Temporary Closure of Inpatient Ward due to Mumps Virus Reinfection in Elderly Patient

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Abstract

We report a case of suspected reinfection with the mumps virus in an elderly patient which resulted in temporary closure of an inpatient ward. A 65-year-old man with colorectal cancer was admitted to the digestive surgery ward at our hospital to undergo a stoma closure operation. He was subsequently referred to our department with right swelling in the preauricular region on postoperative day 4. The swelling subsided within a few days, and the patient was discharged. A serum titer test revealed a high level of antibodies to the mumps virus, however. Therefore, staff who had come into close contact with the patient were examined and the decision taken to stop admitting new patients to the ward. When symptoms are detected in a patient has already had mumps, it is important to consider the possibility of reinfection. Furthermore, it is necessary for medical workers to undergo a serum antibody test to the mumps virus and receive a further vaccination if antibody levels are too low to confer immunity.

Key words: Mumps — Mumps virus — Nosocomial infection

Introduction

Mumps is a contagious, systemic infection. The characteristic symptoms and signs of infection with this virus comprise an ache in the parotid gland, swelling, and fever⁽⁶⁾. Although infection is most commonly seen during childhood, it can also occur in adults, and reinfection is sometimes observed⁽⁴⁾.

Here, we report a case of an elderly patient who showed symptoms of reinfection with the mumps virus. This case presented an oppor-

tunity to understand the importance of the antibody titer confirmation in medical workers.

Case Presentation

Patient: A 65-year-old man.

Medical history: Colorectal cancer and mumps.

First medical examination day: X.19.201X.

Clinical history: The patient was admitted

to the department of digestive surgery for closure of a colostomy. Preoperative oral care was performed at the oral surgery outpatient department on the day he was admitted.

The colostomy was performed under general anesthesia on X.20.201X.

No abnormal findings were observed intraoperatively. Postoperatively, the patient was transferred to the high care unit (HCU), returning to the general ward on postoperative day 1. On postoperative day 2, the patient complained of fever and swelling in the area anterior to the right ear. The patient was subsequently re-examined on X.24.201X.

Countenance findings: Mild swelling in the area anterior to the right ear, but no swelling in the area anterior to the left ear. The patient reported no tenderness in either of these areas.

Oral findings: Saliva was observed draining from an opening in the parotid gland, but no pus was found.

Whole body findings: Body temperature was 36.7°C; no fever was observed. There were no other findings of note.

Blood findings: The white blood cell count was normal, at 8,300/ul. C-reactive protein (CRP) was as high as 16.82 mg/dl.

Clinical diagnosis: Anesthesia mumps, or mumps.

The blood test revealed a normal white blood cell count, but high CRP level. The postoperative course was considered normal, however. Imaging revealed no signs of infection or salivary lesions. Postoperative parotitis (anesthesia mumps) was initially suspected, which is associated with use of general anesthesia, and the patient placed on 600 mg/day acetaminophen to reduce inflammation. A serum antibody titer test for mumps to aid in a differential diagnosis, a complement fixation assay (CF), a neutralization test (NT), a hemagglutination inhibition assay (HI), an IgG enzyme immunoassay (IgG-EIA), and IgM-EIA test were administered.

Table 1 Mumps antibody titer test

IgG-EIA: 6.4	Positive	IgM-EIA: 1.60	Positive
HI: 4	Positive	NT: <4	Negative
CF: 4	Positive		

Legend: All positive for mumps except according to neutralization test

Clinical Procedures and Outcomes

From X.24.201X, the patient was isolated in a private room due to suspicion of mumps. By X.26.201X, the swelling in the area anterior to the right ear had disappeared, and the wound in the abdomen was normal. The patient was discharged from the digestive organ surgery ward on the 1st of the following month. On the 4th of the same month, the results of the serum antibody titer test conducted at an external laboratory showed that the patient was positive for mumps: the CF titer was 4; the NT titer was <4; the HI titer was 4; the IgG-EIA titer was 6.4; and the IgM-EIA titer was 1.6 (Table 1).

