

МІНІСТЕРСТВО ОХОРОНИ ЗДОРОВ'Я УКРАЇНИ
Харківський національний медичний університет

GENERAL PATHOLOGIC ANATOMY

*Manual for practical classes in pathomorphology
for English-speaking teachers*

ЗАГАЛЬНА ПАТОЛОГІЧНА АНАТОМІЯ

*Методичні розробки
до занять з патоморфології
для англomовних викладачів медичних закладів*

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Foreword

Pathomorphology, one of the most important medical subjects is aimed at teaching students understanding material basis and mechanisms of the development of main pathological processes and diseases.

This manual published as separate booklets is devoted to general pathological processes as well as separate nosological forms. It is intended to the English-medium students of the medical and dentistry faculties. It can be used as additional material used for individual work in class. It can also be used to master the relevant terminology and its unified teaching.

The manual is based on the syllabuses in Pathomorphology for Medical Students (2015).

For a practical class of 2 hour duration the following time calculation is recommended:

1. Greeting of students and check of students presence, topics substantiation – 5 min
2. Determining the primary level of the knowledge – 5 min.
3. Independent work of the students – 50 min.
4. Determining the final level of the knowledge – 20 min.
5. Checking the protocols of the practical class and attestation of the students – 10 min.

The suggested Manual allows to organize the teaching process in the proper way.

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Lesson

Intracellular accumulations

Validation of the subject: The knowledge of the present subject is essential for successful understanding of the other chapters in general and systemic pathomorphology. In the medical practice the knowledge of parenchymatous degenerations can be useful for diagnosis of cardiovascular, kidney, hepatic and other diseases.

Objectives of the lesson: to discuss the etiology, pathogenesis, classification, morphological characteristics, possible outcomes and the role of parenchymatous protein, fat (lipid) and carbohydrate degenerations.

Practical habits and skills. Students have to be able to definite different types of parenchymatous degenerations, to differentiate the types of degeneration on the basis of investigation of macro- and micro- specimen. Use the knowledge for diagnosis of parenchymatous degenerations in clinics.

Specific manuals for work on a practical class

Scientometric foundation of the topic is defined at the beginning of classes. Then readiness for the class is checked by the test control.

The students (under teacher control) determine macrospecimens, slides, microspecimens on electrified stand and electronic micrographs.

Visual aids

Annotated tables:

- classification of dysproteinoses
- causes and conditions causing degenerative processes
- morphogenesis of degenerative processes
- degenerative processes and diseases in humans
- classification and types of obesity and lipid degenerations
- classification of lipoidoses
- classification of dysfunctional carbohydrate metabolism
- types of glycogenosis

Coloured tables:

- fatty degeneration of the liver, kidney, myocardium
- reaction to fats and carbohydrates

Slides:

- granular degeneration of the liver and kidney
- lipid (fatty) degeneration of the myocardium
- lipid (fatty) degeneration of the liver
- glycogenic infiltration of the epithelium of the renal tubules

Macrospecimen:

- granular degeneration of the kidney (dull swelling of the kidney)

- cutaneous horn (hyperkeratosis)
- lipid degeneration of the myocardium
- lipid degeneration of the liver
- lipid degeneration of the kidney
- spleen in Gaucher`s disease.

Microspecimen:

- # 33 – granular degeneration of the kidney;
- # 169 – keratinising type of squamous carcinoma of the skin;
- # 44 – fatty degeneration of the liver;
- # 46 – fat degeneration of the myocardium;
- # 152 – glycogen in kidneys.

Electronic micrographs

- granular degeneration of the proximal tubules of nephrocytes;
- granular degeneration of hepatocytes;
- hydropic degeneration of hepatocytes.

Questions to control basic knowledge:

- 1) Do you think granular degeneration is a reversible process?
- 2) Indicate the most common outcome of hyalin-drop degeneration: a) reverse development, b) cell necrosis.
- 3) Name the signs, characterising fatty degeneration of the liver: a) decrease in size, b) soft texture, c) increase in size, d) red colour of the parenchyma, e) yellowish-ochre colour of the parenchyma, f) hard texture.
- 4) Indicate which of the following parenchymatous degenerations belong to:
 - 1) lipoidosis; 2) glycogenosis
 - a) Gaucher`s disease
 - b) Pompe`s disease
 - c) Girke's disease
 - d) Tay-Sach`s disease
 - e) Niemann-Pick disease
 - f) Anderson`s disease

Answers: 1) yes. 2) – b. 3) – b c e. 4) 1 – a d e; 2 – b c e

Stages of individual work in class

Discuss theoretical questions in the process of macro- and microspecimens studying:

- 1) Define the term "Lesion". Name the types of lesions.
- 2) Name the morphologic mechanism of degenerations.
- 3) Give the classification of degenerations.
- 4) Name the types of dysproteinoses. What macro-, micro- and electronmicroscopic changes take place in the organs during dysproteinoses.

- 5) Outcome and functional significance of different kinds of dysproteinoses.
- 6) Name the hereditary degenerations related to amino acid metabolism disturbance.
- 7) What are the causes and mechanisms of fat degeneration.
- 8) Characterise the appearance of the heart, liver and kidneys in fat degeneration.
- 9) Which histochemical methods (reactions) will help to trace fat in the tissues.
- 10) Outcome and functional significance of parenchymatous fat degenerations.
- 11) Name systemic lipoidoses.
- 12) Give the modern classification of carbohydrate degeneration. State the histochemical reactions, necessary to reveal the presence of carbohydrates in tissues.
- 13) What are manifestations of carbohydrate dysfunction in diabetes mellitus?
- 14) Name glycogenoses.
- 15) Give the characteristics of carbohydrate degeneration related to disturbed metabolism of glycoprotein.

Macrospecimen:

Ichtyosis. Pay attention to the skin of the fetus: characterise changes of it. Where these changes are predominantly located?

What is related to the described changes?

Hyperkeratosis «Cutaneus horn» Pay attention to increased deposition of horny substance in the area of the nail bed. Describe the appearance of the macro specimen. What type of horny degeneration is discussed and what is the cause of this pathology?

Fatty degeneration of the myocardium (tiger's heart). Pay attention to the organ size, expansion of the chambers, soft texture. Characterise the appearance of the sectioned myocardium, pay attention to the greenish-yellow colour. Describe appearance from the endocardial side.

What is related to the yellowish-white striations from the endocardial side, especially deeply expressed in muscles and trabecules of the heart ventricles?

Lipid degeneration of the liver (goose's liver). Pay attention to the organ size, flabby texture, yellowish-ochre colour of the parenchyma. What is the cause of such changes? What are possible outcomes?

Large white kidney – lipid degeneration of the kidney. Pay attention to the organ size, flabby texture, white colour of the parenchyma. How do you characterise the type of the sectioned tissue? What are the causes of such changes? What are possible outcomes?

Spleen in Gaucher's disease: Describe the appearance of the macro specimen. Pay attention to the organ enlargement, changes in colour, texture. What are the causes of the changes in the appearance of the organ in Gaucher's disease? Pay attention to the nodular and diffuse nature of cerebrosid deposition.

Microspecimen.

33 – *granular degeneration of the kidney* (stained with hematoxylin and eosin).

Using low magnification find convoluted tubules, pay attention to the presence of protein fragments coloured pink in their lumens. Using great magnification study the epithelium of the convoluted tubules, pay attention to the swelling of the cytoplasm causing the narrowing of the lumen of tubules, uneven colouring of cytoplasm because of the presence of protein grains, disappearance of some nucleus.

169 – *keratinising type of squamous carcinoma of the skin*; (stained with hematoxylin and eosin).

Using low and great magnification find the complexes of neoplastic cells growing into the underlying tissues. Pay attention to the presence in the centre of complexes keratinized cells which form so called «cancerous pearls». Name the types of horny degeneration.

152 – *glycogen in the kidneys* (Shabadash reaction).

Using low and great magnification find accumulation of glycogen grains and granules in the lumens and epithelium of the convoluted tubules. The glycogen grains and granules are raspberry coloured. What disease is characterised by such condition in kidneys?

44 – *fatty degeneration of the liver* (stained with hematoxylin and eosin, Sudan III).

Pay attention that fats are accumulated mainly in the peripheral regions of the hepatic lobules. Stained with Sudan III, fat looks like orange drops, however stained with hematoxylin and eosin it looks like emptiness formed at the place of fat location. What fatty hepatic degenerations do you know?

46 – *fatty degeneration of the myocardium* (stained with Sudan III).

Pay attention to the orange colour of drops in cytoplasm of cardiomyocytes. Demonstrative specimen.

Electronograms

Granular degeneration of the nephrocytes of the proximal tubules. ×18 000.

Pay attention to the swelling and homogeneity of mitochondria, numerous vacuoles in the cytoplasm and to the desquamation of microvilli

Granular degeneration of hepatocytes. ×15 000.

Pay attention to the enlargement of the quantity and sizes of the mitochondria, enlargement of canaliculi of endoplasmic reticulum with ribosomes on the membrane.

Ballooning (hydropic) degeneration of hepatocytes. ×18 000.

Pay attention to the enlargement of canaliculi of endoplasmic reticulum with forming of vacuoles, filled with flake-like content.

Control final knowledge:

Krok problem test

1. Autopsy of the patient who had been ill with leukemia and died of increasing chronic anemia revealed an enlarged heart, dull, flabby, pale gray myocardium. There were yellow plaques and bands under the endocardium. Which pathologic process is observed in the heart?

- A. *Parenchymal fatty degeneration**
- B. *Vacuole degeneration*
- C. *Hyalin-drop degeneration*
- D. *Mesenchymal fatty degeneration*
- E. *Functional hypertrophy*

2. External examination of a newborn revealed dry dull pale skin with uneven surface and presence of gray scaling plates. Which type of degeneration is this pathology associated with?

- A. *Horny**
- B. *Hydropic*
- C. *Hyalin-drop*
- D. *Fibrinoid swelling*
- E. *Mucoid swelling*

3. Microscopic study of the biopsy material from the female patient who suffers from diabetes mellitus has revealed that the epithelium of narrow and distal segments of the tubules is high with light foamy cytoplasm. Staining with Best's carmine revealed red grains in the cytoplasm of the epithelium and tubules. Which parenchymatous dystrophy is present?

- A. *Protein*
- B. *Fat*
- C. *Hyalin-drop*
- D. *Mucous*
- E. *Carbohydrate**

The class is finished with analysis of the results of each student individual work by checking of macro- and microspecimens description and final test control.

Lesson

Extracellular accumulations

Validation of the subject: studying the subject is necessary for understanding of the other subjects of general pathology and also as a guide to study the pathological anatomy of diseases (infectious, allergic, rheumatic as well as hypertension, atherosclerosis, renal diseases, endocrinopathy). The knowledge of the cause and pathogenesis of mesenchymal degeneration is very important for understanding of clinical disciplines when studying them and also for medical practice.

Objective of the lesson: to discuss the etiology, pathogenesis, classification, morphological changes in the connective tissues; possible outcomes and significance of mesenchymal degeneration in organ dysfunction.

Specific manuals for work on a practical class

Scientometric foundation of the topic is defined at the beginning of classes. Then readiness for the class is checked by the test control.

The students (under teacher control) determine macrospecimens, slides, microspecimens on electrified stand and electronic micrographs.

Visual aids

Annotated tables:

- connective tissue structure
- morphogenesis of mesenchymal degeneration
- morphogenesis of amyloidosis
- classification of amyloidosis

Coloured tables:

- hyalinosi
- amyloidosis
- fat metabolism dysfunction
- specific microscopic staining for amyloid

Slides:

- "sago spleen"
- hyalinosi of spleen artery
- arteriosclerotic nephrosclerosis
- obesity of the heart

Macrospecimen

- "sago spleen"
- sebaceous (waxy) spleen
- kidney amyloidosis
- glazed spleen (sugar-icing spleen)
- hyalinosi of scars
- general obesity – adipose tissue

- fat capsule of the kidney
- obesity of the heart

Microspecimen

- # 32 – mucoid swelling of the aorta wall in atherosclerosis
- # 36 – hyalinosis of the splenic arteriole
- # 38 – amyloidosis of the spleen (sago spleen)
- # 42 – amyloidosis of the liver
- # 43 – obesity of the heart

Questions to control basic knowledge:

- 1) Is amyloidosis a type of carbohydrate degeneration?
- 2) Name the types of mesenchymal protein degeneration: a) mucoid swelling
b) dull swelling c) hyalinosis d) amyloidosis e) hyaline-drop degeneration
f) fibrinoid swelling
- 3) What structures are changed in mucoid swelling: a) collagenous fibres
b) hepatocytes c) main substance of connective tissue d) epithelium of convoluted tubules
- 4) Classify for 1 – protein; 2 – fatty; 3 – carbohydrate mesenchymal degeneration: a) fibrinoid swelling b) general obesity c) amyloidosis
d) mucoid swelling e) hyalinosis f) mucus degeneration

Answers: 1 – no. 2 – a, c, d, f. 3 – a, c. 4 – 1) a, c, d, e; 2) b; 3) f.

