REVIEW

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The resurgence of mumps in young adults and adolescents

ABSTRACT

Routine immunization against mumps has substantially reduced the number of cases annually, yet recent outbreaks such as the one in Iowa and Great Britain remind us that we must suspect it and be able to recognize both its typical and its less common signs and symptoms. The Iowa outbreak from December 2005 through April 2006 affected nearly 2,600 people in 11 states and prompted the US Centers for Disease Control and Prevention (CDC) to update its recommendations for mumps vaccination, which are discussed here.

KEY POINTS

The CDC empirically defines mumps as the acute onset of unilateral or bilateral tender, self-limited swelling of the parotid or other salivary glands lasting longer than 2 days without another apparent cause.

Most people, including health care workers born in 1957 or later, college students, and international travellers, should receive two doses of the measles-mumps-rubella vaccine if they have not already done so (unless they have a physician-documented history of mumps infection or a positive serologic test for it).

The mumps vaccine is a live-attenuated vaccine and is contraindicated in immunocompromised people, pregnant women, and people who are allergic to any of its components.

BEFORE THE MUMPS VACCINE, nearly every child contracted the mumps before age 15. The incidence of this highly contagious illness began to decline after 1977, when we started to vaccinate all 1-year-old children with the combination measles-mumps-rubella (MMR) vaccine,[1] and it fell even further after 1989, when, in response to a resurgence of measles, the US Centers for Disease Control and Prevention (CDC) recommended a second dose of vaccine for children entering school (**FIGURE 1**).[1] From 2001 to 2003, fewer than 300 cases of mumps were reported in the United States, a 99% decline from the 185,691 cases reported in 1968.[2] As a result, many physicians nowadays may be unfamiliar with the clinical presentation of mumps.

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However, in December 2005, a large number of students at several colleges in Iowa came down with the mumps.[1] Over the next 5 months the outbreak came to involve 2,597 cases in 11 states, mostly in the Midwest; 57% of the cases reported were in Iowa, and most were in college students (mean age 21 years, range 1–96). The incidence rate was highest in those aged 18 to 24 years.

The cause of this outbreak is uncertain. Waning of vaccine immunity may have played a role: of the patients in Iowa, 51% had received two doses of vaccine, 12% had received one dose, 6% had not been vaccinated, and the vaccination status of the other 31% is unknown. On the other hand, mumps also broke out in Great Britain in 2005, affecting 56,390 people ages 15 to 24, most of whom had not been vaccinated.[3]

