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КАФЕДРА ПРОПЕДЕВТИКИ ВНУТРЕННИХ БОЛЕЗНЕЙ

ОБСЛЕДОВАНИЕ ПАЦИЕНТОВ С ЗАБОЛЕВАНИЯМИ СИСТЕМЫ КРОВИ

EXAMINATION OF PATIENTS WITH HEMATOLOGIC DISEASES

Учебно-методическое пособие

Минск БГМУ 2025

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Содержит сведения о клинических синдромах при заболеваниях системы крови.

Предназначено для студентов 3-го курса медицинского факультета иностранных учащихся, обучающихся на английском языке по специальности «Лечебное дело».

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ABBREVIATIONS

BP — blood pressure
CBC — complete blood count
ESR — erythrocytes sedimentation rate
MCV — mean corpuscular volume
MCH — mean corpuscular hemoglobin
MCHC — mean corpuscular hemoglobin concentration
RBC — red blood cells (erythrocytes)
WBC — white blood cells (leukocytes)
Hb — hemoglobin

EXPLANATORY NOTE

Total duration of classes is 3,5 hours.

Hematologic diseases are disorders of the blood and blood-forming organs. Blood is a main, high-specialized body fluid. It consists of four main components: plasma, red blood cells, white blood cells, and platelets. Blood has many different functions, including:

– transporting oxygen and nutrients to the cells and carries away carbon dioxide and other waste products;

– forming blood clots to prevent excess blood loss;

– carrying cells and antibodies that fight infection;

– bringing waste products to the kidneys and liver, which filter and clean the blood;

– regulating body temperature.

Blood cells are formed by a process called hematopoiesis. In the human adult, the bone marrow produces all of the erythrocytes, 60–70 % of the leucocytes (granulocytes), and all of the platelets. The lymphatic tissues, particularly the thymus, the spleen, and the lymph nodes, produce the lymphocytes (comprising 20–30 % of the leucocytes).

In case of hematological disorders blood circulation is stopped in some area (e.g. thrombosis of artery) of blood functions are damaged (e.g. oxygen transport in case of anemia). Symptoms of hematologic diseases are variable and can be found in any part of the body.

The purpose of the class: to teach students the most common symptoms and syndromes of hematologic diseases; to teach methods of diagnostics of hematologic diseases.

Objectives of the class:

1. To study the main patient's complaints in case of hematologic diseases.
2. Master the subjective, objective, laboratory and instrumental methods of examination in case of hematologic diseases.
3. To consolidate theoretical knowledge on the main clinical hematologic syndromes by examining patients with hematologic diseases.

Issues of discussion:

1. Main patient's complaints in case of hematologic diseases.
2. Physical examination (inspection, palpation, percussion, auscultation) of a patient with diseases of the blood system.
3. Laboratory and instrumental investigation methods in diseases of the blood system.
4. Anemic syndrome. Clinical signs.
5. Hemorrhagic syndrome. Clinical signs.
6. Infectious syndrome. Clinical signs.
7. Hyperplastic syndrome. Clinical signs.

PATIENT'S EXAMINATION IN CASE OF HEMATOLOGIC DISEASES

Complaints

Hematological diseases have very diverse patient's complaints (Table 1). In the initial stages of many blood diseases, patients have only general complaints: weakness, fatigue, dizziness, headache, shortness of breath, palpitation, which are related with hypoxia due to anemia. Fever may be associated with secondary infection (with a decrease in the immune response) and the breakdown of immature cells (with leukemia).

The most common symptom of blood diseases is coagulation disorder: excessive and continuous bleeding (nose bleeding, metrorrhagia, gastrointestinal bleeding), hemorrhagic rash on the skin (petechiae, ecchymosis), subcutaneous hematomas. These symptoms develop due to violations of hemostasis (internal and external pathways). In case of anemia patients can complain for perversion of taste and smell, burning sensation at the tongue, swallowing disorder.

Due to the uncontrolled proliferation of bone marrow cells in leukemia, patients complain of bone pain, lymph nodules enlargement, heaviness in the right and left hypochondrium due to hepatomegaly and splenomegaly.

