Chapter 5 — Special Conditions

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This chapter contains guidelines for the management of pertussis in individuals with special medical or physiologic conditions. Pertussis in individuals infected with the HIV virus and in pregnant women has been described in the literature and is included in detail in this chapter. Pertussis in individuals with other immunocompromising conditions (e.g., cancer, immune deficiency disorders) and chronic respiratory diseases (asthma, cystic fibrosis) is also discussed in this chapter, but has been less well characterized.

HIV/AIDS

Case Reports

Persons infected with the human immunodeficiency virus (HIV) may frequently experience changes in pulmonary status due to a variety of respiratory pathogens. Although the most common pulmonary infection in persons with acquired immune deficiency syndrome (AIDS) is *Pneumocyctis carini*, other viral, bacterial, mycobacterial and fungal infections are also common.[1] *Bordetella pertussis* infection has been described in both HIV-infected adults[2,3] and children.[4] Pneumonia due to *Bordetella bronchiseptica* in a patient with AIDS has also been described.[5,6] Additionally, there has been at least one reported pertussis death in a 5-year old AIDS patient.[7]

In several of these case reports, the diagnosis of pertussis was not suspected upon presentation and was made only following an extensive work-up. Similarly, an additional case series reports unexpected isolation of *B. pertussis* from specimens of three adults with AIDS who underwent diagnostic bronchoscopy for the evaluation of respiratory symptoms.[8]

Prospective Studies

The prevalence of pertussis was studied prospectively in 60 adult HIV-infected persons presenting with respiratory symptoms to a tertiary care center. Nasopharyngeal specimens were obtained for culture from all patients. Seventy-two percent had cough and 33% had cough >14 days, but none of the cultures were positive for pertussis.[9] In another study, bronchoalveolar lavage specimens from 20 children infected with HIV were evaluated for evidence of pertussis. All cultures were negative, but testing with indirect immunofluorescence with a monoclonal antibody revealed three had *B. pertussis* associated with pulmonary alveolar macrophages.[10] Interpretation of these results should be made with caution because of the limitations to this test (see **Chapter 2: Diagnosis and Laboratory Methods**).

Vaccine Safety and Immunogenicity

Vaccination of HIV-infected children appears to be safe and at least partially immunogenic. In one study of HIV-infected children, there were no cases of pertussis in 239 child-years of follow-up among children vaccinated with acellular pertussis vaccine

versus 3 cases of pertussis in 171 child-years of follow-up among unvaccinated HIV-infected children.[11] In this study, antibody response to all 3 antigens in the acellular vaccine was evident in half of HIV-infected children and partial response (to one or two antigens) was evident in an additional 25%. However, antibody levels were lower than controls and correlated with pre-immunization CD4 counts.[12] No adverse events from pertussis vaccination among HIV-infected children have been reported,[11,12,13,14] and vaccination has not been shown to affect clinical deterioration or lower CD4 cell count in perinatally HIV-infected children.[13]

Recommendations

Although pertussis infection and death have been described in HIV-infected individuals, current evidence does not suggest that pertussis is a common infection in these persons. Furthermore, no outbreaks of pertussis have been described among persons with HIV infection. Immunization of children aged <7 years with a pertussis-containing vaccine should be completed according to the childhood immunization schedule, as no severe adverse events have been reported and the vaccine provides protection in most HIV-infected children.

PREGNANCY

Maternal Illness

There are no known obstetric or neonatal adverse outcomes associated with pertussis in a pregnant woman if she is no longer infectious at the time of delivery. However, paroxysmal cough during pregnancy can lead to extreme discomfort and erythromycin may not be well tolerated due to gastrointestinal side effects. Although most cases of pertussis in pregnant women do not differ in severity from those of other adults, severe cases have been reported.[15]

Mother-to-Infant Transmission

Several case reports exist that document mother-to-infant transmission of pertussis at the time of or shortly after birth.[16,17,18,19] In these cases, pertussis in the mother was often mild and not suspected until the development of symptoms in the neonate. In contrast, pertussis among infants was severe, usually resulting in complications, and in some cases, death. Several mothers were young (aged <25 years) and began coughing three weeks antepartum to one week post-partum.