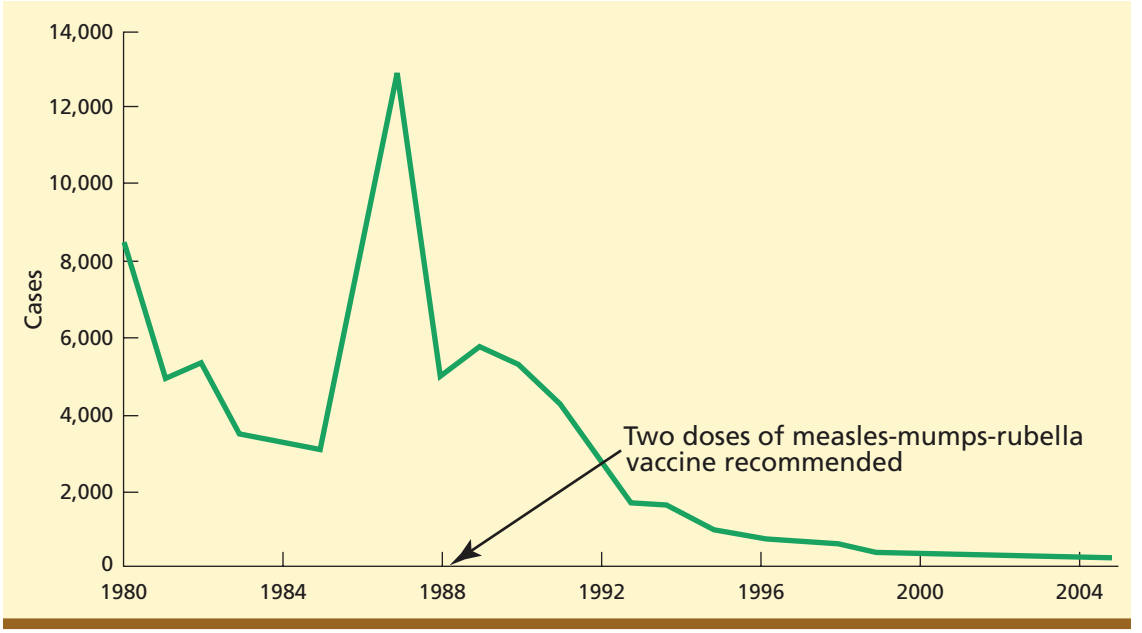

FIGURE 1. The number of reported mumps infections in the United States, by year, 1980–2004

With the resurgence of mumps infection, it is important to review the salient features of this once-common disease.

GENOTYPES SHOW GEOGRAPHIC CLUSTERING

The mumps virus belongs to the family Paramyxoviridae, genus *Rubulavirus*, which also includes parainfluenza viruses 2 and 4 and is distantly related to measles virus.[4] It is an enveloped, single-stranded RNA virus of negative polarity.

While there is only one serotype, 10 distinct genotypes have been identified in the small hydrophobic protein in the viral envelope.[5] These genotypes show distinct geographic clustering. For example, genotype G was responsible for the cases in the 2005–2006 US outbreak.

MUMPS HAS SHIFTED TO ADOLESCENTS, YOUNG ADULTS

Mumps was recognized by Hippocrates in the 5th century BCE, and it is found worldwide.[6] Humans are the main reservoir; it is spread from person to person primarily by respiratory droplets and possibly by fomites.

Before routine pediatric vaccination was adopted, children ages 2 to 12 were most commonly affected, and by age 15, 92% had evidence of previous infection.[7] In those days, mumps was an endemic disease that usually was most active in late winter and early spring.[8] As the disease declined in the 1980s, it shifted to older age groups, ie, adolescents ages 10 to 19 and young adults.

VIRAL SHEDDING PRECEDES CLINICAL ILLNESS

Infection starts when the nasal or buccal mucosa is exposed to the virus.[9] The virus first replicates in the epithelial cells of the upper respiratory tract, then spreads to regional lymph nodes. For a while, the virus can be found in the blood as it spreads to secondary targets.

Viral shedding precedes the onset of clinical illness and continues 4 to 5 days after symptoms appear. Infection results in lifelong immunity.

Mumps infection results in lifelong immunity

MUMPS AFFECTS PAROTID GLANDS, OTHER ORGANS

Unilateral or bilateral parotitis occurs in 95% of cases,[10] usually with painful swelling. Other signs and symptoms are fever, malaise, vomiting, neck stiffness, and headache (FIGURE 2).

