

Research progress of varicella and its immunoprophylaxis

Xinyan Chang¹, Min Chen²

¹Southwest Petroleum University Hospital, Chengdu, China

²Department of Endocrinology, Changji Branch, First Affiliated Hospital of Xinjiang Medical University, Changji, China

Abstract: Chickenpox is an acute infectious disease induced by varicella-zoster virus, and the transmission of chickenpox is very high. If people who are not vaccinated with chickenpox vaccine are easily infected, and other complications may be induced, which will affect the quality of life of patients. Therefore, we should know about chickenpox and immune prevention knowledge, identify its symptoms, features and so on, so as to facilitate timely prevention. This article mainly summarizes the current situation of chickenpox and its immune prevention, and provides favorable basis for disease prevention.

Keywords: chickenpox; Immunization; progress

1. Introduction

Chickenpox is a common disease in children. Once the disease is not controlled in time, it will lead to serious consequences and even death. If chickenpox breaks down, it will lead to infection and sepsis. According to relevant statistics, about 15% of children have induced chickenpox in adulthood due to the infection rate of chickenpox virus, or patients with immunodeficiency can also induce chickenpox. If you want to prevent chickenpox, you need to be vaccinated against chickenpox. At present, it has been confirmed that many people have been vaccinated with chickenpox vaccine, and its safety is very high. According to related research symptoms abroad, after children are vaccinated with chickenpox vaccine, more than 92% of patients and children have the protection of chickenpox, and its application effect is remarkable. This article mainly expounds the research progress of chickenpox and its immune prevention.

2. Clinical symptoms of chickenpox

Patients with chickenpox generally have mild and moderate symptoms, but they often induce pneumonia, secondary infection, central nervous system disorder, etc. Chickenpox spreads rapidly. After the first occurrence of chickenpox, the virus will continue to survive in the nerve root of patients. When the cellular immunity decreases, the virus will continue to be activated and induce chickenpox again. Usually, the latent time of chickenpox is about 15d, and most patients will have prodromal symptoms before herpes. The symptoms are sore throat, fever, fatigue, etc., which usually lasts for about 3ds, and then patients will have systemic symptoms, mainly including nausea, vomiting, sore throat, joint pain, etc. [1]. In the early stage, the rash will turn red, then it will develop into a blister papule, which will fester and rupture within 2 days, and the rash will constantly migrate to the face, limbs, etc. Usually, it will scab and then fall off around 2 weeks, and disappear after a while.

3. Epidemiological characteristics of chickenpox

3.1 Population distribution

According to the relevant statistics on the age and gender of chickenpox patients, it is found that there is no obvious difference in the gender of chickenpox infected people, but regarding the age, children are the high incidence group of chickenpox, mainly because students have social characteristics of groups, and if chickenpox happens, it is easy to infect people around them [2]. According to the varicella vaccine surveillance study in the United States, 13% of children aged 5-10

years are susceptible to varicella, and related studies in the United Kingdom show that about 40% of children aged 1-9 years are susceptible to infection, and only less than 10% of children aged over 15 years are susceptible^[3]. After the related research and analysis in China, it is shown that the important place to induce chickenpox is school, and the main reason to induce chickenpox is the poor immune system function of patients, and the death of patients due to poor immune function is also an important inducement^[4].

3.2 Regional and time distribution

Chickenpox usually occurs in temperate zone, and it shows remarkable seasonal characteristics, especially in dry and cool season, which is easy to induce chickenpox epidemic, and it is also the high incidence season for inducing chickenpox every year.

4. Immune prevention of chickenpox

4.1 Use of varicella vaccine

At present, the only vaccine used to prevent varicella virus infection is live attenuated varicella vaccine. Japan was the first to develop Oka live attenuated varicella vaccine. After it was developed, it was tested by different age groups with low immunity, and its safety and application effect were relatively high. In 1980, chickenpox vaccine was also used in clinical trials in the United States. In 1995, in order to reduce the incidence of chickenpox in the United States, the Drug Administration formulated the vaccination rate chickenpox vaccine for children under one year old^[5]. In 1996, chickenpox vaccination was also carried out in various kindergartens in China, which effectively reduced the incidence of chickenpox, especially in kindergartens with high vaccination rate, and there was no chickenpox among children. Now the chickenpox vaccine commonly used in the market made the V-Oka vaccine strain approved by the World Health Organization in 1983. After continuous improvement, in 2005, the United States approved the production of measles-mumps-rubella-chickenpox combined vaccine (MMRV) for children aged 1 to 12 years, with remarkable effect and high safety.^[6]

