MEDICAL UNIVERSITY - PLOVDIV
FACULTY OF MEDICINE

SYLLABUS

IN

RADIOLOGY

(RADIATION ONCOLOGY AND NUCLEAR MEDICINE)

Approved by the Section Council on 26.05.2022/ Proceedings № 3

Confirmed by the Faculty Council on 15.06.2022/ Proceedings № 6

RADIOLOGY (RADIATION ONCOLOGY & NUCLEAR MEDICINE)

Syllabus

Discipline	Exam in Semester	Hours				Hours per academic year and semester	
						III	
RADIOLOGY	VI	Total	Lectures	Seminars	Credits	V	VI
		108	48	60	5.0	18/30	30/30

Course name:
Radiology (Radiation oncology & Nuclear medicine)

Type of discipline:
Mandatory

Level of education:
Master **/M/**

Forms of education:
Lections, practical exercises

Course:
Course III

Duration of education:
Two semesters

Academic hours:
48h lections, 60h exercises

Technical equipment applied in the training:
Multimedia presentations, radionuclide diagnostic, discussion and showing how to perform a radiotherapy plan and radiotherapy treatment

Form of evaluation:
Test, written and oral exam

Evaluation criteria:
An average current grade is formed for each semester

Aspects of evaluation criteria:
Participation in discussions, solving tests and practical diagnostic tasks

Semester exam:
Yes (entrance test, written question and interview; options for distance exam are also prepared)

State Exam:
No

Main teacher: Habilitated lecturer from Department "Clinical Oncology" and Department "Imaging Diagnostics"

Department:
Clinical Oncology

Semester exam:
Exam – test with open questions for medical radiology

Lecturer:
Habilitated professor from Chair "Clinical oncology"

Chair:
„Clinical oncology"

ANNOTATION

Radiation therapy (RT, radiation oncology) and Nuclear Medicine (NM) are among the most dynamically developing specialties of medicine due to the rapid progress of imaging diagnostic equipment and the application of new, more specific radiopharmaceuticals for diagnosis and therapy. Nowadays RT is an indispensable part of the complex therapy of malignant tumors. This is possible with the introduction of high-energy sources of ionizing radiation and various radionuclides, with the creation of a new generation of reliable, highly efficient radiotherapy equipment, methods that combine the vast clinical experience with the achievements of modern imaging and computer technology and achievements in the field of radiobiology. Getting acquainted with the general treatment tactics, methods and possibilities of modern RT are an integral part of modern medical education.
NM functional imaging allows not only qualitative but also quantitative assessment of both normal and pathologically altered organ function. The main advantage of NM methods over other imaging methods is the ability to visualize the change in the function of the studied organs and systems even before the appearance of structural changes and this leads to continuous expansion of its areas of application in modern medical practice.

COURSE OBJECTIVES

To provide medical student with theoretical knowledge and practical skills about the main principles, methods and indications of modern nuclear medicine and radiotherapy:

- types of ionizing radiation
- influence of ionizing radiation on human organism
- diagnostic and therapeutic application of radionuclides
- modern equipment for imaging nuclear medicine diagnostics
- methods and possibilities of the imaging nuclear medicine diagnostics

- main indications of nuclear medicine diagnosis
- main types and methods of radiotherapy
- indications and contraindication for radiotherapy
- role of radiotherapy in the treatment of non-malignant disorders
- specificity of clinical follow-up of the patients, undergoing radiotherapy.

EXPECTED RESULTS

After finishing the education the students are expected to have acquired the following theoretical knowledge and practical skills:

- to be aware of the influence of ionizing radiation on the human organism
- to know the modern devices for nuclear medicine diagnosis
- to know the main methods of nuclear medicine diagnosis
- to know the main indications for nuclear medicine diagnosis
- to interpret the results of nuclear medicine diagnostic studies
- to know the indications for radiotherapy
- to know the main types and methods of radiotherapy
- to know the main principles of planning and conducting the radiotherapy
- to know the most frequent oncologic diseases which require application of radiotherapy
- to be aware of the specificity of clinical follow-up of the patients, undergoing radiotherapy.

