

CASE: 55 yo man with no significant medical history except hypertension comes to ED from the street because he is found 'confused and agitated'. Creatinine in ED was 6.4. Blood pressure was 135/70, 100% on RA, exam was difficult to elicit secondary to agitation but he had 1+ le edema. CV: tachycardia, lungs clear to auscultation. What initial steps would you take to generate a diagnosis for his acute renal failure and how would you manage him?

Approach to Acute Renal Failure

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First, consider anatomically where the problem may lie:

- **Prerenal**
- **Intrarenal (glomerular or tubular)**
- **Postrenal**

Then, collect urine for laboratory studies. Place urinary catheter if little to no urine is being produced, but obtain urine sample *before* catheter placed because catheter trauma can cause hematuria (can be up to 4 RBCs per HPF, any greater than 4 RBC's/HPF warrants a further work up for hematuria). Catheter can relieve obstruction and help determine urine output accurately, but has little other therapeutic value.

Clinical Findings

1. Evaluate volume status. Check blood pressure including orthostatics, examine for rales, jugular venous pressure, edema, skin turgor, moist or dry mucous membranes.
2. Evaluate for symptoms and signs of uremia. Symptoms include nausea, anorexia, itching, restless legs, insomnia, peripheral neuropathy. Signs include asterixis, confusion/mental status changes, pericardial rub.
3. Check for signs of allergic process: skin rash, wheezing may be present.
4. Check for signs of embolic disease: livedo reticularis, cool or discolored digits.

Laboratory Evaluation

1. **Fractional Excretion of Na (FeNa).** Useful in patients with oliguric renal failure (<400 cc Urine a day). FeNa < 1% suggests a pre-renal state. However: patients with cirrhosis, shock, and CHF can have FeNa < 1 with concurrent intrinsic renal dz. Diuretics can falsely elevate the FeNa.
2. **Urinalysis:** Evaluate microscopically for proteinuria and casts.
 - RBC casts or dysmorphic RBCs suggest glomerulonephritis
 - Granular casts suggest acute tubular necrosis
 - WBC casts suggest pyelonephritis, glomerular or tubulointerstitial disease
 - Hyaline casts don't mean much, can be associated with pre-renal state
 - Crystals to look for include uric acid, Ca oxalate, cysteine or ethylene glycol
 - Tumor cells can be visualized sometimes
 - RBCs can be associated with trauma, infection, renal stones, malignancy, polycystic kidney disease also
3. **If total anuria:** Think shock/sepsis or total bilateral obstruction.
4. **Alternate causes:** Consider serologies for autoimmune processes, HIV, hepatitis cryoglobulins, ASO titers.

Radiologic Evaluation

1. **KUB x-ray:** May show kidney stones.
2. **Renal ultrasound:** obtain in acute renal failure of unknown etiology. Can show urethral obstruction and hydronephrosis, polycystic kidney disease, and size. Small kidneys suggest chronic and irreversible renal damage, while large kidneys are associated with poorly controlled diabetes,

acromegaly, acute glomerulonephritis, and infiltrative processes such as amyloidosis, leukemia, and lymphoma.

3. **IVP:** less used. Can evaluate the parenchyma and calyces. Good initial study for hematuria.
4. **CT:** complementary study to ultrasound, especially if a cyst is seen. Can show renal stones, condition of ureters, and parenchymal abnormalities.
5. **Renal venography / arteriography:** used infrequently, but good tests to evaluate for renal artery stenosis, renal vein thrombosis, and vasculitis.
6. **Renal artery duplex:** used to assess renal arteries/stenosis.

INDICATIONS FOR ACUTE HEMODIALYSIS:

Acidemia

Electrolytes

Ingestion/toxin (barbituates, ethylone, glycil, lithium, methanol)

Overload (fluid)

Uremia: symptoms include lethargy, mental status changes, seizures, asterixis, peripheral polyneuropathies, uremic pericarditis

Case Follow-up: Urinary catheter was placed; there was 1 liter urine output. Renal ultrasound showed mildly enlarged kidneys bilaterally. Patient then had a brisk auto-diuresis of 7 liters/day. This was felt to be consistent with obstructive uropathy. Creatinine normalized in 4 days while maintaining adequate IVF repletion (try to match at least of half of urine output to avoid hypovolemia/hypotension). Tamsulosin was started, PSA checked & was markedly elevated. Final diagnosis: bladder obstruction from enlarged prostate, probable prostate cancer.

Clinical Pearls

- Consider ureteral obstruction even if patient making urine
- Urinalysis before urinary catheter placement
- AEIOU mnemonic for indications for emergent dialysis

References

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