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VARICELLA CELLULITIS IN CHILDREN (PERSONAL EXPERIENCE)

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Annotation. *The frequency of complications with varicella is 5-30%, and their level is much higher in patients with immunodeficiencies. In 8-50% of hospitalized children with varicella virus infection develop skin and soft tissue complications such as cellulitis, lymphadenitis, abscess, hysteria, toxicoderma. They are located on vulnerable parts of the body against the background of a state of anergy in a sick child, which is caused by the varicella virus. The aim is highlight clinical and diagnostic features and methods of treatment of varicella virus cellulitis in children based on own experience and according to literature sources. The high frequency of complications is associated with untimely detection of signs of inflammation and untimely treatment in case of secondary flora joining. The main etiological factors of superinfection are β-hemolytic streptococcus group A and staphylococcus aureus. Recently, cellulitis of the subcutaneous tissue is one of the most serious complications in patients with varicella virus infection. The clinical picture of this complication includes local and general manifestations. Local symptoms are accompanied by pronounced redness in the affected area, a significant increase in tissue volume due to swelling, intense, throbbing pain that worsens with touch or movement, the presence of purulent secretions from the affected area, compaction or softening of tissues at the site of the lesion, local hyperthermia. Treatment of varicella cellulitis involves a wide range of measures, which include: antibiotic therapy, drainage of purulent foci, symptomatic treatment, local treatment, supportive therapy, physiotherapy, observation and control. Before determining the optimal antibiotic, it is important to take into account the regional characteristics of the resistance of microorganisms and information about the typical causative agents of varicella cellulitis. Broad-spectrum antibiotics such as amoxicillin with clavulanic acid, ceftriaxone, clindamycin, or vancomycin are usually used for treatment. So, the main etiological factors causing complications in the form of necrotic cellulitis on the background of varicella virus are β-hemolytic streptococcus group A and Staphylococcus aureus. Diagnosis of varicella cellulitis includes a set of examination methods to confirm the diagnosis: daily examination of the child's body surface for inflammatory foci. The optimal treatment tactic is combined therapy (surgical and conservative treatment). Vaccination is recommended for children who are in risk groups - patients with oncology who receive cytostatics, corticosteroids; children with congenital and acquired immunodeficiencies.*

Keywords: *varicella cellulitis, skin infections, pediatric surgery, diagnosis, treatment.*

Introduction

Every year in the world, 80-90 million people get sick with varicella virus infection. There are about 4 million people in the USA, of which 11,000-13,500 are hospitalized, and 100-150 deaths are registered [30]. In France, the incidence of varicella virus infection is about 700,000 cases per year, of which 3,500 require hospitalization, 15-25 cases of the disease end in death [1, 19]. 100,000 to 150,000 cases of the disease are registered in Ukraine every year [25]. Yes, in recent years there has been a trend towards their growth. In the Vinnytsia region, the incidence rate of varicella virus infection in 2023 is 99.98 cases per 100,000 population, according to the Vinnytsia Regional Center for Disease Control and Prevention of the Ministry of Health of Ukraine.

The frequency of complications with varicella virus infection is 5-30%, and their level is much higher in patients with immunodeficiencies [25]. In 8-50% of hospitalized children with varicella virus infection develop skin and soft tissue complications such as cellulitis, lymphadenitis, abscess, hysteria, toxicoderma. They are located on vulnerable parts of the body against the background of a state of anergy in a sick child, which is caused by the varicella virus infection [2, 9]. The main etiological factors causing complications in the form of necrotic cellulitis on the background of varicella virus infection are β-hemolytic streptococcus group A and staphylococcus aureus [3, 23, 28].

It should be noted that the above-mentioned complications are most often observed in children under 5 years of age [4, 7, 31].

The main cause is a secondary bacterial infection that develops on vulnerable areas of the skin against the background of the varicella virus (varicella zoster virus), which causes a state of anergy [8, 9].

The aim is highlight clinical diagnostic features and methods of treatment of varicella cellulitis in childrenbased on own experience and according to literature sources.