PROGRAM FOR LECTIONS
III course, V semester

№	T O P I C	Hours 16 h	Date
1.	General principles of Nuclear medicine Radiopharmaceuticals. Devices - SPECT/CT; PET/CT; PET/MRT.	**2 h**	
2.	NM-Endocrinology. Metabolic and hybrid diagnostic of thyroid gland. Diagnostic of skeletal system.	**2 h**	
3.	NM-diagnostic of cardio-vascular, pulmonary, gastrointestinal, renal and central nervous systems.	**2 h**	
4.	NM diagnostic in clinical oncology. Metabolic radionuclide (brachy) therapy.	**2 h**	
5.	Biological Action of Ionizing Radiation. Radiotherapy – Main Principles and Methods. TNM classification	**2 h**	
6.	Radiotherapy of Breast Cancer and Lung Cancer	**2 h**	

7.	Radiotherapy of Cervical Cancer and Uterine Cancer	**2 h**	
8.	Radiotherapy of Rectal and Prostate cancer	**2 h**	

PROGRAM FOR PRACTICE
III course, V semester

№	**T O P I C**	**Hours 16h**	**Date**
1.	Nuclear Medicine – main principles and methods	**2 h**	
2.	Radionuclide Diagnosis (RND) of thyroid gland	**2 h**	
3.	Radionuclide Diagnosis (RND) of kidneys	**2 h**	
4.	RND of skeletal system. RND in oncology. PET	**2 h**	
5.	Classification of methods of Radiotherapy. TNM Classification of Malignant Tumours.	**2 h**	
6.	Radiotherapy of Breast Cancer and Lung Cancer	**2 h**	
7.	Radiotherapy of Cervical Cancer and Uterine Cancer.	**2 h**	
8.	Radiotherapy of Rectal and Prostate cancer	**2 h**	

LECTIONS – THESES

LECTION № 1 - 2 h

General principles of Nuclear medicine Radiopharmaceuticals. Devices- SPECT/CT; PET/CT; PET/MRT

1. Main principles of Nuclear Medicine (NM)
    1.1. diagnostic devices – Gamma camera, SPECT, PET
    1.2. diagnostic methods – in vivo, in vitro
    1.3. radionuclides, most frequently used in NM
    1.4. radio-immune-assay (RIA)

LECTION № 2 – 2 h

NM-Endocrinology. Metabolic and hybrid diagnostic of thyroid gland. Diagnostic of skeletal system.

1. History, types of RN studies
    1.1. Radio-Iodine Test
    1.2. RIA of thyroid hormones

2. Modern Gamma-camera imaging
    2.1. main principles
    2.2. indications for imaging with 99mTc
    2.3. indications for imaging with 131-I
3. Differentiated Thyroid Cancer
    3.1. brachy-therapy with 131-I
    3.2. follow-up of patients

4. RND of skeleton
    4.1. radiopharmaceuticals
    4.2. diagnostic methods
    4.3. application with primary and metastatic bone tumors

LECTION № 3 — 2 h

NM-diagnostic of cardio-vascular, pulmonary, gastrointestinal, renal and central nervous systems.

1. RND of **cardio-vascular, pulmonary, gastrointestinal, renal and central nervous systems.**
    1.1 radiopharmaceuticals
    1.2. diagnostic methods
    1.3. application

LECTION № 4 — 2 h

NM diagnostic in clinical oncology. Metabolic radionuclide (brachy) therapy.

1. Application of PET in oncology
    1.1. main principles
    1.2. radiopharmaceuticals for PET
2. Main indications for PET
    2.1. staging and re-staging of malignant tumors
    2.2. assessment of therapy
    2.3. detection of UPS
3. Metabolic radionuclide (brachy) therapy.
    3.1. radiopharmaceuticals

LECTION № 5 - 2 h

BIOLOGICAL ACTION OF IONIZING RADIATION. RADIOTHERAPY – MAIN PRINCIPLES AND METHODS

1. Biological action of ionizing radiation
    1.1. Radioactivity
    1.2. Dozimetry
2. Methods of Radiotherapy (RTh)
    2.1. external beam RTh
    2.2. intra-cavitary brachytherapy
    2.3. intersticial brachytherapy
    2.4. metabolic/ RN brachytherapy
3. Radiotherapy of malignant tumors
    3.1. main principles.
    3.2. treatment planning.
    3.3. Radiation reactions and complications

