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Measles and respiratory failure: Case report and review of the last European outbreaks

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ABSTRACT

Measles is an preventable acute viral illness, with the potential for severe and fatal complications. According to the European Centre for Disease Prevention and Control in the last surveillance report, a total of 10 271 cases of measles were reported from January to December 2013. And 127 of those were reported in Spain with a 2.7/1 million habitants rate. In 2010, the World Health Organization European Region made a new commitment to eradicate measles by 2015 in the zone, however, measles cases and outbreaks are still occurring in many countries. We present the last 2 cases with severe measles-associated respiratory failure and a review of the literature of the last European outbreaks. Two young adults were admitted in the intensive care unit due to respiratory failure with a confirmed measles infection. Both treated with high flow nasal cannula during 3 to 5 days; one had a pneumococcal pneumonia co-infection. An incomplete vaccination schedule was documented in one of them while the other did not remember his. Within 10 days of admission, both were discharged from intensive care unit and the hospital with no complications. Measles can present with a variety of symptoms in adults and is responsible for a high morbidity especially during outbreaks. Pneumonia is a severe complication of measles infection, commonly reported. Surveillance and vaccination programs should be strengthened in order to achieve measles elimination.

1. Introduction

Measles is a preventable acute viral illness caused by a *Morbillivirus* with the potential for severe and fatal complications. Transmission occurs through the respiratory tract and is highly infectious, with a peak 3 days prior to the onset of the rash. Most symptoms before the rash are indistinguishable from any other respiratory illness. After an incubation period of 8–10 days, fever, cough and conjunctivitis usually become present. The rash appears 2 to 4 days later, initially as small erythematous patches distributed in face and neck with further dissemination to trunk, and finally becoming confluent in some areas. It lasts for about 7 days, disappearing progressively until complete resolution, occasionally leaving a fine desquamation layer. Koplik’s spot, a white elevated lesion that appears in the oral cavity often described as grains of salt on a wet background, frequently appears one day before the rash appears. It can lead to severe complications such as pneumonia, encephalitis and secondary bacterial infections; all of this associated with a high mortality rate in developing countries. According to the European Centre for Disease Prevention and Control’s last surveillance report, 10 271 cases of measles were reported in Europe in 2013. Of those, 127 cases were reported in Spain with a 2.7/1 million habitants rate[1]. Considering that humans are the only reservoirs maintaining virus circulation, immunity after infection is considered to be lifelong and it’s preventable due to the existence of a highly effective vaccine[2]. Measles is, at least theoretically, easily eradicated. In 2010, the World Health Organization European Region made a new commitment to eradicate measles by 2015 in the zone, however,

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measles cases and outbreaks are still occurring in many European countries[3]. We present the last 2 cases with respiratory failure due to measles that required intensive care unit (ICU) admission in our center and a review of the literature of these outbreaks in Europe in the last decade.

2. Case report

2.1. Case 1

Thirty-seven year old man, with no relevant medical record, presents with a 4-day history of high fever (39 °C), cough, arthralgia and odynophagia. Chest X ray reported right interstitial infiltrate (Figure 1). Leukopenia as well as hepatitis were documented (leukocytes: 2.5 × 10; aspartate aminotransferase: 315; alanine aminotransferase: 282). Abdominal ultrasound reported no alterations. Two days after his admission, a morbilliform exanthem appeared on trunk followed by conjunctival hyperemia and the identification of Koplik spots. Measles immunoglobulin G and immunoglobulin M antibodies were negative and positive, respectively. He did not remember his vaccination schedule. Due to respiratory failure he was admitted to the ICU, requiring high flow nasal cannula oxygenation. A bacterial co-infection by *Streptococcus pneumoniae* was documented by antigenuria and treated with amoxicillin/clavulanic acid and azithromycin. Respiratory isolation precautions were performed. Six days later he was discharged alive to medical ward with no oxygen supplementation needed, and 5 days later from hospital with no complications.

