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## **Raising awareness about the importance of chickenpox vaccination in children**

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## Abstract

**Introduction:** Varicella is an acute infectious disease caused by the Varicella zoster virus. It is among one of the most contagious infectious diseases. The main symptoms of the disease are an itchy, papular and vesicular rash on the trunk, face, scalp, extremities, mucous membranes. In addition, there is fever, malaise, headache and muscle aches, enlargement of lymph nodes. In most cases, varicella is mild, but 2-6% of patients may develop dangerous complications. The most common complications include bacterial skin infections, neurological symptoms and acute thrombocytopenia.

**Aim:** The purpose of this study is to present the severe and complicated course of varicella in a 12-month-old patient.

**Results:** On the day of admission, the patient presented symptoms of an exacerbation of the course of varicella. The main symptoms were smallpox eruptions, increasing fever track, and enlarged and painful lymph nodes. During his stay, the patient's condition indicated a severe course of varicella. It was complicated by infection of the skin, subcutaneous tissue and lymph nodes. In addition, tests showed Epstein-Barr virus (EBV) infection and positivity for cat scratch disease. He also developed zoster during his hospitalization. Throughout his stay

in the hospital, many tests and consultations were carried out to clarify his symptoms. With appropriate treatment, the patient's condition improved and he was able to be discharged home after a 3-week hospitalization.

**Conclusions:** The presented case shows the severe course of varicella. Due to recommendations and the patient's too young age, he could not be vaccinated against VZV. In each patient, the course of the disease is unpredictable. Vaccination protects against severe symptoms, and also reduces the risk of developing zoster in the future. In addition, long-term immunity can be acquired through vaccination.

**Key words:** varicella-complications, zoster, vaccinations

## **Introduction**

Varicella is most common in children and is one of the most common infectious diseases of childhood. It is caused by the Varicella and Zoster virus (VZV), which goes into a state of latency in ganglionic neurons after primary infection. [1] After a variable period of time, which can last up to several decades, VZV can reactivate causing Zoster. [2] While reactivation of the virus can occur spontaneously, it can also occur after a trigger such as reduced cellular immunity to the virus. Such a situation can occur in old age or during immunosuppression due to drug treatment or disease, X-ray irradiation, infection, trauma or malignancy. [1]

Transmission of the virus occurs via the droplet route of infection or through contact of the vesicular fluid with mucous membranes or damaged skin. Varicella manifests as a diffuse, itchy, vesicular rash, with fever and malaise appearing just before or on the day the rash appears. The infectious period begins 1 to 2 days before the rash appears and lasts until the

lesions are covered with scabs, an average of 7 days. The incubation period lasts 10 to 21 days, averaging 14 to 16 days. The lesions begin as macules, progressing to papules, then to vesicles. The rash usually starts on the head, trunk, and then moves to the extremities. In addition, it can appear anywhere, including on mucous membranes. A characteristic feature is that the lesions are in various stages of healing. Lesions usually do not leave scars unless they become infected or irritated. [3]

The most common complication of VZV in children is a secondary bacterial skin infection caused by Staphylococcus or Streptococcus. Acute cerebellar ataxia is the most common extracutaneous complication. Encephalitis can also occur, leading to seizures and coma. Rarer complications include aseptic meningitis, Guillain- Barré syndrome, hepatitis, myocarditis, hemorrhagic varicella, typhoid, uveitis and iritis. Immunocompromised children are at greater risk of severe disease, as well as serious complications and even death. [4]

### **Case report**

A 12-month-old patient admitted to the Children's Ward for increasing symptoms of varicella. Smallpox eruptions had been present for four days, and for two days there had been an increasing fever track to 39.5 degrees Celsius with mediocre response to antipyretics. On the day of the report, the patient consulted Usual Care with recommendations for symptomatic and antipyretic treatment. After visiting Usual Care from the evening hours, the patient's mother noticed stiffening of the neck muscles. The child had been breastfed. He had not taken solid food for several days, but willingly took liquids by mouth. The child was weakened. Diuresis was normal. No other symptoms.

The child is under the care of an allergologist due to skin lesions. He is taking Zyrtec on a regular basis. Allergy to cow's milk, beta lactoglobulin and egg white. Vaccinated according to the mandatory vaccination calendar.

Born on time by natural forces from pregnancy two, second birth. Birth weight 3300g, 10 points on the Apgar scale. Perinatal period uncomplicated.