4. Modern radiation oncology - IMRT /intensity-modulated radiotherapy/, VMAT /volume-modulated radiotherapy/, IGRT /image-gated radiotherapy, SRT /stereotactic radiation therapy/, SBRT /stereotactic body radiation therapy/

LECTION № 6 – 2 h

RADIOTHERAPY OF BREAST CANCER AND LUNG CANCER

1. Radiotherapy of Breast Cancer
    1.1. tactics of complex therapy
    1.2. place of RTh (examples)
    1.3. daily and total Doses
    1.4. side reactions; prognosis
2. Radiotherapy of Lung Cancer
    2.1. tactics of complex therapy
    2.2. place of RTh (examples)
    2.3. daily and total Doses
    2.4. side reactions; prognosis

LECTION № 7 – 2 h

RADIOTHERAPY OF CERVICAL CANCER AND UTERINE CANCER

1. Clinical characteristics; staging
2. External beam RTh.; volume definition
    2.1. treatment planning
    2.2. daily and total Doses
    2.3. Radiation reactions and complications
3. Intracavitary brachytherapy
    3.1. with initial External beam RTh
    3.2. with additional External beam RTh
4. Metastases; prognosis

LECTION № 8 – 2 h

RADIOTHERAPY OF RECTAL AND PROSTATE CANCER

1. Clinical characteristics; staging
2. Percutaneous radiotherapy - types
    2.1.Radiotherapy planning - volumes and doses
3. Radiation reactions and complications

PRACTICLES - THESES

PRACTICLE № 1 – 2 h

NUCLEAR MEDICINE – MAIN PRINCIPLES AND METHODS

1. Nuclear medicine (NM) and Radionuclide Diagnosis (RND) – definition
2. Radionuclides (RN) and Radiopharmaceuticals (RPh)
3. Ionizing radiations - Important physical entities and units
    3.1. Types of ionizing rays - Particulate and Electromagnetic/ photon rays
    3.2. Energy of radioactive rays
    3.3. Penetrating ability
    3.4. Activity and Physical half-life of RN
4. RN – main requirements for NM purposes
    4.1.Optimal for detection type of radioactive emission

4.2. Optimal for detection Energy of emission
4.3. Optimal Physical half-life (T/2)
4.4. Technetium-99m - the most frequently used RN in NM

5. RPh - main requirements for NM purposes
5.1. Selective accumulation
5.2. Simple preparation

6. Main advantages of RND

7. Production of RN
7.1. Nuclear reactors
7.2. Accelerators of charged particles (cyclotrons)
7.3. RN Generators - Operating principle of RN Generator
7.4. Molybdenum/ Technetium Generator – preparation of ^{99m}Tc RF

8. Modern devices for RN imaging
8.1. The Gamma Camera System (GC)
8.2. Structure of Scintillation Detector

9. Presentation of RND results
9.1. Time/ Activity curves (TAC)
9.2. % of uptake of the RF in the organ or region of interest (ROI)
9.3. Scintigraphic images - scintigrams

10. Types of GC imaging studies
10.1. Static scintigraphy
10.2. Dynamic scintigraphy
10.3. Whole-body scintigraphy
10.4. SPECT – Single-photon/ Gamma-emission computer tomography

11. Positron emission tomography (PET) – metabolic/ molecular imaging
11.1. positron emitting RN and RPh
11.2. PET scanners

12. Hybrid diagnostic devices - PET/ CT; SPECT/ CT

SEMINARS № 2 – 2 h

RADIONUCLIDE DIAGNOSIS (RND) OF THYROID GLAND (TG)

1. Anatomy and Physiology of TG
1.1. Regulation of Thyroid function

2. Functional RND of the TG (functional tests)
2.1. Measurement of thyroid radioactive Iodine uptake (RAIU)

3. Functional-morphological RND of TG (GC scintigraphy of TG) - imaging and quantitative assessment of RF uptake in the TG
3.1. Radiopharmaceuticals (RF)
3.1.1. RN of Iodine - 131-I or 123-I
3.1.2. 99mTc-pertechnetate

