

Acute Renal Failure

What is AKI?

According to The Kidney Disease: Improving Global Outcomes (KDIGO), which is the most current and preferred definition, it is:

an increase in serum creatinine of ≥ 0.3 mg/dL within 48 hours OR an increase in serum creatinine of $\geq 50\%$ within 7 days OR Urine output of < 0.5 mL/kg/hour for > 6 hours

Etiology:

1) Prerenal: Decreased renal perfusion (70% of causes)

- a. Intravascular volume depletion: Dehydration, third-spacing
- b. Decreased arterial pressure: CHF, sepsis,
- c. Extracellular fluid loss : Burns, diarrhea, vomiting, diuretics or hemorrhage
- d. Decreased CO: CHF, shock
- e. Medication changes to renal vasculature: ACE-i, ARBs, NSAIDs, Tacrolimus, Cyclosporine

2) Intrinsic: classified according to the site of injury

- a. Vascular Injury: afferent arteriolar vasoconstriction --> decreased GFR (Ex. TTP, Vasculitis, RAS, malignant HTN)
- b. Glomerulonephritis: Includes renal (PSGN, IgA, membranoproliferative GN), hematologic dz (HUS, TTP), systemic inflammation (SLE, HSP), and pulm-renal syndromes (Goodpasture, granulomatosis with polyangitis). +hematuria(RBC casts) and proteinuria.
- c. Interstitial Nephritis: analogous to an allergic rxn in the kidney, may be associated with fever, arthralgia, and rash. Allergic rxns can be due to drugs (penicillin, cephalosporin, NSAIDs, Sulfas, PPIs), autoimmune disorders (ex. SLE), infections (diphtheria, GAS), or other dzs such as sarcoidosis.
- d. Acute Tubular Necrosis (ATN): cell death and necrosis from renal ischemia (prolonged hypoperfusion aka prolonged prerenal state), toxins(rhabdo, uric acid crystals, radiocontrast dye, hemolysis, amnoglycosides)

3)Postrenal: Renal outflow obstruction

- a. Intrarenal/tubular: crystals, nephrolithiasis
- b. Ureteral: bilateral nephrolithiasis, thrombosis, edema from retrograde pyelography
- c. Extra-ureteral: Bladder or cervical CA
- d. Bladder neck: neurogenic bladder, autonomic neuropathy
- e. Urethra: BPH, prostate CA, urethral stricture

-Evaluate for volume status, skin tenting LE edema, ascites, skin rash, purpura, bladder distension, prostate enlargement etc.

-Monitor urine output, sediment, UA, electrolytes

-Calculate FENa (collect urine sample prior to IV fluid or diuretic tx). If patient is on diuretics utilize FEUrea.

-FENa: $(U_{Na}/P_{Na})/(U_{Cr}/P_{Cr})$, FEUrea: $(U_{urea}/P_{urea})/(U_{Cr}/P_{Cr})$

- Renal US to r/o obstruction or assess for hydronephrosis

-Serology for complement levels and renal biopsy if etiology is unclear.

Prerenal	Intrinsic	Postrenal
FENa <1%, BUN/Cr >20, FEUrea <= 35%	FENa >2%, BUN/Cr <20, FEUrea > 50%	
Urine specific gravity >1.020	Urine specific gravity <1.010	
Few hyaline casts	ATN: muddy brown cast AIN: WBC casts, urine eos GN: dysmorphic RBCs, RBC casts	+/- non-dysmorphic RBCs, WBC or crystals.
Replete fluids: Isotonic IVF D/C nephrotoxic agents Renal dosing of meds Optimize CO, hydrate, support pressure, correct electrolytes Treat infections(sepsis)	Steroids may be indicated D/C nephrotoxic agents Renal dosing of meds	Foley cath to relieve obstruction

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