

**MINISTRY OF HEALTH PROTECTION OF UKRAINE  
ODESSA NATIONAL MEDICAL UNIVERSITY**

Medical Faculty №2

Department of radiation diagnostics, therapy and radiation medicine and oncology

**I APPROVE**

Vice-rector for scientific and pedagogical work

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September 1, 2023

**METHODOLOGICAL DEVELOPMENT  
TO PRACTICAL LESSONS  
FROM EDUCATIONAL DISCIPLINE**

Faculty, MEDICAL course, 2<sup>nd</sup> year

Educational discipline RADIOLOGY

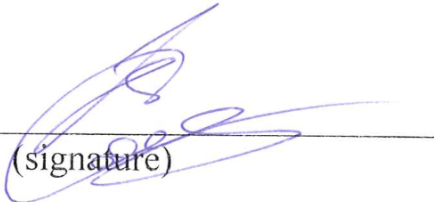
Odesa-2023

**Approved:**

Meeting of the Department of the Radiation Diagnostics, Therapy and Radiation  
Medicine and Oncology  
Odessa National Medical University

Protocol No. 1 dated 30.08. 2023

Head of the department \_\_\_\_\_

  
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# PRACTICAL TRAINING

## Content module 4.

### Complex radiation diagnosis of diseases of the urinary system

#### *Practical lesson No. 11.*

#### **Topic 11. Radiological methods of research of organs of the urinary and excretory system.**

**Goal:** to learn how to choose a certain method of radiation examination and to analyze the indications and contraindications for carrying out this or that radiation method of examination of the organs of the urinary and excretory system; explain the advantages and disadvantages of each of the radiation research methods and their characteristics; learn how to analyze radiographic images of the organs of the urinary system in normal and pathological conditions

**Basic concepts:** X-ray studies of the urinary system: survey urography, intravenous excretory urography, antegrade and retrograde pyelography, cystography, sonography, CT and MRI of the kidneys, radionuclide diagnostics . Radiopaque and radioactive pharmaceutical preparations. Classification of RFP. Radiological anatomy and physiology of kidneys and urinary tract. Preparation of patients for research. Indications and contraindications for radiation examination. Algorithm of X-ray examination in pathology of kidneys and urinary tracts: malformations, inflammatory diseases, urolithiasis, renal colic, tumors and cysts, kidney injuries.

**Equipment:** laptop with presentation, multimedia projector, radiographs, tomograms

#### **Plan:**

**1. Organizational measures** (greetings, verification of those present, announcement of the topic, purpose of the lesson, motivation of students of higher education to study the topic).

#### **2. Control of the reference level of knowledge:**

2.1 Requirements for theoretical readiness of students to perform practical classes:

Know:

1. the principles of obtaining a radiographic image and being able to determine with which method of radiographic examination an image of the organs of the urinary system was obtained
2. topographical anatomy of the organs of the human urinary and excretory system in accordance with the specifics of the introduced methods of radiological diagnostics
3. anatomical and functional features of x-ray imaging of organs of the urinary and excretory system in normal and pathological conditions in the age aspect
4. morphological and functional indicators of organs of the urinary system

*Questions (test tasks, problems, clinical situations) to check basic knowledge on the subject of the lesson)*

1. X-ray studies of the urinary system: survey urography, IV excretory urography, antegrade and retrograde pyelography, cystography, sonography, CT and MRI kidney, radionuclide diagnostics
2. Indications and contraindications for carrying out a certain method of examination of the SBS

1. The upper pole of the left kidney is at the level of the next vertebra
  - A. T11
  - B. T12
  - B. L1

G. L2

D. L3

2. The structural and functional unit of the kidney is:

A. nephron

B. neutron

B. neuron

G. Neutrophil

3. What is the structural unit of the kidney - the nephron?

A. from the capillary glomerulus

B. from convoluted tubules

V. from the capillary glomerulus and tubules

4. The optimal test for the tolerance of iodine-containing radiopaque substances:

A. intravenous

B. intradermal

B. intramuscular

G. conjugative

5. The most important contraindication to excretory urography:

A. increased sensitivity to iodine preparations

B. cough

B. fever

G. bacteriuria

6. When conducting computed tomography with intravenous contrast, the following should be taken into account:

A. level of creatinine and blood urea

B. daily amount of urine and its specific gravity

B. blood bilirubin

**3. Formation of professional abilities and skills (mastery of communication skills, dispensation, determination of treatment scheme, laboratory research, etc.) to be able to:**