Table 1

Patient's complaints in case of hematologic diseases

Hypoxia	Coagulation disorders	Secondary infection	Blood cells proliferation
Weakness, fatigue, dizziness, headache, shortness of breath, palpitation	Nose bleeding, metrorrhagia, gastrointestinal bleeding, hemorrhagic rash on the skin, subcutaneous hematomas	Fever, sweats, pain in the affected area, functional disorders	Bone pain, swollen lymph nodes, heaviness in the abdomen

History of patient (anamnesis) may be useful for blood diseases diagnosis. Certain factors indicate that the person is at risk. Some examples include the following:

– a blood disorder in a member of the patient's family;

– another disorder (such as kidney disease or liver disease) that can cause a blood disorder;

– a person's race (for example, sickle cell disease occurs mainly in black people);

– use of a medication that may cause bleeding (such as aspirin, nonsteroidal anti-inflammatory drugs, or warfarin);

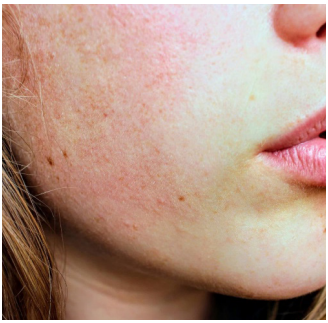
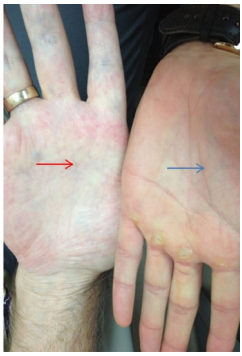
– exposures (for example, an occupational exposure) to a chemical that could cause the bone marrow damage.

Physical examination

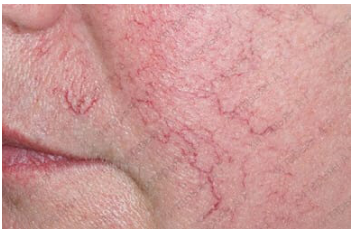
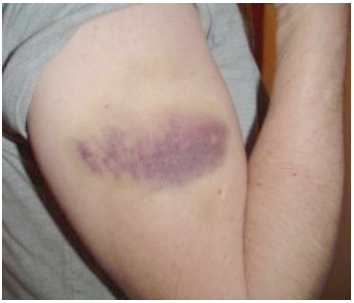
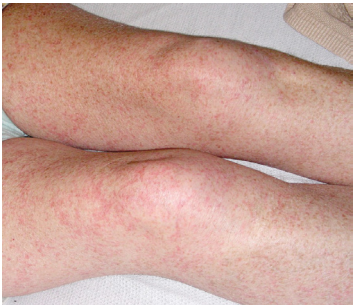
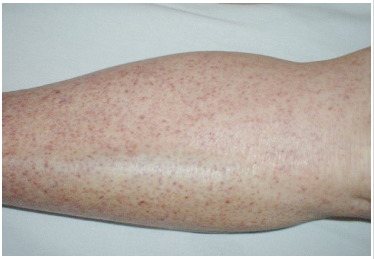
Inspection of skin, mucous membranes and subcutaneous tissue provides important information in case of blood system disorders. Possible signs are as follows (Table 2).

Table 2

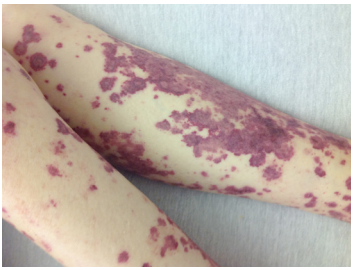
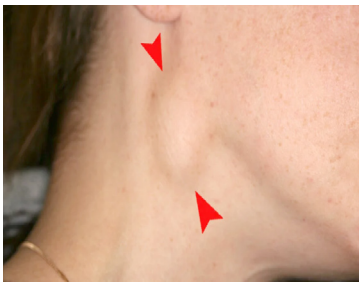
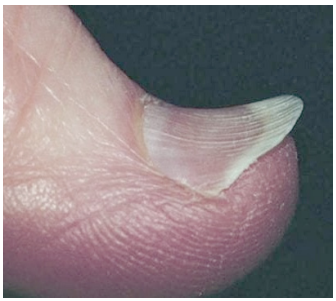
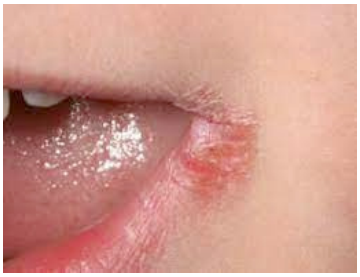
Inspection in case of blood diseases

Signs	Comments
	*Pallor* (in case of anemia). Sites to look for pallor: – lower palpebral conjunctiva; – tongue; – soft palate; – nail beds; – palmar or plantar creases; – skin has a least sensitivity due to race, age, sunlight exposure, etc.
	Erythema (hyperemia) on face can be found in case of erythrocytosis (polycythemia vera)
	Pallor of the palmar creases in the patient's hand (red arrow) compared to the examiner's hand (blue arrow)

