

Case Report

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Still a hospital hazard: Varicella-Zoster virus infection in a health-care worker after exposure to Herpes Zoster

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Abstract

Varicella-Zoster Virus (VZV), a highly contagious herpesvirus, remains a hospital hazard and nosocomial transmission of VZV, despite vaccine availability, is well documented. Although World Health Organization (WHO) recommends immunization for all health-care providers, cases of in-hospital VZV transmission are still reported and summarized here, indicating the existence of susceptible individuals. Here in we present a case of a health-care worker, infected by a patient with disseminated herpes zoster and discuss aspects that generally may contribute to this event like the inadequacy of hospital infection control unit interventions, the risk of reinfection despite immunity, the complacency of employees concerning their immunity status to VZV and unfortunately the anti-vaccination movement. Adherence to published recommendations for reduction of serosusceptible hosts is of primary importance, especially in the era of increased immunocompromised population.

Keywords: Varicella zoster virus; Herpes zoster; Healthcare workers; In-hospital transmission.

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Introduction

Varicella-Zoster Virus (VZV) is a highly contagious, double-stranded DNA human alphaherpesvirus, causing two clinical entities: a) varicella (chickenpox), which represents the primary infection and typically acquired during early childhood, and b) herpes zoster (HZ, shingles), as a result of reactivation of VZV, which remains to sensory ganglia, after primary infection [1]. The risk of transmission is higher with varicella and disseminated HZ, compared to localized HZ, due to the extent of lesion and aerosolized droplets from nasopharyngeal secretions [2]. Both illnesses follow a benign course in immunocompetent patients, however immunocompromised patients may experience complications leading to devastating outcomes [3]. Therefore, it is of great importance for Health Care Workers (HCWs), to have knowledge of their immune status concerning VZV, especially those working with compromised patients. Although vaccina-

tion against VZV infection was first licensed in 1995 and despite regular update recommendations of World Health Organization (WHO) and Centers for Disease Control and Prevention (CDC) regarding the need for immunization of all HCWs [4,5], there are still virus-susceptible HCWs, posing a hidden risk of transmission to their co-workers and importantly to patients, as the disease is contagious two days before the onset of the rash making difficult the early isolation of hosts [6]. Note worthily, atypical presentation of the disease among frail and immunocompromised patients may delay the diagnosis and isolation, as well as the disease may have a severe course, and therefore promptly implementation of control measures remains a challenge for clinicians.

Occasionally, cases of in-hospital VZV transmission to HCW and nosocomial outbreaks are published, probably indicating inadequate adherence to prevention policies of hospital infec-

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tion control settings. Here in is a case presentation of a seronegative HCW, infected by a patient with disseminated HZ and a mini review of the literature for in-hospital transmission of the virus to HCWs after vaccine becoming available.

Case presentation

A 64-year-old male with decompensated cirrhosis was admitted to our Internal Medicine Department due to refractory ascites. During hospitalization, patient developed generalized, erythematous papules, involving multiple dermatomes, and using the 'Direct Fluorescent Antigen' (DFA) method, a modified Tzancktechnique, multinucleated giant cells typical of herpesvirus infection were revealed, establishing the diagnosis of disseminated HZ. Till diagnosis no contact or respiratory precautions had been undertaken. Patient was transferred to an isolation chamber, infection control precautions were instituted with delay, leading to transmission of the virus in a susceptible HCW (with development of high-grade fever, malaise and generalized vesicular, pruritic rash), who was not able to recall a previous infection from VZV or vaccination (unfortunately, pre-employment serologic testing for VZV immunity was not a standard operating procedure of hospital policies). The HCW was given sick leave until the entire rash crusted and returned on duty 12 days later. Contact tracing by the hospital infection control unit, through questionnaire including information about history of varicella and vaccination and with serologic testing for individuals with unknown immunity status, identified neither susceptible HCWs and patients nor secondary cases.

Discussion

Table 1 summarized literature cases of nosocomial transmission of VZV to HCWs after 1995, when vaccine became available. Parameters which should be discussed, considering the relatively high incidence of this event, include (a) the appropriate and timely interventions of hospital infection control unit, (b) the possibility of reinfection, (c) the need of employees' surveillance in health care facilities concerning their immunity status to VZV and reliability in serologic testing and (d) the anti-vaccine movement in the era of increased immunocompromised population.

Table 1: Cases of HCWs infected by VZV after in hospital exposure.

Study	Location	No. of HCWs	Transmission setting	Comments
Yang J et al., 2019 [7]	China	4	Hospital	Exposure to a patient with varicella
Sharit S et al., 2015 [8]	India	8	Hospital	Index case: patient with localized HZ
Apisarnthanarak A et al., 2014 [9]	Thailand	10	Hospital	Index case: patient with varicella
Sood S, 2013 [10]	India	14	Hospital	Index case: patient with disseminated HZ
Johnson JA et al., 2011 [11]	US	1	Hospital	Exposure to a resident with localized HZ HCW was seropositive for VZV after infection at age of 5
Hitomi S et al., 2011 [12]	Japan	1	Hospital	Exposure to a patient with varicella. Seropositivity prior immunity
Saidel-Odes L et al., 2010 [13]	Israel	3	Hospital	Exposure to a patient with localized HZ None of HCWs were vaccinated or previously infected by VZV
Lopez Aetal., 2008 [14]	West Virginia	1	Long-Care Facility	Exposure to a resident with localized HZ Uncertain history of previous infection
Aly NY et al., 2007 [15]	Kuwait	3	Hospital	Exposure to a patient with varicella None of HCWs were vaccinated or previously infected by VZV
Ku CH et al., 2005 [16]	US	1	Hospital	Exposure to a patient with localized HZ Childhood history of VZV infection
Behrman A et al., 2003 [17]	US	5	Hospital	Exposure to patients with VZV and localized HZ All HCWs were seropositive prior employment
Our case	Greece	1	Hospital	Exposure to a patient with disseminated HZ No recall of previous infection or vaccination