Subsequently, serum antibody titer tests for mumps were ordered for the gastrointestinal surgeons involved in this case, the nursing staff in the gastrointestinal surgery ward, the oral surgeon concerned, the oral surgical medical staff, the HCU nurses considered to have been in the closest contact with the patient, and other patients who had been in the same room as the patient. Levels of antibodies to mumps were determined with an IgG-EIA titer. A total of 55 healthcare workers were tested. Among the healthcare workers, 45 with serum antibody titers of ≥ 4 were considered able to work, whereas 10 with antibody titers of <4 were not.

In accordance with Centers for Disease Control and Prevention guidelines on vaccination^{2,7)}, healthcare workers with mumps are required to stop working for 9 days after the onset of symptoms. In the present study, the healthcare workers who were exposed to mumps were suspended from 12 days after initial exposure until 26 days after the last

Table 2 Bed occupancy rate in closed ward in relevant month and same month over previous 6 years

Year	201S	201T	201U	201V	201W	201X
Bed occupancy rate	92.5%	84.3%	92.4%	84.0%	84.3%	59.1%

Legend: Bed Occupancy Rate (%) = Cumulative inpatients days / (Number of Beds × Days of month) × 100

During period ward closed, hospital occupancy rate in relevant month of 201X was 59.1%, which was lower than in same month over previous 6 years.

exposure.

None of the healthcare workers involved developed mumps. The 10 medical staff considered susceptible to mumps comprised 3 dentists, 1 gastroenterological surgeon, and 6 nurses. Although there are no standard countermeasures against secondary infection, there is a restriction on new hospitalization of patients who are susceptible until confirmation that there is no secondary infection. In the present case, admission of new patients was prohibited for 10 days in consideration of the risk of an outbreak of mumps on the ward. With the ward closed, the bed occupancy rate in the relevant month decreased significantly compared with in the same month in the average year, indicating a significant impact on the hospital (Table 2).

Discussion

Mumps is an RNA virus belonging to the genus Rubulavirus in the Paramyxoviridae family. Approximately one third of infections with the mumps virus are subclinical. The incubation period is an average of 16 to 18 days, and infection lasts approximately 2–4 weeks⁽⁶⁾. It appears more commonly in 3- to 6-year-olds, with this age group accounting for approximately 60% of such cases. Those aged >20 years account for 1.4% of all such patients⁽⁶⁾. In recent years, a national epidemic of mumps has occurred every 4 to 6 years, with the most recent occurring from 2015 to 2016 in Japan⁽⁸⁾. Fever, anorexia, and fatigue may appear as early symptoms. Mumps then

shifts from mild upper respiratory symptoms to viremia with systemic symptoms, causing swelling of the salivary glands, including the parotid gland. Approximately 25% of men experience testicular inflammation, and approximately 5% of women experience ovarianitis, so caution is necessary.

In addition, as the mumps virus is found in saliva during the latent period and is transmitted via droplets, it is highly probable that the virus will already have spread prior to an actual diagnosis of the disease itself. In the present case, it is presumed that re-infection had already taken place at the time of hospitalization, but since the diagnosis was only made following discharge, many people had already come into close contact with the patient before he could be isolated. This indicates the importance of confirming the susceptibility of anyone to mumps if they are likely to come into close contact with such patients.

One earlier study focusing on 17% (12/146) of medical facilities in Tennessee in the United States investigated nosocomial infection with the mumps virus⁽¹²⁾. The results revealed that 6 health workers at 3 of these facilities, and 9 patients at 2 of them reported having developed mumps. Thus, when mumps occurs as a nosocomial infection, both patients and medical staff may be infected, emphasizing the necessity of vaccinating susceptible health care workers. In the present case, although 10 of the healthcare workers who were in frequent contact with the patient were susceptible, fortunately none of them developed mumps. The patient had

Table 3 Sensitivity based on negative and false-positive rates for infectious viruses among nurses at hospital entry

	Mumps	Rubella	Measles	Varicella
Number	198	117	252	16
Negative and false-positive rate	33%	19%	42%	2.6%

n=605

Legend: 33% of hospital nurses (198) susceptible to mumps, which was higher than percentage for rubella or varicella. Although staff are urged to vaccinate, it is not mandatory, and no additional tests are conducted.

already been infected with mumps. Mumps was listed as a differential diagnosis, however, so he was isolated, preventing further spread of infection.

