Infectious Disease Challenges in Immigrants From Tropical Countries

Clyde Walter Worley, MAT; Kimberly Ann Worley, MD; and P. Lucy Kumar, MD

ABSTRACT. ***Background.*** **In today's mobile society, international travel and immigration are becoming increasingly more common. This poses an additional challenge to the clinician to expand the differential diagnosis to include diseases endemic to the area of travel.**

Observation. **We present a case of malaria and tuberculosis in a 16-year-old African male immigrant. He had several encounters with the health care system for complaints of nonspecific symptoms for which he was treated with antibiotics without follow-up.**

Conclusion. **Clinicians should take a complete history and expand their differential diagnosis to include diseases endemic to the country of origin and/or travel when treating an international patient. This not only will allow prompt treatment of the patient's condition but also will address public health concerns.** ***Pediatrics*** **2000; 106(1). URL: http://www.pediatrics.org/cgi/content/full/106/1/e3;** ***malaria, tuberculosis, international immigrant.***

ABBREVIATIONS. PPD, purified protein derivative; HIV, human immunodeficiency virus; CDC, Centers for Disease Control and Prevention.

In today's mobile society, the pediatrician should always obtain a travel history before arriving at a diagnosis. This history will allow the physician to include diseases endemic to the regions of travel in the differential diagnosis. This point is illustrated by the following case report.

CASE REPORT

A 16-year-old African male was seen for the first time in a general pediatric clinic for a routine physical examination. He had emigrated from Liberia 3 months earlier, had not been immunized, and was sexually active. The family had lived in a refugee camp before coming to the United States. Before immigrating to the United States, a tuberculosis-screening chest radiograph was preformed and was read as negative. Review of systems revealed the patient had a fever 2 weeks earlier and was treated twice with antibiotics: once at a clinic for indigent people and once at a local emergency department. He had been afebrile for the past 7 days. Further questioning revealed the patient had felt feverish on and off for 5 months and occasionally had dark-colored urine. He stated he shivers and sweat with the fevers. He denied having weight loss, abdominal pain, vomiting, diarrhea, dysuria, cough, or other symptoms.

His complete physical examination was within normal limits. The patient was at the 50th percentile for both height and weight.

Laboratory results include: complete blood count (hemoglobin: 10.9 g/dL; hematocrit: 33.6%; white blood cell count: 5600 $\times$ 10^9/L; platelet count: 115 000 $\times$ 10^9/L; segmental cells: 62%; lymphocytes: 27%; monocytes: 10%; mean corpuscular volume: 78.1 fL); erythrocyte sedimentation rate, 55 mm/hour; total hepatitis A antibody, reactive; hepatitis A immunoglobulin M antibody, nonreactive; purified protein derivative (PPD), reactive (16 mm); chest radiograph, normal; comprehensive chemistry panel, normal; hepatic panels, normal; stool for ova and parasites, negative; urine and blood cultures, negative; human immunodeficiency virus (HIV), negative; and hemoglobin electrophoresis (hemoglobin A1: 97.6%; hemoglobin A2: 2.4%);

The peripheral smear revealed rare malarial parasite ring forms (trophozoites) and Schüffner's stippling, consistent with either *Plasmodium vivax* or *Plasmodium ovale*.

DISCUSSION

Based on the history, clinical presentation, and laboratory data, the diagnoses of malaria and tuberculosis were considered. Because the peripheral smear revealed rare malarial parasite ring forms (trophozoites) and Schüffner's stippling, consistent with either *P vivax* or *P ovale*, the diagnosis of non-*Plasmodium falciparum* malaria was confirmed. Malaria is caused by 4 *Plasmodium* species: *falciparum, vivax*, *ovale*, and *malariae*. It can be contracted by the bite of the female *Anopheles* mosquito, by blood transfusion, or by organ transplant. An estimated 300 million to 500 million cases of malaria are diagnosed annually worldwide, leading to 1 million to 2 million deaths per year.[1,2] According to the Centers for Disease Control and Prevention (CDC), the incidence of malaria in the United States in 1998 was 1381 cases.[3] Nearly all reported cases involved travel outside the United States.