Stages of individual work in class

Discuss theoretical questions in the process of macro- and microspecimens studying:

- 1) Name morphogenetic mechanisms of development of mesenchymal degenerations.
- 2) Name the main causes of fibrinoid changing.
- 3) As outcome of which pathological processes can hyalinosis develop? List the types of vascular hyalinosis.
- 4) Classification of amyloidosis.
- 5) Stages of amyloid morphogenesis. Theories of amyloid pathogenesis.
- 6) The causes and types of obesity.

Macrospecimens:

Hyalinosis of the splenic capsule (glased spleen, sugar-icing spleen). Describe splenic capsule, colour, texture, outlook. Characterise the origin of capsule changes. Give the definition of the process, indicate previous condition. Characterise the level of reversibility.

Amyloidosis of the spleen (sago spleen). Describe the size of the organ, its texture, colour, appearance on the cut section. Indicate the origin of the process, localization of amyloid. Define the process, indicate the steps of morphogenesis. Name specific microscopic staining for amyloid.

Amyloidosis of the spleen (sebaceous or waxy spleen). Describe the size of the organ, its texture, colour, appearance on the cut section. Indicate localization of amyloid. Indicate the difference between «sebaceous» and «sago» spleen.

Amyloidosis of the kidney. Describe the size of the organ, its texture, the width of cortical layer, the appearance of surface on the cut section. Name the diseases which can outcome to amyloidosis of kidney. What is the result of it?

Obesity of the hart. Determine the size of the organ. Pay attention to the quality of fat under the epicardium. Pay attention the growth of fatty tissue in the heart wall on the section, more developed in the right portions. Characterise the type of dysfunctional fatty metabolism. Name the etiology and mechanisms of development of the general obesity, its significance, outcome.

Atherosclerosis of aorta. Characterise the appearance, colour of the aortic intima. Define the origin of the changes; explain the mechanism of development, significance for the organism.

Microspecimen.

32 – *muroid swelling of the aorta wall* (stained with toluidine blue). Pay attention to the difference in colour of unchanged areas and those of muroid swelling. What substances are accumulated in the area of muroid swelling? What are their properties? Name the diseases and conditions which are accompanied by muroid swelling. Name the outcomes of muroid swelling.

36 – *hyalinosis of the splenic arteriole* (stained with hematoxylin and eosin). Using low magnification find the central arteries of the spleen follicule. Using high magnification study the width of the vascular wall and its lumen, the condition of internal and external layers. Explain the mechanisms of development of hyalinosis of the splenic arteriole. Determine the outcome and significance.

42 – *amyloidosis of the liver* (stained with Congo red). Describe the localization of the amyloid, its appearance. Characterise the significance and outcome of liver amyloidosis

38 – *amyloidosis of the spleen (sago spleen)* (stained with hematoxylin and eosin, Congo red). Pay attention to the colour and localisation of amyloid in definite structures of the spleen and to the conditions of cellular elements of the pulp.

43 – *obesity of the heart* (stained with hematoxylin and eosin). Describe the level of development of subepicardial fat, conditions of the adjacent muscular fibers. Name specific microscopic staining. Significance of obesity for the organism.

Electronograms: amyloidosis of kidney.

Pay attention to localisation and structure of amyloid mass in glomerular filter, to the width of basal membrane.

Control final knowledge:

Krok problem test

1. Microscopy of the kidneys from a man died of systemic lupus erythematosus revealed sclerosed glomeruli, the lumens of the small arteries and arterioles are narrow, the median membrane is thin, homogeneous, eosinophilic masses are present in the subendothelial space. Immunologically these masses contain immune complexes and fibrin. Which substance is present in the subendothelial space?

- A. *Fat-Protein detritus*
- B. *Simple hyalin*
- C. *Lipohyalin*
- D. *Complex hyalin**
- E. *Amyloid*

2. Microscopy of the internal organs of the patient who had suffered from rheumatism and died of cardiac decompensation showed that the bands of collagen fibers of the organs were saturated with plasma proteins, were homogenous, eosinophilic, picrinophilic when stained according to van Gieson, PAS-positive, pironinophilic at Brachet's reaction and argyrophilic at impregnation with silver salts. Which pathological process in the connective tissue is most probable?

- A. *Muroid swelling*
- B. *Fibrinoid swelling**
- C. *Fibrinoid necrosis*
- D. *Hyalinosis*
- E. *Amyloidosis*

3. In 53 year-old patient suffered from bronchoectatic disease and hemoptysis, the edema of face and waist has appeared. The protein (33 mg/l) was found in urine. Pulmonary hemorrhage was the cause of patient's death. In autopsy: enlargement of kidneys was found; the kidneys were denser with lardaceous surface of section. Histologically: the deposition of homogenous eosinophilic masses colored with Congo red and given of metachromasia with methyl violet color in glomeruli and canals were found. What pathological process took place in the patient?

- A. *Amyloidosis**
- B. *Grainish degeneration*
- C. *Fatty degeneration*
- D. *Muroid degeneration*
- E. *Hyalinosis*

The class is finished with analysis of the results of each student individual work by checking of macro- and microspecimens description and final test control.

Lesson

Mixed degenerations. Chromo- and nucleoprotein metabolism disturbance

Validation of the subject: the knowledge of mixed degenerations, manifesting themselves in the metabolism of chromo- and nucleoprotein in the stroma and parenchyma is essential to study many diseases of the lungs, liver, kidneys, as well as those of the blood, endocrine system ect. Mixed degeneration can be hereditary or acquired. General knowledge about dysmetabolism of compound proteins is important for understanding the pathogenesis of haemolytic disease, malaria and other diseases.

Objective of the lesson: the students have to be able to differentiate mixed degeneration from the other pathological processes. Compound proteins (chromo-, nucleo- and lipoproteids) play an important role in the life of the organism therefore it is necessary to study the conditions accompanied by accumulation of pigments which are normally produced or appear in pathological conditions. During the classes, it will be necessary to give definition of mixed degenerations, name their types, study the etiology, pathogenesis, classification, morphological changes and also the possible outcomes and the importance for the organism.

Specific manuals for work on a practical class

Scientific and methodical foundation of the topic is defined at the beginning of classes. Then readiness for the class is checked by the test control.

The students (under teacher control) determine macrospecimens, slides, microspecimens on electrified stand and electronic micrographs.

Visual aids:

Annotated tables:

- metabolic dysfunction in tissues
- pigments and dysfunctional pigments metabolism
- chromoproteins
- haemosiderosis

Coloured tablets:

- metabolic dysfunction of nucleoproteins
- brown induration of the lungs

Slides:

- brown induration of the lungs
- liver in posthepatic jaundice

Macro specimen:

- brown induration of the lungs
- haemosiderosis of the spleen
- liver in posthepatic jaundice

- spleen hemomelanosis
- melanoblastoma of the skin
- liver and pancreas in hemochromatosis

Microspecimen:

- # 2–3 – brown induration of the lungs
- # 67 – liver in posthepatic jaundice
- # 65 – kidney hemosiderosis
- # 63 – spleen hemomelanosis
- # 170 – melanoblastoma of the skin

Electronograms:

- Brown induration of the lungs. Siderophag is a cell of heart defect
- Deposition of lipofuscin in the myocardium
- Molecules of ferritin in the grains of hemosiderin

Questions to control basic knowledge:

- 1) Does haemosiderin contain iron (Fe)?
- 2) Indicate which of the following diseases and procedures cause to general hemosiderosis a) anaemia, b) Addison`s disease, c) Rhesus-incompatibility (Rh-conflict), d) transfusion of incompatible blood, e) malaria.
- 3) In which disease can we notice generalized melanosis:
 - a) haemochromatosis, b) malaria, c) Gaucher`s disease, d) Addison`s disease, e) Girke`s disease
- 4) Which of the pigments are lipogenic a) hemomelanin, b) hemofuscin, c) hemosiderin, d) lipofuscin, e) lipochromin, f) pigment of vitamin E deficiency, g) enterochromaphylic cell pigment, h) ceroid.
- 5) Name, what hemoglobinogenic pigments are produced in normal (I) and pathological (II) states: a) bilirubin, b) hematin, c) hemosiderin, d) hematoidin, e) ferritin, f) porfirin.

Answers: 1) yes. 2) a, c, d, e. 3) d. 4) b, d, e, f, h. 5) I) a, c, e; II) b, d, f.

Stages of individual work in class

Discuss theoretical questions in the process of macro- and microspecimens studying:

- 1) What is hemosiderosis? Name its types.
- 2) Mechanisms of hemosiderin formation.
- 3) Name types of jaundice depending on the way of its development.
- 4) Which pathology is caused by bile stasis?
- 5) Where is hemomelanin accumulated and in what disease? What is the colour of the organs?
- 6) In what diseases does porphyria develop?
- 7) Mechanisms of melanin formation.

- 8) Give the examples of general and acquired melanosis.
- 9) What conditions and diseases lead to increased quantity of lipofuscin?
- 10) Name final products of nucleic acid decomposition.

Macrospecimen:

Brown induration of the lungs. Determine the colour and texture of the specimen under section. In what diseases we can find such pathology? What reactions do you know which can help to trace iron containing pigments?

Splenic hemosiderosis. Describe the appearance of the organ, its colour, size. In what diseases we can find general hemosiderosis?

Splenic hemomelanosis. Describe the appearance of the organ, its colour and size. In what disease we can find spleen hemomelanosis?

Liver in posthepatic jaundice. Describe the appearance of the organ, its colour, the condition of bile ducts. What diseases can be characterised by mechanical jaundice. What is the outcome of bile stasis?

Melanoblastoma of the skin. What is the appearance of the skin? Which pigment is responsible for such skin colour? Which group of pigments is it? How is it classified according to the spread of the process?

Microspecimen.

#2–3 *brown induration of the lungs* (stained with hematoxylin and eosin, Prussian blue reaction). Name the organ, determine accumulation of hemosiderin. What is its colour in Prussian blue reaction? What changes are found in alveolar walls? What is the possible colour of sputum? What is the outcome of this pathology?

#67 *liver in posthepatic jaundice* (stained with hematoxylin and eosin). Describe the condition of the bile ducts, capillaries, hepatocytes in posthepatic jaundice, the outcome. When does mechanical jaundice develop most frequently?

Study electronograms: brown induration of the lungs. Find siderophag which is the cell of heart defect.

Control final knowledge:

Krok problem test

1. Gastroscopy revealed an ulcer with dense borders and black-brown bed in the gastric mucosa. Microscopy revealed black-brown pigment on the necrotic layer in the ulcer bed. Which pigment is it?

- A. *Hydrochloric hematin**
- B. *Porphyrin*
- C. *Bilirubin*
- D. *Ferritin*
- E. *Hemosiderin*

2. An 80-year-old man dies from complications of Alzheimer disease. In autopsy, his heart is small (250 gm) and dark brown on sectioning. Microscopically, there is light brown perinuclear pigment with H&E staining of the cardiac muscle fibers. Which of the following substances is most likely increased in the myocardial fibers to produce this appearance of his heart?

- A. *Lipochrome from "wear and tear"**
- B. *Hemosiderin resulting from iron overload*
- C. *Glycogen resulting from a storage disease*
- D. *Cholesterol as a consequence of atherosclerosis*
- E. *Calcium deposition following necrosis*

3. In patient with jaundice the following data were established: in serum the increasing of bilirubin because of the unconjugated form; in faeces and urine increasing of stercobilin; the level of conjugated (direct) bilirubin in serum is normal. What type of jaundice takes place?

- A. *Hemolytic jaundice**
- B. *Parenchymatous (hepatic) jaundice*
- C. *Gilbert's disease*
- D. *Jaundice of newborns*
- E. *Mechanical (posthepatic) jaundice*

The class is finished with analysis of the results of each student individual work by checking of macro- and microspecimens description and final test control.

Lesson

Disturbances in electrolyte (mineral) metabolism. Necrosis

Validation of the subject: The knowledge of disturbances in electrolyte (mineral) metabolism is essential for understanding general changes occurring in general pathological processes (necrosis, organization, tumours) and for studying a group of diseases (metabolic disturbances, those of cardiovascular systems, liver, kidney, endocrine system, musculoskeletal system). The knowledge of necrosis is important to understand the materials of the general course (disturbances in circulatory system, inflammation, immunopathological and compensatory-adaptational processes, tumours) as well as the outcome of many diseases, to study clinical subjects and for clinical anatomical analysis.

Objectives of the lesson: to understand the significance of disturbances in electrolyte (mineral) metabolism, the mechanism causing the processes, the causes, morphological and functional significance of the disturbances of calcium (Ca), potassium (K), iron (Fe) metabolism. Students have to study etiology, pathogenesis, appearance and microscopic changes in necrosis, clinico-morphological forms, the outcome, functional significance of necrosis. The students of the pediatric faculty have to know the peculiarities of mineral metabolism and necrosis in children. For the dentists, the knowledge of calcium and fluorine (F) metabolism is essential.

Specific manuals for work on a practical class

Scientific and methodical foundation of the topic is defined at the beginning of classes. Then readiness for the class is checked by the test control.

The students (under teacher control) determine macrospecimens, slides, microspecimens on electrified stand and electronic micrographs.

Visual aids.

Annotated tables:

- disturbances in electrolyte (mineral) metabolism.
- morphogenesis of tissue calcification.
- formation of the stones.
- necrosis.

