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**СИМПТОМАТОЛОГИЯ, ДИАГНОСТИКА,
ПРИНЦИПЫ ЛЕЧЕНИЯ АНЕМИЙ,
ГЕМОБЛАСТОЗОВ**

**SEMEIOTICS, DIAGNOSIS, PRINCIPLES
OF TREATMENT OF ANEMIA
AND LEUKEMIA**

Учебно-методическое пособие



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MOTIVATIONAL CHARACTERISTICS OF SUBJECT

Total academic hours: 3 hours for 3rd year students of the faculty of General Medicine

Aims: to introduce of the students to the basic clinical data, principles of diagnosing and principles treatment of blood diseases (anemia and leukemia).

Objectives:

1. To introduce the students to anamnestic data of anemia.
2. To familiarize the students with the classification of blood diseases.
3. To study the methods of physical examination of patients, suffering from anemia and leukemia.
4. To study the principles of laboratory diagnosing of blood diseases and some of their complications.
5. To study the principles of treatment of blood diseases.
6. To investigate the main methods of blood diseases prevention.

Requirements for the initial level of knowledge: preparing to the seminar, students should get acquainted with the recommended reading materials and materials of previous courses devoted to the blood system.

Test questions on the topic:

1. Definition of anemia.
2. Classifications of anemia.
3. Characteristics of anemic syndrome.
4. Characteristic of sideropenic syndrome.
5. Specific clinical data of folate- and B₁₂-deficiency anemia.
6. Laboratory data of different types of anemia.
7. Classification of leukemias.
8. Characteristics of acute leukemia stages. Clinical and laboratory data.
9. Main clinical and laboratory characteristics of chronic myeloleukemia.
10. Main clinical and laboratory characteristics of chronic lympholeukemia.

ANEMIA

Anemia is a disease, characterized by decreased number of erythrocytes (less than $3.9 \times 10^{12}/l$ in men, less than $3.7 \times 10^{12}/l$ in women) or/and hemoglobin content (less than 130 g/l in men, less than 120 g/l in women, less than 110 g/l in pregnant women) in blood.

Anemia may be an independent condition. Anemia may be associated with leukemia. A doctor should be able to distinguish both forms of anemia.

The classification of anemia according to ICD X principals includes:

- deficiency anemia (iron deficiency, B₁₂ deficiency, folate deficiency, etc.);
- hemolytic anemia (hereditary and acquired);
- aplastic anemia;
- severe posthemorrhagic anemia;
- anemia of chronic diseases;
- other forms of anemia.

The classification according to the degree of anemia depending on the hemoglobin content in a blood unit:

- mild anemia (hemoglobin 110–90 g/l);
- moderate anemia (hemoglobin 90–70 g/l);
- severe anemia (hemoglobin < 70 g/l).

The severity of the anemic syndrome depends on the degree of anemia.

The classification of anemia according to regenerative capacity of the bone marrow:

- regenerative anemia (reticulocyte count is 0.5–1.2 %);
- hyperregenerative anemia (increased reticulocyte count, sometimes 20–30 % in case of hemolytic or haemorrhagic anemia);
- hypo- or aregenerative anemia (reticulocyte count is less than 0.5–1.2 % in case of hypo- or aplastic anemia).

IRON DEFICIENCY ANEMIA

The most common form of anemia is iron deficiency anemia, the problem faced with by public health care systems worldwide.

Etiology and pathogenesis. Iron plays an important role in human body metabolism. Iron is necessary trace element for biochemical processes of oxygenation and reduction, tissue respiration, collagen metabolism etc. The normal content of iron in an organism of a healthy human is 3–4.5 g. The normal iron content results from the balance of iron nutrition, iron transportation, iron distribution in organism and its excretion.

Iron absorption in the human duodenum is limited 1 mg per day or 2–3 mg per day in pregnant women. β -globulin transferrin provides for all of iron transfer in the organism. Transferrin delivers iron to bone marrow, muscles, hepatocytes, liver and spleen monocytes. Tissue ferritin (and its metabolized form of hemosiderin) is a depot of iron. The reversion of ferritin iron into active metabolic iron is a reliable metabolic mechanism. The blood ferritin content of 1 **mcg** corresponds to 8–10 **mg** of ferritin in tissue depots. It is a specific «buffer» and its role is to support a normal iron content in specific areas in case of sudden bleeding. An increased demand of iron is covered by ferritin mobilization. Daily iron loss is normally 0.5–1 mg. In *mensis* period in women an organism loses 1.5–2 mg per day. Pregnant and breastfeeding women lose 4–6 mg. Every day blood plasma of a healthy person transports 30–40 mg of iron to other tissues.