In Japan, the measles, mumps, and rubella vaccines became mandatory for children in 1989, so uptake was large. Asymptomatic meningitis sometimes occurred as a side effect, however, leading to public opposition. Therefore, since 1993, the mumps vaccine has been optional. Akabane *et al.*¹⁾ reported a mumps antibody retention rate of 71.8% and Takeshige *et al.*¹¹⁾ 82.9%, which is low compared with the prevalence of epidemics of measles, rubella, and varicella. In addition, Takeshige *et al.*¹¹⁾ and Shiraishi *et al.*¹⁰⁾ reported a non-antibody holding rate of >10% in any group within 20–50 years of age or over. Meanwhile, the highest non-antibody holding rate was approximately 20%, which was reported in the 31- to 40-year-old age group^{10,11)}.

The overall antibody holding rate among all the close-contact healthcare workers examined in the present study was 76.4% (42/55), while it was 25.0% for dentists (1/4), 91.7% (11/12) for gastroenterologists, and 76.9% (30/39) for ward nurses, showing no significant difference with previously reported rates. In addition, the antibody holding rates among nurses on joining our establishment were found to be close to those in earlier reports, except for mumps, which were lower (Table 3).

In contrast, the antibody acquisition rate is 86.3% and 100.0% according to the particle

agglutination method (PA) and EIA, respectively, in measles; 93.3% and 98.3% for HI and EIA, respectively, in rubella; and 100.0% for EIA in varicella; but as low as 82.9% for EIA in mumps. To our knowledge, no studies to date have suggested that the mumps vaccination should be repeated or antibody levels remeasured after inoculation, which suggests that antibody titers should be confirmed appropriately^{3,5)}. Although the antibody-positive conversion rate of the domestically produced vaccine strain is higher than the strain used overseas, the incidence of meningitis is relatively high, at 0.03 to 0.06%³⁾, and the vaccination rate is low. It is said that the antibody holding rate is still insufficient⁵⁾.

At our hospital, testing for mumps antibodies at the time of entry is only mandatory for nurses. If the result is below the antibody acquisition standard value, revaccination is recommended. It is not mandated, however, due to the risk of an allergic reaction or meningitis, and no confirmation of antibody acquisition by re-examination is performed. On the other hand, physicians and dentists do not participate in mandatory mumps antibody testing at the time of entry. One problem is that the infection control office at our hospital does not track information on the presence or absence of antibodies. The present case, however, suggests that this needs to be changed as soon as possible.

In general, reinfection with the mumps virus is rare. In recent years, however, there have been reports of such reinfection, mainly in the pediatric area. Hatanaka *et al.*⁴⁾ reported

that among 45 cases of major salivary gland swelling considered to be caused by infection, 10 were cases of primary mumps virus infection (22%), whereas 7 were reinfection cases (16%). It has been pointed out that reinfection with the mumps virus occurs at the same frequency as primary infection⁴⁾.

To our knowledge, there are currently (October 2018) no standard diagnostic criteria for assessing reinfection. However, Ochiai *et al.*⁹⁾ proposed >25.8 IU/dl serum IgG antibodies against the mumps virus and <2.0 IU/dl serum IgM antibodies. In cancer patients, however, the immune surveillance mechanism fails, and the immune system is suppressed. The present patient had an IgM-EIA titer of 1.6 and IgG-EIA titer of 6.4, but had already been infected with mumps according to their medical history. As they were being treated for a malignant tumor, it was considered that an abnormality in acquired immunity had occurred, resulting in a diagnosis of reinfection with the mumps virus.

Dentists, oral surgeons, and dental hygienists daily perform medical examinations, and some of such patients have maxillofacial diseases accompanied by salivary gland swelling. In such cases, reinfection with the mumps virus should be taken into account in arriving at a differential diagnosis and the appropriate countermeasures taken. In addition, as part of infection prevention measures, the importance of medical staff receiving vaccination and acquiring antibodies has been reaffirmed.

Conclusions

We encountered a case of reinfection with the mumps virus in an elderly patient. Mumps was listed as a differential diagnosis. Spread of the infection throughout the hospital was prevented by prompt isolation of the patient.

Medical staff susceptible to mumps were suspended and the ward temporarily closed, which led to a great impact on the hospital. This indicates the importance of preventive measures against nosocomial infections,

including the acquisition of antibodies by medical staff.

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