Colour tables:

- metastatic calcification.
- petrificates.
- stones in kidney and gallbladder.
- gangrene of the foot.
- macroscopic changes in necrosis.
- microscopic changes in necrosis.

Slides:

- necrosis of the renal epithelium
- caseous lymphadenitis in tuberculosis.

Macro specimen:

- calcificated fibromyoma of the uterus
- femur in parathyroid osteodystrophia
- stones in gallbladder
- stones in kidney
- gangrene of the foot
- anaemic infarction of the spleen
- haemorrhagic infarction of the lung

Microspecimen:

- # 55 – calcified capsule of thyroid gland
- # 73 – necrosis of the renal epithelium
- # 75 – caseous lymphadenitis in tuberculosis

Electronograms:

- calcified metastases in the myocardium
- cell necrosis (karyopicnosis).

Questions to control basic knowledge:

1. Do you think vascular necrosis is a kind of indirect necrosis?
2. Name the organs which take part in regulation of calcium metabolism:
a) liver, b) parathyroid glands, c) spleen, d) heart, e) thyroid gland, f) lungs.
3. Name in which organs we often notice deposition of calcium salts in metastatic calcification: a) skin, b) lungs, c) stomach, d) spleen, e) kidneys, f) heart, g) arteries.
4. Name the local causes of stone formation a) secretion disturbances, b) metabolic disturbances c) secretion stasis d) inflammation.
5. Classify the groups of the following necroses: (I) according to etiological signs (II) according to morphological signs: a) vascular, b) caseous c) toxic d) ceraceous (waxy), e) traumatic, f) gangrene g) colliquative.

Answers 1. Yes. 2. b, e. 3. b, c, e, f, g. 4. a, c, d. 5. (I) a, c, e; (II) b, d, f, g.

Stages of individual work in class

Discuss theoretical questions during studying of macro- and microspecimens:

1. Name the importance of microelements for the organism.
2. In which processes do calcium salts takes place?
3. By what is calcium metabolism regulated in the organism?
4. Name the types of calcification according to their mechanisms.
5. In which organs does petrification often occur?

6. In which organs does deposition of calcium salts occur during metastatic calcification?
7. Name the diseases, which are accompanied by hyper- and hypopotassiumaemia.
8. Forms of Wilson's disease.
9. Name the general and local causes of stone formation.
10. Name the types of cholelithiasis according to the chemical components.
11. Name the types of uric stones according to their components.
12. Outcomes of urolithiasis.
13. Define the term necrosis.
14. State the stages of necrosis.
15. Describe the changes in micro and macro specimen in necrosis.
16. Types of necrosis according to the mechanisms and the etiology.
17. Clinico-morphological forms of necrosis.
18. Define the term "gangrene". Its types.
19. The outcome of necrosis.
20. The importance of necrosis for the organism.

Macrospecimen

1. *Calcified fibromyoma of the uterus*. Describe the shape, size, texture and colour of the calcified area on the cut section. What changes in the tumour, may cause deposition of calcium salts. What mechanism of this type of calcinosis development?

2. *Femur in parathyroid osteodystrophy*. Describe the states of the soft and compact substance of the bone. What changes occur in the bone tissue? What mechanism cause this type of calcinosis and what are the organs where we can find deposition of calcium salts.

3. *Gallstones*. Determine the size of the gallbladder. What has filled its cavity? Describe the colour of the stones, the size and the surface. Name the stones of the bile duct according to their chemical composition.

4. *Renal calculi (stones)*. The appearance of the stones, their shape and surface. Pay attention to the changes in renal tissues. What is the possible outcome of renal stones?

5. *Gangrene of the foot*. Pay attention to the changes in the colour (causes and pathogenesis), texture. Give the definition of the process and indicate the border of the unchanged tissue and name it.

6. *Anaemic infarction of the spleen*. Find the location, shape, colour and size of the area of necrosis. What type of necrosis is it and what are the causes and mechanisms of its development?

Microspecimen.

55 – *calcified capsule of the thyroid gland (stained with hematoxylin and eosin)*. Pay attention to the staining with hematoxylin of the large focus of the sclerotised and hyalinated capsule of the thyroid gland. Which type of calcinosis is it?

73 – *Necrosis of the renal epithelium (stained with hematoxylin and eosin)*. Determine the microscopic changes which characterise necrosis within the proximal and distal tubules of the kidney. Determine cell swelling, absence of nucleus, homogenic cytoplasm, the narrowing of the tubular lumen and the presence of eosinophilic grains in it.

75 – *Tuberculous caseous lymphadenitis (stained with hematoxylin and eosin)*. Demonstrational specimen

Electronograms.

1. Calcified metastases in myocardium. Determine the organelles in which calcium salts are deposited.
2. Cell necrosis, karyopicnosis. Pay attention to the decrease in the size of the nucleus, high density of the karyoplasm; nucleolus can not be differentiated.

Control final knowledge:

Krok problem test

1. Autopsy of a woman who had suffered from rheumatism with combined mitral defect showed that the cusps of the mitral valve are thickened, adhere to each other, stone-like. Which pathological process is responsible for the stone-like density of the heart valves?

- A. *Metastatic calcification*
- B. *Metabolic calcification*
- C. *Hyalinosis*
- D. *Amyloidosis*
- E. *Dystrophic calcification**

2. Fragment of dead tissue, which can't be autolyzed, replaced by connective tissue and which is localized among alive tissue is named...

- A. *Sequestrum**
- B. *Dry gangrene*
- C. *Wet gangrene*
- D. *Infarction*
- E. *Caseous necrosis*

3. Call a kind of an infarct according to macroscopic signs, which is characteristic in myocardium.

- A. *White with a hemorrhagic halo**
- B. *Hemorrhagic*
- C. *Anemic*
- D. *Mixed*
- E. *Red*

The class is finished with analysis of the results of each student individual work by checking of macro- and microspecimens description and final test control.

Lesson

Disturbance of blood circulation, arterial and venous hyperaemia, anaemia, stasis, haemorrhage, plasmorrhagia.

Disturbance of lymph circulation. Disturbance of tissue fluid content

Validation of the subject: the knowledge of disturbances of blood- and lymph circulation, of tissue fluid content in tissues is necessary for successful mastering of the material from general (inflammation, tumors) and systemic pathomorphology (cardiac, pulmonary diseases, those of a digestive tract, kidneys, reproductive organs and infectious pathology) and for formation of clinical mentation of the future doctor, because all the specialists meet blood circulation disturbances in their practice.

Objective of the lesson: to study causes, mechanisms of development, morphologic manifestation, the significance for the organism and outcomes of different types of blood circulation disturbances. To study special terminology. The students of Medical faculty should pay attention to the clinical significance of hyperemia, which appear after anaemia after paracentesis has been performed. The foreign students are known about the possibility of stases in brain vessels in malaria and about some peculiarities of bleeding in the countries with hot climate (continuation, frequency of bleeding by diapedesis and arrosion of the vascular walls with a great amount of blood-sucking insects).

Specific manuals for work on a practical class

Scientific and methodical foundation of the topic is defined at the beginning of classes. Then readiness for the class is checked by the test control.

The students (under teacher control) determine macrospecimens, slides, microspecimens on electrified stand and electronic micrographs.

Visual aids

Annotated tables:

- classification of blood circulation disturbances
- lymphatic system: functions and types of lymph-circulation insufficiency
- morphology of lymphatic system insufficiency
- disturbance of tissue fluid content.

Coloured tables:

- "nutmeg" liver
- brown induration of the lung
- different types of haemorrhages
- liver blood supply

Slides:

- "nutmeg" liver
- dotty cerebral haemorrhages
- stases in capillaries of the brain

Macrospecimens:

- "nutmeg" liver
- brown induration of the lung
- chronic ulcer of the stomach with vessel erosion at the bottom
- dotted and massive cerebral haemorrhages
- dotted haemorrhages under the epicardium, endocardium and in dura mater
- cephalohematoma
- cardiac liver cirrhosis
- cyanotic induration of kidneys and spleen.

Microspecimens:

- # 1 – "nutmeg" liver
- # 11 – punctate cerebral haemorrhages
- # 12 – stases in capillaries of the brain.

Electronogramme:

- brown induration of the lung

Questions to control basic knowledge:

1. Is stasis a result of venous plethora?
2. Name the pathologic processes, which may cause haemorrhage with vascular wall rupture: a) vascular aneurysm, b) enzyme exposure on vascular wall, c) mechanical vessel injury, d) enhancement of vascular wall permeability.
3. Name the processes which develop in the liver when venous hyperemia occurs: a) plethora of the portal vein branches, b) plethora of the central veins, c) atrophy of liver beams, d) inflammatory infiltration of the stroma, e) lipid degeneration of hepatocytes.
4. Name the processes, which provide intracapillary aggregation of erythrocytes: a) increase of vascular wall permeability, b) increase of erythrocyte superficial potential, c) decrease of erythrocyte superficial potential, d) increase of large-dispersive blood proteins fractions, e) arterial plethora, f) venous plethora, g) ischemia.
5. What types of hyperemia are related to: 1 – vacant hyperemia and 2 – hyperemia after anaemia: a) skin hyperemia after cup application, b) hyperemia after an exit out of caissons, c) hyperemia of abdominal cavity after removal of ascitic fluid, d) hyperemia of organs after an elimination of large tumors.

Answers: 1 – yes; 2 – a, c; 3 – b, c, d, e; 4 – a, b, d, f, g; 5. 1) a, b; 2) c, d.

Stages of individual work in class

Discuss theoretical questions in the process of macro- and microspecimens studying:

1. Classification of blood circulation disturbances.
2. Definition of arterial plethora, types of general and local arterial plethora, their significance for the organism.

3. What are the types of general and local venous plethora? Their morphologic characteristic and outcome.
4. Morphogenesis of congestive liver fibrosis and brown induration of the lungs.
5. Definition of ischemia, causes and outer conditions of a local ischemia development, its types and significance for the organism.
6. Stases, causes and mechanisms of their development, significance for the organism.
7. Name the terms of bleeding and hemorrhage, development mechanisms of the latter, significance for the organism. Latin terminology.
8. Types of lymphatic system insufficiency, their morphologic manifestations and significance for the organism.
9. Disturbance of a tissue fluid content, types of hypostases.

Macrospecimen:

"Nutmeg" liver. Pay attention to the organ size, its consistency and the color at section. Why was the liver named "nutmeg" liver? What diseases result in such pathologic process? Name the stages of congestive liver fibrosis morphogenesis.

Brown induration of the lung. Characterize the organ consistency. Explain the origin of the term "brown induration of the lung" and morphogenesis of brown induration of the lung.

Cyanotic induration of kidneys. Pay attention to the size, consistency and colour of the organs. Explain etiology and morphogenesis of cyanotic induration.

Cyanotic induration of the spleen. Pay attention to the size, consistency and colour of the organs. Explain etiology and morphogenesis of cyanotic induration.

Chronic stomach ulcer complicated with bleeding. Describe the outlook of the bottom and margins of the stomach ulcer; specify the localization of arrosioned vessel, large blood clots from a stomach cavity, which found at autopsy.

Heart rupture in myocardial infarction. Determine the shape of the rupture, its margins condition and colour, blood clots in the pericardium cavity. Name the mechanism of bleeding development, the term denoting a blood agglomeration in pericardium cavity, the cause of patient death when such pathologic process occurs.

Haemorrhages into dura mater and brain tissue. Pay attention to localization, size and colour of the haemorrhages. There are the changes in colour of the haemorrhages, what does it caused by? Name the mechanisms of haemorrhage development in these specimens.

Cephalohematoma. Pay attention to haemorrhages localization and size. Give the definition and name possible outcomes of this pathologic process.

Cardiac cirrhosis of the liver. Describe the outlook of the organ, its capsule, colour on the section, excessive development of the stroma in the portal tracts. As an outcome of what process has this pathology developed?

Microspecimens.

1 – "nutmeg" liver (stained with hematoxylin and eosin). Under low magnification determine the condition of the central veins and interbeam capillaries lumen, under high magnification study the outlook of the liver beams in the center of the lobule and periphery, paying attention to the volume decrease (atrophy) in the beams in the lobule center and to the presence of lipid degeneration in hepatocytes in the peripheral part of the lobule.

11 – *dotty cerebral haemorrhages* (stained with hematoxylin and eosin). At low magnification find dotty haemorrhages localized mainly around small capillaries in the brain tissue.

12 – *stases in capillaries of the brain* (stained with hematoxylin and eosin). At low and high magnifications find and study the plethoric capillaries. Pay attention to the fact that erythrocytes lie in capillaries like column of coins («sludge-phenomenon»).

Electronograms:

Brown induration of the lung. Pay attention to the great number of the siderophages and collagen fibers in the periendothelial area.

Control final knowledge:

Krok problem test

1. A patient with hepatic cirrhosis developed a collapse and hyperaemia of the peritoneum after removal of 10 litres of ascitic fluid from his abdominal cavity. Determine the kind of arterial hyperaemia of the peritoneum.

A. *Hyperaemia after anaemia**

B. *Inflammatory*

C. *Vicarious*

D. *Collateral*

E. *On the ground of an arteriovenous shunt*

2. An autopsy of a foetus, who died from intranatal asphyxia owing to an acute disturbance of the uteroplacental circulation, revealed microfocal perivascular petechial haemorrhages in the pia mater, under the epicardium and under the pleura. Name the mechanism of impairment in the walls of vessels which most probably resulted in the haemorrhages.

