Case 35

The patient was an 18-month-old female who presented to the emergency room with fever, a diffuse rash (onset 5 days ago), and a swollen right hand. On examination she was irritable but alert. Her temperature was 39°C and her heart rate was increased at 180 beats per min. She had diffuse vesiculopustular lesions over her entire body (Fig. 1), with some areas showing older, crusted lesions. She had cellulitis of the right hand manifested by marked erythema, swelling, and tenderness. There were no mouth lesions, the lungs were clear, and the liver and spleen were not enlarged. Laboratory data were significant only for leukocytosis with a white blood cell count of 15,800/μl with 88% neutrophils. The chest radiograph was clear. A radiograph of the right hand showed only soft tissue swelling. The patient was treated with intravenous cefazolin. Improvement in the condition of her right hand was notable within 48 h. This patient had a systemic viral infection with a complication of bacterial superinfection (cellulitis).

1. This patient had a characteristic rash (Fig. 1) at various stages of evolution. What is the differential diagnosis? What was her underlying viral illness?

2. Which complications other than bacterial superinfection (as seen in this case) can occur as a result of this viral infection?

3. Which specific antiviral therapy has been shown to be efficacious?

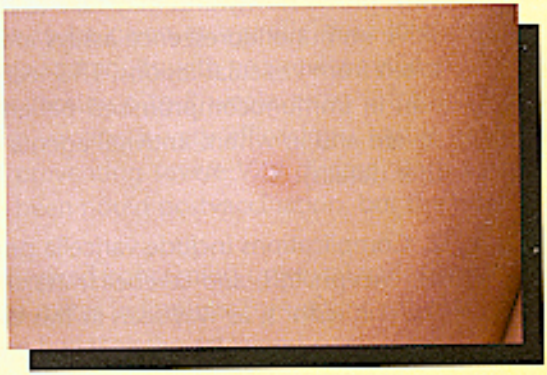

Figure 1

4. After acute primary infection with this virus, latent infection develops. Which illness may occur years later as a result of viral reactivation? How do the clinical manifestations of this reactivation infection differ from those of primary infection?

5. What are the infection control issues related to this patient's illness?

6. How can this disease be prevented?

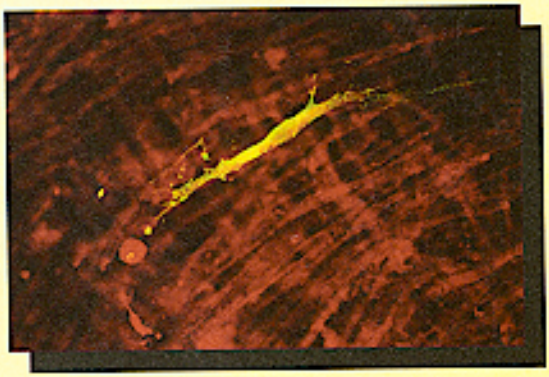

Figure 2

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Case Discussion

1. The underlying viral illness was varicella (chicken pox). The differential diagnosis in this case includes impetigo (group A streptococcal infection), disseminated enteroviral infection, or disseminated herpes simplex virus infection in a child with underlying skin disease (e.g., eczema). This child had no history of a preexisting dermatologic disorder.

The finding of generalized vesicular, pustular, and crusted skin lesions at various stages of evolution is characteristic of varicella. This illness is due to primary infection with varicella-zoster virus (VZV), which is a member of the herpesvirus group. These are enveloped, double-stranded DNA viruses.

The diagnosis of chicken pox is often made on the basis of clinical findings alone. For laboratory confirmation, the virus can be detected either by shell vial techniques (Fig. 2) or by standard tissue culture. Standard tissue culture is rarely used since the virus grows slowly and may take as long as 2 to 3 weeks to recover. Rapid and sensitive immunofluorescence assays are available and can be performed on scrapings taken from vesicular lesions. This technique will be used primarily to diagnose infection in immunocompromised patients in whom the disease course may be more severe and in whom antiviral agents may be required (see answers 2 and 3 for further details).