In addition to identification of the species, the peripheral blood smear will also reveal the parasite density (number of infected erythrocytes per 1000 erythrocytes). Higher parasite burdens are associated with poorer prognosis. Patients native to a region in which malaria is endemic have fewer complications attributable to partial immunity derived from repeated exposure to the organism. If a patient is infected with *P falciparum*, it is crucial to determine the geographic origin of the organism and the incidence of chloroquine resistance in the region. Chloroquine resistance in non-*P falciparum* species has also been noted.[4,5] However, chloroquine remains the drug of choice unless there is no response or parasitemia continues.[6,7] For current resistance patterns and treatment recommendations, the CDC should be contacted.

This patient presented with episodic fevers, chills, dark-colored urine, and anemia. In malaria, fevers are classically high, spiking, associated with sweating, and occur at regular intervals. A description of the fever pattern will often provide a clue to the particular malaria species. *P ovale* and *P vivax* present with a tertian fever that spikes regularly every 48

From the Department of Pediatrics, East Tennessee State University, Johnson City, Tennessee.

Received for publication Dec 21, 1999; accepted Feb 3, 2000.

Reprint requests to (P.L.K.) East Tennessee State University, Department of Pediatrics, Box 70578, Johnson City, TN 37614-0578. E-mail: naves@access.etsu.edu

hours, whereas *P malariae* quartan fever cycles every 72 hours, and continuous fevers with intermittent irregular spikes are characteristic of *P falciparum*. Anemia is caused by the destruction of red blood cells when the schizonts are released. Hemoglobinuria may result in dark-colored urine. Splenic sequestration may result in thrombocytopenia.[1,2]

Treatment should be initiated immediately after diagnosis by peripheral blood smear. Proper therapy is based on the *Plasmodium* species, geographical origin of the parasite, parasite density, and the patient's clinical status.

The patient began a 3-day course of chloroquine, per the CDC. He had no adverse reactions to therapy. He then began a 14-day course of primaquine. However, before initiation of primaquine therapy, it is important to note that this patient's glucose-6-phosphate dehydrogenase was normal. If glucose-6-phosphate dehydrogenase activity had been low, primaquine could have induced a hemolytic anemia.[1,2] After completion of therapy, no parasites were seen on peripheral blood smear.

Further history revealed the patient did receive bacille bilié de Calmette-Guérin as an infant; however, this should not produce such a strongly positive PPD. After receiving bacille bilié de Calmette-Guérin, patients will often develop reactivity <10 to 12 mm to PPD. This reactivity wanes in 3 to 5 years. The CDC and the American Thoracic Society recommend that any reactivity to PPD ≥10 mm be considered positive in foreign-born persons from Asia, Africa, or Latin America.[9] Because of the patient's strongly reactive PPD and history suggesting exposure, the diagnosis of asymptomatic primary tuberculosis was made. The patient was started on isoniazid prophylaxis for 6 months.

An estimated one third of the world's population is infected with tuberculosis,[10] which causes more deaths than any other infectious disease.[11] In today's mobile society, tuberculosis is just a plane flight away. The CDC reports that "the percentage of cases in foreign-born individuals increased from 27% of the national total in 1986 to 42% in 1998."[12] This illustrates that the incidence of tuberculosis in the United States is disproportionately distributed among foreign-born persons.[13] Tuberculosis is at least 10 times more prevalent in international children than in children born in the United State.[14] One study found that of 83 pediatric refugees, 20% had reactive PPDs.[15]

This case illustrates the complexity of dealing with the international patient. Immigrants should be thoroughly screened on entering the United States. As demonstrated in this patient, these screening tests are not 100% sensitive and should not replace good clinical judgment. Studies have found that ~50% of pediatric international adoptees have an undiagnosed medical condition on entering the United States.[16] The problem of undiagnosed illness is even greater in the international refugee because of crowded conditions (ie, refugee camps), war, famine, and lack of a US sponsor. Often the international refugee will have sought care at other health care facilities, including emergency rooms and indigent care clinics, with little or no follow-up. This lack of continuity poses even greater concern for both the patient's well-being and general public health issues.