Materials and methods

The analysis and generalization of the results of scientific research for the years 1947-2024, selected on the basis of an information search in the scientometric databases Scopus, Web of Science, PubMed, MEDLINE, Google Scholar using the keywords "varicella cellulitis", "skin infections", "varicella virus", "complicated varicella infection", "necrotizing cellulitis"; bacteriological research. A retrospective analysis of the medical records of hospitalized children with a diagnosis of varicella virus infection, who were treated in the Regional Pediatric

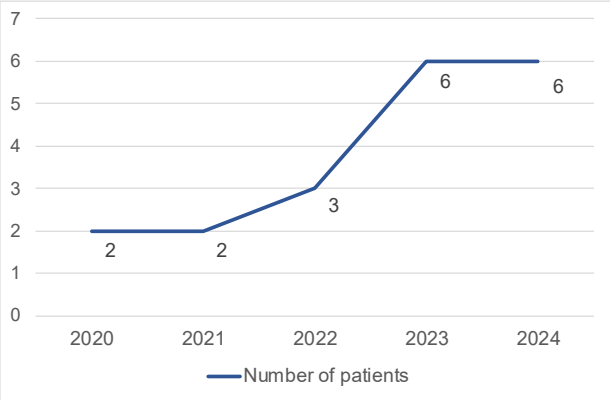

Fig. 1. The total number of patients with varicella cellulitis from 2020 to 2024 receiving inpatient treatment at the Vinnytsia Regional Pediatric Clinical Hospital.

Hospital over the past 5 years, was conducted. According to the results of the study, a complicated course of varicella virus infection in the form of varicella virus infection was noted in 19 patients.

Most varicella cellulitis were diagnosed and treated in 2023 and 2024 (Fig. 1).

Regarding the age distribution, it should be noted that the majority of patients with varicella cellulitis were no more than 5 years old - 17 children (89.5%), which corresponds to the data of the literature of other scientists. According to research data, white varicella cellulitis is more often diagnosed in the summer-autumn period - 12 (63.2%) children were treated during this period of time. The other 7 (36.8%) children received inpatient treatment in the winter-spring period. The average length of stay in the hospital was 13.5 days. In 16 (84.2%) children, according to the bacteriological examination, staphylococcus aureus was also found, in the rest of the patients, β-hemolytic streptococcus, enterobacter.

The study was carried out in accordance with the research work of the Department of Pediatric Surgery "Development of modern and improvement of existing methods of diagnosis, treatment, prevention and rehabilitation of surgical pathology in children" No. 0123U102436 dated 05/04/2023. UDC 616-089.8,616-07/.08:616.1/9.

Results. Discussion

Varicella cellulitis is a bacterial complication that occurs against the background of varicella virus infection, characterized by acute purulent inflammation of the subcutaneous tissue and soft tissues [13, 18].

Since the infection spreads to the surface and deep layers of the skin, soft tissues, it is worth mentioning the structure and physiology of these structures.

The morphological structure of the skin is presented in Figure 2. The skin consists of three main layers: epidermis, dermis, and hypodermis. Each of these layers differs in its unique structure and functions [4, 17].

The epidermis is the outer layer of the skin, which performs a barrier function and protects against environmental influences. It consists of several layers of cells: horny, shiny, granular, spiny and basal layers. The dermis is located under the epidermis and consists of two main layers: papillary and reticular. This layer provides innervation, strength and elasticity of the skin. The hypodermis is the deepest layer of the skin, mainly consisting of fat cells (adipocytes). It is responsible for providing thermal insulation, energy storage, cushioning and protection of internal organs. This layer also contains larger blood vessels and nerves that feed the dermis and epidermis. These three layers work together to provide protection, regulate temperature, sense the environment and perform other important functions for the health of the body [5, 6, 22]. Soft tissue is a group of tissues that support, surround and connect other structures and organs of the body. They include muscles, tendons, ligaments, fascia, adipose tissue, blood vessels, nerves and some other tissues [12, 21, 24].