Figure 1. Patient with measles and respiratory failure at ICU admission.

2.2. Case 2

Twenty-two year old man, with a history of aspirin allergy and asthma during infancy without exacerbation in the last 12 years, presents with dyspnea and tachypnea with low oxygen saturation. Prior to admission, he presented unspecific symptoms such as fever, chills and malaise during 1 week. Forty-eight hours later, a non-pruritic morbilliform rash appeared predominantly in face (Figure 2) and thorax. Three days later, due to worsening respiratory symptoms, he was admitted into the hospital. An abdominal ultrasound and chest X ray reported no alteration (Figure 3). Leukopenia and hepatitis was documented (leukocytes: 3; 10 × 10 aspartate aminotransferase: 398; alanine aminotransferase: 470). Immunoglobulin M antibodies for measles were positive as well as PCR in urine and saliva samples. Measles immunoglobulin G antibodies were negative even though he referred vaccination during infancy. He referred contact with a documented measles case. As consequence of measles, respiratory failure was presented (PaFiO2: 153) that required high flow nasal cannula oxygenation during his 3 days spent at the ICU. He was discharged to medical ward and 2 days later from hospital with no complications.

Figure 2. Facial morbilliform erythema.

Figure 3. Patient with measles and respiratory failure at ICU admission.

3. Discussion

We have experienced with concern how measles continues as an actual problem in Europe and the rest of the world, despite the fact that an effective vaccine has been available for more than 30 years. It remains as the most frequent cause of a vaccine-preventable death in children, especially in developing countries[2] and measles-associated pneumonia as the most common severe complication[4], and in this mentioned population is responsible for the high mortality observed.

Pneumonia is due either to a direct effect of the virus on the respiratory epithelium or as consequence of bacterial or viral coinfection. *Streptococcus pneumoniae*, *Haemophilus influenzae* and *Staphylococcus aureus* are commonly isolated in these patients. Also, adenovirus and parainfluenza virus, have been associated as a copathogen[2]. In recent years, pneumonia was reported in 49%–57% of adults cases[5]. As exposed before both of the patients required ICU admission due to this complication. Recovery from measles pneumonia is, in most cases, complete, at least in a short-term period, with no studies in long term.

Concerning adults, it continues to be a highly contagious disease with low mortality (0.3% to 0.7%) but high morbidity, mainly due to complications[4]. Measles infection targets epithelial, reticuloendothelial system, monocytes, macrophages and T lymphocytes[2]. It leads to a decline in CD4 lymphocytes, starting even before the onset of the rash and lasting up to 1 month after[6]. Complications due to measles affecting almost every organ have been described, most of them caused by disruption of epithelial surfaces or immunosuppression and tend to be associated to the fatal cases[7].

Gastrointestinal complications such as diarrhea, hepatitis and appendicitis have been described. Hepatitis could be presented in about 37.5% of the patients, as reported in a French outbreak in 2010–2011[8]. Once again, hepatitis was presented in both displayed cases. It can also affect the central nervous system in 3 different ways: acute post-infectious measles encephalitis, measles inclusion-body encephalitis and subacute sclerosing panencephalitis. The latter associated with an irreversible fatal condition. However, the coagulase negative staphylococci complications are rare (0.1%)[4]. It has been proposed historically a higher case fatality in males, nevertheless recent studies show equal rates of complications despite gender[4].

In the last years, reports of this disease have increased, as noticed in the last outbreaks in Europe seen in Italy, France and Spain[8-11]. Countries with previously good measles outbreak control now report cases in older children and adults, while countries with poor control tend to report cases in infancy and early childhood, following the expected epidemiologic patterns[12]. In 2000, the Unites States declared measles elimination from the country[13], in Europe a commitment was made in 2010 to eliminate measles by 2015, however recent outbreaks discuss the feasibility of this commitment. Achievement and maintenance of the World Health Organization recommended minimum of 95% vaccination coverage with 2 doses is necessary for achieving measles elimination[14].