Contact plus airborne isolation infection control measures by infection control unit, after an in-hospital case of VZV infection should be early and strictly adapted. A major obstacle and unfortunately, an unmodifiable factor for early preventive strategies' application, as already mentioned, is the possibility of transmission during pre-symptomatic incubation period. Consideration should be furnished to the inadequate isolation facilities of many hospitals, since patients with diagnosis of varicella or disseminated HZ should be transferred to an airborne infection isolation room. In addition, all HCWs are recommended to wear a respirator protective equipment when entering the room, irrespective of their immunity status, as well as their previous history of vaccination or varicella due to the existing risk of infection or reinfection [11,18]. Patients should also be advised to have their skin lesions covered and wear a surgical mask when other individuals are in the same room. The virus spreads via airborne route or through contact with skin lesions from all patients with varicella and disseminated HZ, as well as through contact with lesions of localized HZ from immunocompromised patients. Although it is estimated that up to 96% of susceptible hosts, will develop the disease after exposure to varicella, the likelihood of transmission of VZV from localized HZ is lower [19], while the exact difference in the risk of transmission between immunocompetent and immunocompromised patients needs further clarification. It should be emphasized that there are rare reports of airborne transmission of VZV from immunocompetent patients with localized HZ, thus the risk of in-hospital outbreaks from these patients should not be ignored by clinicians and contact precautions in combination with airborne precautions, may should be applied, even if it is not recommended [10,11,13,14,18-21]. Infected patients are contagious 24 to 48 hours prior the onset of the rash, remaining infectious till all lesions are crusted, while longer isolation of immunocompromised patients may be needed due to prolonged infectious period [21]. All susceptible, exposed individuals should have regular clinical monitoring and receive post-exposure vaccination in accordance with Advisory Committee on Immunization Practices (ACIP) and CDC recommendation, while Varicella-Zoster Immune Globulin (VZIG) or intravenous Immunoglobulin (IVIG) should be administered in case of contraindication of vaccination (e.g., pregnant HCWs) [22]. The use of antiviral prophylaxis with acyclovir or valacyclovir is controversial, due to the limited existing data about efficacy. However, despite preventive measures secondary cases have been reported [13,23,24].

As mentioned above, infection may occur in individuals with prior history of vaccination or primary infection, possibly related with failure of vaccine to produce immunity, the decline of immunity over time or to the existence of mutant strains or new variants of VZV [25]. Cases of infection have been also reported few days after vaccination, a phenomenon called 'breakthrough varicella' and is related to exposure to natural, wild-type virus [26], but the course of the disease is quite benign. However, due to the existing risk of transmission from these cases, preventive measures should be strictly adopted.

Centers for Disease Control and Prevention (CDC) and World Health Organization (WHO) recommend all HCWs without a previous history of VZV infection, vaccination, or laboratory evidence of immunity, get two doses of varicella vaccine, four weeks apart before employment, as vaccination provides 98% protection against varicella and almost 100% protection against severe disease [5,27,28]. In case of unreliable history, serologic screening is required [23,24]. It is of great importance that

vaccinating HCWs with a negative or uncertain history of VZV prior employment, confirmed with an antibody test, is the most cost-effective approach aiming to reduce hospital transmission [5,25]. At the same time, cost of furloughs may be reduced, especially in case of VZV outbreaks in healthcare settings, where the exclusion of HCWs from work may be prolonged emphasizing the well-established knowledge that vaccination is the most appropriate and cost-effective control strategy against vaccine-preventable diseases [5]. Interestingly, literature data demonstrated that a self-reported history of varicella may not be a reliable predictor of VZV immunity, indicating that serologic screening may be needed for all HCWs [26,30-33]. However, it should be mentioned that there are many available tests determining VZV immunity [Fluorescent Antibody to Membrane Antigen (FAMA), Enzyme-Linked Immunosorbent Assays (ELISAs), Latex Agglutination (LA)], ranging in their sensitivity, specificity, and cost [17,34]. FAMA, the most validated assay, is impractical for widespread use, technically difficult and not widely available, as requires special equipment for handling the virus, highlighting that preventive precautions should be implemented irrespective of prior immunity.

It should not be omitted that seroprevalence rate of VZV differs between populations, probably reflecting different vaccination policies or specific socioeconomic factors (e.g., increased migrants/refugees) [35]. Greece, a country which introduced VZV vaccination in mandatory immunization schedules for infants and children, may should adapt written documentation of two-doses of VZV vaccine as a reasonable preventive and cost-effective strategy for all HCWs, since susceptible employees exposed to VZV should be furloughed from health care from the 8th day after the first exposure through the 21st day after the last exposure [22].

An issue of great concern is vaccine hesitancy, a worldwide, persistent problem requiring a challenging approach. Interventions like educational campaigns addressing to questions and concerns about vaccines, ensuring its safety, surveillance interventions with health care providers' assistance may overcome a threat of public health [36]. Vaccine refusal in the era of increased immunocompromised population may have dramatic impact in the course of vaccine preventable diseases and may bring further worries in health care facilities. Stewardship programs in hospitals may be necessary to ensure proper immunization of all HCWs.

Conclusions

Serosusceptible HCWs to VZV may cause a major health and economic burden in hospital settings, therefore precautions, well-organized hospital units and advanced prevention policies are warranted. It consists an ethical duty and obligation of all individuals involved in patients' care to ensure the health and safety of both, through adherence to published recommendations, guidelines, and expert opinions.

Declarations

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