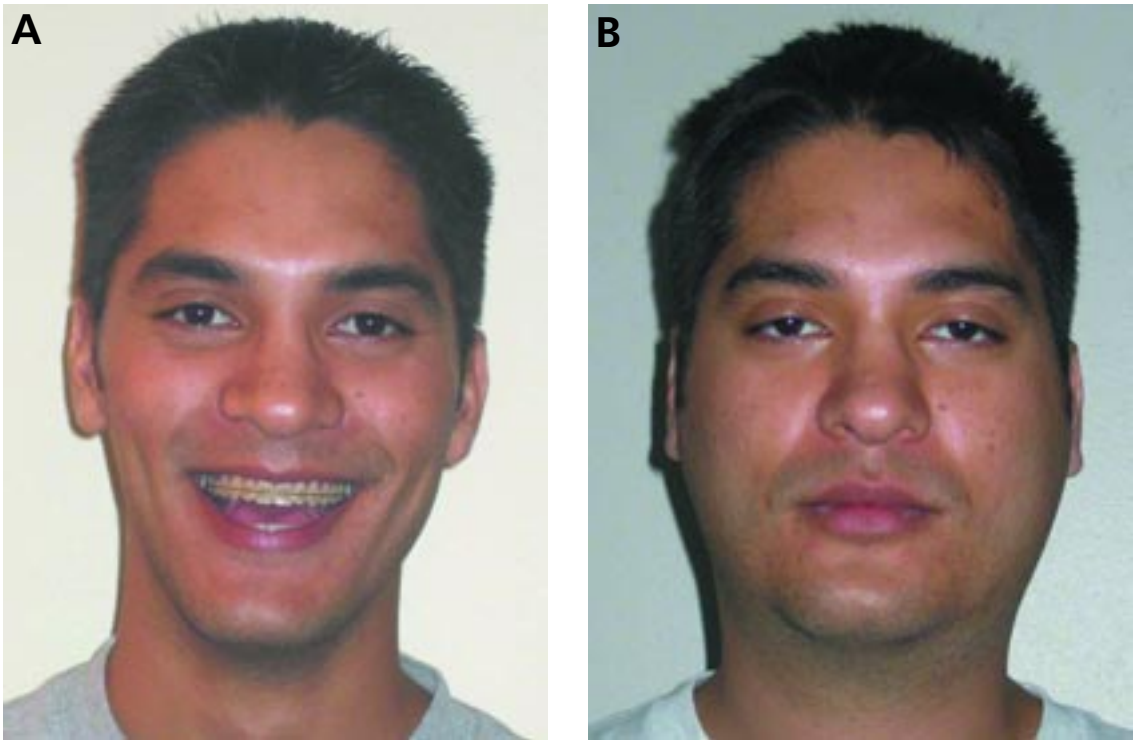

FIGURE 2. A comparison of a person before acquiring mumps (A) and on day 3 (B) of acute bilateral parotitis.

As many as 30% of mumps cases are subclinical

The CDC's case definition for mumps is the acute onset of unilateral or bilateral tender, self-limited swelling of the parotid or other salivary glands lasting longer than 2 days without other apparent cause.

Central nervous system involvement is extremely common, occurring in 10% to 30% of patients, but only 10% to 30% of patients with nervous system involvement have clinical neurologic symptoms.[11–13] Mild aseptic meningitis is the most commonly reported neurologic manifestation, but rare cases of fulminant encephalitis have been reported. Neurologic symptoms usually appear about 5 days after the onset of parotitis, but they can occur in the absence of parotitis. Most mumps patients who have clinical signs of meningitis have little cortical dysfunction.

Analysis of the cerebrospinal fluid reveals an aseptic picture with mononuclear pleocytosis and slightly elevated protein. Cerebrospinal fluid glucose levels may be normal or depressed. Changes in mental status, seizures, or focal neurologic signs indicate encephalitis.

Orchitis. After adolescence, mumps can affect the gonads of both men and women. In 20% to 25% of men it can involve the testicles (orchitis).[14,15] Orchitis is usually unilateral, but bilateral involvement occurs in 17% to 38% of cases.[16] Orchitis typically appears a week after the onset of parotitis, but it may occur in the absence of parotid involvement.

Physical examination reveals erythema of the scrotum with marked tenderness of the testis, which may be swollen to three to four times the normal size. The testicles can be severely affected, leading to testicular atrophy in 30% to 50%; however, sterility is rare.[17]

Oophoritis occurs in 5% of postpubertal women with mumps and generally presents with nausea, vomiting, and adnexal pain.

Mastitis develops in about 15% of women with mumps during the course of the illness.

Other manifestations of mumps include pancreatitis (2%–5% of cases), deafness, myocarditis, polyarthritis, thyroiditis, hepatitis, thrombocytopenia, and ocular involve-

ment. Symptomatic myocarditis is uncommon, although electrocardiographic changes can be seen in 3% to 15% of patients. Most often these changes appear as a prolongation of the PR interval, a flattening or inversion of the T waves, or ST-segment depression.

