Federal State Budgetary Educational Institution of Higher Education

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Guidelines for conducting a practical lesson with 5th year students of the Faculty of Medicine on the topic:

BLOOD FUNCTIONS. GENERAL BLOOD ANALYSIS

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Purpose of the lesson:

Consider the main stages of hematopoiesis

To study the main hematological parameters of a healthy person;

Consider the main types of violations of the total blood volume, their causes and consequences.

To study the pathogenesis and mechanisms of compensatory reactions in blood loss.

The student must: Know:

constituent components of the blood system, the main functions of the blood;

main classes of hematopoietic cells;

causes, types and consequences of changes in total blood volume;

compensation mechanisms and principles of therapy for acute blood loss.

Be able to: determine the hematocrit and characterize the type of hyper- or hypovolemia;

assess the severity of blood loss;

Basic concepts that should be learned by students in the process of studying the topic

Hematopoietic stem cell, hematopoiesis, hematopoietic factors, hematopoietic cellular microenvironment, normovolemia, hypo- and hypervolemia.

Questions for the lesson

Blood as the internal environment of the body, the functions of blood.

The modern scheme of hematopoiesis. The doctrine of the hematopoietic stem cell. Nomenclature of blood cells.

Regulation of hematopoiesis.

Hemogram of a healthy person. Basic indicators, methods for their determination and calculation, age-related hematological norms.

Classification of violations of the total blood volume.

Hypervolemia. Types, causes of development, consequences for the body.

Hypovolemia. Types, causes of development, consequences for the body.

Blood loss. Types, causes of bleeding. Main clinical manifestations and their pathogenesis.

Compensatory-adaptive reactions of the body in acute blood loss. Stages of compensation, their characteristics.

Questions for self-control

Name the functions of blood.

List the characteristics of a stem cell.

What cells belong to the hematopoietic microenvironment?

Name the main hematopoietic factors.

Name the content of reticulocytes in peripheral blood.

Name the content of leukocytes in peripheral blood.

Name the content of platelets in peripheral blood.

What is simple hypervolemia?

When does oligocythemic hypervolemia develop?

When does polycythemic hypovolemia develop?

What determines hematocrit?

Name the stages of compensation for blood loss.

How is the severity of blood loss determined?

How will the peripheral blood parameters change in acute moderate blood loss?

Name the consequences and complications of hypovolemia.

Topic of the lesson: "INTERVIEW AND PHYSICAL METHODS OF THE STUDY OF PATIENTS WITH BLOOD DISEASES"

Outline of indicative framework for action:

Bring the question of the patient, identify the complaints of the patient with a blood disease.

Pay attention to the following complaints: fever, increased bleeding, itching of the skin, burning tongue, perversion of taste and smell, bone pain, pain in the left and right hypochondrium, loss of appetite and weight loss, weakness, easy fatigue, dizziness, headache, shortness of breath during exercise, palpitations.

- fever is explained by:

> pyrogenic action of the decay products of erythrocytes (with hemolytic and B 12-deficient anemia) and leukocytes with the release of purine bases (with acute and chronic leukemia);

> compensatory increase in basal metabolism in some types of anemia;

> a consequence of necrotic-ulcerative processes and the addition of a secondary infection in acute and terminal stages of chronic leukemia, agranulocytosis;

> fever may be accompanied by increased sweating (with leukemia), sometimes significantly pronounced ("drenched sweats") with Hodgkin's disease.

- skin itching: excruciating skin itching may be the first sign of Hodgkin's disease. Itching of the skin is also observed in chronic lymphocytic leukemia, erythremia. It is assumed that the mediator of itching in hematological diseases is histamine, which is released in an increased amount by pathological hematopoietic cells. The second possible mediator of itching may be leukopeptidases isolated from pathological lymphocytes and granulocytes;

- increased bleeding: manifested in the form of hemorrhagic rashes on the skin and mucous membranes (bruises, petechiae) and bleeding from the nose, gums, gastrointestinal tract, uterus, kidneys. It is observed in acute leukemia, hemophilia, thrombocytopenic purpura (Werlhof's disease), etc. The causes of bleeding are a violation of the blood coagulation system and an increase in capillary permeability.

