Hemodialysis Vascular Access and Peritoneal Dialysis Access
Contributions to Nephrology

Vol. 142

Series Editor

Claudio Ronco  Vicenza
Hemodialysis Vascular Access and Peritoneal Dialysis Access

Volume Editors

Claudio Ronco  Vicenza
Nathan W. Levin  New York, N.Y.

131 figures, 24 in color, and 24 tables, 2004
Claudio Ronco
Department of Nephrology
St. Bortolo Hospital
I–36100 Vicenza (Italy)

Nathan W. Levin
Renal Research Institute
207 East 94th Street, Suite 303
New York, NY 10128 (USA)

Library of Congress Cataloging-in-Publication Data

(CIP-Code is available from the Library of Congress on request)
Contents

VIII Foreword
Ronco, C. (Vicenza); Levin, N.W. (New York, N.Y.)

X Preface
Shaldon, S. (Monaco)

Hemodialysis

1 History and Evolution of the Vascular Access for Hemodialysis
Bonello, M. (Vicenza); Levin, N.W. (New York, N.Y.); Ronco, C. (Vicenza)

14 Epidemiology of Vascular Access for Hemodialysis and Related Practice Patterns

29 Vascular Access: Issues and Management
Besarab, A. (Detroit, Mich.)

47 Arteriovenous Fistulas: Different Types and Surgical Techniques
Berardinelli, L. (Milan)

73 Vascular Grafts for Hemodialysis: Types, Sites and Techniques
Warnock, D.G.; Tolwani, A.J.; Gallichio, M.; Allon, M. (Birmingham, Ala.)

94 Temporary Vascular Access for Hemodialysis Treatment
Current Guidelines and Future Directions
Weijmer, M.C.; ter Wee, P.M. (Amsterdam)

112 Hemodialysis Catheters: Materials, Design and Manufacturing
Gloukhoff Wentling, A. (Harleysville, Pa.)
128 Chronic Central Venous Catheters for Dialysis and the Ash Split Cath®
Catheter: Rationale and Clinical Experience
Ash, S.R. (Lafayette, Ind.)

153 Long-Term Vascular Access: The Tesio Catheter
Tesio, F.; Panarello, G. (Pordenone)

159 Vascular Access for Acute Extracorporeal Renal Replacement Therapies
Granata, A. (Catania); D’Intini, V. (Vicenza); Bellomo, R. (Melbourne);
Ronco, C. (Vicenza)

178 Totally Implantable Subcutaneous Devices for Hemodialysis Access
Moran, J.E. (Mountain View, Calif.); Prosl, F. (Mansfield, Mass.)

193 Complications of the Vascular Access for Hemodialysis
Konner, K. (Cologne)

216 Monitoring Techniques of Vascular Access
Segal, J.H.; Weitzel, W.F. (Ann Arbor, Mich.)

228 Hematocrit-Based Measurements of Vascular Access Flow Rate
Bell, D.A.; Zhang S. (Kaysville, Utah)

238 Hemodynamics of the Hemodialysis Access: Implications for Clinical Management
Paulson, W.D. (Shreveport, La.); Jones, S.A. (Ruston, La.)

254 Vascular Access Recirculation: Measurement and Clinical Implications
Schneditz, D.; Krivitski, N. (Graz/Ithaca, N.Y.)

269 Arteriovenous Vascular Access Flow Measurement: Accuracy and Clinical Implications
Krivitski, N.; Schneditz, D. (Ithaca, N.Y./Graz)

285 Interventional Techniques for Malfunctioning Accesses
Shams, J. (New York, N.Y.)

323 Quality Assurance and Continuous Quality Improvement Programs for Vascular Access Care
Walters, B.A.J. (Ft. Lauderdale, Fla./Miami, Fla.); Pennell, P. (Miami, Fla.);
Bosch, J.P. (Ft. Lauderdale, Fla.)

350 Systemic Barriers to Vascular Access Care: Implications for Clinical Outcomes
Sands, J.J. (Celebration, Fla.); Montis, A.L.; Etheredge, G.D. (New Orleans, La.)

363 The Vascular Access: A Long-Term Patient’s Considerations and Reflections
Newmann, J.M. (Reston, Va.)

376 An Experimental Temporary Vascular Access Catheter for Intracorporeal Plasma Separation
Handley H.H. Jr.; Gorsuch, R.; Peters, H.; Punzalan, L. (Napa, Calif.); Cooper, T.G.
(Friendswood, Tex.); Levin, N.W. (New York, N.Y.); Ronco, C. (Vicenza)
387 History and Development of the Access for Peritoneal Dialysis
   Twardowski, Z.J. (Columbia, Mo.)

402 Techniques of Peritoneal Catheter Insertion
   Rodrigues, A.; Cabrita, A.; Nogueira, C. (Porto)

410 Maintenance of Functioning PD Access and Management of Complications
   Verger C. (Pontoise)

422 Catheter Exit Site Care in the Long Term
   Twardowski, Z.J. (Columbia, Mo.)

435 Conditions Leading to Catheter Removal or Substitution
   Dell’Aquila R.; Rodighiero, M.P.; Bonello, M.; Ronco, C. (Vicenza)

447 New Catheter Design for Continuous Flow Peritoneal Dialysis
   Ronco, C. (Vicenza); Gloukhoff Wentling, A. (Harleysville, Pa.); Amerling, R.; Cruz, C.; Levin, N.W. (New York, N.Y.)

