**Ministry of healthcare of the Republic of Kazakhstan**

**The Kazakh Scientific Research Institute of Oncology and Radiology**

**RESIDENCY**

**Specialty**"Radiation therapy"

**SYLLABUS**

**Discipline «**Brachytherapy»

Volume in hours - 225 hours / 5 credits

from them:

Lectures - 75 hours

Practical training - 75 hours

Independent work of resident - 75 hours

Form controls - examination

**Almaty, 2017**

The syllabus is compiled according to the Model curriculum, the Residency Educational Program for the specialty "Radiation Therapy", the Instruction Letter No. 8 for the development of educational and methodological documentation in the organizations of the Republic of Kazakhstan, which are preparing for the residency approved by the Republican Center for Innovative Technologies of Medical Education and Science of the Ministry of Health of the Republic of Kazakhstan on April 27 2010 (Protocol No. 4).

Approved at the meetingRadiological Board

(Protocol 7 from "August" 25, 2017.)

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**3. Explanatory Note**

3.1 Introduction

3.2 The purpose of discipline

3.3 Tasks of discipline

3.4 Learning outcomes

**The purpose of the discipline** is to acquire and improve practical and theoretical knowledge on brachytherapy.

**Tasks of the discipline:**

1. Significance and role of brachytherapy in radiation treatment of patients with malignant neoplasms.

2. Physical, chemical and radiobiological basis of brachytherapy and its technical support.

3. Basic methods of brachytherapy and its hardware.

**A resident must know:**

* Organization of a radiological service, including brachytherapy in the Republic of Kazakhstan.
* Regulations on the activities of the radiological department in the Republic of Kazakhstan and job descriptions, algorithms and instructions for the qualitative performance of activities.
* The history of the emergence and development of brachytherapy.
* Physical and radiobiological basis of brachytherapy (contact radiation therapy).
* Clinical and dosimetric principles of contact radiation therapy.
* Types of radiotherapy treatment machines for brachytherapy
* The variety of methods of contact radiation therapy depending on the localization

process

* The variety of methods of contact radiation therapy depending on the application.
* Types of radioactive sources used in contact radiation therapy.
* Safety regulations, radiation safety standards and the operation of devices with ionizing radiation sources.
* Choice of methods of pre-radial topometric preparation for contact radiation therapy.
* Planning for contact radiation therapy.
* Accounting for the dose of radiation in combined radiation therapy.
* The basis of normal and topographic anatomy, radiology, ultrasound, computer and magnetic resonance imaging for topometric planning of contact radiation therapy.
* Predicting the course of the disease and preventing reactions and complications in the conduct of contact radiation therapy.
* Indications and contraindications to the appointment of contact radiation therapy for patients with various forms of malignant neoplasms with the choice of the optimal irradiation technique.
* Questions of rehabilitation of cancer patients who received brachytherapy and (or) combined radiation therapy and dispensary observation of cancer patients.

**The resident should be able to:**

* Analyze information about the disease, identify common specific signs of the lesion, especially in cases requiring urgent care in intensive care, assess the severity of the patient and the patient's withdrawal from this condition, provide the necessary assistance.
* Interpret data from special research methods (laboratory, radiographic, ultrasound, radioisotope).
* Determine the indications for hospitalization.
* To carry out differential diagnostics of tumors of various localizations, to substantiate the clinical diagnosis.
* Assess the severity of the patient's condition, interpret the clinical and laboratory findings, instrumental data, and determine the extent and sequence of the provision of therapeutic interventions for combined radiotherapy.
* To trace the improvement or deterioration of the patient's condition and the conformity of the chosen irradiation techniques, according to the tasks of radiotherapy.
* To determine the medical indications for contact and / or combined radiotherapy with the application of knowledge about the physical and radiobiological effects of ionizing radiation on the patient's body in order to select the optimal irradiation technique.
* To justify the scheme, plan and tactics of radiation treatment of patients, indications and contraindications to contact and / or combined radiotherapy.
* Independently conduct the analysis and choose the optimal dosimetric plan within the framework of highly specialized medical care.