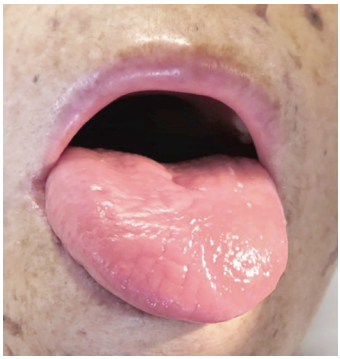
Continuation of the table 2

Signs	Comments
	*Telangiectasias* are small, widened blood vessels on the skin
	*Hematomas* or bruises blood suffusion is a localized bleeding outside of blood vessels
	*Petechiae* are flat pinpoint spots that measure less than 2 mm in size
	*Purpura* is red or purple discolored spots on the skin 3–10 mm in size

Continuation of the table 2

Signs	Comments
	*Ecchymosis* is described as hemorrhagic spots that measure over 1 cm in size
	Swollen lymph nodes. Normal lymph nodes have very little size and they are not visible. Enlargement of lymph nodes generally results from infection, malignancy or blood system diseases
	*Koilonychia* (spoon nails) can be a sign of iron-deficiency anemia
	*Angular stomatitis* (angular cheilitis) can be related with iron-deficiency, vitamin B12 deficiency, Candida albicans or Staphylococcus aureus infection

End of the table 2

Signs	Comments
	*Hunter's glossitis* is the atrophic glossitis resulting from vitamin B12 deficiency

Palpation can be used for lymph nodes, liver and spleen examination in case of blood diseases. Normal lymph nodes are not palpable. Characteristics of lymph nodes by palpation presented below (Table 3).

Table 3

Characteristics of lymph nodes by palpation

Characteristics	Comments
Lymph nodes are visualized / not visualized	Lymph nodes are visible in case of size more than 1 cm
Lymph nodes are palpable / not palpable	Consistency of normal lymph nodes is the same as subcutaneous fat and soft tissue, that's why they are not palpable
Lymph nodes of which group are palpated	Healthy person can have palpable submandibular and submental lymph nodes due to recent tonsillitis, pharyngitis or viral infection, as well as dental problems. Local process (inflammation, malignancy) leads to swollen lymph nodes of one group. Systemic process (leukemia, Hodgkin diseases) usually increases the size of many lymph node groups
Which side (right / left)	Local process (inflammation, malignancy) leads to swollen lymph nodes of one side. Systemic process (leukemia, Hodgkin diseases) has bilateral lymph nodes enlargement
The size of lymph nodes (cm)	We need to estimate diameter of lymph nodes
Lymph node consistency (dense or soft)	In case of acute inflammatory process lymph nodes are soft, in case of malignancy they are firm
Movable or fixed	Inflammation usually has mobile lymph nodes, while blood diseases and cancer lymph nodes may be fixed tightly

End of the table 3

Characteristics	Comments
Joined to each other with surrounding tissues or not	Hodgkin disease and lymph sarcoma have lymph nodes fixed to each other and surrounding tissue
Painful / not painful	Tenderness presents in case of acute inflammation

Hepatomegaly and splenomegaly can be found by palpation and percussion. In case of acute pathology consistency of liver and spleen is soft. Chronic diseases lead to high density. Especially common splenomegaly may be in myeloid leukemia.

The normal size liver does not extend beyond the right costal arch along the right midclavicular line. With hepatomegaly, the lower edge of the liver is located lower. The size of the liver according to the M. G. Kurlov method is increased (normal dimensions are 9 ± 1cm, 8 ± 1cm, and 7 ± 1 cm).

The spleen of normal size is located deep in the left hypochondria and is not palpable. With splenomegaly, the spleen can be palpated.

Complete Blood Count

Complete blood count (CBC) is one of the main tests in Internal Medicine, it is used for diagnosis of various hematological and non-hematological pathologies.

ESR is determined by the Panchenkov's method (in the Panchenkov's capillary) or by the Westergren's method (in a test tube). ESR count in mm for 1 hour and it depends on the age. The normal rate of ESR for male is 2–10 mm/hour, for female — 2–15 mm/hour. The Westergren's method is an international method for determining ESR. It differs from the Panchenkov's method by the characteristics of the tubes used and the calibration of the result scale. But the Westergren's method is more sensitive to increased ESR, and the results in the zone of elevated ESR values will be more accurate than the results obtained by the Panchenkov's method. In many diseases, the ESR is increased, especially for those that are accompanied by changes in the protein fractions of the blood. Increased ESR is observed in various inflammatory processes and infectious diseases, in case of rheumatic and oncological diseases, tuberculosis, myocardial infarction. ESR decreases in case of diseases accompanied by blood clots (polycythemia, cholera).

Hemoglobin is the red blood cell pigment. It's a carrier of oxygen from the lungs to the tissues and carbon dioxide from the tissues to the lungs. Currently, hemoglobin is determined automatically using the photometric method. The amount of hemoglobin is significantly reduced with anemia, other blood diseases, malignant tumors.