Muscat *el al*.[15], reported a 2-year surveillance across Europe with 12 132 cases; most of these were from Germany, Italy, Greece, Romania, Switzerland and UK. Adult population (considered those over 20 years of age) where 18% and 19% of cases in 2006 and 2007, respectively. The majority of them were unvaccinated or with an incomplete vaccination schedule (84% and 12% respectively). Seven deaths were reported in this period, 4 by pneumonia and 2 due to acute encephalitis, which correspond with the most fatal complications.

In an Italian outbreak, Filia *et al*.[9], reported 5 568 cases during 15 months in 2011. Adolescents and young adults were among the most affected (62% median age: 18 years). Interestingly 185 patients (11.6%) were health care workers (HCWs). Complications were presented in 20.3% of the patients: 135 pneumonias, 7 encephalitis and 1 case with Guillain Barré syndrome, 1 death due to pneumonia. About 90.3% of patients were unvaccinated, even though Italy launched its first National Measles Plan with the 2-dose schedule in 2003.

Dominguez *et al*. reported an outbreak in 2006 at Catalonia, a community with a high vaccination rate[16]. A total of 381 confirmed cases were reported of whom 340 (89.2%) occurred among non-vaccinated subjects, 187 (55.0%) were younger than 15 months, before the first dose of administration according to current schedule, most of them indigenous children (P = 0.007). And 11 cases presented in HCWs between 19 and 37 years, with no vaccination schedule in most of them. Exposure in healthcare facilities affected 10% of cases. Complications were presented in 91 cases (23.9%) mainly gastrointestinal and pneumonia, and no deaths were recorded. The first confirmed cases were imported from other countries.

We present only the tip of the iceberg from the last Catalonian outbreak[11], with 293 clinically suspected, and 131 confirmed measles from January to May 2014. And 37 cases required hospitalization (hospitalization rate: 28.2%), none of them adequately vaccinated. First case was imported from another country. Young individuals between 25–54 years were the most prevalent 60.3% (79 cases) and 23.0% (30 cases) presented in HCWs.

As described before[9,11,15], HCWs remain as one of the important issues during outbreaks in different outbreaks. Urbiztondo *et al*.[17] performed a research in measles seroprevalence in 639 HCWs, finding that the prevalence of measles antibodies was 98.0% (95% confidence interval 96.6–98.9); lower in HCWs born in 1981 and after (94.4; 95% confidence interval 86.4–98.4) than in those born between 1965 and 1980, and the proportion of vaccinated HCWs decreased with age. HCWs have an estimated risk of acquiring measles 13 to 19 times higher than the general population. Therefore, screening for young HCWs must be reinforced and they must be vaccinated in order to control nosocomial transmission.

According to vaccination policies, those with a high risk of measles were born between 1965 and 1980, due to lack of vaccination and reduction in circulation of the virus. Patients born before 1965 are considered immune to measles, because of high virus circulation that confers natural immunity.

A tendency has emerged against vaccination in some industrialized countries; this translates into a possible trigger for new outbreaks by creating a pool of susceptible people. Another rising issue is the inability to contain measles outbreaks to a specific geological zone, considering the actual globalized environment that has proven difficult to prevent them[12,15,18].

In the time this manuscript was written (July 2014) the USA was experiencing an outbreak of 554 cases[19], most of them unvaccinated patients and related to cases imported from the Philippines.

Measles can present with a variety of symptoms in adults and is responsible for a high morbidity especially during outbreaks. Surveillance and vaccination programs should be strengthened in order to achieve measles elimination with special attention to young HCWs since they are a high risk group for both infection and transmission. Pneumonia is a severe complication of measles infection, commonly reported. It seems difficult to achieve measles elimination in Europe in the next years with the current policies.

Conflict of interest statement

We declare that we have no conflict of interest.

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