Topic: "Technological foundations of radiation therapy. Radiation therapy of malignant tumors. The body's response to radiation treatment.

Purpose of the lesson : To have an idea about the specialized radiological department, the device of radiation technology, the features of the pre -radiation period. Radiation control.

Specific objectives of the lesson:

Know:

1. The device of radiation technology.
2. Classification of radiation therapy by type of radiation and methods of implementation.
3. Radiation therapy planning.
4. The body's response to therapeutic radiation exposure.

Be able to:

1. Build a remote exposure plan.
   (X- ray therapy , tele -gamma therapy)
2. Correctly determine the method of contact irradiation.
3. Preparing the patient for treatment.
4. Prevention of radiation reaction.
5. Treatment of radiation damage.

The base for conducting and material support of the lesson:

1. Study room.
2. Cabinet of gamma therapy of the department of radiation therapy of the ROD.
3. Test cards.
4. Study tables.
5. Video films, multimedia presentations.
6. Case histories, radiographs of patients served by the gamma room.

Content of independent work:

1. test control of knowledge.
2. Tasks in radiotherapy planning.
3. study of literature on the specified topic.

Literature:

1. » Kishkovsky A.N., Dudarev A.L. "Radiation therapy of non-tumor diseases". M, 1977.
2. Zetgenidze G.A. "Clinical radiology". M.1985
3. Lindenbraten L.D., Korolyuk I.P., "Medical radiology and radiology", M. "Medicine", 2000

4.G.E. Trufanov "Radiation diagnostics and radiation therapy", St. Petersburg, 2005.
5. "Radial diagnostics". A textbook for universities. Under the editorship of prof. Trufanov G.E. M, 2007

Information block:

Radiation therapy for non-cancer diseases

Radiobiological bases of radiation therapy of non-tumor diseases.

- The mechanisms of the local therapeutic action of low doses of radiation have not yet been sufficiently studied.

First , local effects were identified empirically : pronounced anti-inflammatory, decongestant, analgesic,
desensitizing. These effects led to a local improvement in tissue trophism and the elimination of various types of pathological changes.

The absence at the beginning of the 20th century of modern antibacterial therapy and the obtaining of obvious + effects during irradiation led to the widespread use of radiation therapy in the treatment of non-tumor diseases. Among the many experimental and clinical studies of that time, the works of M.I. Nemenova with employees
They studied the effect of X-rays on the nervous system, as a result of which a neuro-regular theory was created. According to this theory, the main factor in radiation exposure is the effect on the autonomic system, the pituitary -hypothalamic region, and the adrenal glands.
In the same years, the cellular-enzymatic theory began to develop, in which the main factor of local radiation action is the destruction of cells, primarily leukocytes , after which cellular decay products, including proteolytic enzymes, have a positive effect on local tissue processes. The electrochemical theory proceeds from the fact that immediately after radiation exposure, a short-term increase in acidosis occurs, which after 6-24 hours is replaced by a slowly increasing and long-lasting (8-16) alkalosis . permeability.
According to another theory - the theory of inhibition of various processes under the influence of radiation, inhibition gives rise to secondary stimulation of local processes and leads to anti-inflammatory, antispastic, antisecretory, desensitizing and other local effects of radiation. It is currently believed that therapeutic doses cause
change in capillary permeability,

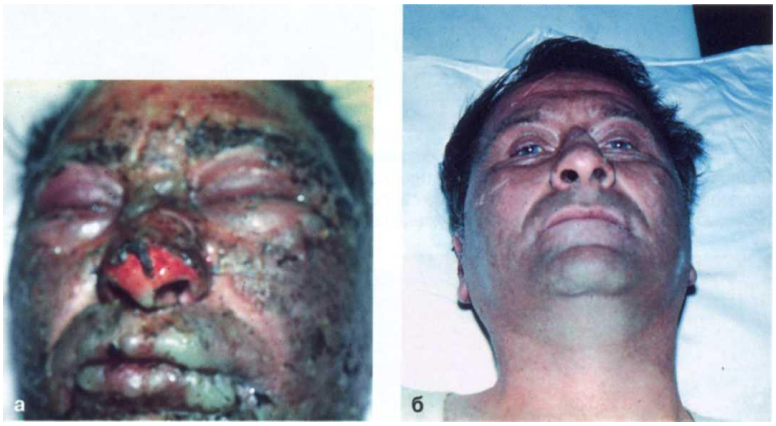
- strengthening the drainage of the focus of inflammation by improving venous and lymphatic drainage ,
- swelling reduction.
- All this leads to the subsequent subsidence of pain, improvement of blood flow and local trophic processes.