Erythrocytes (red blood cells, RBC) are the most numerous blood cells that don't contain nuclei and are the most special cells in the body, the main function of RBC is oxygen transport from the lungs to the tissues and transfer carbon

dioxide from the tissues to the lungs. This process is carried out with the help of hemoglobin. The red blood cells shape (a biconcave disc) gives the optimum ratio of volume to surface for the gases exchange, and provides RBC with the ability to deform during microcirculation. The red blood cells count underlies the assessment of erythropoiesis.

Erythrocytes are the subject of further tests to determine the hemoglobin concentration and hematocrit value (the ratio of the erythrocytes volume to the total blood volume). Following erythrocyte indices characterize RBC quality:

– MCV — mean corpuscular volume (size of erythrocyte);

– MCH — mean corpuscular hemoglobin (amount of hemoglobin in erythrocyte);

– MCHC — mean corpuscular hemoglobin concentration (amount of hemoglobin in erythrocyte calculated by volume of erythrocyte).

Low level of RBC indicates anemia. RBC number below than $1 \cdot 10^{12}$/l is a life-threatening condition. In patients with erythremia, the number of erythrocytes increased to $(8–12) \cdot 10^{12}$/l.

Platelets (thrombocytes) come from giant bone marrow cells-megakaryocytes. Platelets are round or oval in shape. They take part in a blood clot formation. The number of platelets (thrombocytosis) increases in case of bleeding, surgery, cancer. Thrombocytopenia occurs in case of immune thrombocytopenic purpura, leukemia, and infectious diseases.

Leukocytes (white blood cells, WBC) are divided into lymphocytes, monocytes, neutrophils, eosinophils, and basophils. In healthy individuals, the number of leukocytes is $(4–9) \cdot 10^9$/l. Number of leukocytes more than $9 \cdot 10^9$/l is called leukocytosis; the number of white blood cells below $4 \cdot 10^9$/l is called leukopenia. Leukocytosis is observed in many diseases of the blood system (leukemia, Hodgkin's disease), in purulent inflammation, pneumonia and myocardial infarction. Leukopenia is present in case of blood diseases, liver cirrhosis, drug poisoning, radiation sickness, as well as with some infectious diseases (viral hepatitis, influenza, COVID-19). The leukocyte count is the ratio between the various forms of white blood cells. It is counted in blood smear.

Neutrophils amount is 50–70 % of leukocytes. Their cytoplasm is colored in light pink, granules are purple. Neutrophils are divided into band and segmented. Eosinophils have a characteristic bright red grain and a segmented core. Basophils are the smallest granulocytes. The nucleus of their irregular shape occupies almost the entire cell.

Lymphocytes are non-granular cells. The nucleus is located centrally, has a round or bean-shaped form, is painted in blue-violet color.

Monocytes are the largest blood cells. Their horseshoe-shaped or irregular shaped core are colored purple-red. Cytoplasm has a purple-blue color with a delicate reddish grain.

Neutrophils perform a protective function in the body. They fight against microbes and toxins. During infections, intoxication, their number increases significantly. At the same time, immature forms appear: the number of band is increased, young neutrophils appear, even myelocytes can occur in the smear. This neutrophilic rejuvenation is called shift to the left. Eosinophils are very active in allergic diseases and collagen diseases. Their number increases with parasitic diseases, scarlet fever, Hodgkin's disease. In some diseases their number, on the contrary, decreases (tuberculosis, typhoid fever). Basophils are involved in immune response. Basophil number increases with myeloid leukemia. An increase in the number of lymphocytes (lymphocytosis) is observed in tuberculosis, thyrotoxicosis, and especially in lymphocytic leukemia. Lymphopenia occurs in case of Hodgkin's disease, viral infections, autoimmune diseases. Monocytes are cells of the innate immune response, after entering the blood they are in the bloodstream for 1–2 days, then they settle down in the tissues. Monocytosis is observed in malaria, tuberculosis. Monocytopenia occurs in case of severe sepsis, typhoid fever.

ANEMIC SYNDROME

Anemic syndromes defined as a poly-etiologic syndrome characterized by decrease in circulating red blood cell (RBC) mass and hemoglobin (Hb) below the normal values.

Anemic syndrome — is combination of laboratory signs of an anemia and its clinical manifestations caused by a hypoxia and a hypoxemia.

The **etiology** of anemic syndrome can be broadly classified into three categories:

1. *Blood loss.* This can be either acute or chronic. Acute blood loss can result from trauma or surgery, while chronic blood loss can occur due to gastrointestinal conditions like ulcers, hemorrhoids, or cancer.

