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DIAGNOSTICS OF THE EPSTEIN-BARR VIRUS AND ITS SIGNIFICANCE IN MEDICINE

[1] Yodgorova N.T.
[2] Abdieva M.B.
[3] Eshbekova L.Sh.

1. Associate Professor of the Department of Microbiology, Virology, Immunology TTA Candidate of Medical Sciences Yodgorova 1977@ bk . en
2. TTA Faculty of Medicine, 2nd year student, mehrinisoabdiu @ gmail . com , 998991126366+
3. TTA Faculty of Medicine, 2nd year student, eshbekovalobar 14@ gmail . com , 0918+99893290

ABSTRACT

In this literature review, resources on the Epstein-Barr virus, its morphology, diseases caused by it, diagnosis and treatment of the disease, as well as innovative modern methods for diagnosing the Epstein-Barr virus are widely covered. . The development of innovative diagnostic methods and technical convenience made it possible to detect the Epstein-Barr virus in a timely manner and prevent its wide spread among the population. For example, real-time PCR (Real - Time PSR), immuno-PCR, Multiplex PSR , Long - range PSR and other innovative technologies are essential in diagnosing Epstein-Barr virus, which is one of the newer, modern forms of the virus. PCR.

Keywords: Epstein-Barr virus, serological, molecular biological, ELISA, PCR, asymptomatic carriage, autoimmune diseases, lupus erythematosus, rheumatoid arthritis, vasculitis, chronic fatigue syndrome, Burkitt's lymphoma.

INTRODUCTION

Epstein-Barr virus (EBVI) infection is one of the most common diseases. According to WHO, about 55-60% of young children (under 3 years old) are infected with the Epstein-Barr virus, and most of the adult population of the planet (90-98%) has antibodies to EBV. . EBV is ubiquitous and can infect up to 95% of the world's population. In different countries of the world, the incidence ranges from 3-5 to 45 cases per 100,000 population and is a very high rate. EBVI belongs to the group of uncontrolled infections for which there is no specific prevention (vaccination), which, of course, affects the incidence rate. The Epstein-Barr virus was named the Epstein-Barr virus in honor of the scientists who discovered it to Anthony Epstein and Yvonne Barr. Epstein-Barr virus infection is an acute or chronic infection caused by the Epstein-Barr virus from the herpesvirus family (Herpesviridae), which has a favorite feature of lymphoretic and immune systems of the body. According to the International Committee on Taxonomy of Viruses, EBV belongs to the subfamily Herpesvirinae , genus Lymphocryptovirus , type 4 of the human herpes virus. It was first identified from Burkett's lymphoma cells about 35-40 years ago. The virus has a spherical shape with a diameter of up to 180 nm. The structure consists of 4 components: core, capsid, inner and outer shell. The nucleus contains DNA consisting of 2 strands, including up to 80 genes. The viral particle on the surface also contains dozens of glycoproteins necessary for the formation of antibodies that

neutralize the virus.

