LECTURE COMPLEX

Discipline: "Blood and lymph in pathology"
Course code: BPL 3307
Title and code of the OP: 6B10115 "Medicine"
Amount of study hours/credits: 30 hours/1 credits
Course and semester of study: 3rd year/ 6th semester
Lecture length: 2

Shymkent, 2025y.

The lecture complex was developed in accordance with the working curriculum of the discipline (sillabus) and discussed at a department meeting.

Protocol: № 11 «26» 06. 2025y.

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Lecture №1

1. Topic: Methods of examination of patients with hematopoietic system pathology. Diagnostic significance. History taking, general examination, main and additional complaints of patients with hematopoietic system disorders. Data from physical examination methods of the hematopoietic system. Methods and techniques of palpation and percussion of the spleen. Methods and techniques of palpation of lymph nodes.

2. Goal: To train students to identify risk factors, causes, and clinical features of hematopoietic system diseases. To train students in the method and technique of palpation and percussion of the spleen, and palpation of lymph nodes.

3. Lecture theses:
Methods of examination in hematopoietic system diseases.
Despite the undeniable value of special diagnostic methods, conventional clinical techniques can provide important information.

Physical examination is performed in full, as in the examination of other organ systems:

- Color of skin and mucous membranes (including skin changes).
- Tongue changes.
- Enlargement of lymph nodes.
- Enlargement of the liver and spleen.
- Involvement of other systems — primarily the skeletal and nervous systems.

Technique and method of spleen palpation and percussion.

Brief anatomical and topographic notes:

- The spleen is located in the left hypochondrium, between the 9th and 11th ribs.
- Normally, the spleen is not palpable.
- Upper border — around the 9th rib; lower border — at the 11th rib.
- Spleen dimensions: length 10–12 cm, width 6–8 cm, thickness 3–4 cm.
- Enlargement of the spleen (splenomegaly) is the main sign of its pathology.

Percussion of the spleen.
Purpose: to determine size and borders.
Method (according to Kurlov):

1. Patient lies on the back or right side.
2. Percussion is performed with light (superficial) tapping.
3. Two dimensions are determined:
    - Longitudinal (along the 10th rib) — from the posterior to the anterior border of dullness (normally 6–8 cm).

- Transverse (along the midaxillary line) — perpendicular to the first (normally 4–6 cm).
  Normal value: the area of splenic dullness does not exceed 6×8 cm.

Palpation of the spleen (Obraztsov–Strazhesko method).
Purpose: to detect enlargement, tenderness, consistency, and surface.

Conditions: The patient lies on the back, left hand on the chest, right hand along the body. The physician sits on the right. The left hand fixes the left half of the patient's chest. The right hand is placed in the left hypochondrium, parallel to the costal arch.

Stages: The physician gently presses the fingers into the abdominal wall during exhalation. On inhalation, the spleen descends and may slip under the fingers. Determined:

- Size (whether the lower edge protrudes from under the costal arch).
- Consistency (soft, firm).
- Surface (smooth or nodular).
- Tenderness.

Variants: Normally, the spleen is not palpable. An enlarged spleen is palpated as a firm mass under the costal arch.

Diagnostic significance:

- Splenomegaly occurs in:
  - Infectious diseases (typhoid fever, sepsis, malaria).
  - Hematological diseases (leukemia, lymphoma, hemolytic anemia).
  - Portal hypertension, liver cirrhosis.
  - Systemic connective tissue diseases.
- Tenderness may occur with splenic infarction, perisplenitis.
- Consistency and surface:
  - Soft — in acute infections.
  - Firm and nodular — in tumors, chronic hematologic diseases.
- Normally: spleen borders by percussion within 6×8 cm, not palpable.
- Any enlargement of the spleen is an important diagnostic sign requiring further evaluation of the cause.

Palpation of the Lymph Nodes
Under normal conditions, peripheral lymph nodes are round or oval structures measuring 5 to 20 mm. They do not protrude above the skin surface and therefore are not visible to the naked eye during general examination. The following lymph nodes are palpated: occipital, posterior, anterior, mandibular, submental, supraclavicular, popliteal, axillary, epitrochlear, and inguinal. Palpation is performed with the fingertips using a sliding circular motion in the projected area of the lymph nodes, pressing as deeply as possible toward denser structures (bones, muscles). During palpation, attention is paid to the following characteristics: size, shape, consistency, tenderness, mobility,

adhesion to one another or to surrounding tissues, and the condition of the skin over the lymph nodes.