In a ten-year prospective study in Sweden, 35 mothers with serologically- or culture-confirmed pertussis at the time of delivery were evaluated.[20] Thirty-two of the mothers were treated with erythromycin and allowed to nurse their newborns, and 28 of these newborns received prophylactic erythromycin. None of the 32 newborns developed symptoms of pertussis, suggesting that erythromycin given to a mother prior to or at the time of birth, and to the newborn, eliminated the risk of pertussis transmission. No adverse drug reactions were reported in these newborns.[20,21] However, adverse drug

reactions in infants have been reported. (See **Chapter 3: Treatment and Chemoprophylaxis**).

Summary

Pertussis early in pregnancy does not pose substantial risk to mother or fetus, but infants born to mothers infected with pertussis at delivery are at high risk for acquiring severe infection. In such instances the following recommendations are made:

1. Treatment and Chemoprophylaxis

a. ***Cases***. Antimicrobial treatment should be initiated as soon as pertussis is suspected in a pregnant woman, regardless of trimester. The antibimicrobial of choice is erythromycin. Initiating treatment ≥ 3 weeks after cough onset has limited benefit to the patient or contacts. However, treatment is recommended up to six weeks after cough onset in late pregnancy. For dosage and duration of therapy and further information, see **Chapter 3: Treatment and Chemoprophylaxis.**

b. ***Contacts.*** If pertussis is highly suspected in a pregnant or post-partum woman, chemoprophylaxis of all household and close contacts with erythromycin is recommended regardless of their age and vaccination status. Initiating chemoprophylaxis ≥ 3 weeks after exposure has limited benefit for the contacts. However, chemoprophylaxis should be considered for high-risk contacts (e.g., infants) up to 6 weeks after exposure. For more information about chemoprophylaxis and adverse reactions in neonates, see **Chapter 3: Treatment and Chemoprophylaxis**.

2. Other Recommendations

a. Mothers should be placed on droplet precautions (see **Chapter 11: Definitions**) during their hospitalization for delivery or until they have received 5 days of a full course of antibiotics. However, if both mother and infant are receiving 14-day courses of erythromycin, it is not necessary to isolate the baby from the mother and breast feeding is encouraged.

b. Measurement of antibody levels in cord blood is not recommended as there is no correlation of maternal antibody with infant protection.

OTHER SPECIAL CONDITIONS

Asthma

There is no evidence to suggest that childhood pertussis is a predisposing factor for the development of asthma.[22] Pertussis may present with a clinical picture similar to asthma (nocturnal cough); therefore the diagnosis of pertussis may be delayed in children with a known history of asthma.[23] It is unknown if asthmatic children have a more severe or prolonged course of pertussis, although a severe case has been described in an asthmatic child.[24] It is unlikely that bronchodilators improve the clinical course of pertussis in an

asthmatic child. Two studies found salbutamol provided no benefit in the treatment of pertussis.[25,26]

Cystic fibrosis

Pertussis does not appear to be a common problematic infection in children with cystic fibrosis. However, two deaths from pertussis in siblings with cystic fibrosis have been reported.[7]

Other Immunocompromising Conditions

Pertussis infection is not well described in persons with other immunocompromising conditions, such as immunodeficiencies due to congential conditions, malignancies, cancer chemotherapy, or chronic steroid therapy. One case of severe pertussis pneumonia requiring intensive care has been described in an adult bone marrow transplant recipient.[27]

REFERENCES

1. Stover D, White D, Romano P, et al. Spectrum of pulmonary diseases associated with the acquired immune deficiency syndrome. Am J Med 1985;78:429-37.

2. Doebbeling B, Feilmeier M, Herwaldt L. Pertussis in an adult man infected with the human immunodeficiency virus. J Infect Dis 1990;161:1296-8.

3. Colebunders R, Vael C, Blot K, et al. *Bordetella pertussis* as a cause of chronic respiratory infection in an AIDS patient. Eur J Clin Microbiol Infect Dis 1994;13:313-5.