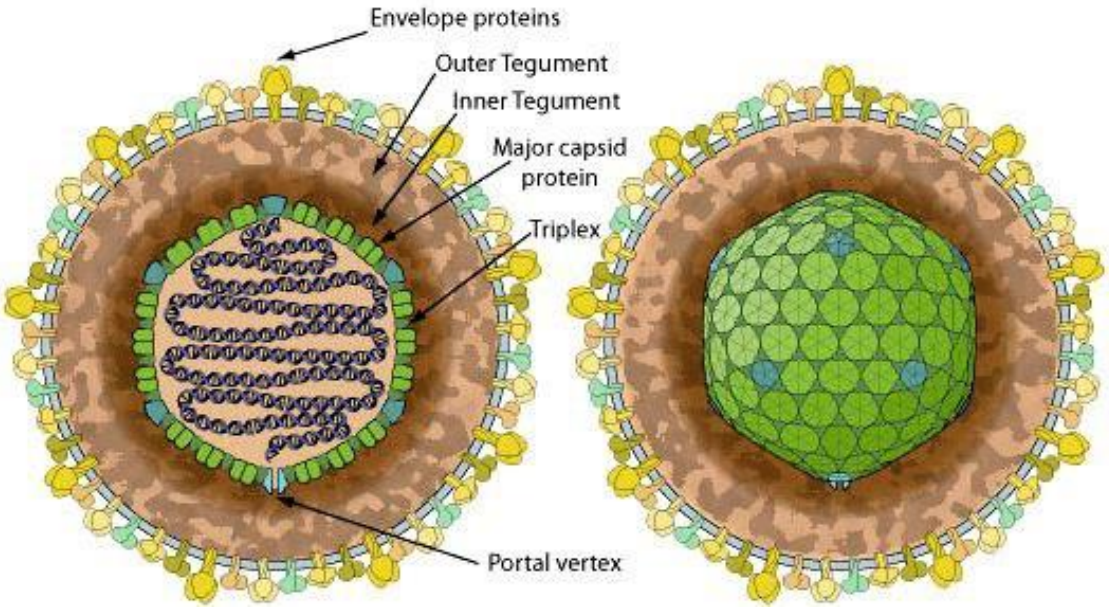

Figure 1. Capsid antigen (VCA); early antigen (EA); nuclear or core antigen (NA or EBNA); membrane antigen (MA).

With different forms of EBVI, the time of their appearance, the meaning is not the same and has its own meaning. The Epstein-Barr virus is relatively stable in the environment, quickly dying on drying, exposure to high temperatures and exposure to common disinfectants (2,3). In biological tissues and fluids, the Epstein-Barr virus can feel good when it enters the bloodstream of a patient infected with EBV, brain cells of a completely healthy person, cells with oncological processes (lymphoma, leukemia, etc.). The virus has a certain tropism (the tendency to infect favorite cells):

1) proximity to the cells of the lymphoretic system (there is damage to the lymph nodes of any group, enlargement of the liver and spleen); 2) proximity to the cells of the immune system (the virus multiplies in B-lymphocytes, where it can remain for life, as a result of which their functional state is disturbed and immunodeficiency occurs); In addition to B-lymphocytes, EBVI also disrupts the cellular connections of immunity (macrophages, NK - natural killers, neutrophils, etc.), which leads to a decrease in the overall resistance of the body to various viral and bacterial infections;

3) proximity to the epithelial cells of the upper respiratory tract and digestive tract, as a result of which children may develop respiratory syndrome (cough, shortness of breath, "false croup"), diarrheal syndrome (loose stools) (1, 4.5).

The Epstein-Barr virus has allergenic properties that manifest themselves in patients with certain symptoms: 20-25% of patients develop allergic rashes, some patients may develop Quincke's edema. Particular attention is paid to this feature of the Epstein-Barr virus. stagnation in the body. Due to the infection of B-lymphocytes, these cells of the immune system have unlimited vital activity (the so-called "cellular immortality"), as well as the ability to continuously synthesize heterophile antibodies (or autoantibodies, for example, antinuclear ones). . (Antibodies, rheumatoid factor, cold agglutinins). EBV lives permanently in these cells. Epstein-Barr virus strains 1 and 2 are currently known, they are serologically indistinguishable.

Causes of Epstein-Barr virus infection

The source of EBVI infection is a patient with clinical manifestations and a virus carrier. The patient is contagious in the last days of the incubation period, in the initial period of the disease, at the height of the disease, as well as during the entire recovery period (up to 6 months after recovery), and up to 20% of them are contagious. Those who get sick occasionally retain the ability to isolate the virus (that is, remain carriers).

