

Acute Glomerulonephritis

DIAGNOSIS OF A POSSIBLE ACUTE GLOMERULAR PROCESS AS THE CAUSE OF ACUTE RENAL FAILURE

| History | Examination | Laboratory/Other |
|--|--|---|
| Recent infection | Hypertension | Urinalysis with hematuria, red cell casts, and proteinuria |
| Sudden onset of edema, dyspnea | Edema | Serologic or culture evidence of recent infection |
| Systemic disorder (eg, lupus erythematosus, Wegener's granulomatosis, Goodpasture's syndrome) | Rash | Laboratory evidence of immune-mediated process (low complement, cryoglobulinemia, antinuclear antibody, anti-DNA, rheumatoid factor, anti-glomerular basement membrane antibody, antineutrophilic cytoplasmic antibody) |
| No evidence of other causes of renal failure | Arthropathy | Renal tissue examination |
| | Prominent pulmonary findings | |
| | Stigmata of bacterial endocarditis or visceral abscess | |

FIGURE 12-19

Diagnosis of a possible acute glomerular process as the cause of acute renal failure (ARF). Acute glomerulonephritis is a relatively rare cause of ARF in adults. In the pediatric age group, acute glomerulonephritis and a disorder of small renal arteries (hemolytic-uremic syndrome) are relatively common causes. This figure depicts the historical, examination, and laboratory findings that collectively may support a diagnosis of acute glomerulonephritis as the cause of ARF [16, 17].

Interstitial Nephritis

DIAGNOSIS OF POSSIBLE ACUTE INTERSTITIAL NEPHRITIS AS THE CAUSE OF ACUTE RENAL FAILURE

| History | Examination | Laboratory/Other |
|-----------------------|--------------------|--|
| Medication exposure | Fever | Abnormal urinalysis (white blood cells or cell casts, eosinophils, eosinophilic casts, low-grade proteinuria, sometimes hematuria) |
| Severe pyelonephritis | Rash | Eosinophilia |
| Systemic infection | Back or flank pain | Urinary diagnostic indices compatible with a renal cause of renal failure (see Fig. 12-16) |
| | | Uptake on gallium or indium scan |
| | | Renal biopsy |

FIGURE 12-20

Diagnosis of possible acute interstitial nephritis as the cause of acute renal failure (ARF). This figure outlines the historical, physical examination and other investigative methods that can lead to identification of acute interstitial nephritis as the cause of ARF [18].

Acute Tubular Necrosis

DIAGNOSIS OF POSSIBLE PIGMENT-ASSOCIATED FORMS OF ACUTE RENAL FAILURE

| Myoglobinuria | | | Hemoglobinuria | | |
|--|---|---|---|---------------|---|
| History | Examination | Laboratory | History | Examination | Laboratory |
| Trauma to muscles | Can be normal | Serum creatinine disproportionately elevated related to BUN | Condition associated with intravascular hemolysis (red cell trauma, antibody-mediated hemolysis, direct red cell toxicity, sickle cell disease) | Can be normal | Normocytic anemia |
| Condition known to predispose to nontraumatic rhabdomyolysis | Muscle edema, weakness, pain | Elevated (10-fold) enzymes (CK, SGOT, LDH, adolase) | | Pallor | High red cell LDH fraction |
| Muscle pain or stiffness | Neurovascular entrapment or compartment syndromes in severe cases | Elevations of plasma potassium, uric acid, phosphorus, and hypocalcemia | | Flank pain | Reticulocytosis |
| Dark urine | Flank pain | Urinalysis with pigmented granular casts, (+) stick reaction for blood in the absence of hematuria, and myoglobin test if available | | | Low haptoglobin |
| | | Clear plasma | | | Urinalysis with pigmented granular casts, (+) stick reaction for blood in absence of hematuria and reddish brown or pink plasma |

FIGURE 12-21

Diagnosis of possible pigment-associated forms of acute renal failure (ARF). Once prerenal and postrenal forms of ARF have been ruled out and renal vascular, glomerular, and interstitial processes seem unlikely, a diagnosis of acute tubular necrosis (ATN) is probable. A diagnosis of ATN is thus one of exclusion (of other causes of ARF). In the majority of cases when ATN is present, one or more of the three predisposing conditions have been identified to be operational. These conditions include renal ischemia due to a prolonged prerenal state, nephrotoxin exposure, and sometimes pigmenturia. A diagnosis

of ATN is supported by the absence of other causes of ARF, the presence of one or more predisposing factors, and the presence of urinary diagnostic indices and urinalysis suggested of ATN (see Figs. 12-15 and 12-16). A pigmenturic disorder (myoglobinuria or hemoglobinuria) can predispose to ARF. This figure depicts the historical, physical examination, and supporting diagnostic tests that often lead to a diagnosis of pigment-associated ARF [19]. BUN—blood urea nitrogen; CK—creatinine kinase; SGOT—serum glutamic-oxaloacetic transaminase; LDH—lactic dehydrogenase.

