

You're the Flight Surgeon

This article was prepared by MAJ Charles T. Howard, USAF, MC, FS, and CAPT Paul D. Vu, USAF, MC, FS.

You are the flight surgeon managing a busy U.S. Air Force Flight Medicine clinic in the continental United States when you get a phone call from one of your remote piloted aircraft (RPA) pilots. The 30-yr-old Captain informs you that he developed a headache and felt warm toward the end of his night sortie. His commander relieved him of his duties and issued 24-h quarters with instruction for him to visit to your clinic. In addition to his symptoms, he tells you over the phone that his 3-yr-old toddler was sent home from preschool yesterday with a fever and perioral lesions. Since his son was coming into the clinic to see the pediatrician, he was wondering if he could stop by to see you. You agree to walk him in.

He is in no distress when you see him in the exam room. He thanks you for seeing him on such short notice and graciously extends his hand. A moment before you shake hands, he quickly retracts it and says, "Doc, I didn't mention this on the phone but, in the last 12 h, I've also noticed some vesicles on my right palm" and he points to three small (1-2 mm) lesions on his right palm and fingers. He also has had a sore throat and difficulty swallowing since his night sortie began. He states that his symptoms of fever, headache, sore throat, and rash all developed within the last 24 h. His two children at home are suffering from similar symptoms for the past 2 d. His wife complained of some oral lesions this morning. She is a stay-at-home mom with his 12-month-old daughter while the toddler attends pre-school part time.

The patient denies previous illness in the last month. His family has been healthy in recent weeks. There has been no recent travel and no new visitors recently. He does not take medications and consumes a daily multivitamin. He denies allergies and reports no changes in diet or hygiene in recent weeks. The pilot finished a deployment 3 mo ago and is up to date on all his vaccinations. His vitals are within normal limits and physical exam is pertinent for bilateral tonsillar vesicles and 6-7 fluid-filled cutaneous tender lesions on his right palm and fingers as well as the start of 2-3 lesions on his left palm. Concerned for a systemic rash you do a thorough skin exam, which includes the patient taking off his shoes and socks. There is a small macular reddish lesion on the plantar surface of the patient's right foot, which is new. The foot lesion and finger lesions are nontender and without discharge. In summary, the patient is an otherwise healthy 30-yr-old male with no significant medical or surgical history. He has no aeromedical waivers or profiles and maintains an active flying class II 1042. The history and exam lead you to conclude that he is suffering from an active infection.

1. Which of the following differential diagnoses should you consider?

- A. Acute pharyngitis.
- B. Contact dermatitis.
- C. Hand, foot, and mouth disease.
- D. Allergic reaction.
- E. All of the above.

ANSWER/DISCUSSION

1. E. All of the diagnoses are possible and must be considered. Parents who have children in community care settings often contend with recurrent illness, largely viral in etiology. You learn from your technician that two children were sent home from the Child Development Center (CDC) on base with lesions reported on their mouths and feet. With this additional information, the case is starting to look more like an infectious outbreak versus an allergic reaction. The patient did not present with urticaria, trouble breathing, or tissue edema, and he did not mention any changes to his work or home environments or mention new medication therapy. The fever and headache also lend more support to an infectious etiology over an allergic reaction.

Your remote clinic allows for open communication with your clinic's only pediatrician and you decide to discuss with him the CDC cases. As you approach him, he greets you with his palms up, showing palmar lesions! He tells you that he believes there is an outbreak of hand, foot, and mouth disease (HFMD) occurring in the local area. He has seen half a dozen kids in recent days with hand, foot, and mouth syndrome and has sent one child to the local emergency department with similar symptoms and a fever of 103°F. Based on the pediatrician's diagnosis, you return to the clinic and inform your patient that he is likely suffering from hand, foot, and mouth syndrome. The clinical symptoms justify an aeromedical disposition of duties not including flying and quarters to isolate this patient from his flying community. As you complete his 1042 and quarters, the pilot asks you what other symptoms he could potentially experience?

DOI: 10.3357/AMHP.4121.2015

2. What additional common symptoms should you suspect in a healthy adult with an uncomplicated case of hand, foot, and mouth syndrome?

- A. Ocular infections.
- B. Acute paralysis.
- C. Oral vesicles on the buccal mucosa and tongue.
- D. Myopericarditis.
- E. Pleurodynia.
- F. Meningoencephalitis.