4. Normal scintigraphy of TG
4.1. Place, form, size, structure
4.2. Function - thyroid uptake of 99mTc

5. Thyroid Pathology in Place - Ectopy
5.1. sublingual goiter
5.2. retrosternal goiter

6. Pathology in Size - enlarged TG (goiter, struma)
6.1. Diffuse goiter (Struma diffusa) – Eu-, Hyper- and Hypothyroid goiter
6.2. Nodular goiter (Struma nodosa)

6.3. Scintigraphic differentiation of thyroid nodules
6.3.1. Cold nodules – cysts; malignant tumours
6.3.2. Warm nodules - benign adenomas
6.3.3. Hot nodules - benign autonomous adenomas - Compensated, sub-compensated, de-compensated (Toxic adenoma)

7. Thyroid Scintigraphy (WB) with 131-Iodine - indications

8. Tumour-positive scintigraphy of TG
8.1. Tumour-specific RF for thyroid malignancies - 99mTc-MIBI, 201-TlCl

PRACTICLE № 3 – 2 h

RND OF KIDNEYS

1. Anatomy and Physiology of Kidneys
1.1. main functions of the kidneys
1.2. Glomerular Filtration (GF), Tubular Secretion (TS)

2. RF for RN kidney imaging
2.1. For dynamic scintigraphy
2.1.1. By TS -131-I-Hypuran; 99mTc-MAG3 – ERPF
2.1.2. By GF - 99mTc-DTPA – GFR
2.2. For static scintigraphy - 99mTc-DMSA

3. RN Renography - TACs (renograms)
3.1.The normal renogram
3.1.1. I phase (vascular, perfusion)
3.1.2. II phase (secretory)
3.1.3. III phase (excretory)
3.2. Pathological renograms

4. Dynamic GC scintigraphy - Functional-morphological imaging of the kidneys
4.1. Performance
4.2. Diagnostic information
4.2.1. Perfusion
4.2.2. Anatomy and morphology
4.2.3. Function – total, relative
4.2.4. Non-ivasive determination of Renal Filtration (GFR) and Secretory Clearances (ERPF)

5. Static and SPECT renal imaging

6. Main indications for static renal scintigraphy – scintigraphic findings
6.1. Inborn disorders
6.1.1. Ectopy – ptosis
6.1.2. Horse-shoe kidney
6.2. Diffuse processes – nephritis
6.3. Space-occupying processes (SOP)
6.3.1. Cysts, Polycystosis
6.3.2. Malignant Tu

PRACTICLE № 4 – 2 h

RND OF SKELETAL SYSTEM. RND IN ONCOLOGY. PET

1. Anatomy and physiology of skeletal system
1.1. Structure of bone tissue
1.2. Bone tissue metabolism

2. Radiopharmaceuticals for Bone Scintigraphy (BS) - Phosphate compounds - ^{99m}Tc-MDP
3. Peculiarities of Bone Scintigraphy (BS) - extremely sensitive and relatively non-specific method
4. Types of BS
    4.1.late static planar whole-body (WB) GC
    4.2. targeted static BS
    4.3. SPECT
    4.4. 3-phase bone scintigraphy (3-PBS)
5. Evaluation of scintigraphic findings
6. The normal adult and immature skeleton
7. Main indication for BS
    7.1. Early detection of bone metastases
    7.2. Cardinal features of skeletal metastatic disease
8. Other indications for BS
    8.1. Degenerative (artroso-atrthritic) bone-joint disorders
    8.2. Trauma and bone fractures
    8.3. Primary malignant bone tumours
9. 3-PBS in inflammatory bone-joint disorders
10. RND in oncology (RND of malignant tumours)
    10.1. Radio-imuno scintigraphy – looking for the "Golden bullet"
    10.2. Tumour-specific RF for thyroid malignancies - 99mTc-MIBI, 201-Thalium
    10.3. Scintigraphic imaging of malignant tumours by means of radio-labeled monoclonal Anti-bodies (Ab), targeted at tumour-specific Anti-genes (Ag), e.g. Anti-CEA-Ag.
11. PET
    11.1. positron emitting RN and RPh
    11.2. PET scanners
    11.3. main indications for metabolic imaging