Mechanisms of EBV infection:

- aerogenic (airborne transmission), in which saliva and mucus from the oropharynx are contagious and are released when sneezing, coughing, talking, kissing;
- a contact mechanism (contact-household transmission) in which saliva appears from household items (dishes, toys, towels, etc.), but this does not matter due to the instability of the virus in the external environment;
- the transfusion mechanism of infection is allowed (during the transfusion of infected blood and its preparations);
- digestive mechanism (water-alimentary tract);
- at present, a transplacental mechanism of intrauterine infection with the possibility of developing congenital EBVI has been confirmed (6,7,14).

Susceptibility to EBV: Infants (under 1 year of age) are rarely infected with Epstein-Barr virus due to the presence of passive immunity (maternal antibodies), children aged 2 to 10 years are most susceptible to infection and the development of a clinically visible form of EBV. Despite the variety of routes of infection, a good level of immunity is noted in the population (up to 50% of children and up to 85% of adults): most people become infected with carriers without developing symptoms, but with the development of immunity. Therefore, it is believed that the disease is not contagious to the environment of a patient infected with EBV, since most people already have antibodies to the Epstein-Barr virus (8). In rare cases, EBV epidemics can still be observed in closed institutions (military units, dormitories),

EBVI, and especially its frequent manifestations, mononucleosis, are characterized by spring-autumn seasonality. Immunity is strong and lifelong after infection. It is impossible to get sick again with an acute form of EBVI. Repeated cases of the disease are associated with relapse or the development of a chronic form of the disease and its exacerbation.

The route of penetration of the Epstein-Barr virus into humans: The entrance of infection is the mucous membranes of the oropharynx and nasopharynx, where the virus multiplies and forms a nonspecific (primary) defense. The results of primary infection are influenced by: general immunity, concomitant diseases, the state of infection entry (presence or absence). Chronic diseases (oropharynx and nasopharynx), as well as infectious dose and virulence of the pathogen. The consequences of primary infection can be:

1) sanitization (destruction of the virus at the entrance);
2) subclinical (asymptomatic form);
3) clinically determined (manifest) form;

4) primary latent form (in which the virus can multiply and isolate, but there are no clinical signs).

In addition, the virus enters the bloodstream from the entrance of the infection (viremia) - the patient may have a temperature and intoxication. At the entry point, a “main focus” is formed - catarrhal tonsillitis, difficulty in nasal breathing. Subsequently, the virus penetrates into various tissues and organs with a primary lesion of the liver, spleen, lymph nodes, etc. It is during this period that “mononuclear cells of atypical tissues” appear in the blood against the background of moderate proliferation of lymphocytes (9,13).

The outcomes of the disease can be: recovery, chronic EBV infection, asymptomatic carriage, autoimmune diseases (systemic lupus erythematosus, rheumatoid arthritis, Sjögren's syndrome, etc.), oncological diseases, oncological diseases and congenital EBV infection - a fatal outcome is possible.

Symptoms of EBV infection

Depending on the climate, certain clinical forms of EBVI predominate. Infectious mononucleosis is more common in countries with a temperate climate, including the Russian Federation, and in the absence of immunodeficiency, a subclinical (asymptomatic) form of the disease may develop. Also, the Epstein-Barr virus can cause "chronic fatigue syndrome", autoimmune diseases (rheumatic diseases, vasculitis, ulcerative colitis). In countries with a tropical and subtropical climate, malignant neoplasms (Burkitt's lymphosarcoma, nasopharyngeal cancer, etc.) can develop , often with metastases to various organs. In HIV-infected patients, EBVI is combined with hairy leukoplakia of the tongue, brain lymphoma, and other manifestations.

It has now been established that the Epstein-Barr virus is directly associated with the development of acute mononucleosis, chronic EBV (or EBV infection), congenital EBV infection, "chronic fatigue syndrome", lymphoid interstitial pneumonia, hepatitis, oncological lymphoproliferative diseases (lymphoma Burkitt, T-cell lymphoma, nasopharyngeal or NFC carcinoma, leiomyosarcoma, non-Hodgkin's lymphomas), HIV-associated diseases (10,12) ("hairy leukoplakia", brain lymphoma, tumors of common lymph nodes).

