educational effort has been useful to many people and that it will continue to be useful to coming generations of physicians and nurses. A special thanks to Anna Saccardo, Marta Scabardi, Alessandra Brando and Ilaria Balbo who have organized the logistics and all the details of the Vicenza courses in the past and present editions. A special thanks goes to Karger publishing house for the usual outstanding quality of the publication. The 30th Annual International Vicenza Course has yet another exceptional group of speakers and we are excited that this special issue of Contributions to Nephrology is ready to guide attendees through the event and serve as a valuable tool for the future. We hope that the readers will enjoy the book and will consider it a companion for their daily clinical practice as well as for research.

Claudio Ronco, Vicenza
The International Vicenza Course on Peritoneal Dialysis – 30 Year Anniversary

From 1975–1982, there were many important developments and events that had a very significant impact on the growth and advancement of peritoneal dialysis (PD) as a renal replacement therapy. In 1975, Drs. Moncrief and Popovich placed their first patient on continuous ambulatory peritoneal dialysis (CAPD). In 1977, the University of Missouri began a collaboration with Drs. Moncrief and Popovich to do clinical studies in patients on CAPD funded by NIH. This collaboration led to the NIH CAPD Registry which operated from 1981–1988 before being integrated with the United States Renal Data System. In 1978, Dr. Trevino-Becerrera organized and chaired the first International PD Congress in Chapala, Mexico. At this congress in Mexico, the decision for subsequent conferences in other areas of the world gave birth to the ISPD. The second congress was held in Berlin in 1981, organized by Drs. Kessel and Gahl. In 1981, in order to promote participation in the NIH CAPD Registry, the University of Missouri organized a CAPD Conference which was held in Kansas City, Mo.; this became a yearly event and grew into the International PD Conference and eventually the International Annual Dialysis Conference (ADC); the 32nd ADC was held in San Antonio, Tex., in February 2012.

In 1982, the Department of Nephrology at S. Bortolamius Hospital in Vicenza, Italy, under the direction of Dr. La Greca, organized the first International Vicenza Course on Peritoneal Dialysis (IVC). Dr. Ronco served as General Secretary of the IVC from 1982 until he became IVC Director in 2001 when Dr. La Greca retired. This course has been presented every three years and this summer will celebrate its 30th anniversary.

Thus, the IVC now joins the ADC and ISPD as a family of meetings that have worked to promote education, research and the best clinical practices in PD therapy. These meetings have exhibited marvelous collaborations during these 30 or more years. Meeting planners and speakers overlap extensively. Each meeting promotes the other two meetings. Many have had the privilege of serving and/or being recognized by several of these meetings. For example, the late Jack Maher, MD was the first President of ISPD, the recipient of the first International Vicenza Award at the fourth IVC in 1991 and the winner of the Lifetime Achievement Award in PD at the ADC in 1993. I was honored to be the 3rd president of ISPD, have chaired the ADC for 32 years and was awarded the second International Vicenza Award at the IVC in 1994. Claudio Ronco, current chair of the IVC, was awarded the ADC Lifetime Achievement Award in PD at the 32nd ADC this year.

Those who have been involved in all three meetings over many years have been welcomed at the IVC by Dr. Ronco as ‘the family’. This reflects the spirit of cooperation and comradeship among...
those who have had the common goal of making PD a better therapy over many decades. The spirit of cooperation among those involved in these three meetings serves as a role model for other specialty areas.

The topics and speakers at the IVC have a tradition of excellence. The publication of the IVC proceedings have often been accomplished ahead of the meeting dates and have been valuable additions to the PD literature.

The IVC has experienced remarkable success in exposing those of us who attend to Italian history and culture. Touring the amazing architectural accomplishments in the city of Vicenza, especially those of Palladio are an extra benefit of attending the IVC. Dinners and receptions are hosted in charming villas. Italian hospitality is legendary.

Dr. Zbylut Twardowski (Columbia, Mo.) summarizes all of the above very well:

'I participated twice at the International Courses on Peritoneal Dialysis organized by St. Bortolo Hospital in Vicenza. The first time it was during the 5th Course in May 24–25, 1994, organized by Prof. Giuseppe La Greca. The meeting was held in the Convention Hall of the BancoAmbrosiano Veneto. The second time I participated on the 15th International Vicenza Course on Peritoneal Dialysis, organized by Prof. Claudio Ronco from May 30 to June 01, 2006, in the Congress Center EnteFiera in Vicenza. The courses were very well organized with important presentations of the best PD experts. In the evening after the course in 2006 we had an impressive Gala Dinner in Villa Imperiali Lampertico.

In addition to valuable presentations I could visit several places of interest designed by famous Andrea Palladio including Villa Capra detta’la Rotonda, Basilica Palladiana, TeatroOlimpico and other places like Villa Trissino where Palladio worked as a mason. It is worth mentioning that the main building of the University of Virginia was named The Rotunda by Thomas Jefferson in honor of Andrea Palladio.'

Dr. Jack Moncrief (Austin, Tex.) also shares his thoughts:

'Thank you for the opportunity to write about the great conferences held in Vicenza. I attended the very first and many subsequent meetings and found them all educational, very well organized and great fun for the participants. The conference was instrumental in helping initiate and demonstrate the value of the transformation of peritoneal dialysis due to the 'long dwell' concept developed by Dr. Robert Popovich and myself here in Austin, Tex. Your conference was responsible for the early and rapid adoption of the CAPD technique by the Italian nephrology community. This interest and utilization has proved correct as there is now a major shift taking place in many countries toward wider use of peritoneal dialysis as an alternative to 'center' hemodialysis.

The nephrology community has recognized your contribution by both the support of the conference and by the many awards you have received, including the recent 'Lifetime Achievement in PD' award at the 'Annual Dialysis Conference' in San Antonio, Tex. This early interest stimulated by the Vicenza conference was directly responsible for the reduction in episodes of peritonitis in PD by the 'drain before fill' concept in which you participated. This concept has now become standard practice throughout the world. Thanks for the opportunity to come to Vicenza and to Italy for so many good reasons.'

Dr. Bengt Lindholm (Stockholm, Sweden) had the following to say:

'I feel honored to be given this opportunity to express my appreciation of this important anniversary. Since the first International Course on Peritoneal Dialysis in Vicenza in 1982, and still going strong for the 30 years thereafter, the Vicenza courses have provided a great educational opportunity for clinicians and researchers wanting to learn more about peritoneal dialysis. The courses which put Vicenza on the map of important nephrology centers in the world have been an ideal platform also for in-depth scientific and clinical updates and discussions among experts dedicated to peritoneal dialysis.

With Giuseppe La Greca as President during the early years, and always with Claudio Ronco as the primus motor, the courses (and the proceedings) have been of great importance and truly conducive to the acceptance, dissemination and development of the new therapy not least during the sensitive infant period of CAPD. The personal, wonderful warm atmosphere of the conferences, and the excellent opportunities for discussions during the social programs, have contributed very much to its success.'
The nephrology community is indebted to the organizers for their visions, endurance and very hard work for the benefit of the patients. I salute, congratulate and thank Claudio Ronco and his team for this achievement!

Congratulations to the Vicenza Nephrology Group for the important contributions of the IVC over the past 30 years.

Karl D. Nolph, MD
Curators’s Emeritus Professor of
Internal Medicine
University of Missouri School of Medicine,
Columbia, Mo.