In addition, the direct effect of irradiation on nerve endings with a change in the functional state of nerve centers and nodes in the direction of removing their pathological excitation has been proven.

Apparently, this leads to an analgesic effect and improved nerve conduction.

Radiation therapy of thermal lesions.

Before and after radiotherapy



The accumulated knowledge about the long-term effects of radiation, as well as the emergence of other effective methods of treatment, have narrowed the indications for radiation therapy for non-tumor diseases, however, effective treatment of patients continues in cases where other types of treatment do not help, as well as in situations where radiation has obvious advantages. In the acute period, remove the phenomena of inflammation, reduce swelling, prevent the development of granulations, excessive keloid scars.

- apply small doses of 1.5-2.0 Gy for acute and 3.0-10.0 Gy for chronic processes 3 times a week.

  single doses:

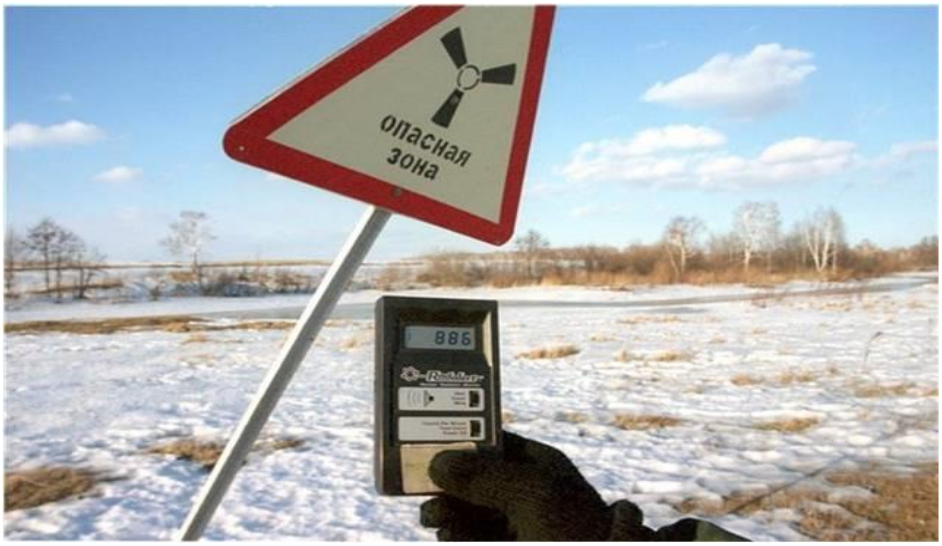
- ✓ in acute diseases - 0.2-0.3 Gy
- ✓ with chronic _ Diseases - 0.5 - 0.7 Gy

  local processes : anti-inflammatory, desensitizing, antiseptic, antisecretory effect, anesthesia, healing without keloid scars, restoration of disturbed trophic processes.

Taking into account the neuroendocrine theory, along with irradiation of the area, pathological changes and indirect irradiation, i.e., irradiation of chains of sympathetic nodes of border trunks, are substantiated.

Such irradiation improves neuromuscular conduction in post- amputation syndrome, phantom pain, syringomyelia.