Clinic of some diseases of EBV infection:

1. Infectious mononucleosis is manifested, an acute form of the disease with cyclicity and specific symptoms (fever, catarrhal angina, difficulty in nasal breathing, enlarged groups of lymph nodes, liver, spleen, allergic rashes, specific blood changes). Adverse signs from the point of view of the development of chronic EBV infection: protracted nature of the course of infection (prolonged subfebrile condition - 37-37.5 ° - up to 3-6 months, the preservation of enlarged lymph nodes for more than 1.5-3 months);

- the occurrence of a relapse of the disease with the return of symptoms within 1.5-3-4 months after the onset of the primary attack of the disease;
- preservation of IgM antibodies (to EA antigens , VCA EBV) for more than 3 months from the onset of the disease; lack of seroconversion (seroconversion is the loss of IgM antibodies and the formation of IgG antibodies to various antigens of the Epstein-Barr virus);
- not started on time or complete lack of specific treatment.

2. Chronic EBV infection is formed no later than 6 months after an acute infection, and in the absence of a history of acute mononucleosis, it may appear 6 or more months after infection. Often, with a decrease in immunity, the latent form of the infection becomes chronic. Chronic EBV infection can occur in the following forms: chronic active EBV infection, hemophagocytic syndrome associated with EBV, atypical forms of EBV (recurrent bacterial, fungal and other infections of the digestive system, respiratory tract, skin and mucous membranes). Chronic active EBV infection is characterized by a long course and frequent relapses. Patients have weakness, increased fatigue, increased sweating, long-term low temperature of 37.2-37.5 °, skin rash, sometimes articular syndrome, pain in the muscles of the trunk and limbs, heaviness in the right hypochondrium, discomfort in the throat, mild anxiety, cough and nasal congestion, in some patients, neurological diseases - an unexplained headache, memory impairment, sleep disturbances, frequent mood swings, a tendency to depression, neglect of patients, decreased intelligence. Often, patients complain of an increase in one or a group of lymph nodes, there may be an increase in internal organs (spleen and liver). In addition to such complaints, when questioning the patient, recent frequent colds, fungal diseases, other herpes diseases (for example, herpes simplex on the lips or genital herpes, etc.) are added, cough and nasal congestion, neurological diseases, in some patients - unexplained headaches, memory impairment , sleep disturbances, frequent mood swings, a tendency to depression, neglect of patients, decreased intelligence. Often, patients complain of an increase in one or a group of lymph nodes, there may be an increase in internal organs (spleen and liver). In addition to such complaints, when questioning the patient, recent frequent colds, fungal diseases, other herpes diseases (for example, herpes simplex on the lips or genital herpes, etc.) are added, cough and nasal congestion, neurological diseases, in some patients - unexplained headaches, memory impairment , sleep disturbances, frequent mood swings, a tendency to depression, neglect of patients, decreased intelligence. Often, patients complain of an increase in one or a group of lymph nodes, there may be an increase in internal organs (spleen and liver). In addition to such complaints, when questioning the patient, recent frequent colds, fungal diseases, other herpetic diseases (for example, herpes simplex on the lips or genital herpes, etc.) are added. Patients often complain of an increase in one or a group of lymph nodes, internal organs (spleen and liver). In addition to such complaints, when questioning the patient, recent frequent colds, fungal diseases, other herpetic diseases (for example, herpes simplex on the lips or genital herpes, etc.) are added. Patients often complain of an increase in one or a group of lymph nodes, internal organs (spleen and liver). In addition to such complaints, when questioning the patient, recent frequent colds, fungal diseases, other herpes diseases (for example, herpes simplex on the lips or genital herpes, etc.) are added to confirm the clinical data, as well as laboratory signs (changes in the blood, immune status , specific antibody tests). In chronic active EBV infection, the process is generalized with a significant decrease in immunity, and damage to internal organs can lead to the development of meningitis, encephalitis, polyradiculoneuritis, myocarditis, glomerulonephritis, pneumonia, etc. Hemophagocytic syndrome associated with EBV manifests itself as anemia or pancytopenia (decrease in the content of almost all elements of the blood, associated with the inhibition of hematopoietic germs). Patients have fever (wave-like or intermittent, in which a sudden and gradual increase in temperature may return to normal), swollen lymph nodes, liver and spleen, impaired liver function,