Iron tissue distribution provides 60–70 % for blood hemoglobin, 20–25 % for ferritin depots, 5–10 % for myoglobin, 1 % for tissue respiration enzymes and other tissues catalytic agents.

Pathogenesis of iron deficiency anemia is usually associated with the following mechanisms:

- alimentary iron deficiency (vegetarians, poor people, disabled people, uneducated people with bad knowledge of adequate nutrition);
- intake of powerful iron chelators (tea tannins, wheat phytates);

- donorship;
- repetitive and frequent vein blood analyses;
- disbalance between iron supply and iron demand (in teenagers, in pregnant and breastfeeding women);
- hereditary deficiency of transferrin synthesis;
- resection of proximal part of intestine;
- chronic bleeding of different localization;
- occult bleeding of different localization;
- chronic diarrhea syndrome;
- parasitic infestation of gastrointestinal tract;
- untreated previous severe bleeding;
- chronic intravascular hemolysis.

Clinical signs and classification. The clinical features of iron deficiency anemia includes two syndromes: anemic syndrome and the sideropenic syndrome.

The anemic syndrome accompanies any form of anemia. The anemic syndrome is a direct result of low hemoglobin content or low erythrocyte content in peripheral blood. The syndrome is a clinical manifestation of tissue hypoxia. Patients complaints include dizziness (vertigo), short periods of blur vision sensation, tinnitus, headache, dyspnea, general malaise, weakness, fatigability, drowsiness, low capacity for physical and mental work, conditions similar to memory disorders due to impaired concentration, irritability associated with weakness, and sometimes mild disorders of behavior. The objective data of anemic syndrome includes skin paleness, paleness of mucosae (lips, tongue, oral, conjunctiva etc.) Physical examination also reveals tachycardia; functional cardiac heart murmur is louder at the mitral apical point. The objective signs of dyspnea usually appear in the periods of physical activity usually. Anemic syndrome is particularly marked in patients with underlying atherosclerosis because of comorbidity.

The sideropenic syndrome is sign of tissue iron deficiency. It doesn't result directly from low hemoglobin level. Clinical features of sideropenic syndrome includes mild trophic tissue disorders:

- nails fragility, nails flatness, *koilonichia*;
- *cheilosis* (angular stomatitis with fissures at the corners of the mouth), flat tongue papillae, advanced caries, hair fragility and hair loss, hair dullness;
- sideropenic dysphagia (*Plummer and Vinson syndrome*) — disorders of food bulk moving along the postcricoid part of esophagus;
- sideropenic odynophagia;
- atrophy of the stomach mucosae;
- perverted taste with pica to clay, chalk, dirt, snow, icicles (*pica chlorotica*) and olfaction changes (pleasure smelling some substances with unpleasant odor such as petrol).

Other specific signs of sideropenic syndrome include muscle weakness, sphincter weakness, delivery weakness in pregnant women, mental health

disorders and decreased mental capacity. Sometimes capillary permeability leads to mild feet edema.

Phases of anemia development include latent the iron deficiency stage and the anemic stage. Slow development of iron deficiency leads to gradual decrease of the iron content first in depots, then in transport forms and finally in tissue iron containing enzymes. The abovementioned process describes the so called latent iron deficiency is and associated only with the sideropenic syndrome. Laboratory signs include low level blood of iron content (Fe < 13 mmol/l in men, Fe < 11 mmol/l in women) and blood ferritin content (< 20 mcmol/l or 20 nmol/ml). The hemoglobin content and erythrocyte level are normal during this initial period. The iron-binding capacity level is increased (> 70 mmol/l) and latent iron-binding capacity level is increased too (> 56 mmol/l). Transferrin iron saturation is decreased (< 17 %).

Laboratory tests and laboratory diagnosis of anemia. Laboratory screening of iron-deficiency anemia reveals the abovementioned shifts plus low erythrocyte number and low hemoglobin content in a blood unit according to the definition of the disease. Besides there are low MCH (< 28 pg), high RDV (> 11.5–14.5 %), low RDW (< 80 fl). Anemia is microcytic, and hypochromic. It is hyperregenerative (reticulocytes content is above 0.5–1.2 % and usually reaches 2–3 %).