4.2 Safety of varicella vaccine

According to the relevant epidemiological statistics, the adverse reactions of healthy children after VarV inoculation are generally mild, but seldom serious. The adverse reaction reporting system of 16 million doses of VarV in the United States shows that the incidence of adverse reactions and serious adverse reactions is 66.9/100,000 doses and 2.8/100,000 doses^[7]. Among them, there are five kinds of common adverse reactions after VarV injection. First of all, the first one will cause mild tenderness and redness in the vaccination site. The second is that the patient has fever or rash within 40 days after vaccination. The third type is infectious vaccine virus. The transmission of vaccine virus among healthy vaccinators is generally relatively small. Among the more than 50 million doses of vaccines issued by the United States from 1995 to 2005, only 5 vaccinators had 6 times of transmission, and among every confirmed transmission patient, the first vaccinator had a rash induced by Oka virus strain^[8]. The fourth type is breakthrough infection. After vaccination, breakthrough chickenpox will occur when exposed to wild virus, with an incidence rate of 0.9/100,000. Breakthrough chickenpox usually occurs among those vaccinated with only one dose of VarV. The fifth type is herpes zoster. Many people pay more attention to whether the vaccine virus will lurk to induce herpes zoster. Now some laboratories have determined that the vaccine virus can lurk in the body and then be activated to induce herpes zoster^[9]. Studies have also shown that the incidence of herpes zoster after immunization is lower than that of natural infection.

4.3 Immune effect of varicella vaccine

The antibody positive rate of healthy people can reach about 87% after one dose of VarV, but it can reach 99% directly after two doses of varicella vaccine. Some studies have analyzed children aged from 3 to 10 years old, and the efficacy of domestic VarV 1 dose vaccine has reached about 85%, which has a good field epidemiological protection effect. After one dose of varicella vaccine was given to adults, the positive rate of serum antibody was low and the T cell response was weak. After a period of time, the immune response could be improved to the level of healthy children after the second dose of

vaccine was given. In the study, 420 healthy adults were vaccinated with 1-3 doses of varicella vaccine, and 37 of them developed breakthrough varicella around 10 days after vaccination, but the clinical manifestations of all patients with varicella were mild, which indicated that although adults could not prevent from getting sick after vaccination with varicella vaccine, the incidence rate could be greatly reduced [10]. And it can reduce the probability of herpes zoster in the elderly, mainly because the lower immunity of VZV-specific cells in the elderly will lead to the activation of latent viruses in the body, and the immunity of VZV-specific cells can be improved after VarV inoculation. According to the related research, the immunocompromised children are sensitive to varicella vaccine, and can show better protection against severe varicella after vaccination. The symptoms of breakthrough varicella patients are mild, but the number of skin lesions is more than that of normal people when they reinfect. Many studies have shown that the humoral immunity of healthy children can be maintained for many years after vaccination, especially when VZV wild virus continues to appear. Japanese data have confirmed that the immunity can be maintained for about 15 years after vaccination with VarV.

4.4 chickenpox has a strong immune persistence

A Japanese research group and staff have followed up 261 vaccinated children aged 1 to 12 for 20 years, and all of them showed positive antibodies after vaccination. Among the 91 people exposed to varicella virus, only 2 people got sick, and the main symptoms were mild symptoms such as fever, no blister scab, less rash, etc., and 23 people with exposure history did not get sick, indicating that varicella has a strong immune persistence. Some American research groups have observed the vaccinated teenagers for 10 years to test whether their immune antibodies have the characteristics of good persistence and protection. According to epidemiological statistics, after vaccination with varicella vaccine, the immunity of the vaccinators will be improved, mainly because the activation of Oka vaccine is gradually enhanced due to the decrease of serum antibody titer after vaccination [11]. When the wild virus attacks again, the latent vaccine strain is activated again, which has the function of lifelong immunity.