Atypical forms of EBVI: often it is an unknown fever that lasts for months, years, accompanied by an increase in lymph nodes, sometimes with the appearance of joint and muscle pain; another option is secondary immunodeficiency with frequent viral, bacterial, fungal infections.

3. Congenital EBV infection occurs when there is an acute form of EBV or chronic active EBV infection during the mother's pregnancy. It is characterized by possible damage to the internal organs of the child in the form of interstitial pneumonia, encephalitis, myocarditis, etc. Premature birth, premature birth are possible. In the blood of a newborn, maternal antibodies to the Epstein-Barr virus (IgG antigens EBNA , VCA , EA) and the child's own antibodies (IgM antigens EA , IgM to VCA antigens), unambiguously confirming intrauterine infection (11,15).).

4. “Chronic fatigue syndrome” is characterized by constant fatigue that does not go away after a long and proper rest. Patients with chronic fatigue syndrome experience muscle weakness, periods of apathy, depression, mood swings, irritability, etc. Characteristic anger and aggression. Patients are lethargic, complain of memory deterioration, mental decline. Patients sleep poorly, and the falling asleep phase is disturbed, intermittent sleep is observed, insomnia and drowsiness are possible during the day. temperature, posture disorder, joint pain.

The risk group includes people with increased physical and mental stress, people in acute stressful situations and people in chronic stress.

5. HIV related diseases

"Hairy leukoplakia" manifests itself in a severe form of the mucous membrane of the tongue and oral cavity, more often against the background of immunodeficiency associated with HIV infection. White folds appear on the lateral surfaces of the tongue, as well as on the mucous membrane of the cheeks and gums, which gradually merge, forming white plates with an uneven surface, like furrows, cracks and erosively covered surfaces. As a rule, there is no pain in this disease. Lymphoid interstitial pneumonia is a polyetiological disease (associated with pneumocystitis, as well as with EBV) and is characterized by shortness of breath, ineffective cough. Against the background of temperature and signs of intoxication, as well as progressive weight loss in patients. The patient has enlarged liver and spleen, enlarged lymph nodes and salivary glands. X-ray examination: bilateral lower lobe interstitial foci of inflammation of the lung tissue, with enlarged roots, structureless.

6. Oncological lymphoproliferative diseases (Burkitt's lymphoma, nasopharyngeal cancer - NFC, T-cell lymphoma, non-Hodgkin's lymphoma, etc.)

Diagnosis of Epstein-Barr virus infection

1. The initial diagnosis is always established on the basis of clinical and epidemiological data. Suspicion of EBVI is confirmed by clinical and laboratory studies, in particular, a general blood test, which can reveal indirect signs of viral activity: lymphomonocytosis (increased number of lymphocytes, monocytes), less often monocytosis in lymphopenia (increased monocytes with a decrease in lymphocytes), thrombocytosis (increased platelets) , anemia (decrease in red blood cells and hemoglobin), atypical mononuclear cells appear in the blood. Atypical mononuclear cells (or virocytes) are mutated lymphocytes that have some similarity with monocytes in their morphological features. These are mononuclear cells, these are young cells that appear in the blood to fight viruses. It is the last sign that explains the appearance of EBVI (especially in the acute form). The diagnosis of infectious mononucleosis is confirmed in the presence of more than