PRACTICLE № 5 – 2 h

CLASSIFICATION OF RADIOTHERAPY METHODS. MODERN RADIOTHERAPY EQUIPMENT. TNM CLASSIFICATION OF MALIGNANT TUMORS

1. Introducing the students to the material base of the Clinic of Radiation Therapy (CRT) and the requirements of the department related to the training in radiation therapy
2. Introducing students to the main goals of training in radiation therapy
3. Introducing students to the methods of radiation therapy and visualization according to the available equipment in CRT

3.1. According to the type of radiation source

3.2. According to the location of the source relative to the patient's body

    3.2.1. Percutaneous radiation therapy -
    - contact therapy - irradiation with 90 Strontium, 32P, etc .;
    - short-distance therapy (Shaul therapy, brachytherapy);
    - medium distance (superficial and medium-deep X-ray therapy);
- long-distance irradiation (TGT, particle accelerators). Modern radiotherapy devices
    3.2.2. Intracavitary RT
    3.2.3. Interstitial RT

3.2.4. Metabolic (intracorporeal) RT

3.3. According to the dose distribution in space and time - IMRT / intensity-modulated radiotherapy /, VMAT / volume-modulated radiotherapy /, IGRT / image-gated radiotherapy, SRT / stereotactic radiation therapy /, SBRT / stereotactic body radiation therapy /

4. Introducing students to TNM - the system of malignant tumors

4.1. TNM system

- T - size and local spread of the tumor
- N - lymphogenic distribution in the regional lymphatic basin
- M - hematogenous spread / metastases /

4.2. TNM-system - as a basis for staging patients, determining treatment tactics and comparing treatment results

4.3. TNM system - as a prognostic factor

5. Demonstration of the available equipment in CRT and its therapeutic possibilities

PRACTICLE № 6 – 2 h

RADIATION THERAPY (RTh) OF BREAST CANCER AND LUNG CANCER

A. 1. The basic principles of radiotherapy planning

1.1. Clinical and biological planning

1.2. Anatomical and topographic planning - principles of 3-D conformal radiation therapy; delineation of the irradiated volumes

