Mumps in a 27-year-old man

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A 27-year-old previously healthy man presented to the emergency department with a two-day history of fever and right-sided scrotal swelling. He was in a monogamous relationship with a male partner and had no history of HIV or other sexually transmitted infections. He had immigrated to Canada from China five years prior, and records of his childhood vaccinations included immunization against measles–mumps–rubella (MMR) but did not specify the number of doses.

The patient reported that he had a self-limited episode of bilateral painful neck swelling seven days before presenting to the emergency department. He did not have headache, neck stiffness, abdominal pain, urinary tract symptoms, urethral discharge or rash. Notably, his partner had symptoms of bilateral parotid gland enlargement about two weeks before the onset of his illness.

Upon examination, his temperature was 39.0°C.The oropharynx was normal, and there was no meningismus or swelling of the parotid glands. Testicular examination showed a tender right testis and epididymis.

Laboratory investigations showed that the patient had a normal complete blood cell count and a serum lipase level of 22 U/L (normal ≤ 60 U/L). Initial investigations included a throat swab for group A streptococcus and a nasopharyngeal swab to detect respiratory viruses using multiplex polymerase chain reaction testing. He had blood taken for cytomegalovirus immunoglobulin M (IgM) antibody, a monospot test, parvovirus B19 IgM antibody and testing for HIV. He also had nucleic acid amplification testing of urine and testing of pharyngeal swabs for both *Neisseria gonorrhoeae* and *Chlamydia trachomatis*. Scrotal ultrasonography showed an enlarged hyperemic right testicle (measuring 5.1 × 3.3 × 3.3 cm^3) and an edematous hyperemic epididymis. Given the constellation of fever, prior neck swelling, right epididymo-orchitis and history of bilateral parotid swelling in his partner, serum mumps serologic testing and polymerase chain reaction testing of both urine and buccal samples for mumps virus were requested.

Two days later, he was seen at follow-up in the infectious disease clinic. His fever had resolved, and the swelling and pain in his scrotum had improved. Results from tests on the nasopharyngeal specimen were negative for influenza A and B, and respiratory syncytial virus. Results from urine polymerase chain reaction testing were positive for mumps, and the patient had an elevated mumps IgM antibody level. Polymerase chain reaction testing of the nasopharyngeal swab for mumps was performed, and the result was also positive. Results of other microbiologic investigations were negative. Contact tracing by the local public health unit was conducted, and no additional active cases were identified.

KEY POINTS

- Mumps is a viral illness that classically causes bilateral parotitis; extrasalivary manifestations may include epididymo-orchitis, oophoritis, pancreatitis and aseptic meningitis.
- Canadians born between 1970 and 1992 are at increased risk of mumps because they lack natural immunity and received only one dose of vaccine in their childhood immunization series.
- Outbreaks continue to occur in North America, even among highly vaccinated populations, which may be the result of both primary vaccine failure and waning immunity.
- The test of choice for mumps diagnosis is a reverse transcription–polymerase chain reaction testing of a buccal swab; serology is not useful in vaccinated populations.
- No testing is necessary in patients with a compatible clinical syndrome who are linked to a confirmed case of mumps.

Discussion

Mumps is a contagious viral illness for which humans are the only natural host.[1] The virus circulated widely in Canada before the introduction of a live attenuated vaccine in 1969. People born before 1970 are presumed to have developed natural immunity.[1] Because MMR vaccination was introduced as part of routine childhood immunization, most cases now occur among adults 20 years of age and older.[1] Canadians born between 1970 and 1992 are susceptible because their vaccine schedule included only one dose and they lack natural immunity.[2] Given the age of this patient, it is likely that he would have received only one dose of vaccine.

Clinical features

Mumps is transmitted either through droplet spread or direct contact with the saliva of an infected person.[1] The incubation period is 15 to 24 days,[2] and patients are considered to be contagious from two days before to five days after the onset of parotitis.[1] About one-third of infections are asymptomatic.[3]

Parotitis is the hallmark of mumps, occurring in 95% of patients with symptomatic disease, and is bilateral in most cases.[3] It typically

begins unilaterally, with involvement of the contralateral parotid gland within several days. Other salivary glands are less commonly affected. Most patients have a brief prodrome of fever, malaise, anorexia and headache before the onset of parotitis.[3] Our patient's illness began with fever and painful bilateral neck swelling, which had resolved by the time of our assessment. With microbiologic confirmation of mumps, it is likely that the patient was experiencing parotitis. However, it is possible that he was experiencing submandibular sialadenitis, which may mimic anterior cervical lymphadenopathy.

Epididymo-orchitis is the most common extrasalivary manifestation, occurring in 15%–30% of postpubertal men.[3] Orchitis is bilateral in about one-quarter of cases and develops four to eight days after parotitis, as in our patient. Infertility secondary to orchitis is uncommon; however, reduction in testicle size may occur in 50% of patients and abnormal results for sperm testing in 25%.[3]

Uncommon extrasalivary manifestations include oophoritis (5%), aseptic meningitis (1%–10%), transient hearing loss (4.1%) and encephalitis (0.1%).[3] Death (1.5% of cases of encephalitis) and permanent hearing loss (0.005%) are uncommon. Pancreatitis can also occur, but the normal result for serum lipase ruled this out in our patient.