Ultrasound examination of the lymph nodes allows for the detection of significant lymph node enlargement. Unchanged lymph nodes on ultrasonography do not appear particularly large and have acoustic properties similar to surrounding tissues. The minimal size of significantly enlarged lymph nodes is 8–9 mm. Lymph nodes detected by ultrasound are considered pathologically altered and require further diagnostic evaluation. Most often, lymph nodes are located along the main vessels or at the hilum of organs. When not very large, they appear hypoechoic with a clearly defined smooth contour. As the pathological process progresses, lymph nodes increase in size, their structure becomes more homogeneous, and echogenicity may increase. The shape becomes irregular, with a tendency to form conglomerates. With structural changes in the nodes, differentiation of the type of pathological process becomes unreliable.

The optimal method for evaluating all groups of lymph nodes is computed tomography (CT). On CT, lymph nodes appear as homogeneous round soft-tissue structures. The main criterion for pathology is enlargement. Normally, lymph nodes detected on CT do not exceed the diameter of a small pit. Lymph nodes with a diameter of 8–10 mm are considered borderline. Abnormally enlarged lymph nodes indicate a pathological process. Their structure and densitometric density may vary with size. Among all sites, mediastinal lymph nodes are the most reliably assessed.

Magnetic resonance imaging (MRI) of a normal lymph node depends on the imaging sequence. On T1-weighted images, an unchanged lymph node has a homogeneous oval or round shape, uniform structure, and clear contours. It is well differentiated from surrounding tissues. Pathologically altered lymph nodes can reach significant sizes and may show irregular structure and shape.

In suspicious cases, radionuclide studies are performed using positron emission tomography (PET).

Ultrasound examination of the spleen.
The spleen’s anatomical location is favorable for ultrasonography. Its structure appears fine-grained, with echogenicity lower than that of the liver. It is outlined by a hyperechoic capsule; vessels are visible near the hilum, and spleen dimensions can be easily measured.

Computed tomography of the spleen reveals its density, size, and structure. Normally, the splenic capsule is not detected. After contrast administration, splenic vessels are clearly visualized and contrast accumulation within the organ is seen.

Magnetic resonance imaging allows visualization of splenic vessels, structure, and dimensions without the need for contrast.

Laboratory Methods of Investigation

1. Complete blood count
2. Urinalysis

3. Coproscopy
4. Blood biochemistry: total and fractionated bilirubin, ALT, AST, ferritin, serum iron
5. Determination of erythrocyte osmotic resistance
6. Coombs test

Instrumental Methods of Investigation

1. Sternal puncture
2. Trephine biopsy
3. Endoscopic examination
4. Ultrasonography
5. Radiological examination

Illustrative material: presentation.
Reference:
Mukhin, N. A. *Selected Lectures on Internal Medicine*. 2nd ed. Moscow: GEOTAR-Media, 2017. – 328 p.

Control Questions (Feedback):

1. Name the main complaints in diseases of the hematopoietic system.
2. What should be paid attention to during general examination of patients with hematopoietic system diseases?
3. How is lymph node palpation performed?
4. What information does spleen percussion provide?
5. What other physical examination methods are used in patient evaluation?

Lecture №2

1. **Topic 2:** Leading clinical syndromes (anemic, hemorrhagic, and thrombocytopenic) of the hematopoietic system. Predisposing factors and causes leading to the development of anemic, hemorrhagic, and thrombocytopenic syndromes. Patient interview, general examination, main and additional complaints, anamnestic features, and objective data. Laboratory and instrumental methods of investigation in leading clinical syndromes of hematopoietic system diseases.
2. **Objective:** Based on the integration of fundamental and clinical disciplines, to teach students the basics of clinical examination of the hematopoietic system in normal and pathological conditions, and to diagnose pathological syndromes during physical, laboratory, and instrumental examination of the patient.

3. **Lecture Theses:**
Anemia is one of the most common pathological conditions in clinical practice. It is not an independent disease, but a syndrome occurring in various diseases and pathological states. Anemia is a condition characterized by a decrease in hemoglobin content and/or the number of red blood cells per unit of blood volume, leading to impaired oxygen transport to tissues and the development of hypoxia.

Etiology and classification. Anemias are diverse in origin. They are classified as follows:

- **By pathogenesis:**
  • Anemias due to blood loss (acute, chronic).
  • Anemias due to impaired hematopoiesis:
  – Deficiency (iron deficiency, B12 deficiency, folate deficiency).
  – Hypoplastic and aplastic.
  • Anemias due to increased destruction of red blood cells (hemolytic).
- **By morphological features (size and color of red blood cells):**
  • Normochromic, hypochromic, hyperchromic.
  • Microcytic, normocytic, macrocytic.

Clinical picture of anemic syndrome.
The main manifestations are associated with tissue hypoxia and compensatory reactions of the body.