Among the risk factors for the occurrence of varicella cellulitis, it is worth highlighting:

- age of the child;
- disorders of the immune system: decreased immune response or immunodepression [11];
- improper care of the elements of the rash with varicella virus infection;
- untimely and irrational treatment of varicella virus infection;
- trauma or damage to the skin: damage to the skin, such as scratches, cuts or burns, can create a path for bacteria to enter and contribute to the development of cellulitis [18];
- the presence of concomitant diseases such as: diabetes and chronic skin diseases [15, 27].

The classification of varicella cellulitis takes into account several aspects, namely: the location of the lesion, the degree of severity and the causes.

The localization of varicella cellulitis can be different, but it usually occurs in the area where the first elements of the rash appeared. A very common location of varicella cellulitis is the face and neck area, trunk, back or chest area, limbs, armpits and inguinal areas. Any place where there are sores, cuts, or skin irritations can be a potential site for the development of varicella virus infection.

By degree of severitylight, moderate and severe varicella cellulitis are distinguished, depending on the volume of tissue damage and the threat of systemic complications.

According to the cause of occurrence, they are divided into varicella virus cellulitis, which arose as a result of a bacterial infection, and cellulitis, which arose as a result of damage or trauma [13, 31, 33].

According to the source of infection, the following are distinguished: varicella cellultis arising as a result of the complicated course of varicella virus infection [18, 34], varicella cellulitis resulting from mixed infections

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(combination of the VZV virus with HHV6 viruses, CMV infections) or non-infectious factors.

Clinical picture. The clinical picture of this complication includes local and general manifestations. Local symptoms are accompanied by pronounced redness in the affected area, a significant increase in tissue volume due to swelling, intense, throbbing pain that worsens with touch or movement, the presence of purulent secretions from the affected area, compaction or softening of tissues at the site of the lesion, local hyperthermia.

Common symptoms of intoxication include: increase in body temperature, above 38°C, chills, feeling of weakness, fatigue, reduced work capacity, tachycardia, increased sweating [16, 35, 36].

Diagnosis is based on a complex of examinations, which include objective, laboratory, instrumental, and, if necessary, additional examination methods.

Objective examination includes assessment of pain syndrome, assessment of swelling, presence of fluctuations, condition of skin, detection of lesion boundaries, mobility of skin and subcutaneous tissue.

Complex application of laboratory studies plays a significant role in the diagnosis of varicella cellulitis. Among such examinations, hemogram and biochemical blood analysis take an important place. In patients with varicella virus, a general blood test shows leukocytosis with a shift of the leukocyte formula to the left, accelerated ESR, and an increased level of C-reactive protein [10, 37].

Bacteriological examination is mandatory- swabs or aspirate from the site of inflammation or purulent formations for vdetermination of the causative agent, identification of the bacterium that caused the infection, and determination of its sensitivity to antibiotics (antibiotic chart).

Instrumental methods of examination occupy an important place in the examination of patients with a complicated version of varicella virus infection. They play a key role in determining varicella virus infection cellulitis, providing complete information about the condition of soft tissues, the presence of abscesses, the spread of infection and the extent of damage. These include ultrasound, MRI, CT, X-ray, etc.

Ultrasound helps visualize abscesses, assess the location and volume of the inflammatory process and the condition of the surrounding tissues.

Use of ultrasound at assessment of purulent formations includes detection of fluid accumulations, abscesses and purulent cavities. Determining the boundaries of the lesion consists in visualizing the boundaries of inflammation and its spread to neighboring tissues. Doppler imaging makes it possible to assess blood circulation in the damaged area and to detect blood microcirculation disorders [16].

MRI provides detailed visualization of soft tissues, characterized by high resolution for assessing the condition of muscles, fascia and subcutaneous tissue. It also allows you to detect deep-seated abscesses and necrotic changes.