ANSWER/DISCUSSION

2. C. Oral vesicles on the buccal mucosa and tongue. The hand, foot, and mouth syndrome is a common acute illness, affecting mostly children, which is characterized by fever, oral vesicles on the buccal mucosa and tongue, and peripherally distributed small, tender cutaneous lesions on the hands, feet, buttocks, and (less commonly) genitalia. The nonpolio enteroviruses (group A and B coxsackieviruses, echoviruses, and enteroviruses) and parechoviruses continue to be responsible for the majority of symptoms related to hand, foot, and mouth syndrome. The incubation period for HFMD is 3 to 5 d; the illness usually resolves in 2 to 3 d without complication.⁵ Ocular infections as in the case of acute hemorrhagic conjunctivitis can cause ocular pain, lid edema, and subconjunctival hemorrhage that rarely lead to permanent visual impairment. The infection peaks in 2 to 3 d and resolves within 10 d without complication.⁶ Acute paralysis similar to paralytic poliomyelitis is rare and sporadic, and occurs with other enterovirus serotypes, the most important of which is enterovirus 71, the only nonpolio serotype associated with outbreaks of paralytic disease.¹ Cardiac involvement during enterovirus infection typically occurs in the form of myopericarditis, as enteroviruses typically affect both the subepicardial myocardium in addition to the pericardium.⁷ Pleurodynia is an acute illness characterized by fever and paroxysmal spasms of the chest and abdominal muscles. Regional and nationwide outbreaks involving a large number of older children and young adults have been reported at infrequent intervals, often separated by decades.⁸ Aseptic meningitis affects persons of all ages, but is most commonly observed in infants less than 1 yr of age. In the older child and adult, aseptic meningitis presents with fever to 40°C, headache, meningismus, nausea, and vomiting. Symptoms of encephalitis complicate the course of aseptic meningitis in as many as 5 to 10% of patients who develop diminished consciousness or seizures. The enteroviruses cause more than 90% of cases in infants; the great majority is due to the group B coxsackieviruses and echoviruses.⁹

After sending the pilot home with strict instructions not to return to work until follow-up with you in 1 wk, you decide that your Flight Surgeon responsibilities are not complete until you have made a courtesy call to his commander and a visit to the flying squadron. You are able to contact the squadron commander and he invites you to brief the squadron on the recent infection and discuss potential medical threats to flying operations at the commander's call this afternoon. Later that day, you arrive at the squadron and a few flyers approach you in the hallway asking about the patient. Protecting patient information, you educate the flyers on HFMD and at the meeting inform the squadron about symptoms related to hand, foot, and mouth syndrome.

An alert sensor operator asks how the disease is spread and how long a person is contagious?

3. By what mechanism and route does the virus spread?

- A. Mucus from the nose.
- B. Saliva.
- C. Fluid from one of the skin lesions.
- D. Fecal oral transit.
- E. All of the above.

ANSWER/DISCUSSION

E. All of the above. People with HFMD are most likely to spread the infection during the first week of their illness. The viruses that cause HFMD can be found in an infected patient's nose and throat secretions (such as saliva, sputum, or nasal mucus), blister fluid, and feces (stool). An infected person may spread the viruses that cause HFMD through close personal contact, the air (through coughing or sneezing), or contact with feces or contaminated objects and surfaces. Generally, a person with HFMD is most contagious during the first week of illness. People can sometimes be contagious for days or weeks after symptoms go away. Some people, especially adults, who get infected with the viruses that cause HFMD may not develop any symptoms.² However, they may still be contagious as the virus can live in their body well after the symptoms have gone away. The human enteroviruses and parechoviruses are ubiquitous viruses found throughout the world, and are transmitted from person to person through fecal-oral contact.⁴ Polioviruses, the prototypic enteroviruses, are the cause of paralytic poliomyelitis, a disease that has been eradicated in the United States and other developed countries (except for very rare cases that are attributable to live, attenuated polio vaccine viruses), and that is targeted for worldwide eradication.

4. As the Flight Surgeon, one of your many duties involves public health responsibilities. What additional measures should you take considering your recent clinical encounter?

- A. Notify the public health clinic of your adult case of hand, foot, and mouth disease.
- B. Send an email notice to the Operations Group informing them of recent cases with specific symptoms to monitor for.
- C. Contact the CDC about a potential outbreak and that isolation may be needed.
- D. All of the above.

ANSWER/DISCUSSION

4. D. All of the above. After notifying the public health office of a potential HFMD outbreak in a specific flying squadron, your public health representative informs you they are actively engaged in notifying essential personnel as the pediatric office has also notified them of an outbreak in the CDC. Public health also informs you they are visiting the CDC today to discuss infectious disease outbreaks with CDC staff and invite you to join them for a site visit. Your CDC visit begins with an introduction and tour by the CDC supervisor and she educates

you on the facility's public health protocols and provides access to student's immunization records. She doesn't understand why the kids are coming down with HFMD because all their immunizations are up to date. She asks you, "Doctor, why did the vaccine fail?"