A review of the literature reveals the following recommendations concerning immigrant health screening[14,16]:

1. Screening tests should be performed on the first visit because this may be the only patient contact.
2. A thorough history and physical examination should be performed, considering the diseases endemic to the patient's country of origin.
3. Infectious disease screening is necessary for HIV, hepatitis B, syphilis, stool for ova and parasites, and tuberculosis (PPD). Hepatitis B and HIV screening should be repeated in 6 months. Screening for hepatitis A is of little value because immunoglobulin G antibodies are almost ubiquitous.
4. All immigrants should have complete blood count with differential and a blood smear review.
5. Well-child issues including hearing, vision, weight, height, language, psychosocial, and immunization status should be addressed.

The CDC, its *Morbidity Mortality Weekly Report*, and its website (www.cdc.gov) are excellent resources for the generalist physician evaluating the health needs of our immigrants.

REFERENCES

1. Barat LM, Zucker JR. Malaria. In: McMillan JA, DeAngelis CD, Feigin RD, Warshaw JB, eds. *Oski's Pediatrics: Principles and Practice*. 3rd ed. Philadelphia, PA: Lippincott Williams & Wilkins; 1999:1177–1184
2. Krogstad DJ. *Plasmodium* species (malaria). In: Mandell GL, Bennett JE, Dolin R, eds. *Mandell, Douglas, and Bennett's Principles and Practice of Infectious Disease*. 4th ed. New York, NY: Churchhill Livingstone; 1995: 2415–2427
3. Williams H, Roberts J, Kachur SP, et al. Malaria surveillance—United States, 1995. *MMWR CDC Surveill Summ*. 1999;48:1–21
4. Ahlm C, Wistrom J, Carlsson H. Chloroquine-resistant *Plasmodium vivax* malaria in Borneo. *J Travel Med*. 1996;3:124
5. Fryauff DJ. Chloroquine-resistant *Plasmodium vivax* in transmigration settlements of West Kalimantan, Indonesia. *Am J Trop Med Hyg*. 1998; 59:513–518
6. White NJ. The treatment of malaria: current concepts. *N Engl J Med*. 1996;335:800–806
7. American Academy of Pediatrics. Malaria. In: Peter G, ed. *1997 Red Book: Report of the Committee on Infectious Disease*. 24th ed. Elk Grove Village, IL: American Academy of Pediatrics; 1997:335–342
8. Zucker JR, Campbell CC. Malaria: principles of prevention and treatment. *Infect Dis Clin North Am*. 1993;7:547–567
9. American Thoracic Society, Centers for Disease Control and Prevention. Diagnostic standards and classification of tuberculosis. *Am Rev Respir Dis*. 1990;142:725
10. Centers for Disease Control. Expanded tuberculosis surveillance and tuberculosis morbidity—United States, 1993. *MMWR CDC Surveill Summ*. 1994;43:361–366
11. Centers for Disease Control and Prevention. Tuberculin skin test survey in a pediatric population with high BCG vaccination coverage—Botswana, 1996. *MMWR CDC Surveill Summ*. 1997;46:846–851
12. Centers for Disease Control and Prevention. Progress toward the elimination of tuberculosis—United States, 1998. *MMWR CDC Surveill Summ*. 1999;48:732–736
13. McKenna MT, McCray E, Onorato I. The epidemiology of tuberculosis among foreign-born persons in the United States, 1986 to 1993. *N Engl J Med*. 1995;332:1071–1076
14. Quarles CS, Brodie JH. Primary care of international adoptees. *Am Fam Physician*. 1998;58:2025–2032
15. Meropol SB. Health status of pediatric refugees in Buffalo, NY. *Arch Pediatr Adolesc Med*. 1995;149:887–892
16. Hostetter MK, Johnson D. Medical examination of the internationally adopted child: screening for infectious disease and developmental delays. *Postgrad Med*. 1996;99:70–82

Infectious Disease Challenges in Immigrants From Tropical Countries

Clyde Walter Worley, Kimberly Ann Worley and P. Lucy Kumar

Pediatrics 2000;106;e3
DOI: 10.1542/peds.106.1.e3

Infectious Disease Challenges in Immigrants From Tropical Countries

Clyde Walter Worley, Kimberly Ann Worley and P. Lucy Kumar

Pediatrics 2000;106;e3
DOI: 10.1542/peds.106.1.e3