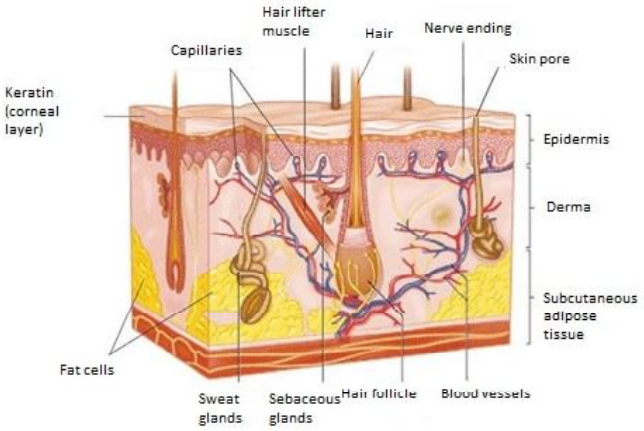

Fig. 2. Skin structure [17].

CT provides an image of the affected area in layers, which allows you to accurately assess the degree of tissue damage. It also allows detect abscesses, swellings and necrotic changes in tissues.

Radiography is used to detect complications, such as assessing the presence of gas in the tissues, which may indicate the presence of gas gangrene or necrotizing fasciitis. It is also used to assess bone health and identify possible osteomyelitis, which is an infection of bone tissue.

With varicella virus infection, in addition to varicella cellulitis, such complications as: abscess, necrotic fasciitis, osteomyelitis, cellulitis, gangrene and other skin lesions may occur.

An abscess can occur due to the penetration of bacteria into the tissue through a wound, trauma, or other damage [29].

An abscess is usually limited to a specific area, while varicella cellulitis has a more widespread nature, covering wider areas of soft tissues.

With necrotic fasciitisthe infection spreads quickly through the fascial spaces (thin membranes of connective tissue surrounding the muscles) and can cover large areas of the body. Tissue necrosis occurs quickly. This condition is characterized by rapid progression, severe pain, edema, red or purplish skin, blisters, tissue necrosis, and systemic symptoms such as fever, tachycardia, hypotension, and sepsis [21].

Cellulite is characterized by diffuse inflammation of the skin and subcutaneous fat. The main symptoms include swelling, redness, pain, increased local temperature and sometimes fever [34]. It can occur on any part of the body, but most often affects the legs, face or hands. It is usually limited to the superficial and deep layers of the skin and subcutaneous fat [26].

Gangrene is a serious impression of tissues with their necrosis, which can be caused by infectious processes, impaired blood circulation or other factors. It is characterized by a dark color of the affected areas, severe pain, necrosis and a characteristic smell.

Treatment of varicella cellulitis involves a wide range of

measures, which should include: antibiotic therapy, drainage of purulent foci, symptomatic treatment, local treatment, supportive therapy, physiotherapy, observation and control [20].

Before determining the optimal antibiotic, it is important to take into account the regional characteristics of the resistance of microorganisms and information about the typical causative agents of varicella cellulitis. Broad-spectrum antibiotics such as amoxicillin with clavulanic acid, ceftriaxone, clindamycin, or vancomycin are usually used for treatment.[32].

After receiving the results of bacteriological culture and determining the sensitivity of microorganisms to antibiotics, therapy can be adjusted for maximum treatment effectiveness [14].

The duration of the course of antibiotics usually depends on the severity of the disease and the dynamics of clinical symptoms, but usually the treatment lasts for 7 - 14 days.

Drainage of purulent formations isa procedure that consists in removing pus from affected tissues to prevent further spread of infection and promote faster recovery. Drainage can be performed using a variety of methods, including the installation of drainage systems or surgical opening and drainage of purulent cavities [5]. This procedure helps to ensure the outflow of pus and reduce the pressure of the formed pus focus, which promotes tissue healing and prevents complications.

The procedure for installing drainage systems is carried out in the following sequence:

Preparation of the patient for the procedure: taking into account the recommendations of the doctor, the patient can receive local or general anesthesia. In addition, antiseptic treatment of the affected area can be performed before the drainage is installed [26].