The treatment principals of iron deficiency anemia include:

- obligatory intake iron containing medicines are necessary;
- oral route of administration are preferable for most people;
- adequate calculation of daily and course dose of iron;
- adequate duration of treatment period;
- two steps of treatment (hemoglobin normalization, iron depot resources recovery);
- sustained follow-up prevention of anemia in high-risk groups;
- dietary adjustment.

Red cell concentrate transfusion is performed in cases of severe anemia (Hb level < 70 g/l).

VITAMIN B₁₂ DEFICIENCY ANEMIA

Etiology and pathogenesis. The major mechanisms of vitamin B₁₂ deficiency anemia include:

- long period of inadequate vitamin intake (minimal daily dosage for an adult is 2.5 mcg); depletion of vitamin tissue store in tissue occurs in 4–5 years;
- stomach diseases and atrophy stomach mucosae;
- extensive stomach resection;
- pancreatic diseases and marked defect of pancreatic secretion of digestive enzymes;
- diseases of distal part of intestine (Chron's disease, resection, etc.);
- chronic diarrhea and malabsorption syndrome.

Clinical signs and diagnosis. Vitamin B₁₂ play an important role in the metabolism of nucleic acids. So the vitamin deficiency leads to a maturation defect of erythrocytes, leucocytes and thrombocytes. The hemogram reveals anemia and mild shift to the left in the leucocyte formula, mild thrombocytopenia. Anemia is hyperchromic (MCH is high), macrocytic (MCV > 100 fl), and hyporegenerative (reticulocytes content < 0.5 %). There are of Cabot rings in erythrocytes of peripheral blood (parts of nucleus). Macrocytic red blood cells provide only defective hemoglobin transfer and tissue oxygenation. That is why the clinical data of B₁₂ deficiency anemia includes the typical anemic syndrome.

Some macrocytic red cells are destroyed in spleen. It results in mild hemolytic jaundice and mild hyperbilirubinemia.

The impairment of nucleic acids metabolism also results in mild defects of the skin, oral cavity, and esophagus epithelia structure. Patients complaints include dysphagia and odynophagia, as well as tongue pain. The tongue is bald and raspberry colored because of papillae flatness.

Vitamin B₁₂ participates both in myelin formation and metabolism of methylmalonic acid. The funicular myelosis syndrome is a specific feature of the vitamin B₁₂ poor content in the organism. Peripheral nerves are usually involved. Demyelination and further axonal degeneration precedes neuronal death. Patients' complaints include numbness, parenthesis in the extremities, disturbances in urinary bladder sphincter and the rectum, *affection of gait*, sometimes mental disorders (irritability, forgetfulness). The objective data of neurological defect includes signs of tactile, pain, temperature sensation impairment paresis of extremities, defective reflexes (diminished or increased), loss of the sense of vibration, ataxia, sometimes dementia.

Impairment the diagnosis of vitamin B₁₂ deficiency anemia is confirmed by the bone marrow investigation (megaloblastic hematopoiesis) and evaluation of the blood content of vitamin B₁₂ investigation.

The treatment principals include:

- elimination of risk factors;
- a course vitamin B₁₂-injections in adequate doses;
- sufficient of long-term therapy;
- a diet rich in vitamin B₁₂ (in accordance with the type of pathogenesis);
- a diet rich in vitamin B₁₂ to provide maintenance of the normal vitamin B₁₂ blood level after recovery.

FOLATE DEFICIENCY ANEMIA

Folates normal content in a healthy person is 5–20 mg. Depletion of the tissue store comes occurs in 4–5 months. High content of folic acid is found in fresh vegetables, fruit, and lettuce. Minimal daily dosage for an adult is 50 mcg. In pregnancy the need for folic acid is higher. B₁₂ vitamin deficit results in the impairment of folic acid tissue metabolism.

The etiology factors of folate deficiency anemia include:

- long period of inadequate vitamin supply;
- diseases of proximal intestine;
- chronic diarrhea and malabsorption syndrome;
- pregnancy;
- adolescence;
- intake of some medicines;
- B₁₂ deficit.

Clinical features of folate deficiency anemia include all signs of B₁₂ vitamin deficiency anemia with the exception of funicular myelosis. The hemogram data are the same. The biochemical blood analysis confirms reveal low folate level.