- loss of appetite and weight loss; characteristic of many blood diseases. Weight loss is especially pronounced, up to cachexia in patients in the final stage of chronic leukemia and hematosarcomas (lymphogranulomatosis, lymphosarcoma);

- perversion of taste and smell: patients willingly eat chalk, coal, earth, clay and experience pleasure from inhaling vapors of gasoline, kerosene, ether and other odorous substances with an unpleasant odor. Such complaints are typical for patients with iron deficiency anemia syndrome.

- burning of the tip of the tongue and its edges: a characteristic complaint of patients with B12 deficiency anemia. Its cause is the development of atrophic glossitis;

- sore throat when swallowing: they are a consequence of the development of necrotic-ulcerative tonsillitis, observed in leukemia;

- dysphagia: characteristic of iron deficiency anemia syndrome. The occurrence of dysphagia is explained both by the spread of the atrophic process from the stomach to the mucous membrane of the esophagus, and by the possibility of developing delicate connective tissue membranes and bridges in its proximal section;

- other complaints from the gastrointestinal tract: (nausea, belching, pain and heaviness in the epigastric region, diarrhea, constipation and other complaints) are associated with the development of atrophic processes in the mucosa of the gastrointestinal tract and are observed in patients with iron deficiency or B12 (folic) - deficiency anemia. Similar complaints can be observed in patients with chronic lymphocytic leukemia, but they are due to leukemic infiltration of the intestinal mucosa.

- bone pain (especially in flat ones): associated with increased proliferation of bone marrow cells and its hyperplasia and are observed in acute leukemia, chronic myelogenous leukemia, erythremia;

- pain in the left hypochondrium: due to the involvement of the spleen in the pathological process and are observed in blood diseases: acute and chronic leukemia, hemolytic anemia and B12 deficiency anemia, thrombocytopenic purpura, as well as in a number of other diseases. Pain may be related to:

> with a rapid increase in the spleen and stretching of its capsule. In this case, it is acute. It is observed during an attack of malaria, with relapsing fever, with a heart attack of the spleen;

> with the transition of the inflammatory process to the peritoneum covering the spleen, and the development of perisplenitis. Perisplenitis is characterized by excruciating, intense pain, aggravated by breathing, coughing, changing the position of the patient;

> the most severe pain occurs when the spleen is ruptured;

> enlargement of the spleen is characteristic of chronic leukemia, causes a feeling of heaviness and fullness in the left hypochondrium, due to a significant increase in the spleen and stretching of its ligamentous apparatus.

It should be remembered that most pathological processes in the spleen proceed without pain;

- Pain in the right hypochondrium:

> a large increase in the liver with myeloid and lymphoid metaplasia in patients with chronic leukemia, causes stretching of the Glisson capsule, which leads to the appearance of heaviness or dull pain in the right hypochondrium;

> with hemolytic anemia, due to severe hyperbilirubinemia and increased secretion of bile pigments by the liver, pigment stones are formed in the gallbladder and ducts, which causes pain in the hypochondrium like hepatic colic;

- general complaints: weakness, easy fatigability, dizziness, headache, shortness of breath on exertion, palpitations are characteristic of both anemia and leukemia. They are related:

> with a decrease in the number of red blood cells, hemoglobin and the development of circulatory-hypoxic syndrome;

> with symptoms of intoxication due to the breakdown of blood cells, the addition of a secondary infection.

Interview the patient about the history of the present disease.

Pay attention to:

- suspected causes of the disease,

- when and how the disease began (acutely, gradually, gradually);

- how the disease proceeded, whether there was a cyclicity in the course of the disease with periods of remissions and relapses, as well as seasonality in the occurrence of relapses. The cyclic nature of the disease with alternating periods of exacerbation and remission is characteristic of chronic lymphocytic leukemia. With B12 (folic) - deficiency anemia, relapses are more often observed in the spring-autumn period;

- whether a blood test was carried out earlier and what are its results;

- where the patient was treated;

- the nature of the previous treatment and its effectiveness, in particular with iron preparations, vitamin B12 and others.