A. *Rupture*

B. *Spasm*

C. *Erosion*

D. *Oedema*

E. *Diapedesis**

3. Transmural myocardial infarction in the patient was complicated with progressive acute left ventricle insufficiency. What is the most typical for this state?

- A. *Edema of the lungs**
- B. *Cyanosis*
- C. *Edema of the extremities*
- D. *Arterial hypertension*
- E. *Ascites*

The class is finished with analysis of the results of each student individual work by checking of macro- and microspecimens description and final test control.

Lesson

Disturbance of blood circulation. Thrombosis. Embolism. Infarction.

Validation of the subject: the knowledge of this type of pathology is necessary for the better fixation of material from previous lessons (degenerations and necrosis) and also for successful studying the basic parts of special pathological anatomy (cardiac and rheumatic diseases, those of the digestive tract, liver, kidneys, sex organs, gestation and antenatal period, infectious diseases and war traumas).

Objective of the lesson: to learn the etiology, pathogenesis, classification, morphologic manifestations, possible outcomes and significance of thromboses, embolism and infarcts for the organism. The knowledge of these pathologic processes is necessary for the physicians of all specialties for their timely prevention.

Specific manuals for work on a practical class

Scientific and methodical foundation of the topic is defined at the beginning of classes. Then readiness for the class is checked by the test control.

The students (under teacher control) determine macrospecimens, slides, microspecimens on electrified stand and electronic micrographs.

Visual aids:

Annotated tables:

- disturbances of blood circulation – thrombosis
- types of embolism.

Coloured tables:

- anemic infarct of the spleen
- infarcts of kidneys
- haemorrhagic lung infarct
- myocardial infarction
- types of thrombi
- pulmonary thromboembolism
- embolism of pulmonary vessels with amniotic fluid
- zones of infarct localization in organs
- embolus moving
- blood coagulation.

Slides:

- thrombophlebitis
- haemorrhagic lung infarct
- organization and vascularization of a thrombus

Macrospecimens:

- parietal thrombus of aorta in atherosclerosis
- obturating thrombus in the aorta bifurcation area
- thrombosis of varicose veins

- chronic heart aneurysm with parietal thrombus
- obturating thrombi of arteries with canalization
- thromboembolism of the pulmonary artery
- haemorrhagic lung infarct
- myocardial infarction with the wall rupture and packing of the pericardium
- acute myocardial infarction
- ischemic infarct of spleen
- ischemic infarct of kidneys with haemorrhagic crown
- small ischemic infarcts of kidneys
- ischemic and haemorrhagic infarcts of brain

Microspecimen

4 – thrombophlebitis

7 – haemorrhagic infarct of the lung

6 – organization and vascularization of a thrombus

Electronogramme:

- three stages of thrombus formation

Questions to control basic knowledge:

1. Can an embolus move against the blood stream?
2. Name the composite parts of hyaline thrombus: a) leukocytes, b) erythrocytes, c) thrombocytes, d) precipitous plasma proteins, e) cholesterol.
3. Give the definition of infarct: a) intravital blood coagulation in vascular lumen, b) necrotic focus, which develops as a result of blood circulation arrest, c) organ degeneration under deviated venous outflow, d) pathologic process resulting from disturbance of interrelation of coagulating systems.
4. List the origins of pulmonary thromboembolism: a) thrombi from veins of general system, b) thrombi from the left atrium, c) thrombi from the right heart chambers, d) thrombi from hemorrhoid veins, e) thrombi from the right auricle.
5. List the types of embolism according to the nature of the embolus: a) thromboembolism, b) embolism with blood flow, c) lipid embolism, d) cellular embolism, e) paradoxical embolism, f) tissue embolism.
6. Name 1 – local, 2 – general factors of thrombus formation: a) changes of blood quality, b) vascular wall damage, c) slowing down of blood flow, d) disturbance in coagulative and anticoagulative blood systems.

Answers: 1 – yes. 2 – b, c, d. 3 – b. 4 – a, c, d, e. 5. a, c, d. 6. 1) b, c; 2) a, d.

Stages of individual work in class

Discuss theoretical questions in the process of macro- and micro-specimens studying:

1. Definition of thrombosis, embolism, infarct.
2. General and local circumstances and mechanism of thrombus-formation.

3. Types of thrombi, their difference from postmortem blood clots.
4. Outcomes of thrombi – favorable and unfavorable.
5. Causes of infarcts in different organs.
6. Types of infarcts and mechanisms of their development.
7. Outcomes of infarcts in different organs (heart, lung, kidneys, spleen).
8. Three general ways of embolus movement in the blood stream.
9. Definitions of retrograde and paradoxical embolism.
10. Mechanisms of embolus development.
11. Types of embolus according to their nature.
12. Diagnosis of air embolism on dissection.
13. Significance of embolism to the organism.

Macrospecimens:

Parietal thrombus in the aorta with atherosclerosis. Thrombus outlook, its relation to the vascular wall and the lumen, its colour, condition of aortic intima. List general and local conditions of thrombus formation. Name possible outcomes of that process.

Obturbative thrombus in the aorta bifurcation area with atherosclerosis. Condition of the aorta intima, its relation to the vascular wall and lumen, its colour. Give the definition of thrombosis. Name possible outcomes of this process.

Thrombosis of varicose veins. Pay attention to a numerous nodular round diverticuli of the vein walls. With what substance are these diverticuli filled? Name the possible outcomes of this process.

Chronic heart aneurysm with parietal thrombus. Characterize: a) the sizes of the heart, b) thickness of the left ventricle. Describe the aneurysm: a) its localization, b) the outlook, c) the wall thickness, d) the content of the aneurysm. What process preceded its development? What are the conditions of thrombus formation in aneurysm?

Thromboembolism of the pulmonary artery. Describe the localization of thromboemboli, their size, and colour. Name the most frequent origin of pulmonary thromboembolism. Characterize the mechanism of death under pulmonary thromboembolism.

Haemorrhagic infarct of the lung. Describe: a) the colour of the surface, b) the colour of the place infarct, of its shape and localization. Name the causes of lung infarct: a)...., b)...., c)... and its favorable and unfavorable outcomes.

Acute myocardial infarction. Characterize: a) the colour of the focus of alteration, b) localization. What is the reason of crown (rim) colour at the peripheral region of necrosis? List the types of myocardial infarction according to the localization. Name the causes of myocardial infarction: a)...., b)...., c)... and its outcomes: a)...., b)...., c)....

Ischemic cerebral infarct. Characterize: a) the colour of the focus of alteration, b) its localization, c) causes of cerebral infarct. Name the outcomes and significance for the organism.

Microspecimens

4 – thrombophlebitis (stained with hematoxylin and eosin) – at low magnification find inflammation infiltration in the vein wall, the place of thrombus connection, pay attention to the constituent parts of the thrombus – leukocytes, fibrin, erythrocytes, agglutinated masses of thrombocytes; determine the type of a thrombus according to the relation with the lumen. Enumerate general processes of thrombus formation. Name possible consequences of thrombosis.

#7 – *haemorrhagic lung infarct* (stained with hematoxylin and eosin). At low magnification find a focus of necrosis in the lung; in this focus alveoli are filled with blood, interalveolar septas are necrotized. Pay attention to the presence of pigmented macrophages in the peri-infarct zone (in the alveoli and stroma of the lung). Name the characteristics of lung infarct and its possible outcomes.

#6 – *organization and canalization of a thrombus* (stained according to van-Gieson). At low magnification of a microscope find a vessel of arterial type with obturating thrombus; in a mass of thrombus find newly-created vessels, covered by endothelium with erythrocytes at the lumen.

Electronograms: *three stages of thrombus formation*

Pay attention to localisation and structure of thrombus mass into the lumen of vessel.

Control final knowledge:

Krok problem test

1. An autopsy of a woman, who died from acute myocardial infarction, a thrombus in a vein of her left shin was found out. A microscopic study of the thrombus revealed that it was substituted with a connective tissue having some cracks and channels with an endothelial lining. Indicate the most probable outcome of the thrombosis.

- A. *Aseptic autolysis*
- B. *Organization and canalization of the thrombus**
- C. *Petrification of the thrombus*
- D. *Septic autolysis*
- E. *Transformation into thromboembolism*

2. A 65-years-old patient suffered by thrombophlebitis of the deep veins of both legs has died suddenly. Autopsy was showed free lying dry friable red masses with a dull crimped surface within the truncus pulmonalis and bifurcation of the lung artery. What process within the vessels did pathologist find?

- A. *Thromboembolism**
- B. *Thrombosis*
- C. *Tissue embolism*
- D. *Postmortem clot*
- E. *Hemangioma*

3. A 52-year-old woman has a history of urinary tract infections. Recently, one of these episodes was complicated by acute pyelonephritis involving her kidneys. She became septic, and a blood culture grew *Escherichia coli*. She developed severe hypotension. She had purpuric areas on her skin. A stool for occult blood was positive. She had a prothrombin time of 50 sec (control 12), partial thromboplastin time of 100 sec (control 25), platelet count of 20,000/microliter, and D-dimer of 4 microgm/mL. These findings are most characteristic for which of the following conditions:

- A. *Disseminated intravascular coagulation**
- B. *Hemophilia A*
- C. *Von Willebrand disease*
- D. *Antiphospholipid syndrome*
- E. *Acute fulminant hepatitis*

The class is finished with analysis of the results of each student individual work by checking of macro- and microspecimens description and final test control.

Lesson

Exudative inflammation

Validation of the subject: As many pathological process and diseases are inflammatory in character, understanding the subject is essential for future studies in general pathological anatomy and also when studying case histories (respiratory system, gastrointestinal tract, liver and especially infectious diseases).

Objective of the lesson: To study the etiology, pathogenesis and morphology of inflammation. To learn how to determine types of tissue reactions. To know the clinico-anatomical forms, possible outcomes and importance for the organism of alterative and exudative inflammations.

Specific manuals for work on a practical class

Scientific and methodical foundation of the topic is defined at the beginning of classes. Then readiness for the class is checked by the test control.

The students (under teacher control) determine macrospecimens, slides, microspecimens on electrified stand and electronic micrographs.

Visual aids.

Annotated tables:

- types of inflammation
- morphological signs of inflammation.

Coloured tables:

- different types of inflammation
- purulent, brain abscess, fibrinous, hemorrhagic;
- croupous pneumonia (lobar pneumonia);
- morphology of exudation; types of exudative reactions.

Slides:

- fibrinopurulent pericarditis
- croupous pneumonia
- purulent leptomeningitis.
- emigration of neutrophilic leukocytes through the vesicular walls during inflammation

Macrospecimens

- fibrinous pericarditis
- purulent leptomeningitis
- chronic osteomyelitis with sequestrum
- brain abscess
- croupous pneumonia in the stage of grey hepatization
- diphtheroid colitis
- hemorrhagic leptomeningitis

Microspecimens

86 – fibrinopurulent pericarditis

87 – leptomeningitis

90 – croupous pneumonia

Electronogramme:

– Inflammation

– Exudation

– Emigration of polymorphic cells (leukocytes)

Questions to control basic knowledge:

- 1) Are labrocytes the main source of inflammatory mediators? Yes or no?
- 2) Name the types of exudative inflammation: a) serous, b) granulomatous, c) interstitial, d) putrid, e) hemorrhagic, f) alterative, g) purulent, h) fibrinous, i) catarrhal, j) fibrinoid swelling, k) mixed
- 3) Name the types of purulent inflammation: a) abscess, b) croupous, c) phlegmon, d) diphteric, e) empyema, f) carbuncle, g) false croup, h) furuncle, i) panaritium.
- 4) Can sclerosis be the outcome of fibrinous inflammation (yes or no)?
- 5) Give the classification for inflammations: course (acute or chronic) – etiology, dominating tissue reaction: a) alterative, b) exudative, c) proliferative, d) acute, e) chronic, f) usual (common), g) specific.

Answers: 1) yes. 2) a, d, e, f, h, i, j. 3) a, c, e, f, i, j. 4) yes. 5) d, e; h; i; a,b,c.

Stages of individual work in class

Discuss theoretical questions in the process of macro- and micro-specimens studying:

- 1) Definition and causes of inflammation.
- 2) What are the morphological forms of banal inflammation according to the character of tissue reactions?
- 3) Define alterative inflammation.
- 4) Types of exudative inflammation according to the character of the exudate.

Macrospecimens:

Fibrinopurulent pericarditis. Describe the macrospecimen, characterize the surface of the epicardium. What is the descriptive name for the specimen? Indicate the causes and outcome; possible clinical determination of pericarditis.

Purulent leptomeningitis. Characterize the state of the pia mater of the brain, state of the gyri, sulci, exudative type. What are the causes of the inflammation, its complications and outcome.

Brain abscess. Appearance of the abscess walls and the content of the space. Which type of inflammation is it? Name the causes of purulent inflammation and its outcome.

Croupous pneumonia in the stage of grey hepatization. Describe the appearance of the lungs; aeration, pleura state, the character of the exudate. Etiological factors, the outcomes of the inflammation and possible complications.