**The resident must have the skills:**

* Pre-treatment tonometry with brachytherapy on x-ray and computer simulators.
* Clinical and dosimetric planning forcontact radiation therapy.
* Methods of contact radiation therapy on the apparatus of brachytherapy.
* Technique of patient placement and technique of introduction of applicators depending on the type of contact radiation therapy and tumor localization
* Method of assessing the quality of contact or combined radiation therapy

**4. The thematic plan of lectures**

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| --- | --- | --- |
| **№** | **Topic name** | **Number**  **of hours** |
| 1 | Physico-technical, clinical-dosimetric, radiobiological justification for use of brachytherapy in the treatment of malignant tumors. | 25 |
| 2 | Indications and contraindications for contact radiation therapy. Advantages and disadvantages of brachytherapy versus distancetechnique for beam radiation therapy. The concept of combined radiation therapy. | 25 |
| 3 | The main technique brachytherapy and its hardware. | 25 |
|  | **Total hours** | **75** |

**5. Thematic plan, content of seminars and exercises**

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| --- | --- | --- | --- |
| **№** | **Topic name** | **Content of the topic** | **Number of hours** |
| 1 | The role and place of  brachytherapy in  radiation therapy  of patients with malignant neoplasms | History of origin and development of brachytherapy.The history of development of brachytherapy technologies. Physico-technical, clinical-dosimetric, radio-biological justification for use of brachytherapy in the treatment of malignant tumors. Indications and contraindications for contact radiation therapyof patientswith malignant neoplasms. | 20 |
| 2 | Varieties of brachytherapy depending on the location of the malignant tumor | Intracavitary, interstitial, in-line, surface (application), intravascular brachytherapy.  Types of brachytherapy applicators, peculiarities of their. | 20 |
| 3 | Varieties of brachytherapy  depending on methods of application | Ways to deliver ionizing radiation source.  The concept of manual (manualafter loading) and automated (remoteafter loading) brachytherapy methods.  Variety of brachytherapytechniques. | 20 |
| 4 | Types of brachytherapy depending on  thedoserateofradiation | The concept of high dose rate (HDR), middle dose rate (MDR), low dose rate (LDR) and pulse dose rate (PDR) brachytherapy methods. Physical, technical, clinical, dosimetric and radiobiological features ofHDR, MDR, LDR and PDR brachytherapy methods. | 15 |
| 5 | Combinedradiation therapy for radiation treatment of individual forms of malignant processes | Indications and contra-indications to application of combined methods of irradiation in patients with malignant neoplasms of different localizations. Performance technique. | 30 |
| 6 | Brachytherapy of oncogynecological diseases | Indications and contra-indications, advantages and disadvantages, side effects, their correction and treatment.  Technique brachytherapy, types of applicators. Pre-radial topometry and dosimetric planning for brachytherapy of gynecological cancer. | 30 |
| 7 | Brachytherapy of  prostate cancer | Innovative methods of radiation for prostate cancer (low dose rate and high dose rate brachytherapy). Indications and contra-indications, advantages and disadvantages. The concept of closed and open radionuclides. The concept of permanent and temporary brachytherapy of prostate cancer. | 30 |
| 8 | Low dose rate brachytherapy of  prostate cancer | Indications for use LDR brachytherapy of prostate cancer. Variety of radioactive sources.  Technique of implementationwith visualization techniques. Features of radiation protection. Pre-radialtopometry and radiation treatment planning. Side effects of LDR brachytherapy methods. Features a protective regime for patients after spending of LDR-brachytherapy for prostate cancer. | 30 |
| 9 | High-dose rate brachytherapy of  prostate cancer | Indications for use HDR brachytherapy of prostate cancer. Variety of radioactive sources and brachytherapy equipment. Techniques for performing the procedure with visualization methods.  Pre-radial topometry and radiation treatment planning. Possible complications and side effects of HDR-brachytherapy of prostate cancer. | 15 |
| 10 | Rehabilitation  of patients with malignant tumors who received brachytherapy  or combined radiation therapy | Possible complications of brachytherapy.Radiation reactions after brachytherapy or combined radiotherapy. Treatment of acute and stunted radiation reactions and side effects of brachytherapy or combined radiation therapy. | 15 |
|  | **Total hours** | | **225** |

