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Case Report

Vaccine Induced Herpes Zoster in An Immunocompetent Child After 3 months of 1st Dose of Vaccination

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Abstract

Varicella zoster virus (VZV) is an enveloped double stranded linear virus, which belongs to the herpesvirus's family. It can cause two clinically different forms of diseases, primary infection known as chicken pox and latent infection know as herpes zoster (Shingles). Primary infection presents with diffuse vesicular rash accompanied by fever, malaise, and pharyngitis. However, latent infection results from reactivation of dormant virus in an immunocompromised patient and presents with painful localized skin rashes called as shingles. Currently, in the US, 2 doses of live attenuated varicella vaccine are available to prevent VZV infection. One of the major side effects of vaccination are the rashes. We report a unique case of vaccine induced VZV infection in a previously healthy child that presents with vesicular rashes 3 months after 1st dose of vaccination. A 16-month-old child with past medical history of premature birth at 32 weeks, presented to the pediatric outpatient clinic with complains of well-demarcated, erythematous, dry rash on both labia. Parents denied fever, cough, or any other signs and symptoms associated with rashes. patient activity level was normal and oral intake was usual. PCR testing was performed was found to be negative for Herpes Simplex Virus-1 (HSV-1) and Herpes Simplex Virus-2 (HSV-2) and positive for VZV. Due to patient recent vaccination status, further classification of infection was needed to determine if the source of infection was wild type chicken pox or vaccine induced. A swab of one of the vesicular lesions was sent to the Ohio Department of Health, for vaccine vs wild-type strain PCR testing. The results were positive for Vaccine induced VZV infection. The patient was started on acyclovir therapy. On follow-up, the patient condition improved clinically. In pediatric populations, it is important to do extensive evaluation of rashes post vaccination as it can be occurred due to wild type, break through or it can be vaccine induced virus. Proper evaluation can significantly impact the management patients as they are maybe infectious and need to be isolated in wild type and breakthrough infection versus non-infectious in case of vaccine induced. After detailed clinical history and physical examination, it is important to investigate further through PCR testing to differentiate one category from another!

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Keywords: Vesicular Rashes; Vaccine induced rashes; PCR testing.

Introduction

VZV is one of the double stranded DNA viruses, which belongs to the herpesvirus's family, that can cause human infection worldwide [1]. The virus mainly targets the T lymphocytes, epithelial cells, and ganglion cells. It can cause two clinically different forms of diseases, primary infection known as chicken pox and latent infection know as herpes zoster (Shingles).

Latent infection results from reactivation of dormant virus in an immunocompromised patient and presents with painful localized skin rashes called as shingles. In immunocompetent children, the primary infection is mild, while the severe form of disease is commonly seen in immunocompromised or elderly population.

In 1995, the first vaccine against the virus was introduced in the US. After vaccination, the rates of infection and mortality have been declined significantly. Immunocompromised or susceptible populations have greater than 90% of chance of occurring infection [2].

Primary infection being highly contiguous can occur in susceptible individual through various routes including nasopharyngeal secretions or direct contact with skin vesicles of the infected individual. After gaining entry, the virus undergoes localized replication involving draining lymph nodes within 4-6 days [3-5].

Primary viremic phase precedes the entry of virus into the reticuloendothelial tissues. Approximately after 9-days, a secondary phase of viremia starts which remains up to the emergence of skin vesicles [6]. The incubation period of varicella ranges from 10 to 21 days. The varicella rash uniquely occurs in sequential crops over several days and begins from macules that quickly turn into the papules, vesicles, pustules, followed by the formation of crusted papules.

VZV can cause number of complications particularly in susceptible individual such as immunocompromised hosts, and pregnant women. The various complications include soft tissue infection, pneumonia, hepatitis, and encephalitis [7]. In immunocompetent individuals during varicella episode, the virus enters sensory ganglia where it acquires the stage of latency [7]. Once in latency, the virus can become reactivated, resulting into characteristic unilateral, painful vesicles, which are mostly distributed in a restricted dermatome, known as shingles. Here we report a unique case of vaccine induced VZV infection in a previously healthy child that presents with vesicular rashes 3 months post-vaccination.