5. There is a childhood vaccine to protect against the viruses that cause hand, foot, and mouth disease.

- A. True
- B. False

ANSWER/DISCUSSION

5. B. False. There is no vaccine to protect against the viruses that cause hand, foot, and mouth disease. The nonpolio enteroviruses (group A and B coxsackieviruses, echoviruses, and enteroviruses) and parechoviruses continue to be responsible for a wide spectrum of disease in persons of all ages, although infection and illness occur most commonly in infants and young children. A person can lower their risk of being infected by washing hands often with soap and water, especially after changing diapers and using the toilet, cleaning and disinfecting frequently touched surfaces and soiled items including toys, and avoiding close contact activities such as kissing, hugging, sharing eating utensils or cups with people with hand, foot, and mouth syndrome.²

As you continue your CDC inspection the supervisor tells you this week has been a particularly tough week with infections and she has had to send six kids home with hand, foot, and mouth lesions. She also tells you that the age ranges of children have been under the age of 5 yr. She was especially concerned about one child who had 3-4 painful sores in the mouth and he experienced difficulty swallowing fluids and wouldn't eat his meals. She stated he looked dehydrated and had a rash on the palms of his hands that alarmed his teachers enough to call his parents. The staff are concerned for the little boy because he looked sick and wasn't tolerating his meals and wasn't very active in his class as he usually is a very active toddler. She informs you that none of the employees taking care of the boy have presented with symptoms. The manager tells you she contacted housekeeping and had the toddler room thoroughly cleaned last night and is having all diaper trash basins bagged and removed twice a day. She is enforcing strict hand washing techniques and limiting new visitors to the CDC. The manager pulls you into her office and asks you and the public health representative what should she tell her staff about getting tested for HFMD?

6. Confirmation of hand foot and mouth disease infection can be accomplished by laboratory diagnosis.

- A. True
- B. False

ANSWER/DISCUSSION

6. A. True. As you inform the supervisor that HFMD diagnosis is based mainly on clinical symptoms and if any of her staff are concerned they should first present to their medical provider for evaluation, but labs are available to assist in the diagnosis of HFMD. Laboratory diagnosis of enterovirus infection is accomplished by the

isolation and identification of the virus in cell culture, by detection of enterovirus RNA by polymerase chain reaction, or retrospectively by serologic methods. Enteroviruses are detected by producing a characteristic cytopathic effect in cultured cells. Submitting specimens from several sites enhances enterovirus isolation. Stool and rectal swabs are most likely to produce an isolate. Other sites often sampled include cerebral spinal fluid (in cases of central nervous system disease), throat swabs, urine, and serum.³

You inspect the toddler play room and one of the teachers informs you that her spouse is a pilot with the RPA squadron and heard from another spouse there was an outbreak in the squadron. She wants to know how many cases they should expect to encounter in the flying squadron in upcoming weeks.

7. How many hand, foot, and mouth cases should you expect from your aviators, assuming their vaccinations are current?

- A. 1-2 cases.
- B. 3-6 cases.
- C. 6-10 cases.
- D. 10-15 cases.
- E. Varies depending on conditions.

ANSWER/DISCUSSION

7. E. Nonpolio enteroviruses are very common viruses and infection rates vary depending on conditions. They cause about 10 to 15 million infections in the United States each year. Anyone can get infected with nonpolio enteroviruses. But infants, children, and teenagers are more likely to get infected and become sick. That's because they do not yet have immunity (protection) from previous exposures to the viruses. Most people who get infected with nonpolio enteroviruses do not require medical attention. In most cases, they may have mild illness, like the common cold. However, some people can get very sick and have infection of their heart or brain or even become paralyzed. Infants and people with weakened immune systems have a greater chance of having these complications. In the United States, people are more likely to get infected with nonpolio enteroviruses in the summer and fall.²

Two weeks after initial presentation of symptoms, the pilot has completed supportive therapy with almost complete resolution of the cutaneous skin lesions. His most recent physical exam is unremarkable for oral lesions or foot lesions. The rest of his physical exam, including vitals, are within normal limits. He reports his two kids are healthy with no signs of infection and his wife's oral lesions have resolved. In reviewing Air Force Instruction 48-123 and the Air Force Waiver guide, you find the pilot is asymptomatic of his viral infection and completed his anti-inflammatory oral medication therapy with no side effects. He states he is ready to return to duty and you decide to return him to flying status and remove him from quarters. The pilot tells you that he missed several sorties over the past 2 wk, which required other staff to work overtime to accomplish the mission. However, he thanks you for keeping him down as he states mission impact could have been worse if he kept flying and infected other personnel. This self-limited illness requires no waiver action in any of the services and does not

affect qualification for Federal Aviation Administration medical certification. You also follow up with the pediatrician and he is also fully recovered and informs you that he has not treated a new case of hand, foot, and mouth syndrome in the recent week.

Howard CT, Vu P. *You're the flight surgeon: hand, foot, and mouth disease*. *Aerosp Med Hum Perform*. 2015; 86(5):497–500.

