

# CJASN

Clinical Journal of the American Society of Nephrology

June 2019 • Vol. 14 • No. 6

## Patient Voice

---

**783** **Managing Fluid Control in the Peritoneal Dialysis Population**

*Shari Gilford*

*See related article on page 882.*

## Editorials

---

**785** **CJASN and Disclosure of Conflicts of Interest**

*Rajnish Mehrotra*

*See related Errata on pages 907, 908, 909 and 910.*

**787** **Therapeutic Potential of Newer Drugs for Treating Hyperkalemia**

*Matthew R. Weir*

*See related article on page 798.*

**789** **Hyperfiltration: Much Ado about Nothing?**

*Sri Lekha Tummalapalli and Michael G. Shlipak*

*See related article on page 854.*

**792** **A Combination of Change in Albuminuria and GFR as a Surrogate End Point for Progression of CKD**

*Josef Coresh and Andrew S. Levey*

*See related article on page 862.*

**795** **The Bone after Kidney Transplantation**

*Tilman B. Drüeke and Pieter Evenepoel*

*See related article on page 894.*

## Original Articles

---

### Acid/Base and Electrolyte Disorders

**798** **Sodium Zirconium Cyclosilicate among Individuals with Hyperkalemia: A 12-Month Phase 3 Study**

*Bruce S. Spinowitz, Steven Fishbane, Pablo E. Pergola, Simon D. Roger, Edgar V. Lerma, Javed Butler, Stephan von Haehling, Scott H. Adler, June Zhao, Bhupinder Singh, Philip T. Lavin, Peter A. McCullough, Mikhail Kosiborod, and David K. Packham, on behalf of the ZS-005 Study Investigators*

*See related editorial on page 787.*

### Chronic Kidney Disease

**810** **Duration of Dual Antiplatelet Therapy in Patients with CKD and Drug-Eluting Stents: A Meta-Analysis**

*Thomas A. Mavrakanas, Yiannis S. Chatzizisis, Karim Gariani, Dean J. Kereiakes, Giuseppe Gargiulo, Gérard Helft, Martine Gilard, Fausto Feres, Ricardo A. Costa, Marie-Claude Morice, Jean-Louis Georges, Marco Valgimigli, Deepak L. Bhatt, Laura Mauri, and David M. Charytan*

### Cystic Kidney Disease

**823** **Growth Pattern of Kidney Cyst Number and Volume in Autosomal Dominant Polycystic Kidney Disease**

*Kyongtae T. Bae, Wen Zhou, Chengli Shen, Douglas P. Landsittel, Zhiyuan Wu, Cheng Tao, Arlene B. Chapman, Vicente E. Torres, Alan S.L. Yu, Michal Mrug, William M. Bennett, and Peter C. Harris, for the Consortium for Radiologic Imaging Studies of Polycystic Kidney Disease (CRISP)*

### Cystic Kidney Disease (Continued)

**834 Proteomic Analysis of Urinary Microvesicles and Exosomes in Medullary Sponge Kidney Disease and Autosomal Dominant Polycystic Kidney Disease**

*Maurizio Bruschi, Simona Granata, Laura Santucci, Giovanni Candiano, Antonia Fabris, Nadia Antonucci, Andrea Petretto, Martina Bartolucci, Genny Del Zotto, Francesca Antonini, Gian Marco Ghiggeri, Antonio Lupo, Giovanni Gambaro, and Gianluigi Zaza*

### Diabetes and the Kidney

**844 Hypoglycemia in People with Type 2 Diabetes and CKD**

*Iram Ahmad, Leila R. Zelnick, Zona Batacchi, Nicole Robinson, Ashveena Dighe, Jo-Anne E. Manski-Nankervis, John Furler, David N. O'Neal, Randie Little, Dace Trence, Irl B. Hirsch, Nisha Bansal, and Ian H. de Boer*

**854 Early Glomerular Hyperfiltration and Long-Term Kidney Outcomes in Type 1 Diabetes: The DCCT/EDIC Experience**

*Mark E. Molitch, Xiaoyu Gao, Ionut Bebu, Ian H. de Boer, John Lachin, Andrew Paterson, Bruce Perkins, Amy K. Saenger, Michael Steffes, and Bernard Zinman, for the Diabetes Control and Complications Trial/Epidemiology of Diabetes Interventions and Complications (DCCT/EDIC) Research Group*  
See related editorial on page 789.