4. Adamson P, Wu T, Meade B, et al. Pertussis in a previously immunized child with human immunodeficiency virus infection. J Pediatr 1989;115(4):589-92.

5. Amador C, Chiner E, Calpe JL, et al.. Pneumonia due to *Bordetella bronchiseptica* in a patient with AIDS. Rev Infect Dis 1991;13:771-2.

6. Woodard DR, Cone LA, Fostvedt K. *Bordetella bronchiseptica* infection in patients with AIDS. Clin Inf Dis 1995;20:193-4.

7. Vitek C, Smith E, Guris D, et al. Pertussis deaths among children, United States, 1996 and 1997. ICAAC. 1998.

8. Valerie N, York M, Hadley K. Unexpected isolation of *Bordetella pertussis* from patients with acquired immunodeficiency syndrome. J Clin Microbio 1989;27(2):337-8.

9. Cohn S, Knorr K, Gilligan P, et al. Pertussis is rare in human immunodeficiency virus disease. Am Rev Respir Dis 1993;147:411-3.

10. Bromberg K, Tannis G, Steiner P. Detection of *Bordetella pertussis* associated with the alveolar macrophages of children with human immunodeficiency virus infection. Infect Immun 1991;59(12):4715-9.

11. Dunn D, Newell M, Packham C, et al.. Routine vaccination and vaccine-preventable infections in children born to human immunodeficiency virus-infected mothers. Acta Paediatr 1998;87:458-9.

12. Martino M, Podda A, Galli L, et al. Acellular pertussis vaccine in children with perinatal human immunodeficiency virus-type 1 infection. Vaccine 1997;15(11):1235-8.

13. Tovo P, Gabiano C, De Martino M, et al.. Pertussis immunization does not affect HIV-1 progression in perinatally infected children (abstract 12170). In 12th International Conference on AIDS 1998:45

14. Ryder R, Oxtoby M, Mvula M, et al. Safety and immunogenicity of bacille Calmette-Guerin, diphtheria-tetanus-pertussis, and oral polio vaccines in newborn children in Zaire infected with human immunodeficiency virus type 1. J Pediatr 1993;122(5):697-702.

15. MacLean D, Calder M. Pertussis in pregnancy. Scott Med J 1981;26:250-3.

16. Nelson J. The changing epidemiology of pertussis in young infants. Am J Dis Child 1978;132:371-3.

17. McGregor J, Ogle J, Curry-Kane G. Perinatal pertussis. Obstetrics and Gynecology 1984;64(4):582-5.

18. Christie C, Baltimore R. Pertussis in neonates. Am J Dis Child 1989;143:1199-1202.

19. Beiter A, Lewis K, Pineda E, et al. Unrecognized maternal peripartum pertussis with subsequent fatal neonatal pertussis. Obstetrics and Gynecology 1993;82(4):691-3.

20. Granstrom G, Sterner G, Nord C, et al. Use of erythromycin to proven pertussis in newborns of mothers with pertussis. J Infect Dis 1987;155(6):1210-4.

21. Granstrom G, Granstrom M, Sterner G. Whooping cough in late pregnancy. Scand J Infect Dis 1990;71(Suppl):27-9.

22. Sundqwist M, Trollfors B, Taranger J. Pertussis in Infancy Does Not Increase the

Risk of Asthma. Pediatrics. 1998;102(6):1496-7.

23. Houston A, Williams P, Wood C. A child with nocturnal cough. Practitioner 1990; 234:77-80.

24. Thomson AH, Simpson H. Serious consequences of whooping cough in asthmatic child (letter). Journal of the Royal Society of Medicine 1986;79(1):59

25. Mertsola J, Viljanen MK, Ruuskanen O. Salbutamol in the treatment of whooping cough. Scand J Infect Dis 1986;18(6):593-4.

26. Krantz I, Norrby SR, Trollfors B. Salbutamol vs. Placebo for treatment of pertussis. Pediatr Infect Dis 1985;4(6):638-40.

27. Postels-Multani S, Schmitt HJ, Wirsing von Konig CH, Bock HL, Bogaerts. Symptoms and complications of pertussis in adults. Infection 1995; 23(3):139-42.