Collect patient history data.

Pay attention to:

- the patient's profession and working conditions, tk. work with certain substances (lead, mercury, arsenic, benzene), as well as radiation exposure, cause the development of diseases of the hematopoietic system (aplastic and hypoplastic anemia, agranulocytosis, etc.);

- living conditions and nutrition (since the wrong daily routine, insufficient exposure to fresh air, monotonous, malnutrition with a lack of vitamins and proteins can lead to the development of anemia syndrome);

- past illnesses

> diseases that are accompanied by overt or covert recurrent bleeding (uterine, hemorrhoidal, pulmonary, nasal, etc.) may be the cause of anemia syndrome (acute and chronic post-hemorrhagic, iron deficiency anemia);

> chronic infections (syphilis, malaria, partly tuberculosis), chronic purulent processes, helminth infestations (broad tapeworm) can cause the development of anemia syndrome;

> diseases of the gastrointestinal tract (achilia, past resection of the stomach and intestines) lead to impaired absorption of iron and vitamin B12 by the body - factors necessary for normal erythropoiesis - and the development of iron deficiency or B12 (folic) - deficiency anemia;

> chronic kidney disease, accompanied by renal failure, leads to the development of severe anemia, which is associated with a violation of the production of erythropoietins by the kidneys, as well as the presence of hematuria in some kidney diseases;

> chronic liver diseases due to impaired production of a number of blood coagulation factors (prothrombin, fibrinogen), accompanied by hemorrhagic syndrome;

> prolonged and uncontrolled use of drugs (butadione, sulfonamides, chloramphenicol, cytostatics, etc.) for certain diseases can cause suppression of bone marrow function and contribute to the development of diseases (hemolytic and aplastic anemia, leukopenia, hemorrhagic syndrome);

> data on heredity make it possible to identify diseases of the hematopoietic system in close relatives. Some types of hemolytic anemia, Osler's disease, hemophilia can be familial.

Conduct a general examination of the patient:

GENERAL CONDITION OF THE PATIENT: satisfactory, moderate, severe, extremely severe.

STATE OF CONSCIOUSNESS: clear, stupor, stupor, coma. Extremely severe unconsciousness is observed in the terminal stages of certain diseases (progressive anemia, leukemia)

BODY, WEIGHT, HEIGHT. With some blood diseases, weight loss, weight loss is noted.

BODY TEMPERATURE rises with anemia, leukemia.

EXAMINATION OF THE SKIN AND MUCOUS MEMBRANES. coloration:

- pale due to a decrease in the number of red blood cells and hemoglobin in anemia syndrome;

- pale with a greenish tinge in early chlorosis;

- pale with an icteric tinge (waxy) with B12 - deficiency anemia;

- icteric (lemon yellow) with hemolytic anemia, due to the breakdown of hemoglobin and an increase in the level of indirect bilirubin;

- earthy-gray shade in chronic leukemia;

- cherry red with true polycythemia (erythremia) due to an increase in the number of red blood cells and hemoglobin.

skin moisture in iron deficiency anemia due to trophic disorders decreases (dryness and peeling of the skin is observed).

Hemorrhages With hemorrhagic diathesis, spots of various sizes, sizes and shapes appear - from small punctate (petechiae) to larger ones (purpura, ecchymosis) and the largest ones (bruising). Initially, hemorrhagic rashes are red, then the color changes to cherry blue, green, yellow, until they gradually disappear. Hemorrhagic spots when pressed on them do not disappear and do not turn pale.

EXAMINATION OF SKIN ADDITIONS. With iron deficiency anemia, due to a violation of trophism, the hair becomes brittle, split, turn gray early and fall out. The nails become thinner, lose their luster, their transverse striation appears, brittleness, and later they become concave (koilonychia).

SUBCUTANEOUS FIBER. The insufficiency of its development is characteristic of many blood diseases, especially for chronic leukemia. The redundancy of its development is observed in B12-deficiency anemia.

