Neisseria Gonorrhoeae Dissemination And Gonococcal Meningitis

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Abstract: Disseminated infection is a serious complication in approximately 2 percent of primary gonococcal infections. Meningeal infection is very rare; only 23 cases have been reported since 1922. We report a sexually active teenager with an acute febrile illness. From her cerebrospinal fluid cultures, *Neisseria gonorrhoeae* was identified. She recovered completely after treatment with ceftriaxone and penicillin. Possible explanations for gonococcal dissemination include unique strains of the organism as well as particular complement deficiencies of the host. Aggressive efforts by physicians to prevent, identify, and treat primary gonococcal diseases should continue because this will reduce the frequency of serious complications. (J Am Bd Fam Pract 1989; 2:123-5.)

One of the more serious complications of untreated infections by *Neisseria gonorrhoeae* is hematogenous dissemination. Seeding of such sites as the joints, skin, liver, heart, and meninges, sometimes in combination, has been reported in approximately 2 percent of patients with a primary gonococcal infection.[1]

The joints represent the most common site of gonococcal dissemination; seeding of the meninges appears to be a very rare complication. There have been only 23 cases of meningeal dissemination in the literature since first reported in 1922.[1,2] The last two cases occurred in January 1984 in the Philadelphia area and one case resulted in death. This report describes a more recent case of gonococcal meningitis.

Case Report

A 17-year-old female high-school student came to the emergency room of Saint John Hospital in Detroit, Michigan, complaining of headache and back pain. She was well until 5 days before admission, when she awoke with nausea and vomiting. Pain developed in the upper back, was unrelieved by acetominophen, and was diffuse and constant. One day before admission, she developed left elbow pain and stiffness. She denied sore throat, cough, dyspnea, trauma, genitourinary symptoms, photophobia, convulsions, or other neurologic symptoms.

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Her history was unremarkable except for a voluntary interruption of her first pregnancy 6 months earlier. Her last normal menstrual period was 2 weeks before admission. She admitted to being sexually active with one partner with intermittent use of oral contraceptives but denied any illicit drug use.

Physical examination: temperature 38.6°C (101.6°F) orally, blood pressure 100/60 mmHg, pulse rate 104/min, respiratory rate 16/min. The patient was cooperative but lethargic. Her neck showed marked resistance to flexion. An area of warmth, erythema, and tenderness about 3 cm in diameter was noted just superior and lateral to the left olecranon process. Diminished extension of the elbow was also noted. Aside from lethargy and meningismus, the neurologic examination was normal. No Kernig or Brudzinski signs could be elicited. The pelvic examination showed a small amount of thin white cervical discharge.

Initial laboratory data showed the leukocyte count was 6.4 10^9/L (6,400/mm^{-3}) with 0.64 neutrophils, 0.07 band cells, 0.21 lymphocytes, and 0.08 monocytes. Random glucose, renal studies, electrolytes, hepatic enzymes, and bilirubin were within normal limits. Serum pregnancy testing was quantitatively negative. A urine drug screen showed the presence of opiates. A lumbar puncture was performed. The cerebrospinal fluid showed the erythrocyte count was 3 10^6/L (3/mm^{-3}) and the leukocyte count was 136 10^6/L (136/mm^{-3}) with 0.56 lymphocytes and 0.44 neutrophils. CSF glucose was 2.8 mmol/L (50 mg/dL), and protein was 0.58 g/L (58 mg/dL). Gram stain showed few leukocytes and no organisms. Arthrocentesis of the left elbow produced approxi-

mately 3 mL of thin serosanguinous fluid that on gram stain revealed no leukocytes or organisms. Cultures for *N. gonorrhoeae* were obtained from the patient's throat, rectum, cervix, CSF, and the aspirated elbow. Blood cultures were also obtained.

Because of the patient's risk status for gonorrhea as well as for intravenous drug abuse, intravenous therapy was started with ceftriaxone and vancomycin; penicillin was added on the following day. At 72 hours, CSF and cervical cultures were reported as positive for beta-lactamase negative *Neisseria gonorrhoeae*, identified by monoclonal antibody and sugar fermentation testing. Ceftriaxone and vancomycin were then discontinued, but penicillin was given for 14 days and the patient made an uneventful recovery. She was discharged with no apparent neurologic sequelae. We counseled her about the risks of sexually transmitted diseases and how they can be prevented. Total and C_4 complement studies were within normal limits. The patient notified her sexual partner of her diagnosis and its infectivity and urged him to seek medical treatment. Detroit Health Department officials were notified of the infection through the hospital's Infection Control Department.

Discussion

Gonorrhea is currently the most common notifiable infectious disease in the United States. While approximately 1 million cases per year are reported, the actual frequency is probably much higher.[4] Usually a sexually transmitted disease, the primary infection is generally limited to mucosal surfaces. Untreated, however, complications secondary to local destruction become manifest. Finally, hematogenous dissemination to a variety of extramucosal sites can occur.

Although apparently extremely rare, the dissemination of the gonococcus to the meninges is a serious complication that should not be overlooked. The microscopic similarity of the organism with the meningococcus (both are cytochrome oxidase-positive, gram-negative diplococcus), as well as the clinical similarity of the meningitis caused by each, can be diagnostically confusing. The two organisms are generally identified by specific monoclonal antibody reactions and by the inability of the gonococcus to ferment maltose and lactose.

Investigations of the causes of gonococcal dissemination have primarily focused on the organism. Recent evidence suggests that different strains of *Neisseria gonorrhoeae* have a predisposition for dissemination.[5,6] Using a method known as auxotyping, strains are differentiated by their requirements for certain nutrients. Two auxotypes in particular have been identified with a propensity to lead to disseminated disease. One of these auxotypes, interestingly, was found to be the causative strain in the 2 cases from the Philadelphia area in 1984.

The possibility that certain host characteristics contribute to dissemination has also been studied. Ross and Densen[7] noted an increased rate of neisserial infections, both meningococcal and gonococcal, in patients with homozygous complement fraction deficiencies of C5 through C8.

The choice of antibiotics in the treatment of gonococcal meningitis must take into account the antibiotic susceptibility of the organism and the penetration of the antibiotic into the CSF. Empirically, because of the meningococcal predominance in meningitis in the younger age groups, penicillin should be included in the initial antibiotic regimen. In addition, most strains of *Neisseria gonorrhoeae* are susceptible to penicillin.[8] However, the recent increase in certain localities of the United States of penicillinase-producing *Neisseria gonorrhoeae* (PPNG) has prompted the Centers for Disease Control to recommend the use of ceftriaxone in the treatment of disseminated gonococcal infections in these areas.[9] The antibiotics chosen should be continued in high dose until culture and susceptibility results are available. Unlike other gonococcal infections, the recommended duration of treatment for gonococcal meningitis is at least 10 days.[1]

Physicians should be suspicious of disseminated gonococcal disease in febrile sexually active youths. Because of the high frequency of gonococcal infections, serious complications will continue to occur. Prompt efforts to diagnose and treat patients with gonorrhea, as well as their sexual partners, should continue to be a high priority of medical professionals; and they can thereby reduce the serious morbidity and mortality from these infections.

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