Choosing the place to insert the drain: usually the area with the largest accumulation of pus is chosen as the optimal place to insert the drain into the pus cavity.

Installation of a drainage system: usually, special drainage tubes or catheters are used, which are inserted into the cavity through an incision or a small wound. The drain can be connected to a plastic container or a vacuum suction system for efficient manure removal.

Fixation of the drain: once the drain is placed, it is secured locally to prevent it from shifting or falling out.

Monitoring and care: after the drainage is installed, the patient is under medical supervision to monitor the condition of the affected tissues and the functioning of the drainage system.

The procedure for making incisions for varicella virus cellulitis using a hypertonic solution includes creating small incisions up to 1 cm or holes in the skin or soft tissues of the damaged area to facilitate drainage of purulent formations. During this procedure, the doctor makes small incisions to create access to the pus cavity, and then injects a hypertonic solution [19].

A hypertonic solution, which usually contains sodium chloride or other salts in a high concentration, is used to speed up the removal of excess fluid from the cavity and ensure better drainage. It helps remove pus and other harmful substances from the affected tissues, helping to clean them and reduce inflammation.

Incisions with hypertonic solution are an important component of the surgical treatment of varicella cellulitis, as they help to improve drainage and promote faster recovery.

Symptomatic treatment of varicella cellulitis is aimed at reducing discomfort and relieving symptoms in patients. The main approaches to symptomatic treatment include the use of nonsteroidal anti-inflammatory drugs (for example, "Paracetamol" or "Ibuprofen") to reduce pain, inflammation, and reduce temperature [8]. Recently, zinc oxide preparations have been used to reduce itching in children with caricella virus (e.g. "Calamine", "Vetryanka stop", "Pouder Plin"), which dry the skin in the place of the vesicle. However, the above-mentioned drugs do not have an anti-inflammatory effect and relieves the symptoms of a varicella virus infection rash. However, the use of the above-mentioned drugs is ineffective in the complicated course of varicella virus infection in the form of inflammation around the elements of the rash.

In this case, the drugs of choice should be local antiseptics. The most common include: diamond green solution, fucorcin solution, methylene blue solution.

Prevention of varicella viruscellulitis includes the following measures:

- a patient with varicella virus infection should conduct a thorough skin examination every day with timely detection of elements of a rash with swelling and redness.
- spot treatment of rash elements, skin damage with aniline dyes;
- timely prescribed antibacterial drugs in case of complications [27].

We give an example of a complicated course of varicella virus infection in a child who was treated in the conditions of Regional Pediatric Hospital in the city of Vinnytsia with signs of cellulitis.

Clinical case. Patient A., 9 years old, on the 8th day of illness turned to the Regional Pediatric Hospital, was previously examined by a family doctor, and was diagnosed with varicella virus infection. In an outpatient setting, she received non-steroidal anti-inflammatory drugs, desensitizing therapy, and applied "Calamine" locally. Upon admission to the hospital, areas of infiltration, edema, and local hyperemia of soft tissues were noted in the left scapular area. On the basis of the anamnesis of the disease, objective examination, laboratory tests, a complication of varicella virus infection in the form of varicella cellulitis was diagnosed. Laboratory tests were performed: general blood analysis, biochemical blood analysis, blood sugar, general urinalysis. According to additional studies, hyperleukocytosis with a slight shift of