Diphtheric colitis. Describe the macrospecimen. Characterize the thickness of the intestinal walls, the types of the film covering the mucous layer. Name the disease and state under which the above inflammation develops.

Slides on the stand:

- *fibrinous pericarditis*
- *croupous pneumonia*
- *purulent leptomeningitis*

Microspecimens

86 – *fibrinopurulent pericarditis* (stained with hematoxylin and eosin). Describe the layers located on the epicardium surface. Name the cause and outcome of the inflammation.

87 – *purulent leptomeningitis* (stained with hematoxylin and eosin). Describe the state of the pia mater of the brain: its thickness, appearance of the vessels, the character of the exudate, the prevalence of infiltration with leukocytes.

90 – *croupous pneumonia* (stained with hematoxylin and eosin). Pay attention to the homogeneity connected with the involvement of the alveoli in the pathological process. Composition of the inflammatory exudate.

Control final knowledge:

Krok problem test

1. An examination of a 7-year-old child, who was referred to infectious department with complaints about a sharp pain in his throat, difficult swallowing, an elevated body temperature up to 39 °C, an oedema of his neck, revealed that the tonsils were enlarged, their mucosa was plethoric and covered with a large number of yellow-whitish films which were closely adjacent to the mucosa. An attempt to remove a film results in a deep bleeding defect. What kind of inflammation takes place?

- A. *Diphtheritic**
- B. *Suppurative*
- C. *Serous*
- D. *Croupous*
- E. *Haemorrhagic*

2. An autopsy of a male, who died from progressing cardiopulmonary insufficiency, revealed petechial haemorrhages under the visceral leaf of the pericardium, the surface of the serous coat was dull and diffusely covered with greyish superpositions in the form of a net, hairs and films, there were 200 ml

of some dull fluid in the lumen of the pericardium. What kind of inflammation was there in the pericardium?

- A. *Croupous**
- B. *Diphtheritic*
- C. *Serous*
- D. *Suppurative*
- E. *Catarrhal*

3. 56-year-old patient has suffered from right-side lower-lobar pneumonia with expectoration of mucus with pus. In autopsy in 9–10 segments of the right lung the cavity with dense walls filled with purulent masses, was found. The whitish path comes from the cavity toward the radix of the lung. Microscopically it was established that the cavity is divided from saved lung tissue with thin membrane, which consists of two layers: internal-granulation tissue, and external –connective tissue. What diagnosis is more probable?

- A. *Chronic abscess**
- B. *Pulmonary gangrene*
- C. *Acute pulmonary abscess*
- D. *Chronic pneumonia*
- E. *Bronchoectatic disease*

The class is finished with analysis of the results of each student individual work by checking of macro- and microspecimens description and final test control.

Lesson

Proliferative and specific inflammation

Validation of the subject: the knowledge of specific and proliferative inflammation is necessary to learn a number of units of general course of pathologic anatomy (such as immunopathological processes, regeneration, tumors) and also pathologic anatomy of diseases (infections, autoimmune, rheumatic diseases etc.).

The foreign students of the medical faculty are to pay attention to proliferative (granulomatous and interstitial) as well as specific inflammation.

Objective of the lesson: to study the etiology, pathology, classification and morphological types of productive and specific inflammations, as well as possible complications, outcomes and significance for the organism.

Specific manuals for work on a practical class

Scientific and methodical foundation of the topic is defined at the beginning of classes. Then readiness for the class is checked by the test control.

The students (under teacher control) determine macrospecimens, slides, microspecimens on electrified stand and electronic micrographs.

Visual aids.

Annotated tables:

- differential diagnosis of tuberculosis and syphilis
- dynamics of the tissue reactions in tuberculosis
- manifestation of tuberculosis in the tissue
- primary syphilis
- hereditary syphilis.

Coloured tables:

- syphilis
- tuberculous granuloma
- tissue reactions in tuberculosis
- scheme of interrelations of the cells in the field of inflammation in tuberculosis
- manifestation of tuberculosis in the lungs
- lepra (lepromatous type, "lion face", undifferentiated type)
- hepatic echinococcosis

Slides:

- cardiosclerosis
- portal hepatocirrhosis
- syphilitic mesaortitis
- miliary pulmonary tuberculosis

Macrospecimens:

- unicameral hepatic echinococcosis
- multicameral hepatic echinococcosis

- cysticercosis of the brain
- cardiosclerosis
- portal hepatocirrhosis (Laennec's cirrhosis)
- condyloma
- polyp of the intestinum tenue
- syphilitic mesaortitis
- miliary pulmonary tuberculosis
- hepatic solitary gummas
- lobular liver in syphilis
- maceration of fetus.

Microspecimens:

- # 96 – atrophic portal hepatocirrhosis
- # 109 – miliary pulmonary tuberculosis
- # 125 – syphilitic mesaortitis
- # 138 – multicameral hepatic echinococcosis
- # 137 – unicameral pulmonary echinococcosis
- # 139 – muscular trichinellosis
- # 97 – cardiosclerosis

Electronograms:

- Pirogov-Langchans giant cell
- lepromatous granuloma
- Wirchoff's lepra cell.

Questions to control basic knowledge:

1. Is productive inflammation characterized by proliferation of cellular elements of the histogenetic and hematogenic origin? (yes or no).
2. From which organs can interstitial inflammation originate: a) spleen, b) stomach, c) heart, d) brain, e) liver, f) kidney, g) lung, h) eye, i) intestine.
3. On what do the changes of tissue reaction during specific inflammation depend? a) increase in hormonal activity of the endocrine glands, b) influence of the nervous factors, c) immunological reconstruction of the organism.
4. Name the types of tuberculous granuloma according to the cellular structure: a) lymphoidocellular, b) plasmocellular, c) giant-cell, d) monocyto cellular, e) epitheliocellular, f) compound.
5. Morphological changes which characterize the following forms of lepra: 1) lepromatous, 2) tuberculous, 3) intermediate; a) proliferation of the macrophages, formation Pirogov-Langchans giant cells, accumulation of lymphocytes, b) unspecific cellular reaction around the vessels and appendages of the skin, small nervous trunks, c) appearance of Wirchoff's lepromatous cells, d) lepromatous diffuse infiltration in the skin.

Answers: 1 – yes. 2 – c, e, f, g. 3 – c. 4 – a, c, e, f. 5 – 1) c, 2) a, 3) b.

Stages of individual work in class

Discuss theoretical questions in the process of macro- and micro-specimens studying:

1. Definition of "proliferative inflammation".
2. Classification of proliferative inflammation.
3. Characteristics of granulomatous inflammation, peculiarity of its course with regard to immunologic state of the organism.
4. The outcome of granulomatous inflammation.
5. Morphologic peculiarities of proliferative inflammation with formation of polyp and pointed condylomas.
6. Outcomes of proliferative inflammation.
7. Importance of proliferative inflammation for the organism.
8. Etiology, clinico-morphological signs of specific inflammation.
9. Peculiarities of tissue reactions in syphilis and tuberculosis.
10. Types of tissue reaction caused by *Mycobacterium leprosum*, clinico-anatomic forms.
11. Description of the inflammation caused by glanderous bacilli.
12. Morphological description of scleroma, its basic signs.
13. Significance of specific inflammation for the organism.

Macrospecimens:

Cardiosclerosis. Characterize the appearance of the organ and name the pathological process. Name the pathological process, which precedes diffuse cardiosclerosis. What is the cause of death in pronounced cardiosclerosis?

Portal hepatocirrhosis (micronodular). Define appearance of the organ, its surface, colour, condition of the capsule and describe the section surface. Point out the pathological process, which preceded formation of the connective tissue. Possible outcome.

Unicameral hepatic echinococcosis. Describe the cavity shape, its internal layer, cyst contents. The appearance of external layer of the cyst. Name the sequence of changing the tissue reaction to the zone of parasitical implantation.

Multicameral hepatic echinococcosis. Pay attention to the form of Echinococcus, its condition. Describe the appearance on section. Name the type of the proliferative inflammation, which develops around the animal parasite and foreign body.

Condyloma. Characterize the appearance of condyloma, its sizes. Describe the character of the growth. Name the localization of condyloma. Type of the proliferative inflammation.

Polyp of small intestine. Describe the appearance of the intestine from the side of the tunica. Name the type of proliferative inflammation and possible complications, outcomes.

Miliary pulmonary tuberculosis. Characterize the appearance of the nodule and the nature of the process. Describe the colour, size, quantity of them. Give

the definition with the regard of the character of pathological process and its morphological form, etiology and degree of the prevalence. Name the way of pathogen dissemination. Translate the term "milliary". In what forms of tuberculosis is it observed? Possible outcomes of granuloma; the causes of death.

Syphilitic mesaortitis. Pay attention to localization of the pathological process with the regard of the aorta part. Describe the appearance of the aorta in the place of localization of pathological process. Pathogenesis of the disease. Name the figurative name of the changing aortic intima in the place of direct injury and the kind of pathological process (which underlie in the aorta changing), its form with the regard of etiology and morphology. In which period of syphilis do you observe these changes? Name the possible complication.

Hepatic solitary gummas. Pay attention to the heterogeneous hepatic appearance. Define the form of the gumma, its colour, periphery of the gumma. Give the definition of the term "gumma" with the regard of the character of the pathological process, its morphological form, etiology and degree of the prevalence. Translate the term "solitary". In which period does syphilis develop in the gummas? Name the outcomes. Explain the essence of the changes in the liver.

Lobular liver in syphilis. Characterize the appearance of the organ. Name the changes preceding the development of lobular liver.

Maceration of the fetus. Describe the outlook of the fetus. Characterize the skin of the fetus. Name the form of syphilis and the cause of death.

Microspecimens

96 – *atrophic portal hepatocirrhosis* (stained with hematoxylin and eosin). Name the organ. Describe the degree of the development of connective tissue, indicate the localization in respect to the structure of the organ. Explain the importance of the term "micronodular hepatocirrhosis". Name the pathological process causing development of connective tissue. Explain the meaning of the term "cirrhosis".

109 – *milliary pulmonary tuberculosis* (stained with hematoxylin and eosin). Name the organ. Characterize the pathological process in the lung. Describe the structure of tuberculous granuloma. Indicate the meaning of the term "milliary". Name the outcomes of granuloma with regard to immunological state of organism.

125 – *syphilitic mesaortitis* (stained according to van-Gieson). Name the vessel where the pathological process takes place. Indicate the localization of the inflammatory infiltrates, degree of its prevalence. Name the form of inflammation according to the morphology, etiology, localization. Describe the cellular structure, presence of the vessels. Characterize the condition of elastic fibers at staining with fuchseline. Name the outcomes. Name the complications and the cause of death.

Demonstrative microspecimens

- # 138 – *multicameral hepatic echinococcosis*
- # 137 – *unicameral pulmonary echinococcosis*
- # 139 – *muscular trichinellosis*
- # 97 – *cardiosclerosis*

Electronograms:

Find the distinctive features of Pirogov-Langchans giant cell, Lepromatous granuloma and Wirchoff lepra cells.

Control final knowledge:

Krok problem test

1. A microscopic examination of the myocardium in a male, who died from cardiac decompensation, revealed sclerosis of the perivascular connective tissue and its diffuse infiltration by lymphocytes, macrophages, plasmacytes and solitary neutrophils. Which of the listed kinds of inflammation was the most probable?

- A. *Interstitial productive**
- B. *Granulomatous productive*
- C. *Alterative*
- D. *Exudative diffuse*
- E. *Exudative focal*

2. In a woman, who suffers from chronic gonorrhoea, some whitish papillary vegetations resembling cauliflower were found out on the vulval mucosa, on the border with the skin. A microscopic examination revealed vegetation of the stratified squamous epithelium and the underlying stroma with its diffuse lymphoplasmacytic infiltration. Which of the pathological processes listed below was the most probable?

- A. *Papilloma*
- B. *Adenomatous polyp*
- C. *Pointed condylomata**
- D. *Fibroma*
- E. *Dermatofibroma*

3. During the microscopic examination of bioptic fragment of the skin the granulomas were found out containing epithelioid cells, surrounded with T-lymphocytes. Between the epithelioid cells the solitary giant polynuclear Langhan's cells located. There were areas of caseous necrosis in the center of some granulomas. Blood vessels were absent. What disease do such changes characterize?

- A. *Tuberculosis**
- B. *Syphilis.*
- C. *Leprosy.*
- D. *Rhinoscleroma.*
- E. *Hodgkin's disease.*

The class is finished with analysis of the results of each student individual work by checking of macro- and microspecimens description and final test control.

Lesson **"Diseases of the Immune system"**

Validation of the subject: the knowledge of this type of pathology is necessary for better fixation of basic topics either of general or special pathological anatomy, and also while studying therapy, pediatrics, infectious diseases and other clinical subjects. For the foreign students of medical faculty, it is necessary to know secondary immune deficiency and autoimmune diseases; it is necessary to pay special attention to primary immune deficiencies.

Objective of the lessons: to study morphologic changes in deviations of immunogenesis, the character of changes in central and peripheral lymphoid organs, reaction of hypersensitivity of immediate and delayed types as well as autoimmune diseases and immunodeficiency syndromes.

Specific manuals for work on a practical class

Scientific and methodical foundation of the topic is defined at the beginning of classes. Then readiness for the class is checked by the test control.

