

**TOPICS FOR PRACTICAL LESSONS,  
DISCIPLINE RADIOLOGY AND RADIOPROTECTION  
For the IIIrd year students Faculty of Medicine, university year 2023-2024**

**I. Evolution of radiology. Notion of Radiophysics.**

1. Medical imaging – definition.
2. Component parts of medical imaging.
3. Radiology. Definition.
4. Construction and principle of function of X-ray tube.
5. Nature of X-rays.
6. X-ray properties.
7. Properties of a radiographic image.

**II. Radioprotection.**

1. Dosimetry.
2. Units of measurement for radiation. International system of units.
3. Absorbed dose. Biological dose.
4. Radiological protection of the patient.
5. Radiological protection of personnel involved with ionizing radiation.

**III. Radiological methods of investigation.**

1. Fluoroscopy. Definition. Forming of image.
2. Radiography. Definition.
3. Forming of radiographic image.
4. The laws of radiographic imaging.
5. Radiographic Image Quality Criteria.
6. Advantages and disadvantages of fluoroscopy.
7. Advantages and disadvantages of radiography.
8. Special radiologic methods.
9. Radiological contrast agents. Classification.
10. Adverse reactions on contrast agents.
11. Linear (conventional) tomography, principle.
12. Tomosynthesis. Advantages and disadvantages.
13. The main concepts of Computed Tomography (CT).
14. Spiral multi-detectoral computed tomography - principles of function.
15. Advantages and disadvantages of CT.

**Magnetic resonance imaging. Ultrasonography. Nuclear medicine.**

1. The main concepts of Magnetic Resonance Imaging (MRI).
2. Advantages and disadvantages of MRI.
3. Indications and contraindications for MRI.
4. Nature and properties of ultrasound.
5. Modes of ultrasound examination.
6. Methodology of ultrasound examination. Advantages and disadvantages.
7. General ultrasonographic semiology.
8. Doppler-ultrasonography. Principles and modes.
9. Basics of nuclear physics. Atomic and nuclear structure. Nature and properties of  $\alpha$ ,  $\beta$ ,  $\gamma$ -radiation.
10. Notion of Radionuclide and Radiopharmaceutical media (preparation), half-lives.
11. Various ways of obtaining radionuclides and radiopharmaceuticals.
12. Requirements for radionuclide and radiopharmaceutical preparation.
13. The principle of obtaining and recording information in radionuclide diagnosis.
14. SPECT (Single Photon Emission Computed Tomography) and PET (Positron Emission Tomography).

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**V. Radiological investigation of the respiratory system. Normal radiological anatomy of thorax.**

1. Standard simple chest radiograph.
2. Chest wall.
3. Chest content.
4. Projection of lung lobes.
5. Lung segments.
6. Pulmonary vascular pattern. Definition. Characteristics of normal pulmonary pattern.
7. Lung hilum. Definition.
8. Linear (conventional) tomography in the diagnosis of respiratory pathology. Indications.
9. Computed tomography of the chest. Indications and contraindications.
10. Lung scintigraphy. Types. Indications and contraindications.

**VI. Radiological signs of pathology of respiratory system.**

1. Main radiological syndromes of respiratory pathology.
2. Pulmonary opacity. Definition.
3. Classification of pulmonary opacities.
4. Total and subtotal opacity of the lung field.
5. Limited opacity in the lung field: intrapulmonary (lobar, segmental, subsegmental processes); extra pulmonary (hydrothorax, pleural densifications).
6. Rounded, ring-shaped opacity.
7. Nodular opacities, diffuse and limited dissemination.

**VII. Radiological signs of pathology of respiratory system.**

1. Pulmonary hyperlucency. Definition.
2. Classification of pulmonary hyperlucencies.
3. Total and limited pulmonary hyperlucency. Intrapulmonary and extra pulmonary hyperlucency. Algorithm for differential diagnosis.
4. Bronchial permeability disorders on radiographic image. Degrees of bronchial obstruction. Differential diagnosis.
5. Disorders of pulmonary vascular pattern in respiratory pathology.
6. Disorders of pulmonary hilum and mediastinal lymph nodes.
7. Radiological diagnosis in pulmonary emergencies.

**VIII. Cardio-vascular imaging.**

1. Imaging methods of investigation of cardio-vascular system.
2. Radiological anatomy of the heart. Topometry.
3. Radiological investigations of the heart. Indications and contraindications.
4. Angio-CT of heart and blood vessels. General principles. Advantages and disadvantages.
5. Echocardiography. General principles. Advantages and disadvantages.
6. Doppler-echocardiography. General principles. Indications.
7. Heart scintigraphy. Indications.
8. Heart MRI. Indications.