Death from mumps is rare, occurring in 1 to 3 per 10,000 cases.

Often subclinical. As many as 30% of mumps cases are subclinical.[18] In the era before vaccination, more than 90% of adults reporting no history of mumps had serologic evidence of prior infection.[19]

OTHER CAUSES OF PAROTID SWELLING

Other infectious and noninfectious disorders can cause parotid changes that can be confused with mumps. Other viruses such as parainfluenza type 3, influenza A, coxsackievirus, Epstein-Barr virus, adenovirus, and human herpesvirus can also cause fever and parotid enlargement. Diffuse infiltrative lymphocytosis syndrome in patients with human immunodeficiency virus infection can lead to painful parotid enlargement. Bacterial parotitis can cause unilateral parotid pain and enlargement.

LIMITED ROLE FOR LABORATORY TESTS

Mumps is generally diagnosed clinically, but laboratory studies may help in unusual presentations or to confirm clinical suspicions.

The results of routine laboratory tests are seldom specific for mumps. The complete blood count may show lymphocytosis or leukopenia. Occasionally the serum amylase concentration may be elevated.

Mumps virus can be isolated from the nasopharynx, saliva, blood, and urine by polymerase chain reaction testing, but this type of testing may not be readily available. Serologic testing can be used to diagnose mumps retrospectively.

TREATMENT IS SUPPORTIVE

Mumps eventually resolves on its own, and as there is no virus-specific treatment, care is supportive. In severe orchitis, surgical incision of the tunica albuginea relieves pressure, but this is rarely necessary.

TWO SHOTS ARE BETTER THAN ONE

Immunization has proven very effective in preventing mumps. Currently in the United States, a live-attenuated virus (the Jeryl Lynn strain) is incorporated into the combined MMR vaccine (prorietary name MMR II), the varicella-measles-mumps-rubella vaccine (ProQuad), and the monovalent mumps vaccine (Mumpsvax).

In 1998, the CDC's Advisory Committee on Immunization Practices[20] recommended that all children receive the MMR vaccine twice: at 12 to 15 months of age and again at 4 to 6 years (or at least 1 month after the first dose). It also recommended that states take steps to ensure that children already in school who had not received their two shots receive them by 2001. Furthermore, it recommended that adults at high risk—health care workers, international travelers, and college students—have "presumptive evidence of immunity."

That did not mean two shots: rather, it meant documented evidence of one dose, laboratory evidence of immunity, documentation of physician-diagnosed mumps, or being born before 1957.

In May 2006, the Committee updated its recommendations and closed these loopholes somewhat.[21] Now, presumptive evidence of immunity means two doses (or one dose in preschool children and adults not at high risk), or serologic evidence, or documented mumps. Health care workers born before 1957 without serologic evidence or documented mumps should consider getting at least one dose. In an outbreak, everyone without serologic evidence or documented mumps who has not already received his or her second dose should consider getting it.

All vaccine is to be given as 0.5 mL subcutaneously.

The 2006 CDC update tightened the requirements for 'presumptive evidence of immunity'

CONTRAINDICATIONS TO MUMPS VACCINE

Immunization with monovalent or combined mumps vaccine is contraindicated in:

- People with serious allergies to gelatin, neomycin, or any of the other components of the vaccine

- Women who are pregnant or trying to conceive, since studies have not yet established the safety of the vaccine in pregnancy
- Immunocompromised people, except those with human immunodeficiency virus who have no symptoms of acquired immunodeficiency syndrome
- Patients receiving cancer chemotherapy or high doses of corticosteroids.

Vaccination should be deferred for 3 to 11 months in people receiving blood products (except washed red blood cells) such as immune globulin. The deferral time depends on the blood product and dosage received. In addition, people who are moderately or severely ill should consult their physician before receiving any vaccine.

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