**862 Combination of Changes in Estimated GFR and Albuminuria and the Risk of Major Clinical Outcomes**

*Toshiaki Ohkuma, Min Jun, John Chalmers, Mark E. Cooper, Pavel Hamet, Stephen Harrap, Sophia Zoungas, Vlado Perkovic, and Mark Woodward, on behalf of the ADVANCE Collaborative Group*  
See related editorial on page 792.

### Maintenance Dialysis

**873 Postdialysis Hypokalemia and All-Cause Mortality in Patients Undergoing Maintenance Hemodialysis**

*Tsuyoshi Ohnishi, Miho Kimachi, Shingo Fukuma, Tadao Akizawa, and Shunichi Fukuhara*

**882 Evolution Over Time of Volume Status and PD-Related Practice Patterns in an Incident Peritoneal Dialysis Cohort**

*Wim Van Biesen, Christian Verger, James Heaf, François Vrtovsnik, Zita M. Leme Britto, Jun-Young Do, Mario Prieto-Velasco, Juan Pérez Martínez, Carlo Crepaldi, Tatiana De los Ríos, Adelheid Gauly, Katharina Ihle, and Claudio Ronco, for the IPOD-PD Study Group*  
See related Patient Voice on page 783.

### Transplantation

**894 Changes in Bone Histomorphometry after Kidney Transplantation**

*Satu Keronen, Leena Martola, Patrik Finne, Inari S. Burton, Heikki Kröger, and Eero Honkanen*  
See related editorial on page 795.

## Research Letter

---

**904 Deceased Donor Kidneys Are Harder to Place on the Weekend**

*Kristen L. King, S. Ali Husain, David J. Cohen, and Sumit Mohan*

## Errata

---

**907 Correction**

See related editorial and Errata on pages 785 and 908-910, respectively.

**908 Correction**

See related editorial and Errata on pages 785 and 907, 909, and 910, respectively.

**909 Correction**

See related editorial and Errata on pages 785 and 907, 908, and 910, respectively.

**910 Correction**

See related editorial and Errata on pages 785 and 907-909, respectively.

## Kidney Case Conference: How I Treat

---

### **911** Management of Adult Minimal Change Disease

*Stephen M. Korbet and William L. Whittier*

## Kidney Case Conference: Nephrology Quiz and Questionnaire

---

### **914** Cerebral Ischemia and Cognitive Dysfunction in Patients on Dialysis

*Louise M. Moist and Christopher W. McIntyre*

## Nephro pharmacology for the Clinician

---

### **917** Clinical Pharmacology Considerations in Pain Management in Patients with Advanced Kidney Failure

*Sara N. Davison*

## Perspectives

---

### **932** Vitamin D and Cardiovascular Complications of CKD: What's Next?

*Debasish Banerjee and Vivekanand Jha*

### **935** Anticoagulant-Related Nephropathy: It's the Real McCoy

*Richard J. Glassock*

### **938** Place of Percutaneous Fistula Devices in Contemporary Management of Vascular Access

*Haimanot Wasse*

## Feature

---

### **941** Quality Improvement Goals for Acute Kidney Injury

*Kianoush Kashani, Mitchell Howard Rosner, Michael Haase, Andrew J.P. Lewington, Donal J. O'Donoghue, F. Perry Wilson, Mitra K. Nadim, Samuel A. Silver, Alexander Zarbock, Marlies Ostermann, Ravindra L. Mehta, Sandra L. Kane-Gill, Xiaoqiang Ding, Peter Pickkers, Azra Bihorac, Edward D. Siew, Erin F. Barreto, Etienne Macedo, John A. Kellum, Paul M. Palevsky, Ashita Jiwat Tolwani, Claudio Ronco, Luis A. Juncos, Oleksa G. Rewa, Sean M. Bagshaw, Theresa Ann Mottes, Jay L. Koyner, Kathleen D. Liu, Lui G. Forni, Michael Heung, and Vin-Cent Wu*