10% of atypical mononuclear cells in the blood, but their number can vary from 10 to 50% or more. For the qualitative and quantitative determination of atypical mononuclear cells, the leukocyte concentration method is used, which is a very sensitive method. Atypical mononuclear cells appear in the first days of the disease, at the height of the disease their number is maximum (40-50% or more), in some patients their appearance is noted a week after the onset of the disease. In most patients, atypical mononuclear cells continue to be detected within 2-3 weeks from the onset of the disease, in some patients they disappear at the beginning of the 2nd week of the disease. In 40% of patients, atypical mononuclear cells in the blood continue to be detected for a month or more (in this case, it makes sense to actively prevent the process from becoming chronic). Also, at the initial stage of diagnosis, a biochemical study of blood serum is carried out, in which signs of liver damage are found (a slight increase in bilirubin, an increase in the activity of enzymes - ALT, AST, GGTP, thymol test).

2. The final diagnosis is made after special laboratory tests.

1) Heterophilic test - detection in the blood serum of heterophilic antibodies detected in most patients with EBVI. This is an additional diagnostic method. In response to EBV infection, heterophile antibodies are produced - these are autoantibodies synthesized by infected B-lymphocytes. These include antinuclear antibodies, rheumatic factors, cold agglutinins. They belong to the class of IgM antibodies . They appear in the first 1-2 weeks from the moment of infection, and their gradual increase in the first 3-4 weeks is characteristic, then in the next 2 months it gradually decreases and remains in the blood throughout the entire recovery period (3-4 weeks). 6 months). In the presence of signs of EBV, with a negative result of this test, it is recommended to repeat it after 2 weeks. False positive results for heterophile antibodies in hepatitis, leukemia, lymphoma, can cause conditions such as drug use. Also, positive antibodies of this group may be present in: systemic lupus erythematosus, cryoglobulinemia, syphilis.

Serological tests for antibodies to the Epstein-Barr virus by ELISA (linked enzyme immunoassay)

IgM to VCA (capsid antigen) - is detected in the blood in the first days and weeks of the disease, maximum at the 3-4th week of the disease, can circulate up to 3 months, then their number decreases to an undetectable level. values and disappear completely. Their duration of more than 3 months indicates a long course of the disease. They are found in 90-100% of patients with acute EBVI. IgG to VCA (capsid antigen) - appears in the blood 1-2 months after the onset of the disease, then gradually decreases and remains at the threshold (low level) for life. An increase in their titer is characteristic of an exacerbation of chronic EBVI. From IgM to EA (early antigen) - appears in the blood in the first week of the disease, persists for 2-3 months and disappears. It occurs in 75-90 percent of patients. Preservation of high titers for a long time (more than 3-4 months) is alarming in terms of the formation of a chronic form of EBVI. Their appearance in chronic infection serves as an indicator of reactivation. Often they can be detected during primary infection in carriers of EBV. From IgG to EA (early antigen) - appears at the 3-4th week of the disease, reaches a maximum level at the 4-6th week of the disease, disappears after 3-6 months. The appearance of high titers repeatedly indicates the activation of a chronic infection. IgG to NA -1 or EBNA (nuclear or nuclear antigen) - delayed, as they appear in the blood 1-3 months after the onset of the disease. For a long time (up to 12 months), the titer is