2. *Decreased red blood cell production.* This can be due to a variety of factors, including:

– nutritional deficiencies: iron *(this is the most common cause worldwide)*, vitamin B12, folic acid deficiency;

– bone marrow disorders: lymphoproliferative syndromes or aplastic anemia;

– chronic diseases: chronic kidney disease, inflammatory diseases, cancer, endocrine disorders;

– toxins or medications: drugs, alcohol, and toxins;

– genetic disorders (affect the production and function of hemoglobin): thalassemia and sickle cell anemia.

3. *Increased red blood cell destruction (hemolysis):*

– inherited disorders: glucose-6-phosphate dehydrogenase (G6PD) deficiency or hereditary spherocytosis, sickle-cell anemia, etc.;

– acquired disorders: Autoimmune hemolytic anemia, infections (e.g., malaria), mechanical damage (e.g., from a prosthetic heart valve).

Complaints: weaknesses, fatigue, dizziness, syncopal and orthostatic condition, decrease of memory, pica — desire to eat unusual and nondietary substances (chalk, clay), paresthesia, dyspnea, palpitation, dyspepsia, neurological symptoms, including abnormal sensations such as pins and needles, numbness in hands and feet. Chest pain and reduced exercise tolerance — with more severe anemia. Mild anemia may otherwise be asymptomatic.

Objective examination in case of anemic syndrome see below (Table 4).

Table 4

Objective examination in case of anemic syndrome

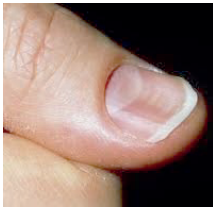
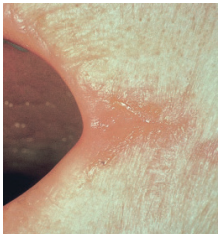
Method	Result
Inspection (Table 5)	Pallor/jaundice skin, mucous membranes of the mouth and pharynx, the conjunctivae, the lips, and the nail beds. Trophic disorders of the mucous membranes: cheilosis, glossitis, esophagitis, gastritis. Trophic disorders of the skin and appendages: brittle hair, brittle nail, bone pain, koilonychias (“spoon nails”). Tachypnea

End of the table 4

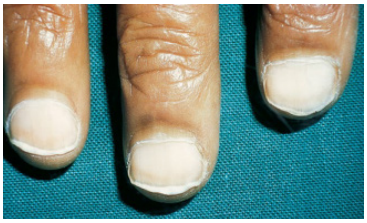
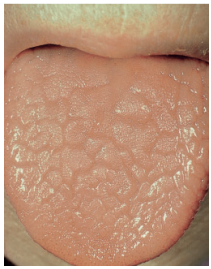
Method	Result
Percussion	Left heart border shifts left
Auscultation	Tachycardia. Systolic murmur at apex (due to low blood viscosity and turbulent blood flow inside of left ventricle). Systolo-diastolic murmur at jugular vein (turbulent blood flow inside of inferior bulb of jugular vein)
Blood pressure	↓ BP (postural hypotension)
Laboratory and instrumental investigations	
CBC	↓ hemoglobin, hematocrit, RBC. Reticulocyte count. MCV. MCH
Biochemical blood test	Iron deficiency anemia: ↓ iron level, transferrin iron-binding capacity, and serum ferritin level. Vitamin B12 deficiency anemia: ↓ serum vitamin B12 level. Folic acid deficiency anemia: ↓ serum RBC folate level. Hemolytic anemia: ↑ unconjugated bilirubin. Hereditary anemia: ↓ pyruvate kinase, ↓ glucose-6-phosphate dehydrogenase (G6PD) enzyme. Kidneys diseases: ↑ creatinine, ↑ urea, ↓ erythropoietin
Urinalysis	Urobilinogen present in urine
Marrow examination	Marrow aspirate/biopsy special stains

Table 5

Inspection in case of anemic syndrome

Sign	Comment
	Koilonychias (“spoon nails”)
	Angular cheilosis

End of the table 5

Sign	Comment
	Pallor of the nail beds in a dark skinned patient
	Pallor of conjunctival mucosa
	Glossitis

Anemia can be classified based:

1. Etiological (based on mechanism): blood loss, decreased blood cells production, hemolysis.
2. Severity (Table 6).

Table 6

Classification of anemia by severity

Anemia severity	Hb level
Mild	90 g/l to levels within normal limits
Moderate	70–90 g/l
Severe	< 70 g/l
Life-threatening	< 55 g/l