The treatment principals of folate deficiency anemia include:

- elimination of risk factors;
- folic acid intake in adequate doses;
- diet rich in folates.
- maintenance of normal folate blood level after recovery.

HEMOLYTIC ANEMIA

Hemolytic anemias are a group of anemias caused by excessive hemolysis.

There are hereditary and acquired hemolytic anemias. Acquired anemias may be autoimmune, associated with the blood inflow of hemolytic toxins or medicinal poisoning, causing by macrocytosis etc.

Specific features of this type of anemia include a typical anemic syndrome depending on the severity of anemia, -suprahepatic jaundice with elevated unbound bilirubin in blood serum and reticulocytosis.

Hemolysis may be severe, chronic, or episodic. Severe hemolysis is called hemolytic crisis. The latter has such manifestation as chill, fever, pain in the abdomen, and signs of shock signs. Severe hemolysis sometimes may provoke acute kidney failure.

It is very important to analyze the data of present history (anamnesis morbi) and past history (anamnesis vitae). Elimination of high-risk factors in some variants of acquired anemia is indispensable to life.

APLASTIC ANEMIA

Aplastic anemia is a variant of the disease resulting from the defect of bone marrow erythrocyte precursors. Aplastic anemia may be hereditary and acquired. Acquired anemias — may be associated with the genetic impairment of idiopathic stem cell pool. They may be autoimmune and reversible caused by toxins of different origin. Aplastic anemia develops under the influence of viruses or exposure to radiation. Very often aplastic anemia accompanies leukemia or other hemoblastoses.

The clinical characteristics include the anemic syndrome hyporegenerative anemia, confirmed by laboratory analyses. The anemic syndrome may be severe and lead to anemic coma. Sometimes reticulocytes are totally absent both in the peripheral blood and in bone marrow samples. The biochemical blood analysis reveal normal iron and ferritin content. Other symptoms depends on the etiology of the disease. For example, the clinical form of aplastic anemia caused by leukopenic type of leukemia is usually associated with infectious complications of different localization.

Treatment of aplastic anemia depends on the causative factor and the underlying disease.

LEUKEMIAS

Leukemia is a group of neoplasms originating from marrow stem cells.

The etiology of leukemia is usually insidious in every each specific case of the disease. Possible etiological factors include viruses, chemical agents, or ionizing radiation, unstable individual genetic program, as well as specific pathological features of human genetics.

It is a severe blood disease and it's main feature is uncontrolled hyperplasia of hemopoietic cells in organs of obligate and facultative hematopoiesis with metaplasia of hemopoietic tissue. Deep metabolic disorders, considerable structural and functional lesions alterations in different organs is a consequence of any leukemia.

Leukemias are subdivided into two groups: acute and chronic.

ACUTE LEUKEMIA

Acute leukemia is a malignant tumor arising from bone marrow. The malignant transformation of any pluripotential bone cell leads to it's excessive proliferation. Replacement of normal bone marrow by clonal blast cells leads to depression of normal hematopoiesis. Clonal cell proliferation results in leukemia. The peripheral blood contains excessively increased number of functionally inadequate cells.

The etiology of acute leukemia is usually insidious. In general, the list of etiological factors may include viruses, toxins, or ionizing radiation. Any of the factors is able to provoke mutation of bone marrow pluripotent cell. Some hereditary genetic disorders are associated with malignant bone marrow transformation. There are some arguments for electromagnetic effect leading to the development of acute leukemia.

Classification. FAB classification divides all acute leukemia into the following groups:

- myelodisplastic syndrome;
- acute myeloblastic syndrome (M0–M7 forms);

– acute lymphoblastic syndrome (T-cell form, B-cell form, general acute lymphoblastic leukemia).

Differential diagnosis of acute leukemia forms requires modern specific cytological and cytochemical tests. The hemogram and clinical symptoms give only approximate conclusion about the disease.

Clinical picture of acute leukemia. Clinical features of acute leukemia are quite variable. It depends both on the stage of the disease and on leukemia form. Concomitant diseases also play a role. There are very few symptoms of acute leukemia in the initial period of an acute leukemia. Patients' complaints include fatigue, weakness, sore throat, pain in extremities and joints pain, headaches, easy bruisability, petechiae, and skin paleness. Periods of fever are typical signs of acute leukemia. Periods of temperature are often associated with rigor.