Case Presentation

A 16-month-old child with past medical history of premature birth at 32 weeks, presented to the pediatric outpatient clinic with complains of well demarcated, erythematous, dry rash on both labia for 7-days. According to the parents, initially these lesions were pruritic, vesicular, and developed on patient left thigh 2-3 days ago. After that, the lesions spread along patient left thigh, left buttock and lower back. Parents declined fever, cough, or any other signs and symptoms associated with rashes.

patient activity level was normal and oral intake was usual. Parents denied the use of new detergents, soaps, or diapers. Parents also declined close sick contacts, and there are no other household members that have similar type of rashes. There are no pets at the home, and no significant time spent outside or exposure to the plants. However, she does attend the daycare.

Patient vaccinations are up to date. patient received patient varicella vaccine on patient left thigh 3 months ago and developed no adverse effects at that time. Furthermore, parents stated that they have been applying pink salve, Aquaphor, and Lotrisone cream on the rashes with no improvement.

The child has normal development and was appeared alert and orientated on general examination. Physical examination revealed rashes on patient left thigh, buttock, and on lower back. The lesions had erythematous bases, mainly groups of vesicles, and few maculopapular approximate counts 30-40 in number (Figure 1 A and B)

Initial lab tests including complete blood count and blood culture were taken, and patient was referred for dermatologic consultation. Complete blood count revealed normal white blood cells, red blood cells, and platelets count. However, blood culture did not grow any pathogenic organism.

On further work-up, PCR tests for HSV-1, HSV-2, and VZV DNA were sent. PCR test detected the presence of VZV DNA and was negative for HSV 1 and HSV 2. For further classification of infection, wild type chicken pox versus vaccine induced infection, the PCR typing was sent out to the Ohio Department of Health. The results revealed the cause of the rash was vaccine induced VZV infection. The patient was started on acyclovir therapy. On follow-up, patient condition improved clinically, and majority of the lesions were crusted over.

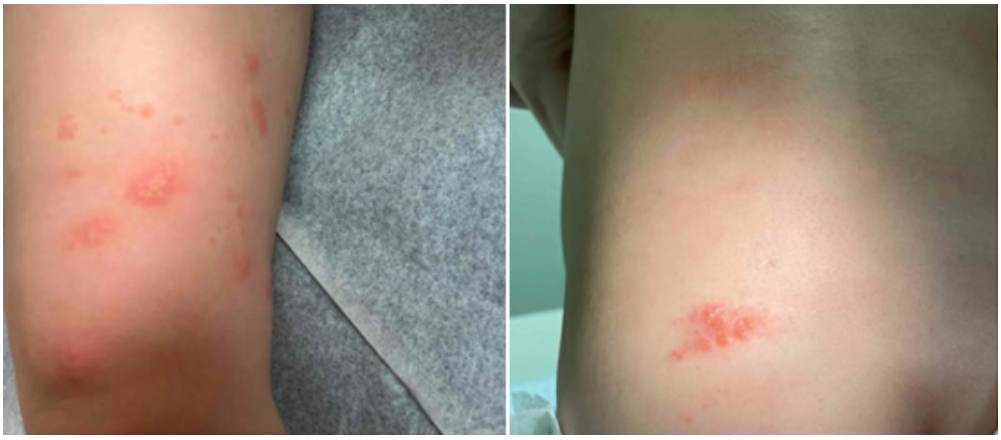

Figure 1: The picture from a 16-month-old child shows (A) multiple groups of vesicular maculopapular lesions are present on the left thigh. (B) Multiple similar types of lesions are also found on the left buttock.

Discussion

The varicella vaccination is a live attenuated vaccine, which can result in a milder form of chickenpox in up to 5% of recipients [8].