1.3. Dosimetric planning - the role of the radiotherapist and physics

B. 1. Breast cancer (BC) - etiology, histological variants, TNM - system

2. Complex treatment of breast cancer - surgery, radiation, chemotherapy, hormone therapy, targeted therapy, others

3. Types of radiotherapy for breast cancer:

3.1. Teleradiotherapy (TRT) - electron and photon therapy, tele-gamma therapy

3.2. Preoperative, postoperative, radical, palliative

3.3. Irradiated volumes, dose distribution in space and time, daily and total focal doses, risk organs.

3.4. Clinical-biological and dosimetric planning and implementation of the radiotherapy plan

4. Demonstration of clinical cases

C. Lung cancer - etiology, histological variants, TNM - system

1. Complex therapy - surgery, radiotherapy, chemotherapy, immunotherapy, targeted therapy

2. Radiation therapy

2.1. Types - preoperative, postoperative, radical, symptomatic

2.2. Dose distribution in space and time - daily and total focal doses

2.3. Demonstration of clinical cases

PRACTICLE № 7 – 2 h

RADIATION THERAPY (RTh) OF CERVICAL CANCER AND UTERINE CANCER

1. Radiation Therapy of Cervical cancer

1.1. Etiology, histological types, TNM-staging

1.2. treatment options – surgery, radiation therapy

1.3. Types of RTh - preoperative RT, postoperative RT, radical RT (intracavitary and external beam RT), palliative RT

2. Radiation Therapy of Uterine cancer

2.1. Etiology, histological types, TNM-staging

2.2. treatment options – surgery, radiation therapy, hormonal therapy

2.3. Types of RTh – preoperative RT, postoperative RT, radical RT (intra-cavitary and external beam RT), palliative RT

PRACTICLE № 8 – 2 h

RADIATION THERAPY (RTh) OF PROSTATE CANCER AND RECTAL CANCER

1. Prostate cancer – screening, diagnosis, staging, general principles of therapy. Role of radiotherapy.

2. Rectal cancer - screening, diagnosis, staging, general principles of therapy. Role of radiotherapy.

LITERATURE

1. Medical oncology. Edited by K. Timcheva. Sofia 2018. ISBN 978-954-553-145-3

2. Collection of tests in clinical oncology. Edited by J. Grudeva-Popova. Plovdiv 2018ISBN 978-619-7085-97-6

3. Anemia in malignant diseases. I. Nenova, J. Grudeva-Popova. Plovdiv 2016. ISBN 978-619-7085-62-4

4. Pharmacotherapy and problems of clinical pharmacy (part 2). Edited by M. Karaivanova. Sofia 2014

5. Guide to radiotherapy for medical students - Marinova L, Yaneva M., Varna 2008

6. CardioOncology or Oncocardiology - modern issues of diagnosis and treatment. J. Grudeva-Popova (ed.). Plovdiv 2012. ISBN 978-954-9549-58-4

7. Collection of clinical oncology tests. Zhanet Grudeva-Popova (ed). Plovdiv 2019

8. Radiation Oncology Self-assessment Guide, John Suh (Editor), 2017

9. The MD Anderson Manual of Medical Oncology. Hagop M. Kantarjian, Robert A. Wolff, Charles A. Koller, McGraw-Hill Medical. 2nd edition, 2011

10. Clinical Radiation Oncology: Expert Consult-Online and Print Consult, Leonard L. Gunderson (Author), Joel E. Tepper (Author) Saunders; Revised edition, 2019

11. Textbook of Radiation Oncology 3 Ed. Richard MD Hoppe (Author), Saunders; 5-rd Revised edition, 2018

12. Radiation Oncology - management decisions. Chao Cl., Perez C, Brady LW Lippincott Williams & Wilkins, 4th edition, 2014

13. Textbook of Medical Oncology. Franco Cavalli (Editor), Stanley B. Kaye, Heine H. Hansen, Heine H Hansen, James O. Armitage, Martine Piccart-Gebhart (Editor). Informa Healthcare; 5th edition, 2019

EXAMINATION CONSPECT
OF NUCLEAR MEDICINE AND RADIOTHERAPY

1. Radiation oncology - basic principles, planning and equipment.
2. Classification of methods for radiation oncology: according to the type and source of radiation; in accordance with the location of the source relative to the patient's body.
3. Classification of TNM for malignant tumors. Radiation reactions and complications.
4. Radiation therapy for breast cancer.
5. Radiation therapy for lung cancer.
6. Radiation therapy for rectal cancer. Combined radio-chemotherapy.
7. Radiation therapy for cervical and uterine cancer.

8. Radiation therapy for prostate cancer.
9. Basic principles of radionuclide diagnostics. Equipment. Radionuclides. Methods.
10. Radionuclide diagnosis of the thyroid gland.
11. Radionuclide diagnosis of the kidneys.
12. Radionuclide diagnostics of bones.
13. Radionuclide diagnostics in oncology. PET-CT.

QUESTIONS FOR SELF-PREPARATION

Topic 1
RADIONUCLID DIAGNOSTICS - BASIC PRINCIPLES

1. What are the basic principles of radionuclide diagnostics?
2. The most important physical quantities and units characterizing radionuclides?
3. What is the structure of radionuclide generators and the principle of operation?
4. What are the characteristics of radiopharmaceuticals and the requirements for them?
5. What are the main features of SPECT and PET scanners?
6. What are the types of nuclear medical diagnostic methods?

Topic 2
RADIONUCLID DIAGNOSIS OF THE THYROID GLAND

1. What are the indications for thyroid scintigraphy?
2. What are the main radiopharmaceuticals for functional-morphological examination of the thyroid gland?
3. What is the information value of thyroscintigraphy in diffuse and focal processes?
4. What is the principle of tumor-positive diagnosis and its application in diseases of the thyroid gland?
5. What is the role of RIA in thyroid disease?