2. Complications include varicella pneumonia, hepatitis, arthritis, glomerulonephritis, encephalitis, and cerebellar ataxia. In addition, secondary bacterial infections of the skin lesions, as was seen in this case (cellulitis of the right hand), can also occur (see also case 64). These bacterial infections are most commonly caused by gram-positive organisms. Reye's syndrome, with encephalopathy, elevated transaminase levels, and elevated serum ammonia levels, can occur in children with varicella or influenza who take aspirin.

3. Recent studies have shown that acyclovir is beneficial in treating varicella in both immunocompetent and immunocompromised children and adults. Because of its expense, the use of this agent has been controversial in immunocompetent children, but it is clearly indicated in immunocompromised children and in adults. In both of those populations the complications described in answer 2 are much more common.

4. Zoster (shingles) can occur later in life as a result of reactivation of VZV from latent infection in ganglia. Typically, skin lesions appear in a dermatomal distribution innervated by the specific dorsal root or extramedullary cranial ganglia where VZV had been latent. Pain often occurs with the rash and can persist even after the skin lesions heal. This complication is more common in elderly patients. Rarely, skin lesions disseminate beyond the primary dermatome involved. In immunosuppressed patients, however, complicating viremia can occur with dissemination to extradermatomal skin sites, lungs, liver, and central nervous system. This latter condition, with extradermatomal sites of infection, is called disseminated zoster.

5. Patients with chicken pox are very contagious. It is estimated that up to 90% of nonimmune household contacts will become infected. Secondary cases are frequently more severe. The increased severity is believed to be due to high viral inoculum. Hospitalized patients with chicken pox must be placed in respiratory isolation, and strict infection control measures regarding skin contact (handwashing, use of gloves and gowns, etc.) must be implemented.

Hospital workers without a history of chicken pox or those already known to be seronegative for VZV should not come into contact with these patients.

6. A live, attenuated varicella vaccine is available for use in the United States for all children over 12 months of age with the exception of certain immunocompromised individuals including children with leukemia, lymphoma, congenital immunodeficiency, or symptomatic HIV infection and children receiving high-dose immunosuppressive drugs for treatment of malignancy, nephrosis, or severe asthma. Current recommendations call for the vaccine to be given as a single dose in children 12 months to 13 years of age. Adolescents and adults with no previous evidence of disease should receive two doses of the vaccine 4 to 8 weeks apart since it is not as immunogenic in that population. The vaccine is very efficacious, and it has been shown to be particularly effective at preventing severe VZV disease. Both vaccine-associated and natural infection have been noted postvaccination, but the disease is usually quite mild in both situations.

Two major questions remain unanswered concerning universal varicella vaccination. First, will the vaccine strain cause zoster in immunocompetent patients later in life? Limited data suggest that it may, but that the rates and severity of zoster are reduced compared with those in individuals who have natural disease. Second, will immunity wane in adults as natural disease declines, resulting in an "at-risk" population? Since adults are most vulnerable to severe varicella disease, this is a legitimate concern. Twenty-year follow-up data suggest that immunity persists, but these studies were done in settings where natural disease continues to be common, offering the opportunity for immunized individuals to receive a "booster" effect from exposure to infected individuals.

References

1. **American Academy of Pediatrics Committee on Infectious Diseases.** 1995. Recommendations for the use of live, attenuated varicella vaccine. *Pediatrics* **95:**791–796.
2. **Plotkin, S. A.** 1996. Varicella vaccine. *Pediatrics* **97:**251–253.
3. **Whiteley, R. J.** 1995. Varicella-zoster virus, p. 1345–1351. *In* G. L. Mandell, J. E. Bennett, and R. Dolin (ed.), *Principles and Practice of Infectious Diseases,* 4th ed. Churchill Livingstone, Inc., New York.