- **General symptoms (tissue hypoxia syndrome):**
  • Weakness, fatigue.
  • Dizziness, fainting.
  • Dyspnea on exertion.
  • Palpitations, tachycardia.
  • Pallor of skin and mucous membranes.
- **Specific symptoms depending on the type of anemia:**
  • Iron deficiency anemia: dry skin, brittle hair and nails, pica (pica chlorotica), glossitis, cheilitis.
  • B12 deficiency anemia: Hunter's glossitis (bright red "lacquered" tongue), paresthesias, gait disturbances, symptoms of funicular myelosis.
  • Hemolytic anemias: jaundice, splenomegaly, increased indirect bilirubin.
  • Anemia of chronic disease: moderate manifestations against the background of the underlying pathology.

Laboratory studies:
• Complete blood count: decreased Hb, erythrocytes, changes in color and size of RBCs, increased or decreased reticulocytes.
• Blood biochemistry: serum iron, ferritin, bilirubin, LDH, vitamin B12, folic acid.
• Bone marrow (myelogram): to assess hematopoiesis.

Instrumental methods:
• Abdominal ultrasound (spleen, liver).
• Endoscopy if gastrointestinal bleeding is suspected.

Differential diagnosis:
• Iron deficiency anemia vs. anemia of chronic disease.
• Megaloblastic anemia vs. sideroblastic anemia.
• Hemolytic anemias vs. mechanical jaundice.

Clinical significance of anemic syndrome:
• It is a universal syndrome in therapy, hematology, gastroenterology, nephrology, and other fields.
• It may be the first sign of serious diseases (gastrointestinal cancer, chronic blood loss, systemic diseases).
• It always requires identification of the underlying cause, not only correction of hemoglobin levels.

Anemic syndrome is a polyetiological condition that accompanies a wide range of diseases. Its timely detection and proper interpretation are key to diagnosis and treatment planning.

Hemorrhagic syndrome is a pathological condition characterized by increased bleeding and a tendency to spontaneous or excessive hemorrhages resulting from disorders in the hemostasis system.

Pathogenesis (main mechanisms). Disorders can occur at different levels:
• Vascular component: increased fragility and permeability of capillaries.
• Platelet component: quantitative (thrombocytopenia) and/or qualitative (thrombocytopathies) defect.
• Plasma component: deficiency or defect of coagulation factors (hemophilia, coagulopathies).
• Combined forms: DIC syndrome, severe systemic diseases.

Classification (by pathogenetic principle):

1. Vascular-purpuric type — with pathology of the vascular wall (vasculitis, connective tissue diseases).
2. Thrombocytopenic/thrombocytopathic type — with decreased platelet count or impaired platelet function.
3. Coagulopathic type — with deficiency of plasma clotting factors (congenital — hemophilia, acquired — liver disease, DIC).
4. Mixed type — DIC syndrome, severe infections, oncohematologic diseases.

By clinical manifestations:
• Petechial-spotted (small pinpoint hemorrhages, ecchymoses).
• Hematoma type (deep subcutaneous and intramuscular hemorrhages).
• Mixed type.

Clinical manifestations. General signs:
• Gum bleeding, nosebleeds.
• Bruises and petechiae on the skin and mucous membranes.

• Hematomas after minor trauma.
• Hemorrhages into internal organs.

Features depending on the type:
• Vascular type: multiple small pinpoint hemorrhages (petechiae, purpura), often symmetrical.
• Platelet type: petechiae, ecchymoses, nosebleeds, uterine bleeding.
• Coagulopathic type: large hematomas, hemorrhages into joints (hemarthroses), muscles.
• DIC syndrome: combination of bleeding and thrombosis.

Diagnosis. History and clinical data:
• Presence of spontaneous bleeding.
• Family history (hemophilia, hereditary coagulopathies).
• Comorbidities (liver disease, kidney disease, infections).

Laboratory studies:
• Complete blood count: platelet count.
• Coagulogram: prothrombin time, aPTT, fibrinogen.
• Bleeding time (Duke, Ivy).
• Platelet aggregation tests.
• Coagulation factor studies.

Differential diagnosis:
• Distinction of vascular, platelet, and coagulopathic types by the nature of bleeding and laboratory findings.
• Exclusion of secondary causes (liver cirrhosis, sepsis, oncohematologic diseases).

Clinical significance:
• Hemorrhagic syndrome may be a manifestation of both local blood diseases and systemic conditions (liver, kidney, connective tissue diseases).
• Often serves as the first symptom of serious pathologies (hemophilia, leukemia, DIC syndrome).
• Requires not only symptomatic treatment (stopping bleeding) but also identification of the underlying cause.

Hemorrhagic syndrome is an important interdisciplinary syndrome encountered in therapy, pediatrics, surgery, and hematology. Knowledge of its mechanisms and clinical forms allows for correct diagnosis and treatment.