Topic 3
RADIONUCLIDE DIAGNOSTICS OF THE EMBASSY SYSTEM

1. What are the types of nuclear medicine methods for determining the functional and morphological state of the excretory system?
2. What is the diagnostic value of nuclear medical methods for determining the functional and morphological state of POS?
3. What are the indications for dynamic renal scintigraphy?
4. What factors determine the choice of radiopharmaceutical for renal scintigraphy?
5. In which cases it is necessary to perform static scintigraphy with 99mTsDMSA?

Topic 4
RADIONUCLID DIAGNOSIS OF THE BONE SYSTEM. RADIONUCLID DIAGNOSTICS IN ONCOLOGY

1. What are the types of nuclear medicine methods for examination of the bone and joint apparatus?
2. What are the main radiopharmaceuticals?
3. What is the role of bone scintigraphy for the diagnosis and staging of cancer?
4. What are the indications for 3-phase bone scintigraphy?
5. What are the most commonly used tumor-positive radiopharmaceuticals?
6. What is the application of PET in oncology?
7. What is the advantage of hybrid research methods over conventional ones?

Topic 5
CLASSIFICATION OF RADIATION THERAPY METHODS.
TNM CLASSIFICATION OF MALIGNANT TUMORS

1. What are the basic principles of radiation therapy of malignant tumors?
2. What are the methods of radiation therapy according to the type and source of radiation?
3. What are the methods of radiation therapy according to the location of the source relative to the patient's body?
4. What are the methods of radiation therapy according to the dose distribution in space and time?
5. What is the role of TNM - the system for determining treatment tactics and prognosis of malignant tumors?
6. Indicate the principle of action and therapeutic possibilities of linear accelerators.

Topic 6
RADIATION TREATMENT OF MALIGNANT DISEASES OF:
A. THE BREAST GLAND

1. What are the stages of breast cancer according to the TNM system ?.
2. What are the methods for treating breast cancer?
3. What types of radiotherapy are used for breast cancer?
4. What factors influence the clinical and biological planning in breast cancer?
5. Indicate the main steps in dosimetric planning of breast cancer?
6. Determine the therapeutic behavior at different stages of the disease / TNM - system /.
7. Define the role of radiation therapy in the complex treatment of breast cancer?

B. LUNGS

1. Present the classification of lung cancer according to the TNM-system - clinical stages.
2. Indicate the main histological variants and their importance in determining therapeutic behavior.
3. What methods are included in the complex treatment of lung cancer?
4. What methods of radiotherapy are used for lung cancer according to the stage of the disease and the goals?
5. What methods of radiotherapy are used in lung cancer according to the dose distribution in space and time?
6. What are the possibilities for radiotherapy of non-tumor diseases?
7. What are the basic principles of radiotherapy for non-tumor diseases - indications and contraindications for treatment?

Topic 7
RADIATION TREATMENT FOR CANCER OF THE CERVIC AND BODY OF THE UTERUS

1. What are the stages of planning radiotherapy for malignant diseases?
2. What characterizes clinical-biological planning and what is its result?
3. What is the purpose of anatomical and topographic planning?
4. What is the role of the radiotherapist and physicist in dosimetric planning?
5. What methods of radiotherapy are used for cervical cancer?
6. What treatment is used for cervical cancer depending on the stage of the disease?
7. What methods of radiotherapy are used for cancer of the uterine body?
8. What equipment is needed for radiotherapy for cervical and uterine cancer?

Topic 8

RADIATION TREATMENT OF RECTAL CANCER AND PROSTATE CANCER:

A. RECTUM CANCER

1. What are the stages of planning radiotherapy?
2. What characterizes clinical-biological planning and what is its result?
3. What is the purpose of anatomical and topographic planning?
4. What radiotherapy methods are used for rectal cancer?
5. What treatment is applied depending on the stage of the disease?
6. What methods of radiotherapy are used in rectal cancer?
7. What equipment is needed for radiotherapy at this location?
8. Role of preoperative radiochemotherapy