**6. Resident self-study work plan**

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| --- | --- |
| **№** | **Maintenances of independent work of a resident** |
| 1 | Polyclinic reception of patients with the formulation of directions for radiotherapy. |
| 2 | Participation in clinical analysis of patients on consuls in the specialized clinical centers and in the radiological departments of the Institute.  On duty in the department of radiation therapy. |
| 3 | Work in the library, on the Internet.  Forming the portfolio of the resident listener. |
| 4 | Curation of patients with malignant tumors of female genital organs in the Center of oncogynecology and in the department Day hospital of radiotherapy with independent maintenance of necessary medical documentation. |
| 5 | Participation in weekly radiological advice.  Participation and presentation of clinical cases of supervised patients with oncogynecologic pathology at the radiological boards of the Institute. |
| 6 | Participation in the compilation and analysis of plans for radiation treatment of oncogynecologic patients on daily radiological discussions - participation in the stages of pre-radial CT topometric preparation of radiological patients; independent delineation of the volumes of irradiated targets at the stage of preliminary planning of radiation treatment of radiological patients with malignant neoplasms of the female sexual sphere. |
| 7 | Participation in pre-radial X-ray centering of oncogynecologic patients and at the stage of calculation of individual dosimetric planning on the apparatus of brachytherapy.Independent participation in conducting contact radiotherapy sessions on the brachytherapy equipment of the Institute. |
| 8 | Curation of oncological patients with prostate tumors in the Center of Oncourology of the Institute with the maintenance of appropriate medical documentation.Interpretation of general clinical laboratory, instrumental, ultrasound, X-ray data in patients receiving radiotherapy. |
| 9 | Participation in the compilation and analysis of plans for radiation treatment of patients with malignant tumors of the prostate on daily radiological discussions - participation in pre-radial CT-topometric preparation; independent delineation of the volumes of irradiated targets at the stage of preliminary planning of radiation treatment of radiological patients with prostate tumors. |
| 10 | Participation in pre-radial X-ray centering of oncogynecologic patients and at the stage of calculation of individual dosimetric planning on the apparatus of brachytherapy.Independent participation in the conduct of contact radiation therapy sessions on the apparatus of brachytherapy with oncogynecologic patients. |
| 11 | Curation of patients with malignant tumors of the bladder, prostate gland in the profile center of oncourology and in the department Day hospital for radiotherapy with the maintenance of the relevant medical documentation.Interpretation of general clinical laboratory, instrumental, ultrasound, X-ray data in patients receiving radiotherapy of the bladder, prostate. |
| 12 | Interpretation of PSA parameters and evaluation and its dynamics in the process of antitumor radiation therapy in oncological patients. |
| 13 | Individual correction of blood indices in cancer patients of different profile receiving radiotherapy. |
| 14 | Individual correction of radiation reactions and side effects of radiotherapy in cancer patients of different profile receiving radiotherapy. |
| 15 | Registration and delivery of abstracts. |
|  | **Total hours - 75** |

**7. List of visual and other manuals, methodical instructions**

**8. Assessment of knowledge**

Current and boundary control (monitoring the work of the resident in the clinic, analyzing the filling and keeping of medical records, testing and oral interviews).

Final control: an exam including testing, interviewing and assessment of practical skills.