1. on the basis of anamnesis, choose the method of X-ray examination of the SBS

2. to analyze the necessity of carrying out radiological methods of the study of SBS

3. justify indications and contraindications to the beam method

Dynamic renoscintigraphy simultaneously assesses:

and. all answers are correct

b. anatomical structure of the urinary system

in. topographical position of the urinary system

d. functional ability

d. the presence of passive reflux

The most informative radiological method of evaluating the urodynamics of the upper urinary tract:

and. excretory urography

b. chromocystoscopy

in. electromyography of bowels and ureters

g. micturition cystography

It should be used for express diagnosis of a closed kidney injury

and. X-ray examination of the kidneys and urinary tract

b. excretory urography and ultrasound examination

in. radioisotope renography and abdominal aortography

g. chromocystoscopy

d. would be correct and d

**Recommendations (instructions) for the performance of tasks (professional algorithms, orientation maps for the formation of practical skills and abilities, etc.)**

*Work performance methodology, performance stages:*

Stage 1. to analyze a series of radiographs of the SVS

Define:

A) research objects

B) X-ray examination stage;

C) the method of X-ray examination of the SCS on the provided images.

**Indexes bodies urinary systems in norms**

Kidneys	Position	Distance between upper ones poles 7cm, between the lower 11 cm, the bowl of the right kidney at the level of the body L-II, the bowl of the left at the level of the body LI, disk LI - L-II, the angle between the axes of the kidneys 20-24°.
	dimensions	length – 12cm, width 6 – 7cm
	contours	clear, even
	form	leguminous
	structure shadows	homogeneous
	density	on CT density + 30 - + 35 units H, the density of the renal sinus is 100 units of H
	mobility	not more length bodies one lumbar vertebra
Bowl	position	in the middle part of the medial parts of the kidneys
	dimensions	1.2 * 1,2 see
	distance from the edge of the bowl to edges of the kidney	In the middle - 2-2.7 cm The upper pole is 3 cm Lower pole – 3.5 see edges
	edges	upper convex, lower – concave
	form	Round when found outside kidney; Triangular – at intrarenal position.
Cups	structure	Homogeneous
	density	+ 5 -+15 unit N
	form	Cone, glass
	number	the great ones three: top, average, lower Little ones –6 – 8
	departments	Neck, vault
	Edges	clear, levels
	Structure	Homogeneous
Sechovo di	density	- 10 from N
	position	along m. PSOAS, on line innominata, and then arcuate along the wall of the small pelvis and further medially
	length	25 – 30 see
	form	spindle-shaped
	width	to 5 mm
physiological narrowing	I - IN area transition bowls into the urethra II - IN area crossroads with hip vessels III - L. innominata	

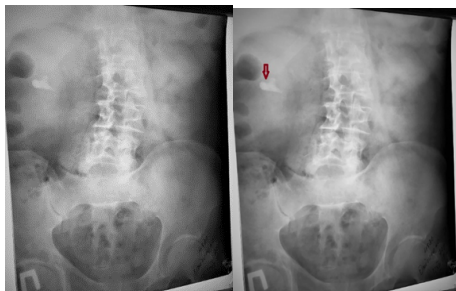
Bladder	position	IN area confluence ureter in bladder lower limit on levels pubic joint, upper reaches equal third sacrum vertebra
	form	round, elongated, pyramidal, variable
	dimensions	At little filling unequal at a higher level.
	edges	levels
	structure	homogeneous
	density	+ 5 - + 25 units N
	adrenal glands:	Density + 15 - + 20 unit N
	right	width 2.4 thickness 0.5 height /in cm/ 1.4 width
	left	2.1 thickness 0.7 height/in cm/ 2.2
	testicles	density + 12 - + 20 units of N; length - 5 cm width 1 – 2 see half placed from Z 30.