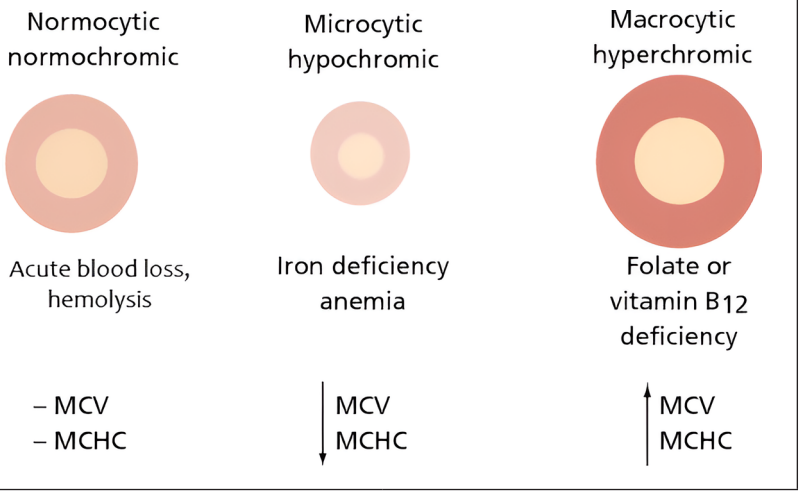
Normal reference values of RBC and Hemoglobin are at Appendix, but they are not universal and may vary at different laboratories.

3. Morphology — using RBC indices (MCV, MCH) (Table 7).

Table 7

Classification of anemia by morphology

Color (MCH)	Size (MCV)
MCH 27–31 pg/cell — Normochromic	MCV 80–100 fl — Normocytic
MCH < 27 pg/cell — Hypochromic	MCV < 80 fl — Microcytic
MCH > 31 pg/cell — Hyperchromic	MCV > 100 fl — Macrocytic (megaloblastic)



4. Functional (Reticulocytes count):
– hyper-regenerative anemia (Rt > 3 %);
– regenerative anemia (Rt 0,5–2 %);
– non-regenerative anemia (Rt < 0,5 %).

HEMORRHAGIC SYNDROME

Hemorrhagic syndrome is a condition characterized by excessive bleeding due to defects of hemostatic system.

Hemostasis is the process by which bleeding is arrested after injury to blood vessels. It is a complicated process that involves interactions between the blood vessels, platelets and plasma coagulation factors. A defect in any of phases of coagulation can result in a coagulation disorders.

Hemorrhagic syndrome includes 3 variants:

1. *Coagulopathy* (disorders of the system blood clotting, for example, hemophilia) (Table 8).

2. *Thrombopathy* (thrombocytopenia / thrombocytopathy, for example immune thrombocytopenic purpura).

3. *Vasopathy* (damage of vascular wall, for example, hemorrhagic vasculitis).

Table 8

Difference between thrombopathy and coagulopathy

Signs	Platelets disorders (extrinsic pathway)	Coagulation protein disorders (intrinsic pathway)
Petechia	Common	Rare
Ecchymosis	Rare	Common
Hemarthrosis	Rare	Common
Delay bleeding	Rare	Common
Bleeding after minor cut	Intensive and prolonged	Minimal
Patient's sex	Female more common	80–90 % male
Family history	No	Yes

Complaints in case of hemorrhagic syndrome are the following:

– nosebleeds (epistaxis), hemoptysis (coughing blood);

– bleeding gums;

– gastrointestinal bleeding (vomiting with blood, vomiting with coffee ground mass, melena);

– excessive or prolonged menstrual blood flow *(menorrhagia)*;

– excessive or prolonged bleeding after injury;

– unexplained skin marks *(petechiae, purpura, ecchymoses, hematoms)* (Table 9).

Serious internal bleeding can cause damage to inner organs such as the brain, kidneys, lungs, and liver. In such case complaints will be related with damaged organ.

Presence of systemic symptoms (fever, anorexia, bone pain, weight loss) may indicate malignancy. History of recent viral infection is common for autoimmune processes. Exposure of some drugs (carbamazepine, vancomycin, etc.) can lead to drug-induced thrombocytopenia.

Objective examination in case of hemorrhagic syndrome see below (Table 9 and 10).

Table 9

Objective examination in case of hemorrhagic syndrome

Method	Result
Inspection (Table 1)	Skin marks such as petechiae, purpura, ecchymoses, hematoms. These signs are present not only on skin, but in subcutaneous fat, muscles, etc. pallor of skin and mucous membranes in case of anemia Color of urine can be reddish (hematuria)
Palpation	Hemorrhagic rash won't change color when you press on them. They will stay purple, red, or brown. Pulse can be weak in case of anemia, tachicardia
Percussion	–
Auscultation	Tachycardia in case of severe anemia Systolic murmur at apex in case of severe anemia
Blood pressure	↓ BP (postural hypotension) in case of severe anemia Positive Tourniquet test