## Review

---

### **954** Vascular Access for Hemodialysis Patients: New Data Should Guide Decision Making

*Michael Allon*

## On the Cover

### *What's the diagnosis?*

A healthy 51-year-old male presented with influenza B infection and bilateral methicillin-resistant *Staphylococcus aureus* necrotizing pneumonia, complicated by profound shock, acute respiratory distress syndrome, and acute kidney injury. Multiple vasopressors and hydrocortisone were used. Renal replacement therapy was required. Refractory hyperkalemia (6.7 mmol/L) was treated with additional polystyrene sulfonate complex (PSC): calcium polystyrene sulfonate 15g orally and 30g enema, and sodium polystyrene sulfonate 120g orally over a 4-day course. Hematochezia and abdominal muscle guarding were noted 4 days after completing the course of PSC. Perforation of the intestines was suspected and urgent surgery disclosed perforations over the terminal ileum, ascending colon, cecum, and rectum. *Clostridium difficile* glutamate dehydrogenase and toxin were negative.

Biopsies at the time of surgery revealed the following:

Multiple dirt-like blue-purple foreign bodies spread over the tracts of transmural perforations. Several perforations broke through whole muscle wall, accompanied with acute peritonitis which was composed of granulation tissue, fibrinous exudates, and neutrophils (Figure 1A). Those foreign bodies were crystals of PSC with a characteristic fish scale appearance (Figure 1B). In addition, multiple abrupt deep ulcers, which were surrounded by generally healthy mucosa, were seen and these were scattered widely and not in a distribution consistent with ischemia (Figure 1C). PSC-associated intestinal necrosis and perforation was confirmed.

Cases of PSC-associated colonic perforation have occurred in patients with chronic kidney disease or receiving chronic dialysis. This case highlights the occurrence of PSC-associated intestinal perforation, which occurred in a patient with previously normal renal function and AKI.

Figure 1A: **Rectal Transmural Perforation Tract** (2X, H&E stain) through the whole muscle wall with acute peritonitis composed of many neutrophils, granulation tissue, and fibrinous exudate; multiple dirt-like blue-purple foreign bodies – polystyrene sulfonate complex crystals – spreading over the tract of transmural perforation.

Figure 1B: **Polystyrene Sulfonate Complex Crystal** (400X, H&E stain) chartered with fish scale appearance.

Figure 1C: **Abrupt Deep Ulcer at Appendiceal Mucosa** (40X, H&E stain) surrounded by generally healthy mucosa. Neither heavy lymphoid infiltration nor chronicity of mucosa injury is seen surrounding the ulcer area.

(Images and text provided by Chih-Hen Yu<sup>1</sup>, MD; Chang-Wen Chen<sup>1\*</sup>, MD; Chen Chang<sup>2</sup>, MD; Jen-Lung Chen<sup>3</sup>, MD; Junne-Ming Sung<sup>4</sup>, PhD;

<sup>1</sup>Medical Intensive Care Unit, National Cheng Kung University Hospital, College of Medicine, National Cheng Kung University, Tainan, Taiwan;

<sup>2</sup>Department of Pathology, National Cheng Kung University Hospital, College of Medicine, National Cheng Kung University, Tainan, Taiwan;

<sup>3</sup>Division of General Surgery, Department of Surgery, National Cheng-Kung University Hospital, College of Medicine, National Cheng-Kung University, Tainan, Taiwan; <sup>4</sup>Division of Nephrology, Department of Internal Medicine, National Cheng-Kung University Hospital, College of Medicine, National Cheng-Kung University, Tainan, Taiwan)