Inflammation of tonsils associated with acute leukemia leads to erroneous diagnosis of common acute tonsillitis. Leucemic tonsillitis is much more severe and presents with deep ulcers covered with greyish deposit. Gums are inflamed too. Necrotic gingivitis is also present. Gingival ulcers are deep and extensive. The oral mucosae is also involved. Oral ulcers are deep. Easy contact bleeding is usual symptom.

Leukemic clonal cells affect the periosteal tissue of jaws. Jaw pain, tooth mobility and loss of teeth are accompany leukemic jaw infiltration, making the patient seek dental help. Blood investigation helps to make the correct diagnosis. Subperiosteal leukemic infiltration of other localization is associated by bone pain.

Dispnoe occurs in the initial period. The pathogenesis of dispnoe is connected with anemic syndrome because of aplastic anemia and heart failure. Hypotension and soft arrhythmic pulse, associated dilation of the heart borders, and dullness of heart sounds are present. The gallop rhythm is sometimes audible as a result of a very severe involvement of the heart muscle.

Hepatomegaly and splenomegaly are characteristics of the disease. The organs are soft, and painful. Splenomegaly is accompanied by jaundice and mild hemorrhagic syndromes. Severe hemorrhagic syndrome is a result of thrombocytopenia. Hemorrhages appear both on the skin and on the mucosa of internal organs. Petechiae diameter may be from 1 mm up to a palm size. The marginal symptoms of hemorrhagic syndrome include rhinorrhea, gingival, gastrointestinal and uterine bleeding, as well as intracranial bleeding. Severe bleeding itself may have a fatal outcome.

Stages of acute leukemia. Acute leukemia typically develops from one stage to another according to the mechanism of deep clonal pathogenesis. As a rule, the stages of the disease include the following.

Stage 1. The first attack of the disease is characterized by a of full clinical picture. This stage includes a period of initial symptoms, a procedure of making the specific diagnosis, an initial course of specific treatment, and the first reliable positive effect. The period of initial symptoms usually includes non-specific symptoms such as weakness, and fatigue. Some forms of the disease may be

asymptomatic at this stage. Only the blood analysis gives chance to suspect a acute leukemia at this stage.

Stage 2. Remission stage. There is a complete and partial remission. The complete remission is characterized by absence of clinical symptoms for 1 month or more, marrow blast cells content less than 5 %, marrow lymphocytes content less than 30 %, peripheral blood hemoglobin level more than 100 g/l, and peripheral blood thrombocytes more than $100 \times 10^9/l$.

The partial remission is characterized by the marrow blast cells content below or no more than 20 %. The clinical symptoms are absent. The peripheral blood data are similar to the data of complete remission.

Stage 3. Relapse of the disease. Pathophysiology of the disease is associated with recurrence of acute leukemia. It results from the failure of the specific therapy in respect of the remaining leukemic clonal cells. So, the clinical picture is more severe than the manifestations at the first stage. It is also more difficult to each success with a comprehensive course of treatment. Bone marrow content of blasts increases excessively. The peripheral blood reflects both cytopenia as for erythrocytes and thrombocytes, leucocytosis originating from clonal leukocytes.

There may be several remissions and relapses of the disease.

Stage 5. It is a period of complete clinical and hematological remission. The duration of this stage can be 5, 7 or even 10 years. Some scientists consider long complete remission as a recovery. Nevertheless, a relapse of acute leukemia may occur in 5, 7, 10 years of remission.

Terminal stage. This period reflects the final phase of clonal progression. It is the time of both absolute depletion of normal hematopoiesis and absolute resistance to specific therapy. At the terminal stage a patient presents with cachexia. The hemorrhagic syndrome may become life-threatening. Palpation reveals enlarged lymph nodes. They are not painful. The spleen and the liver are enlarged. Palpation is painful. The organ consistency is not soft. Spleen infarction may occur.

A patient becomes susceptible to any kind of infection. Sometimes defective barriers of the organism turns the patient's normal bacterial microflora into aggressive infectious agents.

The leukemic form of the terminal stage leads to total infiltration of the body's organs and tissues, resulting in their disfunction and multiple organ failure,

Diagnosis. General blood analysis. Anemia and thrombocytopenia are presents. The severity of these symptoms depends on the disease stage and type of acute leukemia. The data of peripheral blood leucocytes content may be different. Most often considerable leucopenia is observed. Other patients presents with pronounced leucocytosis up to 200 000 per 1 ml of blood. These data are variable. Both leucopenia and normal content of leucocytes may be revealed.

