Osteopathic Family Physician (2010) 2, 18-20

ELSEVIER

acofp Osteopathic Family Physician

Postinfectious glomerulonephritis: a case summary

Lisa Beck, DO,[a] Robert Langan, MD[b]

From [a]Phoenixville Hospital-Department of Family Medicine, Pheonix Family Medicine, Phoenixville, PA 19460; and [b]St. Luke's Hospital and Health Network, Family Medicine Center, Bethlehem, PA 18017.

KEYWORDS:
Postinfectious glomerulonephritis;
Nephritic syndrome;
Acute renal failure;
Streptococcal pharyngitis

Summary Postinfectious glomerulonephritis is the most common cause of nephritic syndrome and acute renal failure in children. This condition usually results from a recent group A streptococcal infection and the diagnosis is based on clinical suspicion and laboratory data. This case describes a child with new onset hypertension and a past history of untreated streptococcal pharyngitis. Treatment is supportive and recent reviews demonstrate that antibiotic therapy directed at the infection does not modify the course of glomerulonephritis.

Case presentation

A 10-year-old Caucasian patient presented to the emergency department with severe headaches, facial edema, and nausea that had been worsening over the past two weeks. The headache distribution was right sided and was temporarily relieved with ibuprofen. The patient also noted a sore throat and low-grade fever three weeks prior, which lasted several days. Caregivers observed an increasing frequency in the patient's urinary habits during the past three weeks as well. The patient denied dysuria or hematuria and there were no changes in the patient's dietary habits.

On presentation, blood pressure was 163/111 mm Hg and the patient was afebrile and of normal stature for age. Physical examination showed a young patient in mild distress with headache, bilateral trace ankle edema, and periorbital edema. Cardiac auscultation and pulses were normal and neurologic functioning was intact. Laboratory studies and imaging were performed. Computed tomography of the head was normal. Urine analysis showed 2+ protein, microscopic hematuria, and red blood cell casts. Hemoglobin and hematocrit were 9.8 gm/dL and 29.3%, respectively. Electrolytes, liver function tests, and kidney function studies were normal. The complement level of C3 was found to be abnormally low at 17 mg/dL (normal >85 mg/dL) and a pharyngeal culture for group A *Streptococcus* (GAS) was positive. An antistreptolysin O (ASO) titer was elevated at 860 IU (normal 12–166 IU). A diagnosis of postinfectious glomerulonephritis (PIGN) was made based on the history, physical examination, and laboratory data.

Topic review

PIGN is an acute self-limiting process causing nephropathy after infection with certain strains of GAS. It is the leading cause of acute nephritic syndrome in children. Cases of poststreptococcal illnesses including PIGN and rheumatic fever are most prevalent in ages three through ten.[1] There appears to be no racial preference associated with PIGN, but it is found predominately more in males than females.

GAS infections have many manifestations in the pediatric population. Pharyngitis, scarlet fever, glomerulonephritis, and rheumatic fever can all be seen after a GAS insult. Psychiatric manifestations can also be seen as a result of GAS infections in children. Pediatric autoimmune neuropsychiatric disorders associated with streptococcal infections (PANDAS) are conditions in which children with a tic

Corresponding author: Lisa Beck, DO, 300 Schuylkill Road, Phoenixville, PA 19460.
E-mail address: lnb114@gmail.com.

1877-573X/$ -see front matter © 2010 Elsevier Inc. All rights reserved.
doi:10.1016/j.osfp.2009.08.004

disorder and/or obsessive-compulsive disorder note worsening of their disorder after a streptococcal infection.[2,3]

Damage to the kidneys in PIGN is initiated by outside bacterial insult, usually as a result of GAS. Other forms of acute glomerulonephritis can be caused by internally produced antigens, such as lupus. In PIGN, the antigenicity of certain nephritogenic strains of beta-hemolytic GAS—namely 1, 4, and 12—are ultimately responsible for glomerular damage. These damaging strains of GAS initiate a harmful cascade by which antigen-antibody complexes develop and cause proliferation, inflammation, and ultimately damage the glomerular cells of the basement membrane.[4] However, the exact mechanism of damage from immune complexes is unknown. The molecular size of immune complexes and the size of pores in the basement membrane offer an explanation of why children are much more affected with PIGN than adults. The basement membrane pores are much smaller in children; therefore, large immune complexes are more easily trapped in the pores, causing basement membrane damage.[5] The time period in which glomerular damage occurs is approximately 10 days after GAS pharyngitis or two weeks after impetigo caused by GAS.[1]

PIGN presentation is variable but usually includes oliguric acute renal failure, headaches, and hematuria. The hematuria produced will often be described as smoke- or tea-colored. Edema can be present caused by loss of protein in the urine from nephritis. Back pain may also be present because of edema of the renal capsule. Laboratory data reveals an increased ASO titer and decreased complement levels, specifically C3.[6] Renal biopsies in patients with PIGN show inflammatory infiltrates, whereas urinary sediment demonstrates red blood cell casts and protein.