Table 10

Laboratory investigations

Method	Result
Complete blood count	Thrombocytopenia Anemia due to bleeding
Coagulation tests	Bleeding time: prolonged ↑ Prothrombin time (evaluates ability to clot) ↓ Prothrombin index ↑ INR (International normalized ratio) ↓ Fibrinogen D-dimer (elevated D-dimer test result may indicate that patient has a blood clotting condition)

Tourniquet test (Rumpel-Leede capillary-fragility test) is a clinical diagnostic method to determine a patient's hemorrhagic tendency. It assesses fragility of capillary walls and is used to identify thrombocytopenia. For performing this test, we need to inflate blood pressure cuff to a point midway between systolic and diastolic blood pressure for 5 minutes, reduce and wait 2 minutes. The test is positive if there are more than 10 new petechiae per 1 square inch (2,5 × 2,5 cm) (Fig. 1).

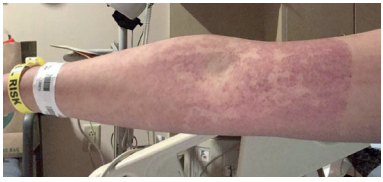


Fig. 1. A positive tourniquet test

INFECTIOUS SYNDROME

Infective syndrome may have any infectious diseases in case of hematologic disease due to immune system dysfunction.

Patients with some hematologic diseases, such as leukemia or primary immunodeficiency, are at increased risk of developing infections. Patients with leukemia are predisposed to infections because of both the immunodepression related disease, and to a further immunosuppression related to therapy with steroids, cytotoxic drugs and monoclonal antibodies.

Reasons of infection in case of leukemia are the following:

– neutropenia;

– impaired immunity;

– breakdown of normal barriers (skin, mucous membranes);

– indwelling catheters and other medical devices.

The infectious process can develop in any organ, but infections of the skin, oral cavity and respiratory system are more common. Bacterial infections tend to occur in case of neutropenia. The respiratory tract is the most common site of infection. Patients with leukemia can develop a pneumonia, pharyngitis, tonsillitis, paranasal sinuses, bronchitis. Approximately 20 % of patients with acute leukemia and neutropenia will develop a sepsis. If neutropenia persists, the risk for fungal infections increases. Common skin infections in case of leukemia include cellulitis and infections at area of injections (Table 11).

Table 11

Clinical signs of infectious syndrome

Infection	Clinical signs	Laboratory investigations
Tonsillitis	Fever Pain in the affected area Symptoms of inflammation at affected area Local lymph nodules swelling	↑ C-reacted protein CBC: – leukocytosis; – neutropenia; – shift to the left. Specific tests (sputum, urine, etc.)
Paranasal sinuses		
Bronchitis		
Pneumonia		
Colitis		
Skin infections		
Urinary infectious		

HYPERPLASTIC SYNDROME

Hyperplastic syndrome — uncontrolled production of lymphocytes that cause monoclonal lymphocytosis, lymphadenopathy and bone marrow infiltration.

Etiology and pathogenesis. Causes of this syndrome include radiation, intoxication (benzene), immunosuppressive treatment, chemotherapy, chronic (viral) infection.

Complaints in case of hyperplastic syndrome are the following: fever, night sweats, weight loss, skin itching, lymph nodes enlargement, bone pain, abdominal pain, fatigue, weakness, secondary infection.

Objective examination in case of hyperplastic syndrome see below (Table 12).

Table 12

Objective examination in case of hyperplastic syndrome

Method	Result
Physical examination	
Inspection (Fig. 2)	Pallor of skin and mucous membranes in case of anemia. Necrotizing tonsillitis. Enlargement of gums. Leukemia cutisis is neoplastic infiltration of the skin or subcutaneous tissue by leukemic cells. Lymphomatoid papulosis (reddish-brown papules). Hemorrhagic diathesis. Enlargement of lymph nodes
Palpation	Lymph nodes are painless, soft, not fixed, not joined to each other with surrounding tissues. Liver and spleen are soft, painful. Pulse can be weak in case of anemia, tachycardia
Percussion	Hepatomegaly. Splenomegaly. Tenderness when tapping on breastbone and tubular bones
Auscultation	Tachycardia in case of severe anemia. Systolic murmur at apex in case of severe anemia
Laboratory investigations	
Complete blood count	Leukocytosis: lymphocytosis, or with predominance of immature myeloid cells (myelocytes, promyelocytes), blasts, “leukemic failure”. Botkin–Gumbrecht shadows. Thrombocytopenia. Anemia. ↑ ESR
Immunophenotype	Philadelphia chromosome (specific genetic abnormality of chronic myeloid leukemia — translocation in 22 chromosome)
Bone marrow	Infiltration of bone marrow with lymphocytes