It is paramount to differentiate the rash caused by vaccine itself from the wild-type strain of virus to make appropriate infection control, and patient management decision

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particularity for susceptible individuals. The features to consider while evaluating a chickenpox-like rash in a vaccine recipient are: 1) the time interval since vaccination; and 2) the severity of the illness.

Immunization against VZV was introduced in US in 1995. Since introduction of the VZV immunization efforts, a great reduction in primary infection, disease severity, risk of transmission, and hospitalization has noted. In addition to reducing primary VZV infection, the vaccination has also been found to reduce the risk of developing shingles, especially in children.

In 2007, the United States introduced the two-dose schedule for VZV. The second dose was seen to be more effective to produce immune response in the recipients who failed to respond to the first dose [9]. The double dose of vaccine was more effective in increasing the number of seroconversions, raising antibody titers, and lasting immunity.

Currently, dual dose of VZV vaccination is recommended in immunocompetent children and adults with no evidence of immunity. The 1st dose should commence at the age of 12 to 15 months, while 2nd dose should be given at the age of 4 to 6 years [9].

Clinically, wild type chickenpox illness in vaccinated individuals has a similar presentation as typical chickenpox. Wild type VZV can occur either <1 or >6-week post-vaccination. In most cases, if VZV is acquired during this time interval it is assumed to be due to the acquisition of a wild-type strain due to an insufficient time interval for body to produce immunity against vaccination or complete failure to mount the immune response towards vaccine, however it is rarely seen. The patients with wild-type chicken commonly present with fever, cough, fatigue, and followed by generalized rashes, which are typically 200-400 lesions that are mostly vesicular with and a few that are maculopapular. Patients during vesicular phase of rashes, especially during the first 5 days, are highly infectious and can transmit the virus to others.

The rashes induced by the vaccination commonly occur between 1 to 3 weeks, and in some cases can take up to 6 weeks. The characteristic of the rashes is generalized predominately maculopapular rather than vesicular. The number of rashes ranges from <20 to maximum of up to 50 lesions. Clinically, patients have no associated sign or symptom. The maculopapular rash induced by the attenuated vaccine virus is much less infectious and contagious compared to the vesicular rashes induced by wild-type virus.

Break-through chickenpox, also known as mild varicella-like syndrome (MVLS), is an infection which occurs in the vaccinated individuals caused by wild-type strain of virus.

The illness is usually mild due to the development of partial immunity against virus, that was able to attenuate the signs and symptoms. Data suggested that MVLS occur up to 3% of vaccinated children each year [10]. Typically, occurs after 6 weeks of vaccination. The lesions are generalized rashes with <50 lesions, mostly maculopapular with few vesicles.

In comparison to wild type diseases, these patients are usually much less infectious, however they are still be considered as infectious until all the vesicular lesions are

curst over, usually the time duration is shorter, ranging from 1 to 4 days in comparison to wild type infection.

Previously, vaccine induced herpes zoster occurs within months to a few years after the vaccination in immunocompetent children has also been described [11]. To the best of our knowledge, these cases are unique, and requires appropriate timing for vaccination administration, medical history, clinical features and finally by laboratory confirmation by polymerase chain reaction (PCR). PCR testing can be helpful in differentiating vaccine induced rashes versus the wild type based on single nucleotide polymorphisms (SNP). As, wild type vs vaccine induced have different management protocols. Therefore, it is crucial that clinicians further investigate the possibility of an unusual presentation of vaccine induced VZV and manage accordingly!

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

All authors consent for the publication of this case report**.**

Availability of data and material

We assure the editors that, all the data and material used in this case report, will be made available to them on demand**.**

Competing interests

Authors declare no competing interests.

Author contributions

Fnu Raja, M.D, responsible for the construction and writing of the manuscript, orchestrating the specimen delivery for PCR testing and the collection of images Thessicar E. Antoine-Reid, PhD is responsible for conceptualization and investigation of the manuscript and critical review and commentary of manuscript.

Conflicts of interest

There are no conflicts of interest.

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