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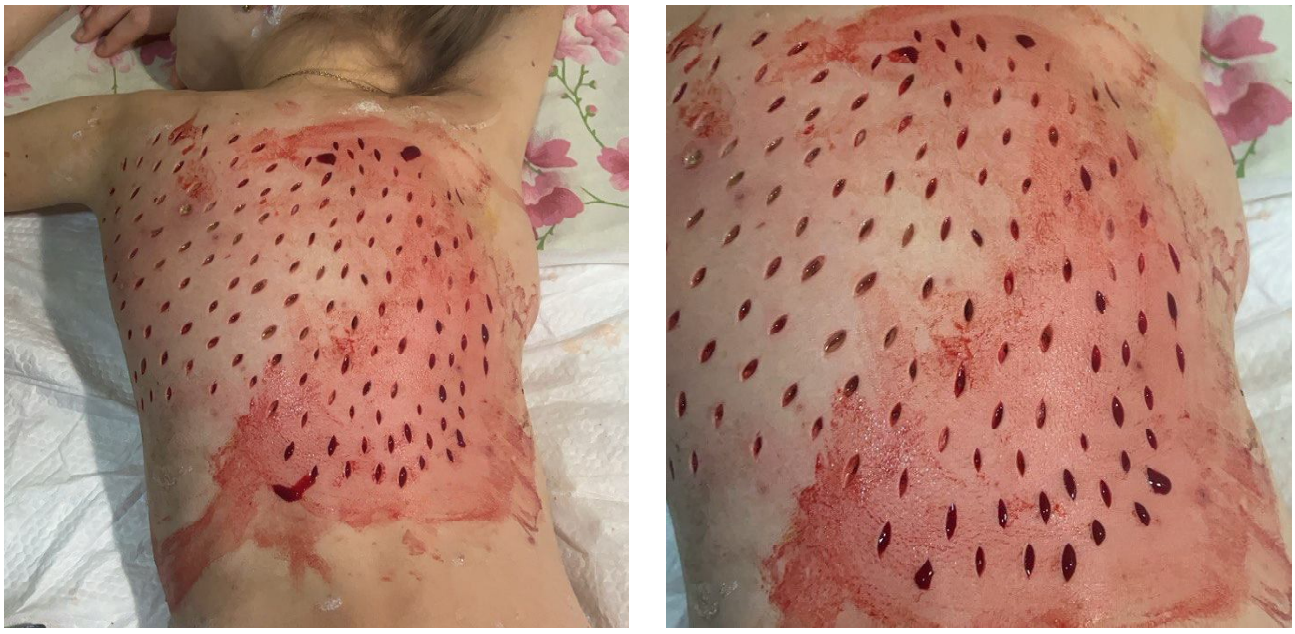

Fig. 3. Patient A., age 9. Diagnosis: varicella virus infection, severe course, varicella cellulitis.

the formula to the left, an elevated level of ESR, C-reactive protein was higher than reference values.

Status localis: in the left scapular area, infiltration, edema and local hyperemia of soft tissues were detected, which rapidly increased, fluctuation was determined.

The child underwent surgery: opening and drainage of varicella cellulitis in the left scapular region. The operation was performed under general anesthesia. The operative field was treated with betadine three times. Cuts of up to 1 cm were made in a staggered manner within the limits of infiltratively changed tissues to the border with healthy tissues. The incisions were opened with a clamp - serous and hemorrhagic contents were released. The material for bacteriological research was taken. Overlaid bandages with magnesium sulfate 25% (Fig. 3).

Infusion therapy was prescribed in a total volume of 1000-1400 ml/day for 5 days, antibiotic therapy - "Cefotaxime" for 5 days, Paracetamol solution 40 ml for pain syndrome and hyperthermia.

The postoperative course was uneventful. On the 13th day, the child was discharged from the hospital in satisfactory condition for further outpatient treatment at the place of residence.

According to bacteriological research, the causative agent of group A streptococcus was obtained, which was sensitive to "Ampicillin" and insensitive to "Cefotaxime". Taking into account the data of the bacteriological examination, the antibiotic "Ampicillin" was prescribed instead of "Cefotaxime".

Taking into account data from the literature and own observations, it should be noted that varicella virus cellulitis, the cause of which is a secondary bacterial infection (group A streptococcus, staphylococcus aureus, mixed infections), which develops on vulnerable areas of the skin under the influence of the varicella virus and spreads to superficial and deep skin layers, soft tissues. Risk factors for the development of cellulitis include the following: disorders of the immune system; improper care of the elements of the rash; injuries or damage to the skin; concomitant diseases: the presence of other diseases, such as diabetes, immunodeficiency states or chronic skin diseases; age and gender. Treatment of varicella cellulitis involves: antibiotic therapy, drainage of purulent foci, symptomatic treatment, local treatment, supportive therapy, physiotherapy, observation and control.