The students (under teacher control) determine macrospecimens, slides, microspecimens on electrified stand and electronic micrographs.

Visual aids

Annotated tables:

- central and peripheral organs of immune system
- autoimmune diseases
- prime immunodeficiency syndromes

Coloured tablets:

- structure of the spleen
- structure of the lymphatic node

Slides:

- allogenic cells surrounded by lymphocyte-killers
- plasmatic cells
- theories of immunity
- most important differential signs of T- and B- lymphocytes
- the role of thymus in the immune response
- immunity and tumors
- T- and B-lymphocytes
- classification of immunodeficiency states.

Macrospecimens:

- kidney in lupus nephritis
- thymus in thymicolymphatic state
- Hasimoto's goiter.

Microspecimens:

8 – accidental thymus involution

10 – Hasimoto's goiter.

Electronograms:

– plasmatic cell at antigen stimulation

– reaction of hypersensitivity of immediate type: sensitized lymphocyte

Questions to control basic knowledge:

1. Is thymus a peripheral organ of immune system?
2. Name phases of cellular immune reaction: a) sensitization of T-lymphocytes, b) afferent link, c) proliferation and blastic transformation of T-lymphocytes, d) reaction of sensitized lymphocyte with antigen.
3. What diseases are autoimmune ones: a) rheumatism, b) Hasimoto's goiter, c) rheumatoid arteritis, d) lupus erythematoses, e) scleroderma, f) hypertension?
4. Name central (1) and peripheral (2) organs of immunogenesis: a) spleen, b) thymus, c) appendix, d) lymphatic nodes.

Answers: 1 – no. 2 – a, c, d. 3 – a, b, c, d, e. 4 – 1) b; 2) a, c, d.

Stages of individual work in class

Discuss theoretical questions in the process of macro- and micro-specimens studying:

1. Give the definition of inception of immunopathologic processes.
6. Name central and peripheral organs of immune system, T- and B-dependent zones.
7. What immune reactions do you know? Specify links of immune reactions.
8. Characterize thymus changes at disturbance of immunogenesis.
9. What changes appear in peripheral lymphoid organs at antigenic stimulation?
10. Give the characteristic to reactions of hypersensitivity of immediate and delayed types.
11. Tell the classification of autoimmune diseases, their morphologic characteristics.
12. Name the types and clinical morphologic manifestations of immune deficiencies.

Macrospecimens

Kidney in lupus nephritis. Pay attention to the sizes of a kidney, its motley surface due to hemorrhages. What is the mechanism of their appearance? The outcome of lupus nephritis.

Thymico-lymphatic state. Describe the complex of organs. Pay attention to the enlargement of thymus and solitary follicles of the colon. What organs besides these are changed in this state?

Hasimoto's goiter. Pay attention to the enlarged thyroid. Describe the outlook of macrospecimen. To what group of autoimmune diseases does Hasimoto's goiter belong?

Microspecimens

8 – *accidental thymus involution* (stained with hematoxylin and eosin). At low magnification of a microscope pay attention to the deminished, but inexplicitly expressed thymus lobules, and in the center of gland, absence of abutments beside the cortical and medulla tissue of lobules. Specify at high magnification, reduction in the amount of leukocytes in the cortex; thickness of interlobular fibric shells. What causes an accidental involution of thymus?

10 – *Hasimoto's goiter* (stained with hematoxylin and eosin). Pay attention to the atrophy of thyroid parenchyma and cellular infiltration of tissue with lymphoid follicles creation. Determine the character of diffuse cellular infiltration; find lymphocytes, plasmatic and reticular cells. What cells dominate in the infiltrate? What is their action on the follicle epithelium?

Electronograms:

– *plasmatic cell at antigen stimulation*, x6000. Pay attention to the enlarged cisterns of endoplasmatic reticulum

– *reaction of hypersensitivity of immediate type: sensitized lymphocyte*, x23000. Pay attention to the great amount of lysosomes, big mitochondria in the cytoplasm, and marginal collocation of chromatin in the nucleus.

Control final knowledge:

Krok problem test

1. A study of the thymus of a 5-year-old child, who died from acute destructive staphylococcal pneumonia, revealed a decrease in the weight of the gland down to 3.0 g. On histological examination, a smaller size of the lobules of the gland with a collapse of the stroma, an inversion of the layers, and cyst-like Hassal's bodies were found out. Which of the diagnoses listed below was the most probable?

- A. *Accidental reaction**
- B. *Thymomegaly*
- C. *Hypoplasia of the thymus*
- D. *Dysplasia of the thymus*
- E. *Agenesia of the thymus*

2. An autopsy of a 43-year-old female, who suffered from attacks of expiratory dyspnoea during her life-time and died from asphyxia, revealed some dense glass-like mucus in the lumens of the bronchi, their walls were thick, the lungs had foci of an emphysema and atelectases. A histological examination of the pulmonary tissue revealed some mucus with an admixture of eosinophils in the lumens of small bronchi, sclerosis of the peribronchial connective tissue and interalveolar septa, dilation of the lumens in the alveoli. What mechanism of hypersensitivity formed the basis for the development of asphyxia?

- A. Immunocomplex reaction

- B. Cytotoxic reaction
- C. Reaginic reaction*
- D. Cytolysis owing to lymphocytes
- E. Granulomatosis

3. In a child, 48 hours after a tuberculin (Mantoux) test, a papule up to 10 cm in diameter formed at the place of an injection of tuberculin. What mechanism of hypersensitivity lay in the basis of the above changes?

- A. Cellular cytotoxicity*
- B. Anaphylaxis
- C. Antibody-dependent cytotoxicity
- D. Immunocomplex cytotoxicity
- E. Granulomatosis

The class is finished with analysis of the results of each student individual work by checking of macro- and microspecimens description and final test control.

Lesson

Compensatory adaptation processes (CAP). Repair.

Validation of the subject: the knowledge of compensatory adaptation processes is necessary for learning productive inflammation and tumors and also in applied course, as the processes of compensatory adaptation occur in every disease. This knowledge is important to study all clinical disciplines and for practical activities.

Objective of the lessons: to learn the essence of CAP, the mechanisms of their development, stages and functional role, morphological changes in hypertrophy, hyperplasia, atrophy, regeneration, structural changes of the tissues, metaplasia and organization.

Specific manuals for work on a practical class

Scientific and methodical foundation of the topic is defined at the beginning of classes. Then readiness for the class is checked by the test control.

The students (under teacher control) determine macrospecimens, slides, microspecimens on electrified stand and electronic micrographs.

Visual aids

Annotated tables:

- types of regeneration
- regeneration of separate tissues
- regeneration of connective tissue
- hypertrophy
- atrophy

Coloured tablets:

- hypertrophy of heart
- hyperplasia of endometrium
- atrophy of myocardium and kidneys
- hydrocephalia and hydronephrosis
- callus of femur
- hydrophysical cachexia (Simmond disease).

Slides:

- myocardial hypertrophy
- glandular hyperplasia of the endometrium
- pulmonary emphysema
- granular tissue
- brown atrophy of liver

Macrospecimens:

- concentric hypertrophy of heart
- excentric hypertrophy of heart

- spleen atrophy
- gynecomastia
- internal hydrocephalia
- hydronephrosis
- acromegaly
- pulmonary emphysema
- elephantiasis of the lower extremity
- brown atrophy of the heart

Microspecimens:

- # 144 – myocardial hypertrophy
- # 145 – endometrium glandular hyperplasia
- # 146 – granular tissue
- # 22 – pulmonary emphysema

Electronograms:

- myocardial hypertrophy
- regeneration of myocardial cell

Questions to control basic knowledge:

1. Is cellular form of regeneration universal?
2. Do compensatory processes include the following: a) regeneration, b) hypertrophy, c) metaplasia, d) hyperplasia, e) atrophy, f) agenesis, g) proliferation?
3. Definition of hypertrophy is: a) organ decrease in size, b) one kind of tissue replaces another, c) enlargement of the organ due to cellular reproduction, d) restoration of the lost structure, e) organ structure replaced by connective tissue, f) enlargement of the organ due to increase of structural unit size.
4. Types of atrophy are: a) physiological, b) pathological, c) general, d) local, e) brown, f) compensatory.
5. Organization manifestation is: a) wound healing, b) metaplasia, c) hyperplasia, d) proliferation, e) encapsulation.

Answers: 1 – no. 2 – a, b, d. 3 – f. 4 – a, b, c, d, e.; 5 – a, e.

Stages of individual work in class

Discuss theoretical questions in the process of macro- and micro-specimens studying:

1. Concept of the processes of compensatory adaptation and types of them.
2. Definition and types of the regeneration.
3. Regeneration of the connective tissue, bones, vessels.
4. Definition of hypertrophy and its types according to the mechanisms of development.
5. Definition of hyperplasia.
6. Definition and types of atrophy.

7. Definition and types of organization.
8. Types of wound healing.
9. The importance of processes of compensatory adaptation for vital functions of the organism.
10. Basic mechanisms of regulation processes of compensatory adaptation.

Macrospecimens:

Concentric and excentric hypertrophy of the heart. Pay attention to the thickness of the wall and volume of the heart cavity in the both specimens. To what conditions of the heart activity does each of them correspond?

Spleen atrophy. Define the size of the organ and condition of the capsule. What is the evidence of its wrinkling? What is the type of atrophy in this case?

Hydronephrosis. Appearance of the kidney, condition of the pelvis and calyces, thickness of renal parenchyma. Variety of pathology according to prevalence and cause. What kind of macrospecimen correspond to similar processes?

Acromegalia. Pay attention to the size of the skeleton. Which process is in the base of these changes and the cause of them?

Elephantiasis of the lower extremity. The size and the condition of the soft tissues and skin. What is the type of pathology? What is it due to?

Microspecimens

144 – *myocardial hypertrophy* (stained with hematoxylin and eosin). Pay attention to the size of the muscular fibers and stroma quantity at low magnification. At high magnification, find the cytoplasm and nuclei of muscular cells (size, shape, and intensity of color).

145 – *endometrium glandular hyperplasia* (stained with hematoxylin and eosin). Determine the endometrium thickness, quantity of glands in it, their shape, quantity of cellular elements in the glands and stroma.

146 – *granulation tissue* (stained with hematoxylin and eosin). Define the quantity and degree of vascular differentiation in the tissue. Name the cells according to their construction.

22 – *pulmonary emphysema* (stained with hematoxylin and eosin). Determine the interalveolar septum thickness, their integrity, sizes.

Electronograms:

Myocardial hypertrophy. Pay attention to the enlargement and quantity of the mitochondria, myofilaments, size of the nucleus. What kind of processes takes place in intracellular ultrastructures of the muscular fibers?

Regeneration of myocardial cell. Pay attention to the quantity of the myofilaments and size of the nucleus. What kind of regeneration takes place in intracellular ultrastructures of the muscular fibers?

Control final knowledge:

Krok problem test

1. An autopsy of a male patient, who died from hypertensive disease, revealed an enlarged heart weighing 600 g, with a thickened left ventricular wall up to 2 cm and a dilated cavity of the left ventricle. Name the kind of an adaptive reconstruction in the heart.

- A. *Eccentric atrophy*
- B. *Concentric hypertrophy*
- C. *Vicarious hypertrophy*
- D. *Eccentric hypertrophy**
- E. *Vicarious hypertrophy*

2. An X-ray film of a male patient, who underwent an operation of bone fragment repositioning after a fracture of his elbow bone with displacement, one month after the surgical intervention revealed a cartilaginous callus. Name the kind of regeneration of the bone tissue.

- A. *Secondary osseous consolidation**
- B. *Primary osseous consolidation*
- C. *Connective-tissue callosity*
- D. *Preceding callus*
- E. *Final callus*

3. After deep burns of the skin a patient has got a keloid scarring. What kind of pathologic processes do those formations relate to?

- A. *Incomplete regeneration (substitution) **
- B. *Complete regeneration (restitution)*
- C. *Atrophy*
- D. *Hypertrophy*
- E. *Metaplasia*

The class is finished with analysis of the results of each student individual work by checking of macro- and microspecimens description and final test control.

Lesson

Mesenchymal tumours

Validation of the subject: Benign and malignant tumours are frequent pathological conditions. Mesenchymal tumours from connective, vascular, muscular, lipid, bony, cartilage tissues, synovial capsules, fasciae, tendons, aponeuroses occur frequently, and malignant variants of them very often cause death. In children, benign tumours of the skin (angioma, nevus) comparatively rare, malignant tumours are more common. Among malignant tumours, sarcoma prevails, cancer develops more rarely.

Objectives of the lesson: to study tumour, types of tumour growth, morphogenesis, histogenesis, differential characteristics of tumours, the degree of maturity and differentiation, terminology and classification of tumours. To learn the classification of mesenchymal tumours, give the morphological characteristic, the ways of dissemination, possible outcomes and significance for the organism.

Specific manuals for work on a practical class

Scientific and methodical foundation of the topic is defined at the beginning of classes. Then readiness for the class is checked by the test control.

The students (under teacher control) determine macrospecimens, slides, microspecimens on electrified stand and electronic micrographs.