**9. Clinical base:**Oncogynecology center, Day hospital of radiotherapy, Oncourology center.

**10. List of recommended literature:**

1) BohmanYa.V. Guide to oncogynecology. L .: Medicine, 1989. -464 p.

2) Vishnevskaya E.E. Modern principles of combined radiation treatment of cervical cancer // Med. Radiology, 1985. - №9. - P.63-68.

3) Krikunova L.I. Radiation therapy of cervical cancer // Practical oncology. - T.3, №3. - 2002. - P.194-199.

4) The role of radiation therapy in gynecological oncology. / Obninsk, 2-3 April, 2002. - P.139-141.

5) Haryana M., Sakata K., Oouchi A., et al. High-dose-rate versus low-dose-rate intracavitary therapy for carcinoma of the uterine cervix: a randomized trial // Cancer, 2002. - Jan 1, 94 (1). - P.117-124.

6) Zwahlen D., Jezioranski J., Chan P., et al. Magnetic resonance imaging-guided intracavitary brachytherapy for cancer of the cervix // Int J RadiatOncolBiol Phys., 2009. - Jul 15, 74 (4). - P. 1157-1164.

7) NurgazievK.Sh., Baypeisov DM, Ismailov S.B. and others. Information-analytical collection "Statistics of malignant neoplasms in 2004-2013 and the prognosis until 2020 (morbidity, mortality and survival)" - Almaty, 2014. - 152 p.

8) Statistics of malignant neoplasms in Russia and CIS countries. -Moscow, 2010.

9) Trufanov G.E. Radiation therapy. - 2009.

10) Kozlova A.V. Radiation therapy of malignant tumors. - Moscow: Medicine, 1976.

11) Vazhenin A.V. Radiation oncology, organization, tactics, ways of development. - Moscow: 2003. - 233 p.

12) Lindenbraten LD, Korolyuk I.P. Medical radiology: Fundamentals of radiotherapy (for universities, 2nd edition). - M .: Medicine, 2000.

13) Trufanov G.E. Fundamentals and clinical application of radiation therapy / Radiation diagnostics and radiation therapy (textbook). - SPB, 2005.

14) Balter S.A. Fundamentals of clinical topometry in oncology. - Moscow: Medicine, 1986. - 254 p.

16) Möller TB, Raif E. Atlas of sectional human anatomy on the example of CT and MRI sections: in 3 volumes (translated from English: under the editorship of Prof. GE Trufanov). - М .: MEDPRESS-INFORM, 2008.

17) Kostylev VA, NarkevichB.Ya. Medical physics. - Moscow: Moscow, 2008. - P.126-155.

18) Law of the Republic of Kazakhstan "On Radiation Safety of the Population" of 23.04.1998 No. 219-I.

20) Yarmonenko S.P. Radiobiology of humans and animals. - Moscow: Higher School, 1988. - 424 p.

Additional literature:

21) TelguziyevaZh., ZholdybayZh.,Shibanova A. etc. Cervical cancer: epidemiology, pathogenesis, diagnosis, treatment (review of literature)// «Hygiene,

epidemiology and Immunology» -Almaty 2011,№2 (48)-P.12-15.

22) TelguziyevaZh., Goncharova T. Study of pharmacokinetics of methotrexate in tumors and in plasma of experimental animals // «Hygiene, epidemiology and immunobiology».-Almaty, 2011. -№4 (50)-Р.161-163.

23) TelguziyevaZh. Philippenko V., ZholdybayZh., Kim S. Application of techniques of complex medical visualization in an estimation chemoradiation therapy of the cancer are //ESTRO Anniversary.-London (UK), 8-12 May 2011-p. 309 .

24) TelguziyevaZh. Metronomic chemotherapy with gemcitabine at radical irradiation of the cancer are//The 17th int. Meeting of the ESGO-Milan (Italy), September 11-14, 2011-p. 58.