THE LYMPH NODES. On examination, it is sometimes possible to detect an increase in lymph nodes in the neck, in the subclavian, axillary, inguinal regions, less often in other places. This can be observed with hemoblastosis (leukemia, lymphogranulomatosis, lymphosarcoma), tuberculosis, metastases to the lymph nodes of malignant tumors.

When palpating the lymph nodes, the following sequence should be observed: occipital, parotid, submandibular, chin, cervical anterior and posterior, supraclavicular, subclavian, axillary, ulnar, inguinal, popliteal. In this case, attention should be paid to the size of the nodes, consistency, soreness, shape, mobility, cohesion with each other and with surrounding tissues:

- with lymphocytic leukemia, there is a systemic, multiple lesion of the lymph nodes. They have an elastic-testy consistency, are vague, so that there is an impression of puffiness around them, painless, not soldered to each other and the skin;

- in most other diseases: hematosarcomas (lymphosarcoma, lymphogranulomatosis), tuberculous lymphadenitis, lymph nodes are always dense, and with inflammation, they are also painful;

- lymphogranulomatosis is characterized by multiplicity and systemic lesions, the lymph nodes are very dense and quickly grow together with each other and the surrounding tissues, forming dense conglomerates, sometimes reaching sizes of 15-20 cm in diameter;

- with tuberculosis, the lymph nodes are smooth, mobile, lie freely in the surrounding tissues. Over time, they become dense, inactive, merge into packages, then suppurate, open outward, forming fistulas that heal with motionless scars;

- with lymphadenitis, local reactive enlargement of the lymph nodes associated with the presence of infection along the lymph flow, smooth, elastic consistency, mobile lymph nodes that are not soldered to each other and to the skin are observed. Soreness and redness of the skin over them indicate acute inflammation in them;

- with cancer metastases, a local increase in lymph nodes is observed, for example, the "Virchow" gland is detected in the left supraclavicular region with metastases of gastric cancer, an increase in axillary lymph nodes with breast cancer, etc.

BONE SYSTEM. Palpation of flat bones and epiphyses of tubular bones, as well as tapping on them can be painful in leukemia, erythremia, anemia syndrome (B12-deficiency anemia, hemolytic anemia), due to bone marrow hyperplasia.

Conduct a respiratory examination:

CHEST EXAMINATION:

- configuration of the chest;

- type, rhythm, depth, frequency of respiratory movements;

- Chest circumference.

CHEST PALPATION:

- soreness;

- resistance;

- voice trembling.

PERCUSSION OF THE LUNG:

- comparative;

- topographic:

> standing height of the tops;

> lower border of the lungs along 3 topographic lines (mid-clavicular, middle axillary, scapular);

> mobility of the lower edge of the lungs along the midaxillary line.

LUNG AUSCULATION:

The respiratory organs are involved in the pathological process due to the occurrence of lymphoid or myeloid infiltration in the lungs and pleura in chronic leukemia, as well as due to the development of acute pneumonia against the background of reduced resistance in many blood diseases.

Conduct a study of the cardiovascular system:

INSPECTION AND PALPARATION OF THE AREA OF THE HEART:

- apical impulse;

- cardiac impulse;

- pulsation in the neck;

- a symptom of "cat's purr".

Due to the development of anemia, there may be a mixture of the apex beat outward (dilation of the left ventricle). There is a sharp pulsation of the carotid arteries.

PERCUSSION OF THE HEART REGION:

- limits of relative cardiac dullness;

- the limits of absolute cardiac dullness;

- diameter of the heart;

- width of the vascular bundle;

- configuration of the heart.

AUSCULTATION OF THE HEART AND VESSELS:

- with anemia syndrome, due to compensatory tachycardia and a decrease in blood filling of the ventricles, the heart sounds become amplified, and only with the development of pronounced dystrophic changes in the heart muscle, the tones can become deaf;

- there is a functional systolic murmur at all points of auscultation, which is explained by a decrease in blood viscosity and an increase in blood flow velocity;

- in severe anemia, a "top noise" can be heard on the jugular veins, the occurrence of which is associated with the same reasons. It is best heard on the right jugular vein and increases when the head is turned to the opposite side.