The blast cells content in the peripheral blood ranges from 2 % up to 80–90 %. Approximately 20 % of patients do not have blasts in peripheral blood. Sometimes the so called *hiatus leukemicus* appears in the peripheral blood

analysis. It means the absence of intermediate cell forms between blasts and mature cells.

Biochemical blood data. It is necessary to pay attention to uric acid level and potassium content. These data reflects some complications of acute leukemia demanding adjustment.

Bone marrow investigation (myelogram). The diagnosis of the acute leukemia is based on the detection of more of more than 30 % of blast cells in myelogram.

Cytochemical and immunological methods are very specific. These methods give reliable information about the level of leukemic clonal cell in bone marrow stem. The methods give grounds for the specific antiblastic therapy.

Instrumental investigation. Common instrumental investigation methods are used to make a conclusion about concomitant diseases or about therapeutic or neurological complications and aftereffects of acute leukemia. These methods include ECG, EchoCG, X-ray examination, ultrasound, MRT, etc.

Standard medical physical examination performed every time the doctor sees the patient.

Principals of treatment. The treatment of acute leukemia treatment is based on obligatory cytostatic therapy, a combination of active cytostatic medicines which cover any clonal cell line, long periods of therapy, as well as alternation of therapy periods and interruption of therapy.

Any case of acute leukemia leads to death during within several years or months if a patient does not get therapy.

CHRONIC LEUKEMIA

There is a peculiarity of all chronic leukemias. Most often their cellular basis is monoclonal benign blood tumor. This situation persists during years.

Classification and nomenclature of chronic leukemias is based on the type of mature and “submature” leukemic cells.

Chronic myeloleukemia

Definition. Chronic myeloleukemia is a benign blood tumor originating from pluripotent stem cell of myelopoiesis. Usually, the cell substrate is formed by neutrophils (granulocytes). The main feature of the disease pathogenesis is severe overproduction of granulocytes in bone marrow and in extramedullary sites — the spleen and the liver.

The initial period (**chronic stage**) of the disease is insidious. The patients capacity for work is adequate, and complaints are absent. Gradually general malaise appear. Heaviness in the right subcostal area is associated with hepatomegaly. Sometimes mild gum hemorrhages and bone pains occur. Blood analyses reveal increased leucocyte level $20-30 \times 10^9/l$, the left shift of the leucocyte formula, mild eosinophilia and basophilia.

The further course (**acceleration stage**) of the disease presents with signs of intoxication of the organism. Patients' complaints are fatigue, high temperature,

weight loss, pains in the bones and in the liver area. The physical examination reveals pail skin, splenomegaly, hepatomegaly, and lymphadenopathy. The blood analysis reveals leukocytosis up to $100\text{--}150 \times 10^9/l$, the left shift, promyelocytes and myeloblast. The basophil level increases up to 5–10 %, eosinophil level increases up to 5–8 %.

Terminal stage (expanded clinical picture) includes all symptoms of the disease. Besides the abovementioned features, there are a hemorrhagic syndrome, necrotizing tonsillitis and stomatitis, leukemic skin rash, cachexia, fever periods, diarrhea, excessive splenomegaly, perisplenitis, and heart failure in elderly patients. Spleen infarctions leads to peritonitis. The patient's complaints include abdomen pain, hiccup, nausea, and vomiting. Myeloid peritoneum infiltration results in ascites. Albuminuria and cylinderuria resulting from myeloid proliferation in kidneys are present.

The blood analysis in this stage reveals leukocytosis up to $200\text{--}400 \times 10^9/l$, shift to the left with an excessive level of promyelocytes and myeloblasts. Mature granulocytes level decreases to 10–15 %. Anemia and marked thrombocytopenia are presents too. Reticulocytes level is decreased. Blasts appear in peripheral blood.

The course of the disease is undulating. Duration of remissions is 1–2 years.

The definite diagnosis of chronic leukemia depends on the result of cytochemical cell investigation of the bone marrow and blood. In 95 % of cases of chronic myeloleukemia there is a Ph-chromosome in the karyotype.