5. Vaccination prevention and suggestions for varicella in China

With the continuous implementation of the domestic immunization program, the incidence of chickenpox has gradually decreased. Chickenpox is one of the important infectious diseases that cause public health incidents in kindergartens and schools, and has been considered as a very serious public health problem. At present, VarV should be included in the immunization program in China as soon as possible. VarV is still the second-class vaccine chosen at its own expense, voluntarily and with informed consent, and there is no relevant immunization program for VarV. A large number of statistical results show that the coverage rate of VarV in China is only about 50%, which does not achieve the purpose of effectively suppressing the spread. The number of severe cases among older children and adults is increasing, which further increases the social pressure. Epidemiological statistics show that chickenpox is easily induced in children aged 1 to 2 years, but the positive rate of serum antibody in children aged 5 to 15 years is relatively high. All, if conditions permit, children under 6 years old should be vaccinated.

6. Conclusion

Vaccination rate chickenpox vaccine can effectively prevent the occurrence of chickenpox, protect susceptible people from infection, and vaccinate all children against chickenpox, which can greatly reduce the incidence rate and improve people's living standards. However, it should be noted that if only individuals are vaccinated, the epidemiological characteristics of chickenpox cannot be improved, and all children need to be vaccinated, so that the epidemiological characteristics can be changed, the spread of the disease can be suppressed, and the virus can be eliminated.

References

- [1] Yang Guiqing, Li Jiabin, Zhuo Fei, et al(2019). *Evaluation of immune effect of varicella vaccine for children in Shenzhen and study on epidemic characteristics of virus genotype [J]. chinese journal of health laboratory technology, vol.29,no.21,p.4.*
- [2] Gu Xiaohong, Ma Ping, Zhu Ping, et al(2020). *Epidemiological characteristics and case*

- immunization history of chickenpox in Tangzha Town Street, Gangzha District, Nantong City in 2018 [J]. chinese primary health care, vol.34,no.5,p.3.*
- [3] Hu Yu, Chen Yaping, Wang Ying, et al(2019). *Meta-analysis of the incidence of breakthrough cases after vaccination with live attenuated varicella vaccine [J]. international journal of epidemiology and infectious disease, vol.46,no.2,p.6.*
- [4] Lin Daojian, Zheng Yunying, Chen Yuanli, et al(2020). *Analysis of varicella epidemic and vaccination in Zhuhai from 2009 to 2018 [J]. Modern Preventive Medicine,vol.47,no.1p.4.*
- [5] Zhang Jiudong, Wang Yanfei(2019). *Analysis of breakthrough cases after two doses of varicella vaccine in Miyun District of Beijing in 2015-2017 [J]. Capital Public Health, vol.13,no.3,p.2.*
- [6] Wang Hongwei, Wei Zhiquan, Jia Zhen(2020). *Analysis of varicella-zoster antibody level among healthy people in Huairou District of Beijing in 2018 [J]. China Health Industry, vol.17,no.13,p.3.*
- [7] Yao Guangsong, Liu Xu, Li Xiaolan, et al(2021). *Epidemiological characteristics of varicella cases among children aged 1-15 in Daying County from 2015 to 2019 [J]. Parasitic and Infectious Diseases, vol.19,no.1,p.4.*
- [8] Zhang Ting, Zou Wenjing, Cai Kun, et al(2021). *Genetic characteristics of varicella-zoster virus in a school chickenpox epidemic in Hubei Province in 2020 [J]. China Vaccine and Immunization, vol.27,no.5,p.4.*
- [9] Xiaohong Shao, Gao Lingyun(2019). *The outbreak of varicella in schools in Rugao from 2014 to 2017 and the persistence of vaccine immunity [J]. Henan Journal of Preventive Medicine, vol.30,no.10,p.2.*
- [10] Deng Xi, Zhang Junmin, Fu Jie(2020). *Epidemiological analysis of varicella and research progress of varicella vaccine immunization [J]. Everyone's Health,vol.510,no.01,pp.288-288.*
- [11] Chen Donghui, Mai Feng, Wu Lei(2021). *Investigation of varicella outbreak in a primary school in Suzhou Industrial Park and analysis of vaccine protection effect [J]. Jiangsu Preventive Medicine, vol.32,no.4,pp.3.*