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CLINICAL VIGNETTE

Acute Kidney Injury: When to Start Renal Replacement Therapy in the Non-Critical Inpatient

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Introduction

Acute kidney injury (AKI), has been estimated to be present in 5 to 20% of hospitalized patients, with a mortality rate as high as 60% in critically ill patients.[1,2] With such a significant associated potential risk of death, many clinicians find it difficult to determine what the optimal time is to initiate dialysis, not just to prevent mortality but also possible morbidity while balancing the potential risks of renal replacement therapy. We present a 72-year-old woman in acute renal failure without an immediate clear etiology.

Case Report

A 72-year-old female with type 2 diabetes, hypertension, and 3a chronic kidney disease presented to the emergency room with acute renal failure, hyponatremia, and hypoglycemia. She had three-days of nausea, vomiting, diarrhea, and general malaise. The patient also had recent mild URI symptoms. Her diabetes regimen included metformin, glipizide, and lisinopril, and her baseline creatinine four months prior was 1.16 mg/dL. On admission, labs were notable for sodium 128 mmol/L, potassium 5.2 mmol/L, chloride 88 mmol/L, bicarbonate 15 mmol/L, anion gap 25, glucose 63 mg/dL, creatinine 8.94 mg/dL, blood urea nitrogen 64 mg/dL, and lactate 4.8 mmol/L. Her venous blood gas showed pH 7.32, pCO2 24 mm Hg, and bicarbonate 12.3 mmol/L. Urinalysis revealed microscopic hematuria and proteinuria. Given her rapidly and significantly elevated creatinine of unclear etiology with hematuria, aggressive evaluation of acute renal failure superimposed on chronic kidney disease was pursued. Testing revealed unremarkable autoimmune and vasculitis labs, negative toxicology screen, negative acetaminophen and salicylate levels, structurally normal kidneys on ultrasound and CT scan, and acute tubular necrosis on renal biopsy. The patient's creatinine peaked at 9.07 mg/dL, potassium at 5.4 mmol/L, blood urea nitrogen at 71 mg/dL, lactate at 5.0 mmol/L, with venous pH nadir of 7.28 on hospital day 1. She was managed conservatively with aggressive intravenous fluid resuscitation, a one-time dose of IV methylprednisolone 250 mg while biopsy results were pending, and discontinuation of metformin, glipizide, and lisinopril. Her lactic acidosis, hypoglycemia, and electrolyte disturbances resolved and creatinine down trended 2.96 mg/dL on discharge with conservative management. The patient did not require dialysis in this admission.

Discussion

While certain life-threatening complications of severe AKI such as severe hyperkalemia, severe acidosis, pulmonary edema, and uremic complications are widely accepted as indications for urgent or emergent dialysis, the timing of initiation of renal replacement therapy (RRT) in community-acquired acute kidney injury—as in the case of our patient—remains unclear and are not defined in clinical practice guidelines for the management of AKI.[3] Studies evaluating the difference in mortality between early and delayed RRT have not consistently shown a benefit in earlier RRT and ongoing trials are being conducted to help address this question.[4]

Multiple studies examined early versus late initiation of RRT in severe AKI although most available randomized controlled trials (RCT) focus on critically ill patients in the intensive care unit. One RCT of patients with community-acquired AKI found that those in the earlier-start arm (initiation of dialysis at specific thresholds of urea nitrogen or creatinine) compared to usual start arm (initiation of dialysis for life-threatening indications) did not have improved survival and actually experienced longer time to recovery of renal function of approximately two days.[1] Additional RCTs evaluating early versus late RRT in patients with severe AKI in predominantly ICU patients were inconsistent, often with no difference in outcomes[5,6]. One study showed reduced mortality in the early start group.[7] A 2017 meta-analysis of 10 RCTs showed no significant benefit of early RRT on 30-, 60-, or 90-day mortality; ICU or hospital mortality; or dialysis dependence on day 90.[8] A 2008 systematic review showed similar outcomes using intermittent hemodialysis compared to continuous renal replacement therapy (CRRT) in patients with severe AKI.[9]

Some late arm patients in studies comparing early versus late RRT recovered renal function prior to needing RRT.[4] This highlights the difficulty in clearly identifying patients who will require RRT. Additionally, RRT has known associated risks including access-related complications (e.g., infection, thrombosis, access malfunction), hemodynamic compromise and hypotension (e.g., volume depletion from ultrafiltration, fluid shifts due to solute disequilibrium), and electrolyte and metabolic complications. Finally, there is concern that complications of RRT including hypotension may prolong renal injury or impede renal recovery in patients with acute renal failure.[1,10]

In light of the dearth of data on severe AKI in the non-ICU setting in addition to a desire to prevent the deleterious effects of RRT, we approached management of her AKI conservatively. The decision to pursue watchful observation while initiating an expedited workup was possible because our patient did not meet any emergent indications for dialysis at the time of admission and was clinically stable. An expedited and thorough evaluation of acute renal failure, including kidney biopsy was conducted during the first 24 hours of patient's admission. Additionally, high dose methylprednisolone was given due to suspicion of an underlying glomerulonephritis process on initial labs. Steroids were discontinued as the preliminary pathology report did not show findings consistent with GN. Further optimization also included a nutrition consultation and dietitian evaluation of our patient. Creatinine was closely monitored twice daily then daily with the need for dialysis continuously reassessed as additional labs returned but never initiated as renal function slowly improved.

Despite having limited literature to guide our decision, the available data included key points that guided our decision-making. Firstly, although preventing clinical deterioration is paramount, the RCT data in non-ICU patients suggested early initiation of dialysis may prolong renal recovery.[1] The absence of clear dialysis indications, allowed an individualized approach including etiology of ARF, relevant comorbidities and patient's ongoing clinical response to implemented interventions. Lastly, medical optimization, should be one of the cornerstones of management. Further studies, particularly RCT data in non-critically ill patients are needed to better identify other factors that may help guide clinicians about optimal timing for initiation of RRT. An individualized approach with careful monitoring may avoid dialysis in severe AKI in the absence of more urgent indications.

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