Smallpox Clinical Description & Recommendations for a Vaccination Program

Smallpox Vaccination Reactions

Hello and welcome to the Vaccination Reactions section of this program. I am Dr. Sharon Frey, an infectious diseases specialist at Saint Louis University. We Ihave conducted smallpox vaccine trials at the Saint Louis Unversity Center for Vaccine Development for the past 3 years. I will be talking to you today about possible reactions to the smallpox vaccine.

Usual and anticipated side effects experienced with the vaccinia vaccine include skin itching and tenderness at the inoculation site, headaches, myalgia, fatigue, fever and rashes. Some one who is newly vaccinated may experience one or two of these side effects or any combination of side effects.

Most side effects are mild to moderate in nature and easily treated with Tylenol or ibuprofen. Occasionally, people will feel poorly enough to stay at home for a day or two. These side effects typically occur between 5 to 12 days after vaccination. Side effects are more likely to occur in individuals who have not been previously vaccinated.

A small papule or pustule is noticeable about three days after the inoculation. The sore will expand as the local skin infection progresses, stimulating the body's immune response. A successful vaccination in someone who has never received vaccination is called a primary reaction. This is often referred to as a “take”. Health care providers are able to determine if the recipient had a successful vaccination within a week. In about two weeks, the sore begins to scab. The scab falls off approximately 3 weeks after vaccination. A small, circular scar indicates that the person was successfully inoculated.

This slide shows the normal progression of an effective smallpox vaccination. You can see the progression from the development of the lesion at day 4 through the scar formation by day 21. The development of a scar is evidence that the vaccination was successful.

In rare occasions, individuals may experience serious adverse events. These serious adverse events are more likely to occur in certain risk groups. Those at increased risk include the following groups: pregnant women, people with immunodeficiencies, people

with eczema or other chronic skin diseases, and infants under twelve months of age. Prior to vaccination, patients will be screened for these possible health risks, which may result in serious reactions.

Even in patients with no risk factors or contraindications, a small percentage of vaccinees will experience additional adverse reactions. The most common of theses is accidental inoculation. This occurs when the vaccinee touches or scratches the vaccination site and then proceeds to touch another area on the body. The virus is transferred by hand from the site of inoculation to other areas. The most common sites include the face, eyelids, nose, mouth, genitals, and rectum. Most cases of accidental inoculation do not require treatment.

This slide shows a picture of a woman with accidental auto-inoculation of the lower right eyelid following smallpox vaccination.

This slide shows the picture of accidental auto-inoculation of the cheek, which is approximately 5 days old. You can also see the primary take on the child's left arm which is approximately 10-12 days old.

Another effect caused by the smallpox vaccine is Generalized Vaccinia. This is a rare systemic manifestation of lesions appearing on any part of the body, mainly the trunk and abdomen. Lesions can occur between 6 to 9 days following the vaccination and rapidly progress to the scarring stages. The lesions can be extensive or recurring. VIG is indicated for treatment of severe cases.

This slide shows a picture of an apparently normal child with Generalized Vaccinia following smallpox vaccination. While the rash appears severe, the child recovered without sequelae.

This slide shows a picture of typical early vaccinia lesions of Generalized Vaccinia with no secondary crusting. You can see the mix of smaller papules just beginning to umbilicate on the patient's cheek.

Other adverse events related to the smallpox vaccine include secondary bacterial infections at the inoculation site, Vaccinia Keratitis or infection of the cornea, and congenital Vaccinia, i.e., transfer of infection to a fetus during pregnancy that is evident at birth.

This slide shows a picture of a Streptococcal infection at the vaccination site. The lesion is heaped-up and proliferative. Pure culture of group A, beta-hemolytic streptococci was recovered from thin fluid under the lesion. The lesion is discolored due to the application of a Mercurochrome preparation.