Chronic Lympholeukemia

Characteristics of chronic lympholeukemia include hyperplasia of lymphoid tissue in lymph nodes, bone marrow, in the spleen and mesenchymal tissue. It is also characterized by lymphoid infiltration of organs. Most often the general organs' are involvement. Sometimes the pathological process' is localized in the bone marrow only. Usually, skin and bones are not involved. The course of the disease is associated with deep disorders of metabolism in the involved organs. Chronic lympholeukemia is a disease of the second part of life. Men suffer from chronic lympholeukemia leukemia more often than women.

The onset of the disease is insidious. Usually, the first sign of the disease is a pathological blood analysis. The signs of leukemia include leukocytosis because of excessive lymphocytosis characterized by Botkein and Gumprecht shadows. Lymphocytes are mainly β -lymphocytes, morphologically mature but functionally inadequate. Leukocyte level increases during the development of the disease from $10\text{--}20 \times 10^9/l$ up to $40\text{--}80 \times 10^9/l$ and $1500\text{--}300 \times 10^9/l$ in the terminal stages. Most of leukocytes are lymphocytes (90–95 %). Bone marrow lymphocytes number is more than 30 %. It is a ground for definite diagnosis of chronic lympholeukemia.

Leukemia prophylaxis include regular medical inspection and seeking immediate medical advice if signs similar to the features of leukemia appear. These signs are fatigue, weight loss, loss of appetite, signs of hemorrhagic syndrome, and long term common infections.

SELF-TESTING

1. Adequate hemoglobin level (g/l) after the course of treatment of iron deficiency anemia for women is:

- a) 100 g/l;
- b) 115 g/l;
- c) 120 g/l;
- d) 130 g/l;
- e) 140 g/l.

2. Adequate hemoglobin level (g/l) after the course of treatment of B₁₂ deficiency anemia for men is:

- a) 140 g/l;
- b) 130 g/l;
- c) 120 g/l;
- d) 115 g/l;
- e) 100 g/l.

3. Adequate hemoglobin level (g/l) after the course of treatment of folium deficiency anemia for a women is:

- a) 100 g/l;
- b) 115 g/l;
- c) 120 g/l;
- d) 130 g/l;
- e) 140 g/l.

4. Adequate erythrocyte level after the course of treatment of iron deficiency anemia for women is:

- a) $3.8 \cdot 10^{12}/l$;
- b) $3.9 \cdot 10^{12}/l$;
- c) $2.2 \cdot 10^{12}/l$;
- d) $1.0 \cdot 10^{12}/l$;
- e) $6.55 \cdot 10^{12}/l$;

5. Adequate erythrocyte level after the course of treatment of B₁₂ deficiency anemia for men is:

- a) $3.2 \cdot 10^{12}/l$;
- b) $3.0 \cdot 10^{12}/l$;
- c) $3.9 \cdot 10^{12}/l$;
- d) $4.0 \cdot 10^{12}/l$;
- e) $7.55 \cdot 10^{12}/l$.

6. The criteria of normalizing of latent tissue iron deficiency is peripheral blood of ferritin content:

- a) 10 ng/ml;
- b) 22 ng/ml;
- c) 18 ng/ml;

d) 15 ng/ml;

e) 40 ng/ml.

7. Main principal of treatment of iron deficiency anemia is:

a) eliminating diet;

b) folic acid;

c) bed regimen;

d) physical exercises;

e) iron containing drugs.

8. Definite laboratory signs of chronic myeloleucosis include:

a) blast cells in blood analysis;

b) blast cells in bone marrow analysis;

c) more than 30 % blast cells in bone marrow analysis;

d) severe anemia;

e) thrombocytopenia.

9. List of clinical syndromes of acute leucosis include:

a) anemic;

b) toxic;

c) hemorrhagic;

d) hyperplastic;

e) hepertensive.

10. Botkin–Gumprecht cells appear in case of:

a) heart failure;

b) chronic myeloleukosis;

c) low physical activity;

d) chronic lympholeukosis;

e) iron deficiency anemia.

Answers: 1 – d, e; 2 – a, b; 3 – d, e; 4 – a, b; 5 – c, d; 6 – b; e; 7 – e; 8 – a, c; 9 – a, b, c, d; 10 – d.

RECOURSES

Nemtsov, L. M. Special propedeutics of internal diseases / L. M. Nemtsov. Vitebsk : VSMU, 2013. 318 p.

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