Nephrotoxin Acute Renal Failure

NEPHROTOXIC ACUTE RENAL FAILURE

| | | |
|-------------------------|----------------------|------------------------|
| Prerenal | Vasoconstriction | Crystalluria |
| Diuretics | NSAIDs | Sulfonamides |
| Interleukin 2 | Radiocontrast agents | Methotrexate |
| CEIs | Cyclosporine | Acyclovir |
| Antihypertensive agents | Tacrolimus | Triamterene |
| Tubular toxicity | Amphotericin | Ethylene glycol |
| | | Protease inhibitors |
| Aminoglycosides | Endothelial injury | Glomerulopathy |
| Cisplatin | Cyclosporine | Gold |
| Vancomycin | Mitomycin C | Penicillamine |
| Foscarnet | Tacrolimus | NSAIDs |
| Pentamidine | Cocaine | Interstitial nephritis |
| Radiocontrast | Conjugated estrogens | |
| Amphotercin | Quinine | Multiple |
| Heavy metals | | |

FIGURE 12-22

Nephrotoxin acute renal failure (ARF). A variety of nephrotoxins have been implicated in causing 20% to 30% of all cases of ARF. These potential nephrotoxins can act through a variety of mechanisms to induce renal dysfunction [6, 20, 21]. CEI—converting enzyme inhibitor; NSAID—nonsteroidal anti-inflammatory drugs.

References

1. Anderson RJ, Schrier RW: Acute renal failure. In *Diseases of the Kidney*. Edited by Schrier RW, Gottschalk CW. Boston: Little, Brown; 1997:1069–1113.
2. Hou SH, Bushinsky D, Wish JB, Harrington JT: Hospital-acquired renal insufficiency: A prospective study. *Am J Med* 1983, 74:243–248.
3. Shusterman N, Strom BL, Murray TG, et al.: Risk factors and outcome of hospital-acquired acute renal failure. *Am J Med* 1987, 83:65–71.
4. Levy EM, Viscoli CM, Horwitz RI: The effect of acute renal failure on mortality. *JAMA* 1996, 275:1489–1494.
5. Liaño F, Pascual J: Epidemiology of acute renal failure: A prospective, multicenter, community-based study. *Kid Int* 1996, 50:811–818.
6. Thadhani R, Pascual M, Bonventre JV: Acute renal failure. *New Engl J Med* 1996, 334:1448–1460.
7. Feest TG, Round A, Hamad S: Incidence of severe acute renal failure in adults: Results of a community-based study. *Br Med J* 1993, 306:481–483.
8. Davenport A: Differentiation of acute from chronic renal impairment by detection of carbamylated hemoglobin. *Lancet* 1993, 341:1614–1616.
9. Mendell JA, Chertow GM: A practical approach to acute renal failure. *Med Clin North Am* 1997, 81:731–748.
10. Kopp JB, Miller KD, Mican JM, et al.: Crystalluria and urinary tract abnormalities associated with indinovir. *Ann Intern Med* 1997, 127:119–125.
11. Charlson ME, MacKenzie CR, Gold JP, Shires T: Postoperative changes in serum creatinine. *Ann Surg* 1989, 209:328–335.
12. Kellerman PS: Perioperative care of the renal patient. *Arch Intern Med* 1994, 154:1674–1681.
13. Nolan CR, Anger MS, Kelleher SP: Eosinophiluria—a new method of detection and definition of the clinical spectrum. *N Engl J Med* 1986, 315:1516–1519.
14. Wilson DM, Salager TL, Farkouh ME: Eosinophiluria in atheroembolic renal disease. *Am J Med* 1991, 91:186–191.
15. Abuelo JG: Diagnosing vascular causes of acute renal failure. *Ann Intern Med* 1995, 123:601–614.
16. Falk RJ, Jennette JC: ANCA small-vessel vasculitis. *J Am Soc Nephrol* 1997, 8:314–322.
17. Kobrin S, Madacio MP: Acute poststreptococcal glomerulonephritis and other bacterial infection-related glomerulonephritis. In *Diseases of the Kidney*. Edited by Schrier RW, Gottschalk CW. Boston: Little, Brown; 1997:1579–1594.
18. Eknayan G: Acute tubulointerstitial nephritis. In *Diseases of the Kidney*. Edited by Schrier RW, Gottschalk CW. Boston: Little, Brown; 1997:1249–1272.
19. Don BR, Rodriguez RA, Humphreys MH: Acute renal failure associated with pigmenturia as crystal deposits. In *Diseases of the Kidney*. Edited by Schrier RW, Gottschalk CW. Boston: Little, Brown; 1997:1273–1302.
20. Chaudbury O, Ahmed Z: Drug-induced nephrotoxicity. *Med Clin North Am* 1997, 81:705–717.
21. Palmer B, Henrich WL: Nephrotoxicity of nonsteroidal anti-inflammatory agents, analgesics, and angiotensin converting enzyme inhibitors. In *Diseases of the Kidney*. Edited by Schrier RW, Gottschalk CW. Boston: Little, Brown; 1997:1167–1188.