Visual aids

Annotated tables:

- histological classification of tumours
- definitive distinctions of mature and immature tumours
- tumours from mesenchyma

Slides:

- fibromyoma of the uterus
- cavernous haemangioma of the liver
- low-differentiated fibrosarcoma

Macrospecimens:

- fibroma of the skin
- fibromyoma of the uterus
- lipoma
- chondroma
- sarcoma: of the forearm, foot, femur
- haemangioma of the liver
- lymphangioma
- haemangioendothelioma of the liver.

Microspecimens:

- # 151 – fibromyoma of the uterus
- # 163 – low-differentiated fibrosarcoma
- # 152 – cavernous haemangioma of the liver.

Electronograms:

- fibrosarcoma
- rhabdomyosarcoma
- osteosarcoma

Questions to control basic knowledge:

1. Does fibroma occur in the skin?
 2. Name the tumours of fibrous tissue: a) fibroma, b) dermatofibroma, c) lipoma, d) hybernoma, e) leiomyoma.
 3. Designate the most frequent localisation of desmoid: a) uterus, b) breast, c) abdominal wall, d) myocardium, e) liver.
 4. Name the malignant tumour from bony tissue: a) chondrosarcoma, b) osteosarcoma, c) fibrosarcoma, d) liposarcoma, e) leiomyosarcoma.
 5. What tumours of blood vessels are: 1 – benign and 2 – malignant: a) capillary haemangioma, b) haemangioendothelioma, c) haemangiopericytoma, d) venous haemangioma, e) benign haemangiopericytoma, f) glomus tumour.
- Answers 1 – yes. 2 – a, b. 3 – c. 4 – b. 5. 1) a, d, e, f; 2) b, c.

Stages of individual work in class

Discuss theoretical questions in the process of macro- and micro-specimens studying:

1. Name the malignant tumour from connective tissue; ways of its dissemination.
2. List benign and malignant tumours of fibrous, lipid and muscular tissues.
3. Name benign and malignant tumours from blood and lymphatic vessels.
4. Benign and malignant tumours from synovial capsules, mesothelium and bone tissue.
5. List secondary changes in tumours.
6. Negative influence of tumours on the organism.

Macrospecimen:

Fibroma of the skin. Characterize the outlook of the tumour, its connection with the skin, name the most frequent localisations, and list the types of fibroma according to the density.

Fibromyoma of the uterus. Describe the outlook of the tumour, its color, presence of a capsule; list the types of fibromyoma of the uterus according to the layer of the uterus, possible complications, malignant analogue.

Lipoma. The outlook of the tumour, its color, consistency, localisation, name the malignant analogue of lipoma.

Cavernous haemangioma of the liver. Describe the outlook of the tumour, its color, borders, the content of the cavities, type of the tumour.

Sarcoma of the femur, forearm, foot. Name the organ; describe the tumour, its attitude to the surrounding tissue, the ways of dissemination.

Microspecimens.

151 – *fibromyoma of uterus* (stained according to Van-Gieson). Describe if the tumour has a capsule, pay attention to the atypical tissue, disorders in collocation of picryophil and fuxinophil fibres of different thickness. Draw the specimen.

163 – *low-differentiated sarcoma* (stained with hematoxylin and eosin). Determine the structure of the tumour, the sizes and shape of its cells, variety of mitoses and cellular atypism. Draw the specimen.

152 – *cavernous haemangioma of the liver* (stained with hematoxylin and eosin). Determine the organ, describe the state of the cavities of the tumour, the attitude of the tumour to the tissue of the liver, the size of the cavities, their bed and content. Draw the specimen.

Electronograms:

Fibrosarcoma. Pay attention to the tumour cells containing elongated nuclei with irregular distribution of chromatin.

Rhabdomyosarcoma. Find binuclear cell from myofibril bundles going in different directions.

Osteosarcoma. The tumour cells have a big indented nucleus with marginal location of chromatin and well-pronounced nucleoli. A thin rim of cytoplasm surround the nucleus. On the peripheral part of cell there are masses of osteoid tissues.

Control final knowledge:

Krok problem test

1. On examination of a 6-year-old child with a tumour on the femoral diaphysis, several metastatic foci of another osseous localization were found. A histological examination of the primary tumour revealed that it consisted of some round cells, which had scanty cytoplasm, were characterized by an insignificant tendency to formation of pseudorosettes, and manifested themselves with solitary mitoses. What is your diagnosis?

- A. *Plasmacytoma*
- B. *Chondroma*
- C. *Ewing's sarcoma**
- D. *Osteosarcoma*
- E. *Fibrosarcoma*

2. A newborn baby has some red-blue flattened tumor, 5×4×0.3 cm in size, in a capsule on the skin of its face. Microscopically, the tumour consists of large

thin-walled vascular cavities which have an endothelial lining and are filled with blood. Name the tumour.

- A. *Venous haemangioma*
- B. *Cavernous haemangioma**
- C. *Capillary haemangioma*
- D. *Haemangiopericytoma*
- E. *Lymphangioma*

3. A clinical study is performed with patients who had a diagnosis of breast cancer. Characteristics of the grade, stage, molecular biology, and histologic type are analyzed. Of the following characteristics, which is most likely to be associated with the best prognosis for these patients?

- A. *Decreased nuclear/cytoplasmic ratio**
- B. *Increased expression of laminin receptors*
- C. *Increased cathepsin expression*
- D. *Decreased apoptosis*
- E. *Decreased doubling time*

The class is finished with analysis of the results of each student individual work by checking of macro- and microspecimens description and final test control.

Lesson

Tumours from melanin-creating tissue, nervous system and brain meninges

Validation of the subject: the knowledge of the above tumours is necessary to understand oncologic diseases at clinical departments. In medical practice it is necessary for comparison of clinical data with the findings of biopsies and operative material and also for clinicoanatomical analysis of section materials.

Objective of the lesson: to study how to distinguish different types of tumours from nervous system and melanin-creating tissue.

Specific manuals for work on a practical class

Scientific and methodical foundation of the topic is defined at the beginning of classes. Then readiness for the class is checked by the test control.

The students (under teacher control) determine macrospecimens, slides, microspecimens on electrified stand and electronic micrographs.

Visual aids

Annotated tables:

- classification of tumours of central and peripheral nervous systems
- tumours of autonomic nervous system

Coloured tables:

- nevus and melanoma (macro- and microstructure)
- neurinoma
- neurofibromatosis (Recklinghausen's disease)
- arachnoidendothelioma

Slides:

- neurofibroma
- arachnoidendothelioma (meningeoma)
- melanoma
- glioblastoma

Macrospecimens:

- glioblastoma
- ependioma
- medulloblastoma
- neurinoma
- neurofibromatosis
- arachnoidendothelioma
- melanoma
- metastases of melanoma to the liver and bones

Microspecimens:

176 – neurofibroma

154 – arachnoidendothelioma (meningeoma)

177 – glioblastoma

170 – melanoma of the skin

Questions to control basic knowledge:

1. Are melanocytes the cells of neurogenic origin?
2. What localisations among enumerated are the most characteristic for nevi:
a) face, b) neck, c) trunk, d) extremities.
3. Histologically there are 3 variants of astrocytomas: a) fibrillar, b) tubular, c) protoplasmatic, d) trabecular, e) tubular-trabecular, f) fibrillar-protoplasmatic.
4. Chose correctly build histogenetic chains of tumours of nervous system:
a) astrocyte-astrocytoma-astroblastoma, b) medulloblast-ependymoma-medulloblastoma, c) ependymocyte-ependymoma-ependymoblastoma, d) angioblast-ganglioneuroma-malignant paraganglioma, e) lemmocyte-neurilemmoma-malignant neurilemmoma.
5. Tumours of autonomous nervous system are: a) ganglioneuroma, b) meningeoma, c) hemodectoma, d) neurofibromatosis, e) glomus tumour, f) ependymoma, g) sympathogonioma.

Answers: 1 – no. 2 – a, c. 3 – a, c, f. 4 – a, c, e. 5 – a, c, e, g.

Stages of individual work in class

Discuss theoretical questions in the process of macro- and micro-specimens studying:

1. Why are all tumours of central nervous system considered to be malignant?
2. Give the classification of tumours of nervous system.
3. List benign and malignant tumours of melanin-forming tissue.
4. Why do melaninaemia and melaninuria occur in melanoma?

Macrospecimen:

Glioblastoma. Pay attention to the presence of tumour tissue in the cerebral one, the outlines of its margins, its colour. Explain its varied appearance.

Ependymoma. Describe the tumour localisation, characterise its growth to the surrounding tissues, the colour of the tumour on dissection, its consistency. The significance of the tumour for the organism. Name of the tumour in the case of malignancy.

Medulloblastoma. Determine the localisation of the tumour, describe the growth to the surrounding tissues, the relief of its margins, its colour on dissection, consistency. Name the ways of intracranial metastases.

Neurofibromatosis. Describe the size, shape and localisation of the tumour nodes, the consistency, the outlook of the tumour, the degree of skin pigmentation. Give the surname of the scientist who described neurofibromatosis.

Arachnoidendothelioma. Describe its localisation, outlook, consistency, changes in the surrounding cerebral tissues, the margins of tumour node.

Skin melanoma and its metastases (into the liver and bones). Describe the colour, surface, type of growth to the surrounding tissues. Pay attention to the uneven colouring of the tumour nodes in the liver and vertebrae. What are the possible non-skin localisations of primary melanoma nodes?

Microspecimens.

177 – *glioblastoma* (stained with hematoxylin and eosin). At low magnification find the tumour in the cerebral tissue. At high one investigate the tumour composition: pay attention to the cellular polymorphism, the size and quantity of the nuclei, numerous vessels in the tumour, the presence of secondary changes. The histogenetic type of the tumour, maturity of the cells, growth speed, frequency of intracranial metastases.

154 – *arachnoidendothelioma* (stained with hematoxylin and eosin). Pay attention to elongated cells, organised in concentric structures. Name histogenesis, maturity degree of cellular components of the tumour. Give the names of specific corpuscles, which are characteristic for the tumour. Name the malignant variant.

176 – *neurofibroma* (stained with picrofuxine according to Van-Gieson). Pay attention to the shape of the cells, arrangement of conglomerates of the tumour cells which are organised into typical structures. The most frequent tumour localisation.

170 – *melanoma of the skin* (stained with hematoxylin and eosin). Pay attention to the domination of parenchyma over stroma; cell polymorphism, presence of granules of black-brown pigment in the cytoplasm. Name the formation which preceded the formation of melanoma.

Control final knowledge:

Krok problem test

1. A 45-year-old male underwent surgical removal of a tumour, 4 × 3 cm in size, from the lateral ventricle of his brain; the tumour surface had small papillae, and it was connected with a vascular plexus. Microscopically, the tumour consisted of villus-like vegetations covered with epithelial cells of the cubical and columnar shape and the monomorphous kind. Which of the tumours listed below was the most probable?

- A. *Ependymoma*
- B. *Ependyoblastoma*
- C. *Choriopapilloma**
- D. *Choriocarcinoma*
- E. *Glioblastoma*

2. A 40-year-old male patient underwent removal of a tumour, 2 cm in diameter, which was localized in the region of the cerebellopontine angle of the brain stem and tended to grow into the auditory meatus. Histologically, the tumour consisted of spindle cells with rod-shaped nuclei; the tumour cells and fibres formed rhythmic structures. Name the kind of the tumour.

A. *Medulloblastoma*

B. *Meningioma*

C. *Schwannoma**

D. *Oligodendroglioma*

E. *Astrocytoma*

3. A male underwent surgical removal of a black tumour, 2 cm in diameter, from the skin of his thigh. Microscopically, the tumour consisted of polymorphous cells, the cytoplasm of most of them having some brown pigment (with a positive reaction to DOPA). A large number of pathological mitoses was registered. Which of the tumours listed below was the most probable?

A. *Carcinoma*

B. *Sarcoma*

C. *Carcinosarcoma*

D. *Melanoma**

E. *Nevus*

The class is finished with analysis of the results of each student individual work by checking of macro- and microspecimens description and final test control.

Lesson

Epithelial tumours

Validation of the subject: the number of persons with malignant neoplasm increases throughout the world that is why the questions of diagnosis and treatment of these diseases have great importance for all medical specialities. It is necessary to know the tumours from squamous multilayered or glandular epithelium (organ non-specific and organ-specific, which develop from the cells of certain organs) for understanding oncology problems. The correct assessment of biopsy results by the anatomist can help the physician to choose the correct treatment of the patient, as well as to define the prognosis of the tumour process.

Objective of the lesson: to study the difference between benign tumours from epithelium and malignant ones, to investigate the classification of tumours from epithelium, give the characteristics of organ-specific tumours of endo- and exocrine glands (hypophysis, epinephrons, uterus, pancreas etc.), ways of their dissemination, possible outcomes, significance of tumours from epithelium for the organism.

Specific manuals for work on a practical class

Scientific and methodical foundation of the topic is defined at the beginning of classes. Then readiness for the class is checked by the test control.

The students (under teacher control) determine macrospecimens, slides, microspecimens on electrified stand and electronic micrographs.

Visual aids

Annotated tables:

- classification of the epithelial tumours
- scheme of dissemination of primary cancer
- tumours of epithelial origin – benign: a) papilloma of the urinary bladder, b) adenoma of the kidney
- tumours of epithelial origin – malignant: a) medullar cancer, b) cancer of the lower lip, c) fungoid cancer of the stomach.

