Glomerulonephritis Associated with Infections
Acute Post streptococcal Glomerulonephritis

This is a classic example of the acute nephritic syndrome characterized by the sudden onset of gross hematuria, edema, hypertension, and renal insufficiency. Acute poststreptococcal glomerulonephritis is one of the most common glomerular causes of gross hematuria in children, surpassed only by IgA nephropathy.

ETIOLOGY AND EPIDEMIOLOGY.

Acute post streptococcal glomerulonephritis follows infection of the throat or skin by certain “nephritogenic” strains of group A β-hemolytic streptococci. The factors that allow only certain strains of streptococci to be nephritogenic remain unclear.

Post streptococcal glomerulonephritis commonly follows streptococcal pharyngitis during cold weather months and streptococcal skin infections or pyoderma during warm weather months. Although epidemics of nephritis have been described in association with both throat (serotype 12) and skin (serotype 49) infections, this disease is most commonly sporadic.

PATHOLOGY.

Immunofluorescence microscopy reveals lumpy-bumpy deposits of immunoglobulin and complement on the glomerular basement membrane (GBM) and in the mesangium.

On electron microscopy, electron-dense deposits, or “humps,” are observed on the epithelial side of the GBM.

PATHOGENESIS.

A complement activation primarily through the alternative pathway, and a depression in the serum complement (C3) level. The precise mechanisms by which nephritogenic streptococci induce complex formation remain to be determined.
CLINICAL MANIFESTATIONS.

Poststreptococcal glomerulonephritis is most common in children aged 5–12 yr and uncommon before the age of 3 yr.

-The typical patient develops an acute nephritic syndrome 1–2 wk after an antecedent streptococcal pharyngitis or 3–6 wk after a streptococcal pyoderma.

-The severity of renal involvement varies from asymptomatic microscopic hematuria with normal renal function to acute renal failure.

-Depending on the severity of renal involvement, patients may develop various degrees of edema, hypertension, and oliguria. Patients may develop encephalopathy and/or heart failure owing to hypertension or hypervolemia.

-Encephalopathy may also possibly result from the direct toxic effects of the streptococcal bacteria on the central nervous system. Edema typically results from salt and water retention; nephrotic syndrome may develop in 10–20% of cases.

-Nonspecific symptoms such as malaise, lethargy, abdominal or flank pain, and fever are common. Acute subglottic edema and airway compromise have been reported. The acute phase generally resolves within 6–8 wk.

-Although urinary protein excretion and hypertension usually normalize by 4–6 wk after onset, persistent microscopic hematuria may persist for 1–2 yr after the initial presentation.

DIAGNOSIS.

Urinalysis demonstrates red blood cells (RBCs), frequently in association with RBC casts, proteinuria, and polymorphonuclear leukocytes. A mild normochromic anemia may be present from hemodilution and low-grade hemolysis. The serum C3 level is usually reduced in the acute phase and returns to normal 6–8 wk after onset.

Confirmation of the diagnosis requires clear evidence of invasive streptococcal infection. A positive throat culture report may support the diagnosis or may simply represent the carrier state. On the other hand, a rising antibody titer to streptococcal antigen(s) confirms a recent streptococcal infection.

Importantly, the antistreptolysin O titer is commonly elevated after a pharyngeal infection but rarely increases after streptococcal skin infections.

The best single antibody titer to document cutaneous streptococcal infection is the antideoxyribonuclease (DNase) B level. The Streptozyme test is a useful and simple diagnostic test that detects antibodies to streptolysin O, DNase B, hyaluronidase, streptokinase, and nicotinamide-adenine dinucleotidase using a slide agglutination test.
The clinical diagnosis of poststreptococcal glomerulonephritis is quite likely in a child presenting with acute nephritic syndrome, evidence of recent streptococcal infection, and a low C3 level.

The differential diagnosis of poststreptococcal glomerulonephritis includes many of the causes of hematuria. Acute glomerulonephritis may also follow infection with coagulase-positive and coagulase-negative staphylococci, *Streptococcus pneumoniae*, and gram-negative bacteria.

Bacterial endocarditis may produce a hypocomplementemic glomerulonephritis with renal failure. Acute glomerulonephritis may occur after certain fungal, rickettsial, and viral diseases, particularly influenza.

**COMPLICATIONS.**

Acute complications of this disease result from hypertension and acute renal dysfunction. Hypertension is seen in 60% of patients and may be associated with hypertensive encephalopathy in 10% of cases. Other potential complications include heart failure, hyperkalemia, hyperphosphatemia, hypocalcemia, acidosis, seizures, and uremia.

**PREVENTION.**

*Early systemic antibiotic therapy* for streptococcal throat and skin infections *does not* eliminate the risk of glomerulonephritis. Family members of patients with acute glomerulonephritis should be cultured for group A β-hemolytic streptococci and treated if culture positive.

**TREATMENT.**

Management is directed at *treating the acute effects of renal insufficiency and hypertension.*

Although a 10-day course of systemic antibiotic therapy with penicillin is recommended to limit the spread of the nephritogenic organisms, antibiotic therapy does not affect the natural history of glomerulonephritis.

Sodium restriction, diuresis usually with intravenous Lasix, and pharmacotherapy with calcium channel antagonists, vasodilators, or angiotensin-converting enzyme inhibitors are standard therapies used to treat hypertension.
PROGNOSIS.

Complete recovery occurs in more than 95% of children with acute poststreptococcal glomerulonephritis. Mortality in the acute stage can be avoided by appropriate management of acute renal failure, cardiac failure, and hypertension.