**Control materials for the final stage of the lesson (tasks, assignments, tests, etc.)**

***Situational problem #1.***

A 46-year-old patient with pain in the lumbar region on the right and a sharp rise in body temperature turned to the hospital's reception department at night.

- What X-ray study was performed to establish the diagnosis?
- Was it appropriate to conduct it?
- What projection is given?



***Situational problem #2.***

A child, 5 years old, with manifestations of kidney failure.

- What radiological examination was performed? In which projections are the scans shown?
- Was contrast used?



***Situational problem #3.***

Child, 5 years old. He is in the nephrology department of a children's hospital under examination for repeated episodes of pyelonephritis.

- What examination was carried out?
- What are the indications and contraindications for conducting this examination?
- Is a contrast agent used during the study? If yes, which one?



***Situational problem #4.***

Baby. 5 years. He is in the nephrology department of a children's hospital under examination for repeated episodes of pyelonephritis.

- What examination was carried out?
- What are the indications and contraindications for it?
- Is a contrast agent used during the study? If yes, which one?



***Practical lesson No. 12.***

**Topic 12. Radiation signs of diseases of the organs of the urinary and excretory system.**

**Goal:** to learn how to choose a certain method of radiation examination and to analyze the indications and contraindications for carrying out this or that radiation method of examination of the organs of the urinary and excretory system; explain the advantages and disadvantages of each of the radiation research methods and their characteristics; learn how to analyze radiographic images of the organs of the urinary system in normal and pathological conditions

**Basic concepts:** Radiological signs of congenital anomalies of development and kidney tumors. Radiation signs of inflammatory diseases, developmental anomalies and tumors of the urinary system. Algorithm of X-ray examination in kidney pathology: urolithiasis, congenital and acquired hydronephrosis, vesicoureteral reflux, renal colic, tumors and cysts, kidney injuries.

**Equipment:** laptop with presentation, multimedia projector, radiographs, tomograms

**Plan:**

**1. Organizational measures** (greetings, verification of those present, announcement of the topic, purpose of the lesson, motivation of students of higher education to study the topic).

**2. Control of the reference level of knowledge:**

2.1 Requirements for theoretical readiness of students to perform practical classes:

Know:

5. the principles of obtaining a radiographic image and being able to determine with which method of radiographic examination an image of the organs of the urinary system was obtained
6. topographical anatomy of the organs of the human urinary and excretory system in accordance with the specifics of the introduced methods of radiological diagnostics
7. anatomical and functional features of the x-ray image of the organs of the urinary and excretory system in normal and pathological conditions in the age aspect
8. morphological and functional indicators of organs of the urinary system

*Questions (test tasks, problems, clinical situations) to check basic knowledge on the subject of the lesson)*

1. X-ray studies of the urinary system: survey urography, IV excretory urography, antegrade and retrograde pyelography, cystography, sonography, CT and MRI kidney, radionuclide diagnostics
2. Radiological signs of congenital anomalies of development and kidney tumors
3. Radiological signs of inflammatory diseases, developmental anomalies, and tumors of the vasculature

1. The main x-ray methods for diagnosing hydronephrotic transformation are all of the above, except

- A. excretory urography
- B. cystography
- In renal arteriography
- G. retrograde pyelography
- D. ultrasound

2. The most reliable method of diagnosing bladder cancer:

- A. MRI
- B. CT scan
- C. Cystoscopy
- D. Excretory urography
- E. Ultrasound

3. X-ray examination of the urethra is shown

- A. with acute urethritis
- B. with prostatitis and vesiculitis
- V. if urethral stricture is suspected
- G. with torpid course of urethritis
- D. correct 1. and 2.