25) TelguziyevaZh., Kim S., Bainazarova A. The survival rate of patients with cancer are at use of a combination of chemical radiomodificators and radical irradiation//The 18th International meeting of the ESGO-October 19-22, 2013. -Liverpool, UK. -P. 269.

26) TelguziyevaZh., Kim S.I., Bainazarova A.A. Perspectives of metronomic chemotherapy in the treatment of cancer are radiological//The 18th International meeting of the ESGO-October 19-22, 2013.-Liverpool, UK-P.794.

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28) IshkininE.I., Ongarbaev B.T., Kim S.I., TelguziyevaZh.A. etc. Experience brachytherapy for prostate cancer //Oncology and Radiology Journal (special issue).-Almaty, 2017.-Р.108

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30) Telguziyeva Zh.A., TrushchenkoO.Y., Kaibarov M.E. Application of intensevly-modulated radiation therapy in the treatment of locally-common forms of malignant head and neck tumors.// Oncology and Radiology Journal (special issue). -Almaty, 2017. -P. 164

31) TelguziyevaZh.A.,Filippenko V.I. Patent №22356 invention «Method of treatment for cervical cancer» (15.03.2010)

32) Telguziyeva Zh.A.,Filippenko V.I. Patent №22490 invention «Method of treatment for cervical cancer» (17.05.2010)

33) Telguziyeva Zh.A. Filippenko V.I. Patent №23075 invention «Method of integrated Ultrasound techniques to evaluate the efficiency of combined radiation therapy for cervical cancer» (15.11.2010)

34) TelguziyevaZh., BaimahashevaA., Filippenko V. etc Patent №23100 on invention «Method of treating patients with cervical cancer» (15.11.2010)

35) TelguziyevaZh.,Filippenko V., ZholdybayZh. etc. Patent №23404 from 15.12.2010 on the invention of «The way to improve the effectiveness of radiation therapy for cervical cancer»

36) Periodic protocols for diagnosis and treatment of malignant neoplasms (2012, 2015).

37) «The clinical guide to oncology» //Almaty. 2016.

38) Act implementing the master-class «High-tech radiotherapy-radiosurgery» in KazNIIOiR (31.03-04.04.2016)

39) Act implementing the master-class «High-tech radiation therapy radiation oncology (joint master class for radiologists and medical physicists)»in KazNIIOiR (28.06-02.07.2016)

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41) IshkininE.I., Kim V.B., Ibraimova M.A. etc. Radiation treatment of patients with kidney cancer with metastatic bone lesion // V Congress of oncologists and radiologists Kazakhstan-Almaty 2014.-№180-Р.106-107

42) IshkininE.I., Kim V.B., Antropova T.Y. etc. Evolutionary development of radiotherapy for prostate cancer in the Republic of Kazakhstan // V Congress of oncologists and radiologists Kazakhstan-Almaty 2014.-No. 181-c. 107

43) Kim V.B., IshkininE.I., Almabek A.T. etc. Pre-radialtopometry training in 3d conformal and intensely-modulated radiation therapy, experiences in Kazakhstan // V Congress of oncologists and radiologists in Kazakhstan. -Almaty, 2014-No. 185-c. 109-110

45) Malignant tumors of testicular, prostate cancer, renal cell carcinoma, bladder cancer// Periodic protocols of diagnostics and treatment of malignancies.-Almaty, 2012.-325-377

46) Guide for the target groups of the male population screening for early detection of prostate cancer and ensure its quality// NurgaliyevN.S., ZhylkajdarovaA.Zh., Ishkinin E.I., edited by m.d. Kyrgyz Republic Shmone, m.d., Prof. M.K. Alchinbaev-revision and additions. -Almaty, 2014. -71 p. ISBN 978-601-80100-8-8

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The syllabus was developed in accordance with the working curriculum, discussed at the meeting of the Scientific Council of KazNIIOiR(Protocol №7 from «August» 25, 2017).

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