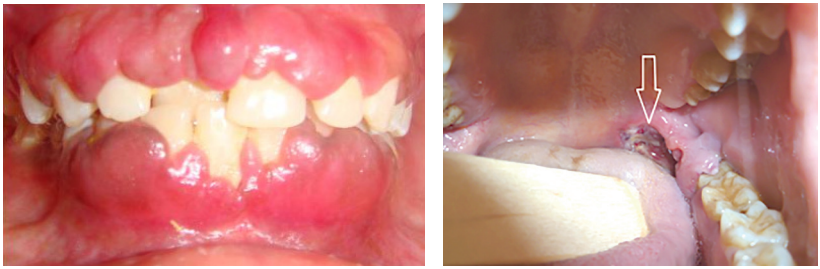


Fig. 2. Inspection in case of hyperplastic syndrome:
a — enlargement of gums; *b* — necrotizing tonsillitis; *c* — leukemia cutisis; *d* — lymphomatoid papulosis; *e* — enlargement of lymph nodes; *f* — hepatosplenomegaly

SELF-CONTROL QUIZ

1. Anemic syndrome is a common condition. What happens when a person has anemic syndrome?

A. The body produces too much iron;
B. The blood does not have enough RBC;
C. The blood does not have enough WBC;
D. Too many white blood cells are produced.

2. What is the most common cause of anemic syndrome?

A. Too little sleep;
B. Too much sugar;
C. Too little iron in the blood;
D. Exposure to X-ray radiation.

3. Which of these groups is the most likely to have anemic syndrome?

A. Men;
B. Women;
C. Teenagers;
D. Older adults.

4. How does anemic syndrome affect the body?

A. The blood doesn't deliver enough oxygen to the body;
B. Blood becomes thin;
C. Tissues retain fluids;
D. Blood becomes thick.

5. A lack of which of these will result in abnormally large RBC and a condition called macrocytic anemic syndrome?

A. Oxygen;
B. Vitamin C;
C. Vitamin B-12 and folic acid;
D. Carbon dioxide.

6. Iron-deficiency anemic syndrome can cause pica, a rare condition in which a person craves eating nonfood items. Which of these would he or she eat?

A. Ice;
B. Soil;
C. Clay;
D. Any of the above.

7. What are the possible causes of hemorrhagic syndrome?

A. Coagulopathy;
B. Thrombocytopenia;
C. Thrombocytopathy;
D. Vasopathy.

8. What symptoms are more specific for coagulopaty?

A. Ecchymosis;
B. Hemarthrosis;
C. Delay bleeding;
D. Bleeding after minor cut.

9. What hematologic diseases is the infectious syndrome specific for?

A. Leukemia;
B. Anemia;
C. Thalassemia;
D. Haemophilia.

10. Clinical signs of infectious syndrome:

A. Fever;
B. Local lymph nodules swelling;
C. Petechiae;
D. Koilonychias.

11. What complaints may patients with hyperplastic syndrome have?

A. Fever;
B. Skin itching;
C. Lymph nodes enlargement;
D. Bone pain.

12. What clinical symptoms are specific to hyperplastic syndrome?

A. Hepatomegaly;
B. Splenomegaly;
C. Tachycardia;
D. Ecchymoses.

Answers: 1 — B, **2** — C, **3** — B, **4** — A, **5** — C, **6** — D, **7** — A, B, C, D, **8** —A, B, C, **9** — A, **10** — A, B, **11** — A, B, C, D, **12** — A, B, C.

Appendix

NORMAL COMPLETE BLOOD COUNT

Parameter	Reference values		Unit	Note
	male	female		
RBC	3,8–5,7	3,5–5,1	10^{12}/l	–
Hemoglobin	130–160	120–150	g/l	–
Hematocrit	40–52	36–42	%	–
MCV	80–95		fl.	–
MCH	27–33,3		pg	–
MCHC	300–370		g/dl	–
Reticulocytes	0,2–1,5		%	–
WBC	4–9		10^9/l	–
Platelets	150–450		10^9/l	–
ESR Panchenkov's method	2–10		mm/h	male
	2–15		mm/h	female
ESR Westergren's method	1–15		mm/h	before 50 y.o.
	1–20		mm/h	after 50 y.o.
Leukocyte count				
Parameter	**%**	**10^9/l**	**Note**	
Basophils	0,5–1	0,01–0,065	–	
Eosinophils	1–5	0,02–0,5	from 5 y.o.	
Neutrophils: band	1–6	0,04–0,57	from 14 y.o.	
segmented	47–72	1,8–6,5	from 5 y.o.	
Lymphocytes	19–39	1,5–4	from 5 y.o.	
Monocytes	2–11	0,05–0,8	from 14 y.o.	

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EXAMINATION OF PATIENTS WITH HEMATOLOGIC DISEASES

Учебно-методическое пособие

На английском языке

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