PULSE STUDY:

Pulse is frequent, small.

BLOOD PRESSURE:

It may be slightly reduced.

Conduct a study of the digestive system:

ORAL CAVITY:

Examination of the oral cavity plays an important role in the diagnosis of blood diseases:

- bright red, shiny, smooth (due to severe atrophy of the papillae), "varnished" with areas of inflammation along the edges and on the tip of the tongue, often with aphthous rashes and cracks. Such language can be detected in patients with B12-deficiency anemia. This symptom is called "hunter's" glossitis;

- rapidly progressive tooth decay and inflammation of the mucous membrane around the necks of the teeth (alveolar pyorrhea) - a common symptom found in patients with iron deficiency anemia;

- necrotic-ulcerative lesions of the mucous membrane of the oral cavity, pharynx, tonsils are detected in acute leukemia and agranulocytosis.

EXAMINATION OF THE ABDOMEN: Allows you to identify bulging in the left and right hypochondria, especially characteristic of patients with chronic myeloid leukemia, and due to a significant increase in the spleen and liver.

PERCUSSION AND PALPATION OF THE LIVER:

- determine the boundaries and dimensions of the liver according to Kurlov;

- palpate the liver and characterize the palpated

body.

An increase in the liver is observed in leukemia and is associated with the growth of myeloid and lymphoid tissue in it. In B12-deficient anemia and hemolytic anemia, liver enlargement is associated with activation of the reticuloendothelium and destruction of red blood cells.

CARRY OUT A STUDY OF THE GALL BLADDER There is pain at the point of projection of the gallbladder with hemolytic anemia.

PERCUSSION AND PALPATION OF THE SPLEEN The presence of an enlarged spleen is observed:

- in diseases of the hematopoietic system (leukemia, hemolytic anemia, B12 deficiency anemia, thrombocytopenic purpura). A significant enlargement of the spleen is called splenomegaly. The most pronounced splenomegaly is observed in the final stage of chronic myeloid leukemia, in which the spleen often occupies the entire left half of the abdomen, and goes into the small pelvis with its lower pole;

- in acute infectious diseases (relapsing fever, sepsis, etc.);

- with chronic infectious diseases (syphilis, malaria);

- with cirrhosis of the liver;

- with thrombosis and compression of the splenic vein.

Spleen density:

- soft, doughy consistency observed in acute infectious diseases;

- dense - with chronic infections, liver cirrhosis, leukemia;

- very dense - with amyloidosis and spleen cancer. Pain on palpation:

- the spleen is painful in most blood diseases;

- Severe pain occurs when:

> infarction of the spleen;

> respawn;

> due to the expansion of the capsule - with its rapid increase. Surface of the spleen:

- in most diseases smooth, even;

- irregularities are observed with perisplenitis and with heart attacks;

- tuberosity of the spleen occurs with syphilitic gums, echinococcosis, cysts and rare tumors. Spleen mobility:

- usually quite significant;

- limited to perisplenitis.

AUSCULATE THE LEFT HYPOCHOLY Perisplenitis is accompanied by a friction rub from the peritoneum.

Carry out a study of the urinary organs

- dysuric phenomena, hematuria with thrombocytopenic purpura (Werlhof's disease);

- an increase in the kidneys on palpation can be observed with hemoblastoses.

Study of the nervous system:

- skin anesthesia and paresthesia due to dystrophic changes in the nervous system with iron deficiency and B12 (folic) - deficiency anemia;

- spastic paresis (weakening of motor functions) with B12-deficiency anemia due to damage to the lateral trunks of the spinal cord;

- Signs of CNS damage: sleep disturbance, emotional instability, etc.

ON THE BASIS OF THE INQUIRY DATA AND PHYSICAL METHODS OF INVESTIGATION, MAKE A CONCLUSION ABOUT THE PRELIMINARY DIAGNOSIS.