Empiric therapy based on typical pathogens and microorganisms causing infections may be used as initial treatment.

Conclusions and prospects for further development

1. The main etiological factors causing complications in the form of necrotic cellulitis on the background of varicella virus infection are ?-hemolytic streptococcus group A and Staphylococcus aureus.

2. Diagnosis of varicella cellulitis includes a set of examination methods to confirm the diagnosis: daily examination of the child's body surface for inflammatory foci.

3. The optimal treatment tactic is combined therapy (surgical and conservative treatment).

4. Vaccination is recommended for children who are in risk groups - patients with oncology who receive cytostatics, corticosteroids; children with congenital and acquired immunodeficiencies.

The perspective of further developments is to improve the methods of early diagnosis, treatment, reduction of postoperative cosmetic defects.

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ВІТРЯНКОВА ФЛЕГМОНА У ДІТЕЙ (ВЛАСНИЙ ДОСВІД)

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Анотація. *Частота ускладнень при вітряній віспі становить 5-30%, а у хворих із імунодефіцитами їх рівень значно більший. У 8-50% госпіталізованих дітей з вітряною віспою розвиваються ускладнення зі сторони шкіри та м'яких тканин такі як: флегмона, лімфаденіт, абсцес, бешиха, токсикодермія. Вони розташовуються на вразливих ділянках тіла на тлі стану анергії у хворої дитини, який викликаний вірусом вітряної віспи. Висока частота ускладнень пов'язана із несвоєчасним виявленням ознак запалення та несвоєчасним лікуванням у випадку приєднання вторинної флори. Основними етіологічними чинниками суперінфекції є β-гемолітичний стрептокок групи А і золотистий стафілокок. Останнім часом одним із грізних ускладнень у хворих на вітряну віспу є флегмона підшкірної клітковини. Мета - висвітлити клініко-діагностичні особливості та методи лікування вітрянкової флегмони у дітей на основі власного досвіду та за даними джерел літератури. Клінічна картина даного ускладнення включає в себе місцеві і загальні прояви. Місцеві симптоми супроводжуються вираженим почервонінням в ураженій області, значним збільшенням об'єму тканин внаслідок набряку, інтенсивним, пульсуючим болем, що посилюється при доторканні або русі, наявністю гнійних виділень з ураженої області, ущільненням або розм'якшенням тканин у місці ураження, локальною гіпертермією. Лікування вітрянкової флегмони передбачає широкий спектр заходів, які включають: антибіотикотерапію, дренування гнійних вогнищ, симптоматичне лікування, місцеве лікування, підтримуючу терапію, фізіотерапію, спостереження та контроль. Перед визначенням оптимального антибіотика важливо враховувати регіональні особливості стійкості мікроорганізмів та інформацію щодо типових збудників вітрянкової флегмони. Зазвичай для лікування застосовують антибіотики широкого спектру дії, такі як амоксицилін з клавулановою кислотою, цефтріаксон, кліндаміцин або ванкоміцин. Основними етіологічними чинниками, що спричиняють ускладнення у вигляді некротичної флегмони на тлі вітряної віспи є β-гемолітичний стрептокок групи А і золотистий стафілокок. Діагностика вітрянкової флегмони включає комплекс методів обстеження для підтвердження діагнозу: щоденне обстеження поверхні тіла дитини на предмет запальних вогнищ. Оптимальна тактика лікування, полягає в комбінованій терапії (хірургічне та консервативне лікування). Рекомендовано вакцинацію дітям, які знаходяться в групах ризику - пацієнти з онкопатологією, які отримують цитостатики, кортикостероїди; діти із вродженими і набутими імунодефіцитами.*

Ключові слова: *вітрянкова флегмона, інфекції шкіри, дитяча хірургія, діагностика, лікування.*