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quite high, then the titer decreases and remains at a threshold (low) level throughout life. In young children (up to 3-4 years old), these antibodies appear later - 4-6 months after infection. If a person has a clear immunodeficiency (AIDS stage with HIV infection, oncological processes, etc.), then these antibodies may not be present. Reactivation of a chronic infection or relapse of acute EBV is observed at high titers of IgG to the NA antigen . Enzyme-linked immunosorbent assay (ELISA) This research method is largely similar to RIA, but differs from it in the use of additional reagents - AG and AT, target enzymes (peroxidase, alkaline phosphatase) and direct methods are developed. This method is widely used in the diagnosis of Epstein-Barr virus (7). If a person has a clear immunodeficiency (AIDS stage with HIV infection, oncological processes, etc.), then these antibodies may not be present. Reactivation of a chronic infection or relapse of acute EBV is observed at high titers of IgG to the NA antigen . Enzyme-linked immunosorbent assay (ELISA) This research method is largely similar to RIA, but differs from it in the use of additional reagents - AG and AT, target enzymes (peroxidase, alkaline phosphatase) and direct methods are developed. This method is widely used in the diagnosis of Epstein-Barr virus (7). If a person has a clear immunodeficiency (AIDS stage with HIV infection, oncological processes, etc.), then these antibodies may not be present. Reactivation of a chronic infection or relapse of acute EBV is observed at high titers of IgG to the NA antigen . Enzyme-linked immunosorbent assay (ELISA) This research method is largely similar to RIA, but differs from it in the use of additional reagents - AG and AT, target enzymes (peroxidase, alkaline phosphatase) and direct methods are developed. This method is widely used in the diagnosis of Epstein-Barr virus (7). Reactivation of a chronic infection or relapse of acute EBV is observed at high titers of IgG to the NA antigen . Enzyme-linked immunosorbent assay (ELISA) This research method is largely similar to RIA, but differs from it in the use of additional reagents - AG and AT, target enzymes (peroxidase, alkaline phosphatase) and direct methods are developed. This method is widely used in the diagnosis of Epstein-Barr virus (7). Reactivation of a chronic infection or relapse of acute EBV is observed at high titers of IgG to the NA antigen . Enzyme-linked immunosorbent assay (ELISA) This research method is largely similar to RIA, but differs from it in the use of additional reagents - AG and AT, target enzymes (peroxidase, alkaline phosphatase) and direct methods are developed. This method is widely used in the diagnosis of Epstein-Barr virus (7). Currently, indirect and direct methods of enzyme immunoassay have been developed. This method is widely used in the diagnosis of Epstein-Barr virus (7). Currently, indirect and direct methods of enzyme immunoassay have been developed. This method is widely used in the diagnosis of Epstein-Barr virus (7).

Schemes for interpreting the results. Rules for the qualitative diagnosis of EBV infection: Dynamic laboratory research: in most cases, a single antibody test is not enough to make a diagnosis. Repeated studies are required after 2 weeks, 4 weeks, 1.5 months, 3 and 6 months. The dynamic study algorithm and its necessity are determined only by the attending physician!
- compare results obtained in the same laboratory.
- there are no general norms for antibody titers; the result is evaluated by the doctor in comparison with the reference values of a certain laboratory, after which it is concluded how many times the desired antibody titer has increased compared to the reference value. The

threshold level, as a rule, does not exceed 5-10 times. High titers are diagnosed at a magnification of 15-30x and above.

PCR diagnosis of EBV infection - Epstein-Barr virus DNA can be qualitatively determined using PCR

The material for the study is saliva or oropharyngeal and nasopharyngeal mucus, epithelial cells of the urogenital tract, blood, cerebrospinal fluid, prostate secretion. Both patients and carriers of EBV can have a positive PCR result. Therefore, to distinguish between them, a PCR analysis is carried out with a certain sensitivity: up to 10 copies per sample for carriers and up to 100 copies per sample for active infection. In young children (up to 1-3 years old) it is difficult to diagnose by antibodies, since immunity is not yet sufficiently formed, therefore PCR analysis is useful in this group of patients. The specificity of this method is 100%. false almost excludes positive results. However, PCR analysis can only multiply the virus (more

Immunogram or immunological blood test

There are two types of changes in the immune status in EBVI: An increase in its activity (an increase in the level of interferon, IgA , IgM , IgG in the blood serum, an increase in the CEC, an increase in CD 16+-natural killers, CD 4+ T -helpers or CD 8+ T increase - suppressors). Violation or deficiency of immunity (decrease in IgG , increase in IgM , decrease in the availability of antibodies, decrease in CD 25+ lymphocytes, decrease in CD 16+, CD 4+, CD 8, decrease in phagocytic activity).