B. PROSTATE CANCER

1. Is there a modern screening for the disease
2. Modern diagnostic methods
3. Principles of staging
4. General principles of treatment
5. Place of radiotherapy - external irradiation, brachytherapy, palliative radiotherapy of bone metastases

TESTS FOR SELF-ASSESSMENT

1. The physical half-life of a radionuclide is:
   a) the dose absorbed in the diseased focus
   b) the number of the decayed nuclei per unit of time
   c) the time for which the initial activity of the radionuclide decreases in half
2. The most widely used radionuclide in Nuclear Medicine is:
   a) 125 Iodine
   b) 131 Iodine
   c) 99m Technetium
3. The normal renogram consists of:
   a) four phases
   b) two phases
   c) three phases
4. The Activity of a RN is defined as:
   a) the number of the decayed nuclei per unit of time
   b) the time for which the initial activity of the radionuclide decreases in half
   c) the Energy absorbed in a volume of tissue
5. The principle diagnostic device in NM is:
   a) Nuclear reactor
   b) Gamma Camera
   c) Cyclotron
6. The most widely used radionuclide for thyroid scintigraphy is:
   a) 125 Iodine
   b) 131 Iodine
   c) 99m Technetium
7. Radionuclide Renography is method for functional diagnosis of:
   a) bones
   b) thyroid gland

c) kidneys

8. A Cyst in the thyroid gland presents on the scintigram as:
   a) hot nodule
   b) warm nodule
   c) cold nodule
9. The Gamma Camera scintigraphy gives diagnostic information about:
   a) organ's anatomy
   b) organ's morphology and function
   c) both a) and b)
10. The RPf used for Bone scintigraphy is:
   a) 99mTc-MDP
   b) 99mTc-Pertechnetate
   c) 131Iodine-NaI
11. The main indication for bone scintigraphy is:
   a) inflammatory bone disorders
   b) early detection of bone metastases
   c) benign bone tumors
12. The most frequently used RPh for PET is:
   a) 18F-FDG
   b) 99mTc-Pertechnetate
   c) 131Iodine - NaI
13. Pathological renograms are:
   a) obturation and nephrectomic
   b) isostenuric and reduction
   c) both a) and b)
14. Toxic adenoma of the Thyroid gland presents on the scintigram as:
   a) hot compensated nodule
   b) hot sub-compensated nodule
   c) hot de-compensated nodule
15. Which of the following RPh is used for Tumour-positive scintigraphy:
   a) 99mTc-Pertechnetate
   b) 99mTc-MIBI
   c) 131 I -Hypuran
16. Measuring Unit for Activity of RN is:
   a) Beckerel (Bq)
   b) Gray (Gy)
   c) Roentgen ®
17. Thyroid nodule with equal to the surrounding tissue uptake is defined as:
   a) hot nodule
   b) warm nodule
   c) cold nodule
18. The scintillation Gamma Camera is detector of:
   a) Alfa-particles
   b) Beta-particles
   c) Gamma rays
19. Malignant tumors present on scintigraphy with tumor-specific RPh as:
   a) zones of increased uptake of the RPh
   b) zones of decreased uptake of the RPh
   c) zones of absent uptake of the RPh

20. The most used particles for radiotherapy are:
    a) protons
    b) electrons
    c) photons
    d) neutrons
21. For radiotherapy we are using:
    A) Nuclear reactor
    B) Gamma camera
    C) Linear accelerator
    D) all of them
22. Daily dose for radiosurgery is:
    a) 1,8-2Gy
    b) 2-5Gy
    c) 5-20Gy
    d) 20-60Gy
23. Treatment for patients with multiple bone metastases include:
    a) 131 Iodine
    b) 89 Strontium
    c) 18F-FDG
    d) 66 galium
24. Total dose in chest wall for patient with breast cancer after total mastectomy is:
    a) 40 Gy
    b) 50Gy
    c) 60Gy
    d) none of them
25. We are using combinated radiotherapy + Xeloda (Capecitabine) for:
    a) rectal cancer
    b) ovarian cancer
    c) anal cancer
    d) lung cancer
26. Most common place for distant metastases from lung cancer is:
    a) skin
    b) brain
    c) liver
    d) heart

HEAD OF DEPARTMENT

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