REFERENCES

- Alexander JP, Jr., Baden L, Pallansch MA, Anderson LJ. Enterovirus 71 infections and neurologic disease—United States, 1977–1991. *J Infect Dis* 1994; 169:905–8.
- Center for Disease Control and Prevention. [Accessed July 2014.] Available from <http://www.cdc.gov/ncidod/dvrd/revb/Enterovirus/hfmd-qa.htm>.
- Gordon RB, Lennette EH, Sandrocks RS. The varied clinical manifestations of coxsackie virus infections: observations and comments on an outbreak in California. *AMA Arch Intern Med* 1959; 103:63–75.
- Ooi MH, Wong SC, Lewthwaite P, Cardoso MJ, Solomon T. Clinical features, diagnosis, and management of enterovirus 71. *Lancet Neurol* 2010; 9:1097–105.
- Robinson CR, Doane FW, Rhodes AJ. Report of an outbreak of febrile illness with pharyngeal lesions and exanthem: Toronto, summer 1957; isolation of group A coxsackie virus. *Can Med Assoc J* 1958; 79:615–21.
- Sklar VE, Patriarca PA, Onorato IM, Langford MP, Clark SW, et al. Clinical findings and results of treatment in an outbreak of acute hemorrhagic conjunctivitis in southern Florida. *Am J Ophthalmol* 1983; 95:45–54.
- Smith WG. Adult heart disease due to the coxsackie virus group B. *Br Heart J* 1966; 28:204–20.
- Warin JF, Davies JB, Sanders FK, Vizoso AD. Oxford epidemic of Bornholm disease, 1951. *Br Med J* 1953; 1:1345–51.
- Wilfert CM, Lauer BA, Cohen M, Costenbader ML, Myers E. An epidemic of echovirus 18 meningitis. *J Infect Dis* 1975; 131:75–8.

This article was prepared by Jeffrey S. Woolford, M.D., M.P.H.

You're the flight surgeon and sole Federal Aviation Administration (FAA) Aeromedical Examiner assigned to a U.S. Air Force base in Europe. Several hours after returning home from your fighter squadron, you are woken at 02:00 by the ring of your call phone. You immediately recognize the voice as one of the squadron wives. You know her and her husband extremely well as you have shared several common assignments over the past few years and have flown with her husband quite often. Her voice quivers with emotion as she initially apologizes for calling at such a late hour and then states that she is driving her husband to the hospital in their local village. She explains only minutes ago she was awakened by what she initially perceived as her husband's graceless attempt to get into bed. The lights were off and she was unable to observe the particulars of his movement, but she noted a rhythmic pattern to the disruption. Frustrated by his apparent lack of consideration, she turned on her bedside lamp and witnessed the last few seconds of what she describes as "uncontrollable shaking." Although his eyes were open, he was not responsive to her efforts to calm him, and her distress was made worse when she noted bright red blood seeping from his mouth. After several minutes his tremors stopped and he seemed to regain his composure, although he remained mildly confused. With inexplicably worsening left shoulder pain, he agreed to have her take him to the hospital. Now en route and fearful of overreacting, she is calling to seek reassurance from you that she is doing the right thing for her husband's health as well as his career. Furthermore, she asks you to meet them at the emergency department and then abruptly ends the call without waiting for your answer. You are out the door as quickly as you can zip your flight suit and, as you drive to the hospital, you recollect the day's events. You remember seeing her husband enjoying a few beers with his fellow fighter pilots after playing 18 holes of golf and you know for certain there was little hydration for most participants throughout the day. Having been the primary care physician for this family for several years now, you

mentally review the pilot's medical history. Thinking back to his recent annual flying physical, you cannot recall any medical conditions or prescription medication usage that might have precipitated the event she described.

1. Acknowledging the paucity of information, you still attempt a preliminary differential diagnosis. Based on what you know so far, what is your primary clinical suspicion?

- Syncope with convulsive accompaniment.
- Simple partial seizure.
- Complex partial seizure.
- Generalized seizure.
- Psychogenic nonepileptic seizure.

ANSWER/DISCUSSION

1. D. Although the history provided is limited, there are several clues that provide insight to the likely diagnosis. A generalized tonic-clonic seizure is characterized as an upper extremity tonic episode lasting 10 to 20 s, followed by a brief period of flexion, then muscular rigidity of raised externally rotated arms abducted with partially flexed elbows. Back, neck, arm, and leg extension then follows, accompanied by apnea and cyanosis, with eyes open and deviated upward. In some cases, expired air results in an "epileptic cry" as it passes partially obstructed vocal cords. Finally, a clonic phase follows with characteristic alternating tone and relaxation, declining in frequency until cessation. In some cases, tongue biting and urinary incontinence may occur.⁴ Additionally, generalized seizures are followed by a postictal state with subsequent confusion and often

DOI: 10.3357/AMHP.4235.2015