Fluid Management Key to Protecting Kidneys in COVID-19 Patients

By Bridget M. Kuehn

The dilemma of how to best manage fluid levels in critically ill patients receiving mechanical ventilation is a familiar one to nephrologists who may frequently encounter this challenge in patients with sepsis. But managing fluid balance in patients with coronavirus disease 2019 (COVID-19) poses a whole new set of challenges.

There is bi-directional crosstalk between the lung and kidney in critically ill patients with acute respiratory distress syndrome (ARDS), said Kathleen Liu, MD, PhD, professor of medicine at the University of California, San Francisco. Patients with COVID-19 frequently experience severe and prolonged ARDS, but whether there are COVID-19–specific pathogenic mechanisms that may affect these interrelationships is unknown, she said. However, previous research on ARDS in patients with other conditions suggests managing fluid levels is essential.

Further complicating care for these patients is the need to reduce the risk of clinicians becoming infected with the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) that causes COVID-19. A shortage of personal protective equipment (PPE) that helps reduce the risk of clinician infection has forced hospitals to ration their use. This makes use of many fluid monitoring techniques that require direct contact with COVID-19 patients more challenging.

"We're trying to minimize physical contact with these patients [to reduce spread of the infection] and to reduce the use of PPEs," said Michael Heung, MD, MS, professor of medicine at the University of Michigan in Ann Arbor.

Liu and Heung were part of a panel of expert nephrologists who spoke during a recent ASN webinar on AKI: The Kidney/Lung Connection and Fluid Management in COVID-19 (1).

Age-old quandary

Fluid management in patients with ARDS is an "age-old quandary" nephrologists have struggled with even before COVID-19, Heung said. Fluid overload can contribute to cardiopulmonary edema, acute kidney injury, sepsis, or death. But removing too much fluid can also exacerbate shock, contributing to a lack of perfusion to organs and potentially kidney injury.

"The key concept is really trying to identify fluid responsiveness," Heung said. He noted there are many tools available to help, including physical exams, vital signs, diagnostic maneuvers, intravenous fluid challenges, or noninvasive approaches like ultrasound. But he said clinicians providing direct care to COVID-19 patients in the intensive care unit may not be familiar with these techniques.

Heung and Liu both cited the Fluids and Catheters Treatments Trial (FACTT) results published in 2006 as a reason nephrologists should consider a conservative approach to fluid management in COVID-19 patients (2). The trial compared a liberal and a more conservative approach, which favors a drier lung in patients with ARDS. The trial did not find a mortality benefit for the more conservative fluid management approach, but it did find that this approach resulted in patients having more ventilator-free days than those in the group with the more liberal approach. Patients receiving the more conservative approach also trended toward needing less dialysis than those receiving the more liberal approach, with 10% needing dialysis compared to 14% in the liberal group, although this result did not meet statistical significance.

"This has really moved the field toward being more conservative with fluid management in the ARDS setting," Heung said.

Heung also cited a small, retrospective trial he and his colleagues conducted in pediatric patients receiving ECMO (extracorporeal membrane oxygenation), which suggested avoiding fluid overload was associated with better survival than trying to correct fluid overload after it occurs (3). Based on data he and his colleagues have collected on COVID-19 patients to date, they have not seen an immediate benefit of fluid removal, but they anticipate one based on the FACTT results and will continue to collect data, he said. The Surviving Sepsis COVID-19 guidelines also promote a conservative approach to fluid management for COVID-19 patients (4).

Sumit Mohan, MD, MPH, raised a potential need for caution with the conservative approach, noting that COVID-19 patients who have gastrointestinal symptoms like severe diarrhea or reduced food intake may be coming in with low fluid volume. "You do have to use some clinical judgment," he cautioned. Mohan is associate professor of medicine and epidemiology at Columbia University Medical Center in New York.

The need for close communications with the interdisciplinary team caring for COVID-19 patients is also important, said Juan Carlos Velez, MD, chair of nephrology at the Ochsner Health System at the University of Queensland in Brisbane, Australia. With limited access to some tools for monitoring fluid status like ultrasound during the pandemic, interdisciplinary collaboration is even more important.

Mohan agreed that better multidisciplinary collaboration is essential. "It forced us to communicate better with the intensivist teams and the nursing staff to figure out [patients' fluid status]," Mohan said. "It's a challenge." ■

References

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