On admission on physical examination, the general condition was average, the child was crying, restless, irritable. Body weight was 10.9 kilograms. Body temperature was 38.8 degrees Celsius. Dry, atopic skin with numerous desquamative pox lesions. In the right supraclavicular area, a palpable thickening measuring approximately 2x3 cm. The skin around

and above the lesion was reddened and warm, painful to palpation. Oral cavity normal, mucous membranes moist, throat pale, tonsils not enlarged. Otoscopically narrow ear canals - unable to evaluate the tympanic membrane. Over the lung fields, alveolar murmur normal, heart tones loud, pathological murmurs were not found. On examination, abdomen soft, non-painful, peritoneal signs negative. Peristalsis alive, parenchymal organs not enlarged. Perineal area normal. Meningeal symptoms difficult to evaluate due to the resistance caused by the lesion in the supraclavicular area.

An antigen test for COVID-19 was performed - the result was negative.

Ultrasound of the right supraclavicular region showed a cluster of several lymph nodes. The largest 12x9 mm and 11x8 mm. Above the nodes swollen subcutaneous tissue to a thickness of 6-7 mm.

In laboratory tests, attention was drawn to microcytic anemia. Hemoglobin value 7.2 g/dl, hematocrit 23.9%, MCV 58.4 fL. There was also thrombocytopenia  $64 \times 10^9 /L$ . In addition, inflammatory markers were increased, CRP 10.3 ng/dL, PCT 1.2 ng/ml. LDH level of 465 U/L was also elevated. Hand smear was abnormal, there was rejuvenation to metamyelocyte 3%, clubbing 19%, divided neutrocytes 48%, eosinocytes 2%, basocytes 1%, monocytes 12%, lymphocytes 13%, reactive lymphocytes 2%, anisocytosis, hypochromia. In a general urine examination, leukocytes loosely cover the visual field. Treatment included hydration, antipyretic treatment and antibiotic therapy with clindamycin.

Follow-up tests performed 12 hours after admission showed significant anemia (HGB 6.4 g/dl, WBC  $3.52 \times 10^{12}/L$ ), increased platelet levels, increasing inflammatory exponents (CRP 14 mg/dl, PCT 17.7 ng/ml). After securing urine cultures, blood cultures, and a swab from a skin lesion located in the right shoulder area, Biotraxone and Heviran were added to the treatment. A chest X-ray was performed and the result was normal. Abdominal ultrasound showed splenomegaly. Poor-oleucocyte irradiated red blood cell concentrate without complications was overlooked. The boy's vital signs were monitored. On examination, tachycardia 140-160/min, tachypnoe of about 30 breaths/min, spO<sub>2</sub> 94%. Diuresis and fluid balance were also monitored. Due to abnormal blood smear - the examination was consulted in the Cytohematology Laboratory of UCK WUM - blasts were not found, clear anisocytosis of red blood cells, numerous anuloocytes present, granulocyte nuclei have PELGER anomaly.

On the next day, despite the applied treatment, the boy's condition was average, the fever was still persistent, peripheral edema appeared, weight gain of about 1 kg. Follow-up examinations were performed: further increase of inflammatory markers (CRP 19.26, PCT 23.74 ng/mL), improvement of red blood cell parameters, APTT prolongation, with normal INR, hypoalbuminemia, high NT-pro BNP level 2110.0 pg/mL, ionically balanced, normal renal and hepatic parameters. Antibiotic therapy was modified by discontinuing Clindamycin and starting Vancomycin.

Subsequent follow-up examinations showed a gradual decrease in inflammatory exponents, a slight improvement in general condition, and resolution of fever. Control ultrasound of lymph nodes showed the absence of features of abscess in the altered body area (right shoulder area). The boy continued to have peripheral edema, tachycardia, tachypnoe. Furosemide was started, resulting in increased diuresis, gradual resolution of edema, improvement in vital signs.

Laboratory tests were repeatedly controlled during the hospitalization. Subsequent follow-up examinations noted a decrease in inflammatory exponents, a decrease in cardiac enzymes, normal levels of albumin, total protein, normal coagulogram. Antibiotic-protected microbiological results were obtained: sterile urine culture (urine control tests normal), blood culture *Staphylococcus epidermidis* MRCNS sensitive to Vancomycin, wound culture: *Streptococcus pyogenes* and *Staphylococcus aureus* - sensitive to the applied Biotrkason and Vancomycin. In view of the above results, antibiotic therapy was continued. In control blood cultures taken after 10 days of targeted antibiotic therapy, no bacterial growths were obtained.

The antibiotic therapy used: Clindamycin 2 days, Biotrkason 21 days, vancomycin 14 days, Heviran 5 days iv, followed by 5 days p.o, sumamed 5 days p.o Sodium compresses and ichthammol ointment were applied locally to the skin lesion, resulting in the outflow of purulent contents.