Treatment for EBV infection

1) Organizational measures include the hospitalization of patients with acute EBVI in the clinic for infectious diseases, depending on the severity. Patients with reactivation of a chronic infection are more likely to be treated on an outpatient basis. Diet therapy is reduced to complete nutrition with mechanical, chemical sparing of the digestive tract.

2) Special drug therapy for EBVI.

Antiviral drugs (isoprinosine from the first days of life, arbidol from 2 years old, valtrex from 2 years old, famvir from 12 years old, acyclovir from the first days of life, in the absence of other means, but less effective). Interferon preparations (viferon from the first days of life, kipferon from the first days of life, reaferon EU-lipind from 2 years old, interferons for parenteral administration from 2 years old). Interferon inductors (cycloferon from 4 years old, neovir from the first days of life, amixin from 7 years old, anaferon from 3 years old).

Special rules for EBVI therapy:

1) All drugs, doses, courses are determined only by the attending physician 2) After the main course of treatment, a long maintenance course is required 3) The combination of immunomodulators is determined carefully and only by the doctor 3) Drugs to increase the intensity of treatment. Immunocorrection (after studying the immunogram) - immunomodulators (thymogen, polyoxidonium, derinat, likopid, ribomunil, immunorix, roncoleukin, etc.); - hepatoprotectors (karsil, gepaben, hepatofalk, Essentiale, ursosan, ovesol, etc.); - enterosorbents (white coal, filtrum, lactofiltrum, enterosgel, smecta); probiotics (bifidum-

forte, probifor, biovestin, bifiform, etc.); antihistamines (zyrtec, claritin, zodak, erius, etc.); other drugs as indicated. instructions .

Prevention of Epstein-Barr virus infection

There is no special prophylaxis (vaccination). Preventive measures are strengthening the immune system, hardening children, observing precautions when a patient appears in the environment, and observing the rules of personal hygiene. The most common diseases among children are viral. The reason is that the child's immunity is not yet strong enough, has not matured, and it is not always easy for him to cope with many external threats. A child can become infected in different ways. EBV is often shed in body fluids, usually saliva. For this reason, infectious mononucleosis caused by a virus is called the "kissing disease." Infection can occur through transfusion of blood and its components, through things and toys that were with the patient, and the virus is also transmitted from an infected mother to the fetus through the placenta during pregnancy. EBV is easily transmitted by airborne droplets and from a donor to a recipient during bone marrow transplantation.

In the risk group, children under one year of age actively explore the world around them with their mouths, trying to taste absolutely everything and everything that comes to their fingertips. Another “problem” age is children from 3 to 6 years old who regularly attend kindergarten and have many contacts. The incubation period is from 1 to 2 months, after which the children develop vivid symptoms that are characteristic of many viral infections.

However, the virus itself with a complex name is not so terrible, but its consequences are completely unpredictable. In one child, it can be completely ignored, while in another it causes the development of serious conditions and even oncological diseases. Evgeny Olegovich warns that the treatment of one of the diseases associated with EBV - infectious mononucleosis with antibiotics of the penicillin group can cause serious complications. Usually, when a doctor takes mononucleosis for a common bacterial sore throat, such an appointment is erroneous. In this case, exanthema may develop. According to Yevgeny Komarovsky, ordinary children who did not suffer from HIV and other severe diseases of the immune system, mononucleosis caused by EBV, do not need any antiviral treatment, much less need immediate immunostimulants. A well-known pediatrician is sure that the children's body is able to overcome this threat on its own.

In conclusion, we can say that the Epstein-Barr virus in medicine remains an urgent problem throughout the world. The discovery of ELISA and PCR methods used in diagnostics made it possible to detect the disease in a timely manner, treat the disease and prevent complications. In the near future, the Republic of Uzbekistan will receive wide support for technological advances such as molecular genetics, digital microbiology and mass spectrometry methods in microbiological laboratory practice, and this will pave the way for scientific achievements and scientific research in the field of microbiology and virology of our country.

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