4. Radiopaque types of stones include all of the above, except

- A. oxalates
- B. phosphates
- In mixed
- G. uric acid stones

5. The correct name of a malignant tumor of the renal parenchyma of epithelial origin

- A. kidney adenoma
- B. hypernephroma



- In hypernephroid cancer
- G. renal cell carcinoma
- D. small cell cancer

**3. Formation of professional abilities and skills (mastery of communication skills, dispensation, determination of treatment scheme, laboratory research, etc.) to be able to:**

- 1 on the basis of anamnesis, choose the method of X-ray examination of the SBS
- 2 to analyze the radiation semiotics of the functional and morphological changes of the organs of the central nervous system
- 3 on the basis of the results of a radiological examination, to determine the pathological changes of the SBS
- 4 conduct an analysis of radiographs of the SVS.

A characteristic sign of a horseshoe kidney on examination radiographs:

- a. the shadow of the isthmus of the horseshoe kidney
- b. the high position of their shadows
- c. vertical arrangement of both kidneys
- d. fusion of the ends of the kidneys (one upper and the other lower)
- e. one-sided fusion

The main methods of radiological diagnosis of ruptures of the urinary bladder:

- a. CT, cystography, ultrasound
- b. excretory urography, ultrasound
- c. Ultrasound, bladder catheterization

The most common kidney tumor in children aged 6 months to 5 years is

- a. squamous cell carcinoma
- b. teratoma
- c. Wilms tumor
- d. sarcoma

It should be used for express diagnosis of a closed kidney injury

- a. X-ray examination of the kidneys and urinary tract
- b. excretory urography and ultrasound examination
- c. radioisotope renography and abdominal aortography
- d. chromocystoscopy
- e. would be correct and d

**Recommendations (instructions) for the performance of tasks (professional algorithms, orientation maps for the formation of practical skills and abilities, etc.)**

*Work performance methodology, performance stages:*

Stage 1. to analyze a series of radiographs of the SVS

Define:

- A) research objects
- B) X-ray examination stage;
- C) the method of X-ray examination of the SCS on the provided images.

Stage 2. analyze kidney images

Stage 3. analyze images of the ureters.

Stage 4. X-ray analysis of the bladder.

**Requirements for work results, including registration**

*Scheme for evaluating the results of radiological examination of the organs of the SBS.*

1. Provisions of the investigated body;
2. The shape and size of the body;
3. Contours of the shadow of the body;
4. State of the organ during contrast;
5. Attribution of observations to the state of "normal", "pathology"

**Control materials for the final stage of the lesson (tasks, tasks, tests, etc.)**

***Situational problem #1.***

The patient, 46 years old, came to the hospital's reception department at night with pain in the lumbar region on the left and a sharp rise in body temperature.

- What X-ray study was performed to establish the diagnosis?
- Was it appropriate to conduct the research?
- What pathology should we think about? Prove your point.



***Situational problem #2.***

Baby. 5 years. He is in the nephrology department of a children's hospital under examination for repeated episodes of pyelonephritis.

- What examination was carried out?
- Are the signs of pathological changes in the urinary-excretory system determined on the given X-rays?
- Describe pathological changes, if you see them.
- Do such changes require surgical correction?



***Situational problem #3.***

Child, 5 years old. He is in the nephrology department of a children's hospital under examination for repeated episodes of pyelonephritis.

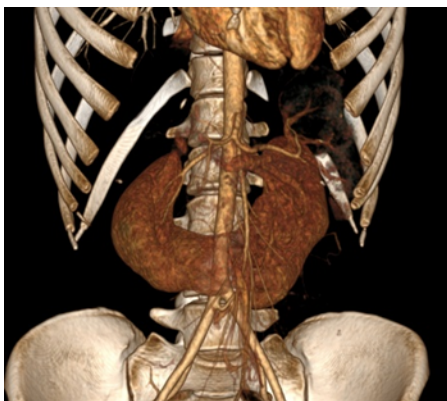
- What examination is carried out?
- Describe pathological changes, if you see them.
- Is it worth consulting a urologist for correction?



**Situational task No. 4.**

Girl. 20 years.