A diagnosis of PIGN requires clinical suspicion, appropriate laboratory testing, and a thorough history and physical examination. In addition to blood urea nitrogen and creatinine levels, ASO titers, complement levels, urine studies, and a pharyngeal culture should be obtained to support the diagnosis of PIGN. Acute phase reactants such as erythrocyte sedimentation rate will initially be elevated in PIGN because of glomerular inflammation. An increased ASO titer develops over two weeks and represents a GAS infection in the previous one to two months. These values decline over four to six months after the infection. However, ASO values can be normal in a small percentage of people with PIGN. The more expensive anti-DNAse-B assay can be performed if clinical suspicion is high but an ASO titer is normal. Anti-DNAse-B assay can also be helpful in a delayed diagnosis of PIGN because it is detectable longer than ASO titers.[7] The streptozyme test, which is a combination of ASO, anti-DNAse-B, streptokinase, Ahase, and anti-NAD, appears to be more sensitive for recent GAS infection than ASO alone. This may be useful in a difficult clinical scenario, with borderline elevations in ASO titers.[8] However, the streptozyme test is somewhat less sensitive in infants and the elderly. In these age groups, ASO titer levels can often be near or below the level of sensitivity of the streptozyme test because streptococcal infections are less common in these categories. For this reason, interpretation of the results should be done cautiously in these populations.[9]

Treatment of PIGN consists of supportive care, such as blood pressure control and fluid volume maintenance, as well as elimination of the initial infection source. Hypertension and increased extracellular volume can be treated with antihypertensive agents and diuretics.[5] Although there is no preferred antihypertensive medication, beta blockers and calcium channel blockers are chosen most often by clinicians. Antibiotic treatment for GAS pharyngitis is aimed at preventing rheumatic heart disease. Recent data suggests that, to prevent complications, a course of four to five days of a cephalosporin has superior bacterial cure rates than the same duration of penicillin when treating culture-positive GAS.[10] However, it is unclear whether antibiotics also prevent PIGN by avoiding an antibody response by the glomeruli. A recent Cochrane review showed that antibiotics may have some protective qualities in preventing PIGN, but more cases need to be examined.[11] After resolution of the streptococcal infection, 95% of children with PIGN will completely recover within three to four weeks. The symptoms of hypertension and hypocomplementemia usually resolve within eight weeks after the initial insult. Proteinuria may last up to six months. Subsequent bouts with PIGN are rare because of the immunity imposed from the initial streptococcal surface proteins. Mortality rates in PIGN are extremely low in children. Progression to end-stage renal disease is also uncommon in this age group. The most common sequelae of persistent hematuria and albuminuria can be seen in up to 20% of patients when followed up 15 years later.[12] Renal failure, hematuria, proteinuria, and decreased glomerular filtration rate are more common sequelae in those with PIGN during adulthood. These potentially severe sequelae demand a rapid diagnosis, adequate management, and follow-up in children and adults with PIGN.

Patient outcome

After the diagnosis of PIGN was made, the patient was admitted to the hospital for blood pressure stabilization. During the short hospital stay, the patient's blood pressures normalized with oral antihypertensives, and a 10-day course of oral azithromycin was started for GAS pharyngitis. Azithromycin was chosen because of the patient's allergy to penicillin, which would have resulted in diffuse urticaria. Upon discharge, the patient was instructed to keep a headache diary and a daily blood pressure record. He continued taking labetalol and nifedipine for blood pressure management until outpatient follow-up four weeks later. At this follow-up visit, the patient was found to be normotensive and symptom-free, so oral antihypertensives were discontinued. There was no

edema on physical examination and urinalysis showed trace protein but no red blood cells or casts.

References

1. Hahn RG, Knox LM, Forman TA: Evaluation of poststreptococcal illness. Am Fam Physician 71:1949-1954, 2005
2. Pediatrics and Developmental Neuropsychiatry Branch of the National Institute of Mental Health: PANDAS. Available at: http://intramural.nimh.nih.gov/pdn/web.htm. Hahn Accessed September 22, 2008
3. Swedo SE, Garvey M, Snider L, et al: The PANDAS subgroup: recognition and treatment. CNS Spectr 6:419-422,425-426, 2001
4. Cotran RS, Kumar V, Collins T: Robbins pathologic basis of disease, ed 6. Philadelphia: Saunders; 1999:949-950
5. Emedecine.com; Geetha D: Poststreptococcal glomerulonephritis. Available at: http://www.emedicine.com/MED/topic889.htm. Accessed September 22, 2008
6. Brady HR, O'Meara YM, Brenner BM: Glomerular disease. In Kasper DL, Braunwald E, Fauci AS, et al, eds: *Harrison's Principles of Internal Medicine*, ed 16. New York: McGraw Hill; 2005:1674-1681
7. Zitelli B, Davis H: *Atlas of Pediatric Physical Diagnosis*, ed 5. Philadelphia: Mosby; 2007:512-513
8. Kholy A, Hafez K, Krause R: Specificity and sensitivity of the Streptozyme test for the detection of streptococcal antibodies. Appl Microbiol 27:748-752, 1974
9. Hostetler C, Sawyer K, Nachamkin I: Comparison of three rapid methods for detection of antibodies to streptolysin O and DNase B. J Clin Microbiol 26:1406-1408, 1988
10. Casey J, Pichichero M: Metaanalysis of short course antibiotic treatment for group A streptococcal tonsillopharyngitis. Pediatr Infect Dis J 24:909-917, 2005
11. Del Mar CB, Glasziou PP, Spinks AB: Antibiotics for sore throat. Cochrane Database Syst Rev 3: CD000023, 2006
12. White AV, Hoy WE, McCredie DA: Childhood post-streptococcal glomerulonephritis as a risk factor for chronic renal disease in later life. Med J Aust 174:489-490, 2001