Slides:

- papilloma of the skin
- squamous-cell keratinising cancer of the skin
- solid breast cancer
- adenocarcinoma of the stomach

Macrospecimens:

- papilloma of the skin
- papilloma of the urinary bladder
- adenoma of the ovary
- papillary cyst of the ovary
- polyposis of the stomach
- polyposis of the colon

- mucous cancer of the stomach
- scirrhous of the stomach
- fibroadenoma of the mammary gland
- cancer of the uterus

Microspecimens:

- # 165 – papilloma of the skin
- # 166 – fibroadenoma of the mammary gland
- # 172 – adenocarcinoma of the stomach

Electronograms:

- ultrastructure of the cancer cell
- adenocarcinoma of the stomach

Stages of individual work in class

Discuss theoretical questions in the process of macro- and micro-specimens studying:

1. Name benign and malignant tumours from epithelium.
2. The most frequent histological types of adenoma.
3. What is the most frequent way of cancer dissemination?
4. What histologic types of cancer may develop in the liver, kidneys, mammary gland, uterus, ovary, thyroid gland?
5. Name secondary changes in tumours.

Macrospecimens:

Papilloma of the skin. Describe the outlook of the tumour, its connection with the skin, the most frequent localisation, outcomes of papilloma, name the malignant type.

Polyposis of the stomach and colon. The outlook of the tumour: size, colour, surface, quantity of tumours, malignant variant.

Papilloma of the urinary bladder. Types of the tumour at the side of the mucous membrane, possible complications, malignant variant.

Cystoadenoma of the ovary. Describe the surface of the tumour, the thickness of the wall, the character of the content, possible complications.

Cancer of the mammary gland. The tumour outlook: size, colour, localisation; name microscopic type of the tumour; name pre-cancer states.

Gastric cancer. Describe the outlook of the tumour, name the macroscopic form of it, its localisation, ways of dissemination. What pre-cancer conditions do you know?

Cancer of the uterine body. Localisation of the tumour, its colour, size; the character of growth, possible complications; enumerate the most frequent metastases. Name pre-cancers of uterine cervix and body. Pay attention to: cancer of the liver (primary and metastatic), cancer of the kidneys and thyroid glands the most difficult for diagnosis.

Microspecimens

165 – *papilloma of the skin* (stained with hematoxylin and eosin). Name the tissue from which the tumour has developed, describe the papillary growths covered by thickened multilayer squamous epithelium keratinised all over the surface. Pay attention to the correct localisation of epithelium layers and presence of basal membrane, type of morphologic atypism, name malignant variants of papilloma.

166 – *fibroadenoma of the mammary gland* (stained with hematoxylin and eosin). Find gland-like canals and connective tissue stroma of the tumour. Pay attention to the state of stroma constricting the gland lumen and surrounding them like thimbles.

172 – *adenocarcinoma of the stomach* (stained with hematoxylin and eosin). Describe atypical epithelial glandular formation of the stroma, pay attention to the attitude of atypical glands to the wall of the stomach and name the type of morphologic atypism, histological variants of adenocarcinoma.

Electronograms: *adenocarcinoma of the stomach* – gland of the mucous membrane of the fundus. In the cytoplasm of the main cells there are many secretory granules. Cytomembrane of the crists has numerous villi.

Control final knowledge:

Krok problem test

1. A histological examination of a scrape from the mucous coat of the uterus made in a female patient, who complained of a disorder in the ovariomenstrual cycle, revealed vegetation of the glandular structures consisting of atypical epithelial cells with hyperchromatic nuclei and pathological mitoses. The changes in the glandular structures were accompanied by an impairment in the integrity of the basal membrane of the cells. Make a diagnosis.

- A. *Adenocarcinoma**
- B. *Glandular hyperplasia of endometrium*
- C. *Chorionepithelioma*
- D. *Mucinous carcinoma*
- B. *Dimorphic carcinoma*

2. A microscopic examination of a biopsy from a uterine cervix revealed some neoplasm consisting of the stratified squamous epithelium characterized by cellular and nuclear atypism, pathological mitoses, as well as keratin pearls in the depth of the epithelial layers. What is your diagnosis?

- A. *Transitional cell carcinoma*
- B. *Nonkeratinizing squamous cell carcinoma*
- C. *Keratinizing squamous cell carcinoma**
- D. *Adenocarcinoma*
- E. *Solid carcinoma*

3. A microscopic examination of a biopsy from a deformed mucous membrane of a lobar bronchus of a 45-year-old male, who smoked for many years, revealed a carcinoma consisting of atypical epithelial cells with hyperchromatic nuclei and numerous pathological mitoses. The growth of the tumour did not spread to the basal membrane of the epithelium. Name the histological form of carcinoma.

A. Squamous cell carcinoma

B. Adenocarcinoma

*C. Carcinoma in situ**

D. Solid carcinoma

E. Small-cell carcinoma

The class is finished with analysis of the results of each student individual work by checking of macro- and microspecimens description and final test control.

Lesson

Cancer of stomach, lung, breast

Validation of the subject: the material is a theoretical base for studying oncology at clinical departments. Studying of this type of pathology is also necessary for clinical interpretation of histologic study of operational, biopsy and autopsy materials.

Objective of the lesson: to study etiology, morphogenesis and histogenesis of cancer of the stomach, lungs, breast; macro- and microscopic types of them, the character of their dissemination, complications and causes of death.

Specific manuals for work on a practical class

Scientific and methodical foundation of the topic is defined at the beginning of classes. Then readiness for the class is checked by the test control.

The students (under teacher control) determine macrospecimens, slides, microspecimens on electrified stand and electronic micrographs.

Visual aids

Annotated tables:

- clinico-anatomical classification of cancer of the stomach, lungs and breast

Coloured tables:

- macroscopic and microscopic forms of cancer of the stomach, lungs and breast
- metastasis and dissemination of cancer of the stomach
- general patient outlook in cancerous cachexia

Slides:

- macroscopic forms of cancer of the stomach, lungs and breast
- histological variants of cancer of the stomach, lungs and breast

Macrospecimens:

- chronic gastric ulcer
- chronic atrophic gastritis
- polyposis of the stomach
- fungiform cancer of the stomach
- diffuse cancer of the stomach
- "Krukenberg's" cancer of the ovary
- central cancer of the lung
- peripheral cancer of the lung
- fibroadenoma
- nodular cancer of the breast

Microspecimens:

- # 172 – adenocarcinoma of the stomach
- # 169 – squamous-cell keratinising cancer of the skin
- # 176 – solid breast cancer

Questions to control basic knowledge:

1. Is chronic gastritis a pre-cancer disease?
 2. Name the types of stomach cancer according to localisation of the tumour: a) pyloric, b) of the lesser curvature, c) duodenal, d) cardiac, e) of the greater curvature, f) oesophageal, g) fungal, h) generalised.
 3. Enumerate general forms of cancer of the lung according to the type of growth: a) plaque-shaped, b) squamous-cell, c) exophytic, d) endophytic, e) mixed.
 4. Name pre-cancer diseases of the breast: a) acute mastitis, b) benign dysplasias of the mammary gland, c) chronic mastitis, d) papilloma of the ducts.
 5. Name the ways of metastasis growth in cancer of the stomach: 1 – lymphogenic, 2 – haematogenic; a) regional lymphatic nodes of the lesser and larger curvatures, b) liver, c) supraclavicular lymph nodes, d) pararectal lymph nodes, e) lungs, f) ovary, g) pancreas, h) bones, i) kidneys, j) epinephrons.
- Answers: 1 – yes. 2 – a, b, d, e, g, h. 3 – c, d. 4 – b, d. 5 – 1) a, c, d, f. 2) b, e, g, h, i, j.

Stages of individual work in class

Discuss theoretical questions in the process of macro- and micro-specimens studying:

1. Pre-cancer diseases of the stomach.
2. Cancer of the stomach: etiology, morphogenesis, histogenesis, clinicoanatomical classification, characteristics of macroscopic forms and histological types, peculiarity of growth and metastasis, complications and causes of death.
3. Pre-cancer processes in the lungs.
4. Cancer of the lungs: etiology and pathogenesis, clinicoanatomical classification, characteristics of macroscopic forms and histological types, peculiarities of growth and metastases, complications and causes of death.
5. Pre-cancer processes in the mammary gland.
6. Breast cancer: clinicoanatomical classification, characteristics of macroscopic forms and histologic types, peculiarities of growth and metastasis, complications and causes of death.

Macrospecimens:

Polyposis of the stomach. Characterise the state of gastric mucosa: outlook, presence of tumour-like formations (localisation, quantity, size, elasticity, the character of the surface, connection with the mucous membrane). Evaluate the pathology.

Fungiform cancer of the stomach. Characterise the outlook of the tumour (localisation, size, shape, consistency, surface, its attitude to the stomach cavity, involvement of the wall). What can precede cancer of the stomach? What are possible causes of death?

Saucer-shaped cancer of the stomach. Describe the tumour of the stomach (localisation, size, shape, consistency, central part of the tumour). Point what type of the tumour growth dominates. Can it occur due to chronic gastric ulcer and by what histologic forms can this tumour be represented?

Diffuse cancer of the stomach. Characterise tumour invasion of the stomach wall (spread and localisation of the tumour, density and flexibility of the wall) and the mucous membrane (relief, surface, state of rugae). What form of cancer develops most frequently?

"Krukenberg's" cancer of ovaries. Describe the tumour of the stomach. Characterise the tumour invasion (multiple lesion of the both ovaries, size, tumour nodes). At what primary localisation of basic focus may the tumour occur, what are the ways of metastasis?

Central cancer of the lung. Define general microscopic changes in the bronchial wall in cancer of the lung (localisation and dissemination of the tumour, its attitude to the bronchi, growth). What changes developed in the adjacent lung tissue and pleura? The attitude of the tumour to the organs of the mediastinum, possible histological variants.

Peripheral cancer of the lung. What is the difference between this tumour and central cancer of the lung (localisation, size, shape, attitude to the pleura, state of the surrounding lung tissue).

Fibroadenoma and nodular cancer of breast. Give the differential diagnosis of benign and malignant tumour of the mammary gland (localisation, dissemination, consistency, the boundary between it and gland tissue, flexibility of the tumour and its attitude to the skin).

Microspecimens

172 – *adenocarcinoma of the stomach* (stained with hematoxylin and eosin). At low magnification define dissemination of the tumour process in the stomach wall, pay attention to the presence of tumour complexes in all the layers of the wall and its invasion of all layers of the stomach wall down the serous membrane. High magnification allows to find adenogeneity of the tumour, marked atypism of epithelium cells with hyperchromatosis of the nuclei and formation of glandular structures of different size and shape, which grow into the surrounding tissues (adenocarcinoma).

169 – *Squamous-cell keratinising cancer of the lung* (stained with hematoxylin and eosin). At low magnification study the walls of the bronchi and adjacent zone of the lung tissue, paying attention to complexes of atypical squamous epithelium. At high magnification define atypical, polymorphic epithelium and the presence of concentric clusters of keratinised substance – "cancer pearls".

176 – *solid breast cancer* (stained with hematoxylin and eosin). At low magnification find and study accretion of atypic epithelium in the ducts and lobules of the gland with abundance of tumour out of their abutments. At high magnification pay attention to infiltrating (invading) growth of tumour with destruction of epithelium basal membrane and abundance of cellular infiltration in the peridural tissue.

Control final knowledge:

Krok problem test

1. A bronchoscopy of the mucous membrane of the main bronchus revealed some tumour. A microscopic examination of the tumour biopsy showed that it consisted of lymphocyte-like cells with hyperchromatic nuclei growing in the form of layers or bands and involving the submucous layer. The tumour had many pathological mitoses. Which of the histological forms of carcinoma listed below was the most probable?

- A. *Squamous cell carcinoma*
- B. *Small-cell carcinoma**
- C. *Adenocarcinoma*
- D. *Adenoacanthoma*
- E. *Scirrhus carcinoma*

2. An autopsy of a female who died from cachexia, revealed some massive exophytic carcinoma on the lesser curvature of the stomach with metastases to the ovaries. What kind of metastatic spreading took place?

- A. *Haematogenous*
- B. *Lymphogenous orthograde*
- C. *Lymphogenous retrograde**
- D. *Implantation*
- E. *Perineural*

3. A 39-year-old woman has noted red, scaling area on her breast for 3 months. On physical examination there is an eczematous 1 cm diameter area on the skin of the right breast areola. There is no palpable lump in this breast. Biopsy of the skin lesion is performed and on microscopic examination shows large cells at the dermal-epidermal junction that stain positively for mucin. Which of the following is the most likely diagnosis?

- A. *Paget disease of breast**
- B. *Nipple discharge*
- C. *Intraductal carcinoma*
- D. *Dermatophyte infection*
- E. *Inflammatory carcinoma*

The class is finished with analysis of the results of each student individual work by checking of macro- and microspecimens description and final test control.

Навчальне видання

ЗАГАЛЬНА ПАТОЛОГІЧНА АНАТОМІЯ

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до занять з патоморфології
для англomовних викладачів медичних закладів*

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GENERAL PATHOLOGIC ANATOMY

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