- What X-ray study was performed?
- Was contrast used?
- Signs of what pathology are given?
- Do they always have clinical manifestations?



**4. Summary:**

**Current evaluation criteria in practical training**

<b>Rating</b>	<b>Evaluation criteria</b>
Perfectly "5"	The applicant takes an active part in practical training; demonstrates deep knowledge, gives complete and detailed answers to questions; takes an active part in the discussion of the results of the radiological examination, correctly and consistently compiles the algorithm of the radiological examination in relation to a certain pathology; uses additional educational and methodological and scientific literature; expresses his own reasoning, gives appropriate examples, demonstrates clinical thinking. The test tasks are completed in full, all 100% of the answers to the questions are correct.
Fine "4"	The applicant participates in a practical session; knows the material well; demonstrates the necessary knowledge, but gives answers to questions with some errors; participates in the discussion of the results of radiation research,

	uses basic educational and methodological and scientific literature. The winner expresses his opinion on the subject of the lesson, demonstrates clinical thinking. The test tasks are completed in full, at least 70% of the answers to the questions are correct.
Satisfactorily "3"	The acquirer sometimes participates in a practical activity; partially speaks and asks questions; makes mistakes when answering questions; shows passive work in practical classes; the radiological research algorithm for a certain pathology is inconsistent with significant errors; shows fragmentary knowledge of the conceptual apparatus and literary sources. The acquirer does not express his opinion on the topic for any reason . The testing is done in full, at least 50% of the answers are correct.
Unsatisfactorily "2"	The acquirer does not participate in the practical session, is only an observer; never speaks or asks questions, disinterested in learning the material; does not take part in the discussion of the results of radiological examination, incorrectly compiles the algorithm of radiological examination for a certain pathology, gives incorrect answers to questions, shows unsatisfactory knowledge of the conceptual apparatus and literary sources. Testing is done, but less than 50% of the answers are correct.

## 5. List of recommended literature

### Main:

1. Kovalsky O.V. Radiology. Radiation therapy. X-ray diagnostics: assistant. for students higher honey. education closing IV level of accreditation / O. V. Kovalskyi, D. S. Mechev, V. P. Danylevich. 2nd edition Vinnytsia: New Book, 2017. 512 p.
2. Radiology (radiodiagnosis and radiation therapy). Test tasks. Part 1. Kyiv: Book plus. 2015. 104 p.
3. Radiology (radiodiagnosis and radiation therapy). Test tasks. Part 2. Kyiv: Book plus. 2015. 168 p.
4. Radiology (radiodiagnosis and radiation therapy). Test tasks. Part 3. Kyiv: Book plus. 2015. 248 p.
5. Methods of radiation diagnostics: a study guide (Protocol of the Medical Center No. 5 dated 05.25.17) N.V. Tumanska, K.S. Barska. 143 p.

### Additional:

6. Radiation medicine: Textbook for medical universities 3-4 academic year. approved by the Ministry of Education and Culture / edited by E. Pylypenka Kyiv, 2018. 232 p. kind. "Medicine".
7. Tomographic methods of radiodiagnostics: a study guide (Protocol of the Central Medical Center No. 5 dated 05.25.17) N.V. Tumanska, K.S. Barska, I.P.Jos, 91 p.
8. Diagnostic, treatment and preventive algorithms in internal medicine: teaching method. manual / under the editorship Prof. V. I. Denesyuk; Vinnytsia national honey. University named after M. I. Pirogov, Cafe. internal Medicine No. 3. Kyiv: DZK Center, 2015. 151 p. : fig., tab.
9. Clinical Radiology : The Essentials Fourth Edition by Daffner MDFACR, Dr. Richard H., Hartman MD, Dr. Ma 4th edition. 2014. 546 p.

### Electronic information resources:

1. <https://radiographia.info/>
2. <http://nld.by/help.htm>
3. <http://learningradiology.com>
4. <http://www.radiologyeducation.com/>
5. <http://www.radiologyeducation.com/>
6. <https://www.sonosite.com>