Diagnosis

The presence of parotitis should prompt physicians to consider a diagnosis of mumps. Although the diagnosis may be clear in an outbreak setting, a variety of other infectious and noninfectious etiologies can cause parotid enlargement (Box 1). Features of these conditions should be obtained through a detailed history, physical examination and directed investigations. Historical features supporting an alternate diagnosis include radiation exposure (primary salivary neoplasm), known primary malignant disease (metastasis), symptoms of a systemic autoimmune condition (Sjögren syndrome or sarcoidosis), unilateral suppurative parotitis (bacterial) or use of drugs known to cause parotid enlargement/parotitis.[3–6] Many other viruses are associated with parotitis. Epstein–Barr virus is a common cause of mumps-like illness in nonoutbreak settings.[3] Mumps orchitis should be considered in acute testicular pain, which can also be caused by testicular torsion, epididymitis, Fournier gangrene and appendiceal torsion.

In an outbreak setting, the Public Health Agency of Canada advises against the use of diagnostic tests. The diagnosis of a "confirmed case" can be made clinically based on a mumps-compatible illness with an epidemiologic link to a laboratory-confirmed case.[7] For sporadic cases, buccal swab polymerase chain reaction is considered the test of choice and should be collected ideally within three to five days of symptom onset.[7] Dacron-, nylon- and rayon-tipped swabs are appropriate and should be placed in a viral transport medium.[2]

Results for polymerase chain reaction testing of urine may be positive up to 14 days after symptom onset, but it has been shown to be less sensitive than buccal samples in recent outbreaks.[7]

Serologic testing is available, but IgM has been shown to lack sensitivity in outbreaks that included partially vaccinated populations.[7] Additionally, mumps IgM is nonspecific; therefore, a positive result for IgM antibody without a link to a confirmed case could represent a false-positive result.[7] A fourfold increase in mumps IgG antibody levels between acute and convalescent sera is considered diagnostic of acute mumps infection.[7]

Box 1: Differential diagnosis for enlargement of the parotid gland[3–6]

Viral cause
- Mumps
- Epstein–Barr virus
- Human herpes virus 6
- Human immunodeficiency virus
- Respiratory viruses
  - Parainfluenza virus type 2 and 3
  - Influenza A virus
  - Adenovirus
- Coxsackie viruses
- Parvovirus B19
- Lymphocytic choriomeningitis virus
- Human bocavirus

Bacterial cause
- *Staphylococcus aureus*
- Oral streptococci and oral anaerobes
- Gram-negative bacteria (including *Burkholderia pseudomallei*)
- *Mycobacterium tuberculosis*
- Non-tuberculous mycobacteria

Autoimmune disorders
- Sjögren syndrome
- Sarcoidosis

Neoplastic disorders
- Primary salivary gland neoplasm
- Lymphoma
- Metastatic malignant disease

Drugs
- Propylthiouracil
- Phenothiazines
- Iodides
- Phenylbutazone

Other conditions
- Sialolithiasis
- Malnutrition
- Chronic alcoholism
- Uremia
- Diabetes mellitus
- Cirrhosis
- Anorexia nervosa

Management and prevention

Mumps is a self-limited illness for which no specific treatment is required. Supportive care with analgesics for parotitis or orchitis may be required. Immunization with a vaccine containing a live

attenuated mumps component is the main strategy for preventing infection and clinical disease. Since the introduction of the single-dose mumps vaccine in 1969, there has been a 99% decline in mumps cases, with a further decrease seen after the introduction of the two-dose vaccine schedule in 1996/97.[1] The current Canadian immunization schedule recommends administration of the first mumps-containing vaccine dose at 12 to 15 months and the second at 18 months.[1] However, provincial schedules and vaccine usage vary and should be confirmed with local authorities. Pregnancy, prior anaphylaxis to the vaccination, anaphylaxis to any component of the vaccine with the exception of eggs and immunocompromised status are contraindications to immunization.[1]

Despite the success of universal childhood immunization programs, mumps outbreaks continue to occur in North America. Both primary vaccination failure and waning immunity are thought to play a role.[7] In a 2009/10 outbreak in Ontario involving 134 patients, 69.5% were incompletely immunized.[2] However, a 2015/16 outbreak at the University of Illinois involving 317 persons (32% confirmed and 68% probable cases) occurred in a highly vaccinated population, with 89% of patients having received at least two doses of the MMR vaccine.[8] The effectiveness of mumps vaccination ranges from 62%–91% after one dose to 76%–91% after two doses.[1] Recommendations for vaccination of individuals with incomplete vaccination schedules who were born between 1970 and 1992, including health care workers, university students living in residence, military personnel and international travellers to endemic areas, can be found in the *Canadian Immunization Guide*.[1]

Mumps is a communicable disease and a notifiable illness. The true incidence in Canada may be underestimated: a cross-Canada survey showed that only 59% of emergency medicine physicians knew that mumps was reportable.[9] Inpatients should be placed under droplet precautions, and outpatients should be excluded from school or work for five days after onset of parotitis. Additional infection control measures can be found in the *Guideline for the prevention and control of mumps outbreaks in Canada*.[7]

Conclusion

Since the introduction of a universal immunization program in Canada, the epidemiology of mumps has changed. Adults aged 20 years or older now represent most cases. Our patient may have received only one dose of vaccine, which would put him in the same at-risk group as those born in Canada between 1970 and 1992. Physicians should consider a diagnosis of mumps in adults with a compatible clinical illness, and notify local public health units accordingly.

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