This slide shows a picture of Vaccinia Keratitis. The picture indicates a cloudy corneal lesions in a mother who bathed her vaccinated infant and then rubbed her eye. VIG is contraindicated for Vaccinia Keratitis.

This picture is a child with congenital vaccinia born in the 28th week of gestation. Her mother received primary vaccination during the 23rd week of pregnancy. The child had typical vaccinial skin lesions and died at 8 days of age. Vaccinia virus was isolated from the placenta of the mother.

The adverse effects with the highest fatatlity rates include encephalitis, Eczema vaccinatum, and progressive Vaccinia (Vaccinia necrosum).

Of the serious adverse events, encephalitis is the most rare of the complications. The overall rate of encephalitis is 2 per 1,000, 000. Mortality from this complication is estimated at 25%, and those who do survive often have permanent neurological sequelae. The first symptoms of encephalitis include headache, vomiting, drowsiness and fever. This reaction can lead to seizures, paralysis and sometimes death. There is currently no known treatment for post-vaccination encephalitis, and VIG is not effective for this complication.

Eczema vaccinatum is a disorder that occurs in individuals with active or healed eczema or other chronic skin conditions. This complication occurs at a rate of approximately 41 cases per 1,000,000 vaccinations. It is manifested by vaccinial lesions that appear in areas of skin involved by eczema, whether current or healed. Mortality can be up to 40% in children less than 2 years old. However, with early recognition and prompt treatment with VIG, mortality can be reduced , and morbidity alleviated.

This slide shows the picture of typical umbilicated papules of vaccinia seen in a patient with Eczema Vaccinatum.

This slide shows a picture of an infant with severe eczema vaccinatum before treatment with VIG.

This slide shows a 22-year-old woman with Eczema Vaccinatum after accidental inoculation by a friend. She became critically ill, with nearly total involvement of her body, and required thiosemicarbazones, as well as large doses of VIG.

This slide shows complete healing of perioral lesions in an infant with eczema vaccinatum after treatment with VIG.

The most deadly of smallpox vaccine side effects is progressive vaccinia, which is almost always life threatening. This complication was previously known as three separate terms: generalized vaccinia, eczema vaccinatum and progressive vaccinia (vaccinia necrosum). Progressive Vaccinia occurs most often in immunocompromised patients, including those with cancer or HIV/AIDS. In the past, the rate of occurrence was 1.7 per 1,000,000 vaccinees in the general population. Progressive Vaccinia occurs when the vaccination site fails to heal and the lesion continues to expand and necrose. Metastatic lesions can occur. VIG might be effective in the treatment of these lesions.

This slide shows a picture of a child with a fatal case of Progressive Vaccinia. It should be noted that this child has an immunodeficiency.

This slide shows a picture of a child with hypogammaglobulinemia and progressive vaccinia. There is extensive necrosis of the primary inoculation site with extension along the entire left upper arm. Despite heroic medical efforts, the disease progressed until surgical removal of the bulk of the lesions accompanied by massive infusions of antibody and chemotherapy resulted in complete cure. The man is alive and functioning today.

There are two products available to counteract serious side effects related to the smallpox vaccine: Vaccinia immunoglobulin called VIG and Cidofovir.

VIG is a product derived from the blood plasma of previously vaccinated people that contains antibodies against the vaccinia virus. It is unclear how well VIG works to stop those complications. The supply of VIG is low, and current stocks date back to the smallpox eradication campaign. Currently, a company is working to producing more VIG.

Cidofovir, an anti-viral drug used to treat Cytomegalovirus or CMV, may also be used. Limited data from animal studies suggests that the drug may be effective against the vaccinia virus. However, Cidofovir may cause kidney damage, is extremely expensive and must be given in a hospital.

At this time both products are considered experimental for treating complications of the smallpox vaccine.

For more information on identification and treatment of adverse effects related to the smallpox vaccine, please visit the CDC's website: http://www.bt.cdc.gov/training/smallpoxvaccine/reactions/default.htm.