Platelets play a key role in primary hemostasis, ensuring the formation of a platelet plug at sites of vascular injury.
Thrombocytopenia — a decrease in platelet count below 150×10^9/L.
Thrombocytopenic syndrome is a set of clinical manifestations arising from a decrease in platelet count or function, presenting with increased bleeding of the petechial-spotted type.

Etiology and pathogenesis. Causes are divided into 4 groups:

1. **Impaired platelet production in the bone marrow:**
   - Aplastic and hypoplastic anemia.
   - Bone marrow lesions (leukemia, tumor metastases).
   - Myelofibrosis, cytostatic drugs, radiation.
2. **Increased platelet destruction:**
   - Immune (idiopathic thrombocytopenic purpura, drug-induced thrombocytopenia).
   - Non-immune (DIC syndrome, massive transfusions).
3. **Redistribution of platelets:**
   - Hypersplenism in portal hypertension, liver cirrhosis.
4. **Dilutional thrombocytopenia:**
   - After massive infusions and blood transfusions.

Classification of thrombocytopenias:

1. By origin: congenital, acquired.
2. By mechanism: central (decreased production), peripheral (increased destruction or sequestration).
3. By clinical course: acute, chronic.

Clinical picture of thrombocytopenic syndrome:
Type of bleeding — petechial-spotted.

Main manifestations:
• Multiple petechiae and ecchymoses on skin and mucous membranes.
• Gum bleeding, nosebleeds.
• Uterine bleeding.
• Hemorrhages into conjunctiva, sclera.
• Bleeding after minor trauma or injections.
• Hemorrhages into internal organs (less common).

Characteristic feature: No large hematomas or hemarthroses (unlike coagulopathies).

Diagnosis.

- **Clinical:** type of bleeding (petechial-spotted), presence of hemorrhagic rash and mucosal bleeding.
- **Laboratory:**
  • CBC: reduced platelet count (<150 × 10⁹/L).
  • Bleeding time (Duke, Ivy): prolonged.
  • Coagulogram: coagulation system parameters normal.
  • Myelogram: assessment of megakaryocytes (to determine mechanism).

Differential diagnosis:
• Distinction from coagulopathic syndrome (hematomas and hemarthroses).
• Distinction from vascular type of bleeding (normal platelet count).
• Exclusion of secondary causes (cirrhosis, hypersplenism, infections, medications).

Clinical significance:
• Thrombocytopenic syndrome may be the first manifestation of severe blood diseases (acute leukemia, aplastic anemia, ITP).
• Danger of life-threatening hemorrhages (gastrointestinal, intracranial).
• Important to identify the cause in time: in immune thrombocytopenia — hormone or immunosuppressive therapy; in hypersplenism — splenectomy may be considered.

Thrombocytopenic syndrome is one of the most common variants of hemorrhagic syndrome. Its recognition is essential for the practicing physician, since timely diagnosis helps prevent life-threatening bleeding and ensures adequate treatment.

Illustrative material: presentation.
Literature: Mukhin, N.A. *Selected Lectures on Internal Medicine*. 2nd edition. Moscow: GEOTAR-Media, 2017. – 328 p.

Control questions (feedback):

1. Classification of anemia?
2. In which pathologies does anemic syndrome develop?
3. Which diagnostic methods can detect aplastic anemia?
4. Which laboratory and instrumental methods are used to diagnose anemic syndrome?
5. What are leukemias?
6. What characterizes lymphocytic leukemia?
7. Which diagnostic methods can detect myeloid leukemia?
8. Which laboratory and instrumental methods are used to diagnose lymphocytic and myeloid leukemia?

11. Educational resources	
Electronic resources, including but not limited to: databases, animations, simulators, professional blogs, websites, other electronic reference materials (e.g.: video, audio, digests)	**"Propaedeutics of Internal Diseases"** Ivashkin, VTInternal diseases propedeutics [Electronic resource] :textbook. - Electron. text data (142MB). - M.: GEOTAR - Media, 2017. - email. wholesale disk Ishki aurular./Bimurzaev G.N., Zaripova G.K. , 2020 /https://aknurpress.kz/reader/web/2594 Ishki aurular pəninen klinikalyk tapsyrmalar zhinagy.Erzhanova G.A., Mukhanova A.K. , 2016/https://aknurpress.kz/reader/web/2370 Shki aurular propedeuticsynan zhardayattyk tapsyrmalar Orazova B.O., Marchenko T.V., 2016/https://aknurpress.kz/reader/web/2348 Akhmetov Kayyrgali Zhaleluly. Ishki aurular propaedeutics Panin clinic daristeri. Almaty: “Evero”, 2020. – 262 bet https://elib.kz/ru/search/read_book/22/ Internal non-infectious diseases with clinical radiological assessment KSU named after A. Baitursynov, 2011. – 94 p. http://rmebrk.kz/book/1024356
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