**IX. Radiological signs of cardio-vascular pathology.**

1. Radiological criteria of enlargement of heart and great vessels.
2. Disorders of pulmonary vascular pattern in cardio-vascular pathology (hypovolemia, arterial hypervolemia, venous congestion, pulmonary arterial hypertension).
3. Pathological cardiac configurations.
4. Common pathological processes, leading to the pathological cardiac configurations.
5. Differential diagnosis in syndromes.

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**X. Radiological investigation and normal radiological anatomy of digestive tube.**

1. Imaging methods of investigation of digestive tube.
2. Simple abdominal radiograph. Indications. Anatomical structures possible to detect on the simple abdominal radiograph.
3. Contrast enhanced investigation of digestive tube.
4. Patient preparation for radiological examination of the stomach and duodenum.
5. Irrigoscopy and irrigography. Indications, patient preparation.
6. Radiological anatomy of the esophagus.
7. Radiological anatomy of the stomach.
8. Radiological anatomy of the small intestine.
9. Radiological anatomy of the colon.
10. Tonus. Definition.
11. Peristalsis. Definition.
12. Functional samples. Indications.

**XI. Radiological signs of pathology of digestive tube.**

1. Images “plus filling”: niche, diverticulum.
2. Images “minus filling”: gap (lacuna), amputation, incisory, notch.
3. Structural changes: halo, stenosis, rigidity.
4. Changes of relief.
5. Functional disorders: tone and motility disorders, abnormal secretion, impaired evacuation.
6. Transit disorders: esophagus, stomach, duodenum, small intestine, colon.
7. Modification of length and size: esophagus, stomach, duodenum, intestine, colon.
8. Modification of position and attachment: stomach, duodenum, intestine.
9. Radiographic diagnosis in acute abdominal syndrome.

**XII. Radiological investigation of the liver, biliary system and pancreas.**

1. Imaging methods of examination of the liver, gallbladder and bile ducts.
2. Radiological anatomy of the gallbladder.
3. Radiological investigations of the gallbladder and bile ducts.
4. Endoscopic retrograde cholangiopancreatography (ERCP).
5. Variants of cholangiography.
6. Imaging symptoms of morphological and functional disorders of gallbladder and bile ducts.
7. Ultrasonographic investigation of the gallbladder.
8. Ultrasonographic investigation of the liver. Normal liver.
9. Imaging symptoms of diffuse hepatic disorders.
10. Imaging symptoms of focal hepatic disorders.
11. Hepatic scintigraphy.
12. Imaging diagnosis of the diseases of pancreas.

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**XIII. Radiological diagnosis in traumatic lesions of bones and joints.**

1. Imaging methods of investigation of locomotion apparatus.
2. Imaging methods of investigation in traumatic injuries of locomotion apparatus.
3. Types of fractures: mechanic fracture, stress fracture, direct fracture, indirect fracture, gunshot fracture, pathological fractures.
4. Imaging semiology of fractures: line of fracture, displacement of fragments.
5. Types of fractures according to the number: single, multiple, comminuted, simultaneous.
6. Types of fractures according to the fracture line trajectory: transversal, oblique, spiral, longitudinal.
7. Incomplete fractures: green-stick fracture, subperiosteal, depressed, torsion, hairline fracture.
8. Age particularities (in old persons and children) of traumatism.
9. Particularities of spinal column fractures.
10. Particularities of cranial fractures.
11. Evolution of fractures.
12. Complications of fractures.
13. Imaging semiology of dislocations (luxations) and subluxations.

**XIV. Imaging diagnosis of osteo-articular pathology of non-traumatic origin.**

1. Imaging semiology of changes in bone shape and dimensions (bone atrophy, bloody bone, bone deformities, bone hypertrophy).
2. Imaging semiology of structural changes (osteoporosis, osteosclerosis, osteodestruction, osteonecrosis, osteolysis).
3. Changes in periosteum (periostosis, periostitis: linear, dantelar, acciform, Codman's triangle).
4. Modifications of soft tissues (volume, structure).
5. Radiological semiology of modifications of joints.

**XV. Diagnostic imaging of the urinary system.**

1. Imaging methods of investigation of urinary system.
2. Simple abdominal radiograph.
3. Radiological anatomy of the urinary tract.
4. Patient preparation for contrast enhanced radiological examination of the urinary tract.
5. Intravenous urography. Indications and contraindications.
6. Ultrasonographic investigation of kidneys. Advantages and disadvantages.
7. Radionuclide investigations of kidneys. Indications and contraindications.
8. Morphological modifications of kidneys (number, localization, shape, contour, dimensions, structure).
9. Functional disorders of urinary tract.
10. Syndrome of deaf kidney.
11. Syndrome of renal parenchymatous mass.