The child was consulted by a pediatric surgeon. During the consultation, drainage of the abscess was obtained. After obtaining cultures from the wound, a topical ointment with clindamycin was included. After application of the ointment, the boy developed urticarial lesions - the ointment was discontinued, and for this reason a single dose of Dexaven was included.

On the following day after systemic steroid therapy, Zoster skin lesions appeared in the right mandibular area, and ACICLOVIR p.o. and topical was included again. After several days, complete resolution of the lesions was achieved. In addition, due to atopic lesions and

increased pruritus, clemastinum (due to the fact that there was vomiting after hydroxyzinum), cholesterol ointment, cholesterol ointment with Hydrocortizone, emollients, periodic baths in potassium permanganate (during the occurrence of smallpox lesions on the skin) were used. During hospitalization, the patient was consulted twice by cardiology - cardiac anatomy normal, high Nt-pro BNP associated with severe infection - normalization occurred at discharge. Abdominal ultrasound was performed again - the result was normal, USG of the skin lesion showed no abscess.

Diagnostics was performed for the cause of lymphadenitis. Positive EBV IgM antibodies was found, with negative IgG, which could explain thrombocytopenia and splenomegaly on ultrasound. CMV infection and toxoplasmosis were ruled out. A questionable IgG antibody result for cat's scratch disease was obtained, and after about 2 weeks the antibody level was checked, obtaining a positive IgG titer - for this reason Sumamed was added to the treatment.

Due to the severity of the infection, tests for immune disorders were taken. Elevated IgG and IgM titers were shown, normal IgE, IgA, in addition, C4 complement component level was normal. HIV non-reactive. No food or respiratory allergies were found. Tests were taken to check iron balance. Normal reticulocytosis, elevated ferritin level, normal iron, microcytosis in morphology.

On the day of discharge, the boy in general good condition. Active, eager to play. On the skin visible post-pox, atopic, itchy lesions. Lesion in the right supraclavicular area still swollen, soft, shrinking, without redness on the skin. Healed oozing lesions. Negative inflammatory exponents. Discharged home in good general condition with recommendations.

## **Discussion**

Vaccination against varicella has been available in Poland for many years. They are recommended for all people who have not suffered from varicella. The vaccine can be given from the age of 9 months, but is most often recommended for administration from 13-14 months. Vaccination is compulsory and free of charge for children under 12 years of age at risk of severe disease: children diagnosed with acute lymphoblastic leukemia in remission, with severe immunodeficiency, in the period preceding treatment that causes immunodeficiency - i.e. cancer chemotherapy, organ transplantation and related immunosuppressive treatment, chronic treatment with high-dose systemic corticosteroids. Vaccination should also be administered to children in the environment of those with

indications for vaccination, as well as children staying in care and education facilities, nursing and care facilities and care and treatment facilities, as well as children attending nurseries. [5]

The risk of infection for non-immunized persons after household contact with an infected person is estimated at 61% to 100%. In the period before the introduction of the varicella vaccination program, it was estimated that there were 4 million cases of varicella in the US each year. The United States was the first country to implement universal varicella vaccination in 1995. Twenty-five years after the introduction of the varicella vaccination program in the United States, the reduction in the incidence of varicella was over 97%. [6]

It has been calculated that the cost of preventing varicella through vaccination is much less than treating varicella. Even if there are no complications, the child's illness causes indirect costs, i.e. the parent's sick leave, the use of symptom relievers, and the cost of treating zoster many years after contracting varicella. [7]

Varicella is very common in Poland. Starting from 2002 - except for 2020 - there has been an upward trend in the incidence of varicella. In 2020, there was a decrease in varicella cases. The decrease in the number of cases is due to with the restrictions introduced in connection with the COVID-19 pandemic, which result in, among others, limiting interpersonal contacts, wearing masks and increased social distancing. [8]

In 2020, 83,089 people were vaccinated in Poland as part of obligatory vaccinations of exposed persons and recommended vaccinations, of which the largest percentage were people in the 0-19 age group. [9]

## **Conclusions**

The clinical case presents a complicated course of varicella zoster virus infection. In this example, we can see how important role vaccinations play in preventing complications. It is important to promote primary infection prevention through vaccination. The course of the disease is unpredictable in each patient. Vaccination protects against severe symptoms and also reduces the risk of developing zoster in the future. In addition, a long-term immunity can be acquired through vaccination.

## **Author Contributions**

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#### Conflicts of Interest

The author declares no conflict of interest.

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