462 Author Index

463 Subject Index
Recent developments in hemodialysis techniques have spurred new interest in the field of the vascular access for renal replacement therapies. In particular, the progressive aging of the dialytic population, the high prevalence of diabetes and the demand for increased dialysis efficiency have all pushed the research towards new solutions to access the patient circulation. The program of creating and maintaining a reliable vascular access in hemodialysis patients is today seen as a multidisciplinary task that may include the collaboration of nephrologists, surgeons and interventional radiologists. New techniques have been made available to measure access flow and to perform continuous noninvasive measurements of access recirculation. New biomaterials are today available with improved biocompatibility and surface characteristics and all these new technological issues require a complete and detailed discussion and evaluation.

Finally, the management of complications and the continuous maintenance and care of the access represent one of the most important challenges in the field of hemodialysis.

On the other side of the problem, peritoneal dialysis is emerging as an important renal replacement therapy for a wide spectrum of patients. The field of peritoneal dialysis is also evolving and new devices providing access to the peritoneal cavity have recently been made available. In this setting, the care of the access together with the management of complications represent a further challenge for the clinician. Furthermore, the care of the exit site represents an important aspect of the maintenance of the access and it should be considered as part of the standard access care. Newer techniques of peritoneal dialysis are becoming popular such as continuous flow peritoneal dialysis. In this setting,
special catheters are required to provide the flows necessary to perform the pro-
grammed treatment schedule.

Based on all these considerations, we felt it was important to generate a
book covering all the important issues in the field as well as describing the
available technology and methods available today. The book indeed represents
an important project and a significant educational effort. We think that a book
on this subject will constitute an important contribution in the field of
hemodialysis and peritoneal dialysis and is particularly suited for the series
Contributions to Nephrology.

The book is intended to represent a practical tool for physicians and nurses
involved in the management and care of end-stage renal disease patients as well
as a reference textbook for medical students, residents and fellows.

Claudio Ronco
Nathan W. Levin
Preface

The recent accidental death of Belding Scribner on June 19, 2003 has highlighted the old adage that precedent claims are rarely correct. The original idea of a bypass to maintain the patency of indwelling arterial and venous catheters was developed by Nils Alwall in 1948 and published in 1949 [1]. In his first animal experiments in rabbits, the carotid artery and jugular vein were cannulated with siliconized glass tubes and patency was maintained with a curved siliconized glass capillary bypass. Following the success of the animal work, Alwall et al. [2] started treating patients with end-stage renal disease. However, because of local infection and clotting he abandoned the technique in 1949. Thus, the real merit of Scribner’s contribution (who recognized Alwall’s original claim in the first publication in 1960 at ASAIO [3]) was his determination not to abandon the technique. This intense determination to succeed was evident in his presentation at Evian in September 1960 which I had the honor to hear [4]. Alwall [5] also gave a presentation at Evian on the Swedish experience in long-term dialysis and as a consequence of their work, I started a long-term ESRD dialysis program at the Royal Free Hospital London in 1961. At this time, the Teflon shunt had a life expectancy of weeks and for this reason we developed a femoral vessel puncture technique with a modified Seldinger catheter [6]. Attempts at leaving the catheter in permanently were soon abandoned after fatal embolic and infectious complications [7] and we switched to the shunt developed by Quinton in 1961 where he had developed a flexible siliconized rubber tube to replace the original all Teflon shunt [8]. The silicone Teflon Quinton shunt had a life expectancy of months to years and without this development it is unlikely that there would be more than one million people today living on dialysis. However, in my opinion,
Fig. 1. a Radial cephalic fistula (side to side), created by S.S. in January 1970, used continuously since then by F.U. (male, born March 12, 1938), self-puncturing 3–4 × week.  
b Patient’s comments.

the definitive access site had to await the development from New York by Cimino and Brescia working at the VA hospital in the Bronx. In 1962 [9], they had attempted to perform regular dialysis with a simple venipuncture and pointed out the advantages of this technique over the indwelling Scribner shunt or our repeated femoral vessel puncture technique. It only required the contribution of Appel, the surgeon of the group, to construct the AV fistula for their argumentation of 1962 to become a reality 4 years later [10]. Today, I have no doubt that the only acceptable long-term approach to hemodialysis is via a venipuncture of a fistularized vein resulting from a surgically created arteriovenous fistula. My personal anecdotal belief is based upon the 33 1/2-year survival of a radiocephalic fistula I created in January 1970 that has been punctured more than 5,300 times by the patient himself (3–4 × week) (fig. 1).

Hemodialysis Vascular Access and Peritoneal Dialysis Access edited by C. Ronco and N.W. Levin admirably fulfils its objective as an instructive teaching
book. The 27 individual contributions cover completely the fields of vascular and peritoneal access. I feel certain that it will establish itself as a leader in the access field.

References


Stanley Shaldon MA, MD, FRCP
25 Le Michelangelo
7 Avenue des Papalins
Monaco 98000
Tel. +37 79 20 56 166
Fax +37 79 20 59 026
E-Mail stanley_shaldon@monaco 377.com