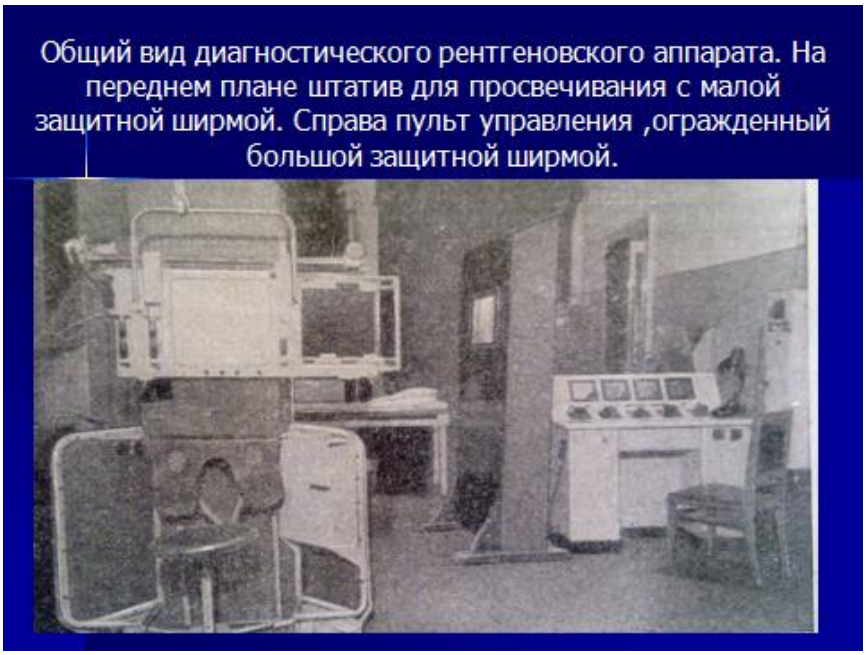
Radiation safety



Protection is a set of devices and measures designed to reduce the physical dose of radiation affecting a person below the permissible dose.

The main protection factors are stationary and non-stationary devices

Stationary devices are called fixed structures - walls, ceilings, protective doors, observation windows, walls for local protection, etc. They provide protection from direct scattered radiation to all persons located in the premises adjacent to the radiation source.



Mobile protective devices - casings in which radioactive preparations or X-ray tubes are placed. The task of the casing is to completely absorb all the emitted radiation, with the exception of the working beam, which is released through the exit window and is used for research or treatment of the patient. Depending on the power of the emitter, the casings have different sizes and thicknesses. Non-stationary devices include safes for storing **radioactive** preparations and containers for their placement and transportation. To work with isotopes, there are special remote radio manipulation drains equipped with remote tools and protective screens.

Non-stationary protective devices include personal protective equipment:

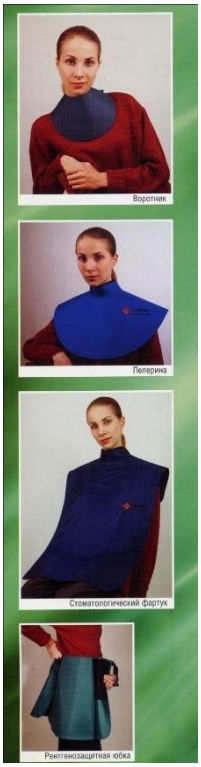
- aprons made of leaded rubber

- protective skirts

- protective gloves

- protective slippers

Parts of the patient's body that should not be exposed to radiation are covered with lead rubber sheets or special lead plates.



The collar is designed to protect the thyroid gland during cranial and dental research.

perelina designed to protect the thyroid gland and internal organs during cranial and dental examinations.

apron is a reliable type of protection for X-ray dental examinations.

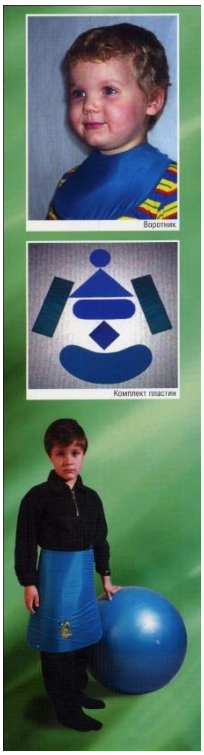
The apron (gonadal protection) is designed to protect the genitals.

X-ray protective skirt the purpose is the same, but covers the pelvic area from all sides.

A set of protective plates is designed to form the patient's irradiation field.

The staff of the radiological department is provided with clothing consisting of a gown, plastic apron with a bib, plastic sleeves, rubber gloves, slippers, shoe covers, glasses made of organic glass, respirators.

X-ray protective glasses recommended for use in angiography and urological research.



Cap to protect the head area.

The apron is unilateral convenient design on flypapers.

The double-sided apron covers the front and back of the body.

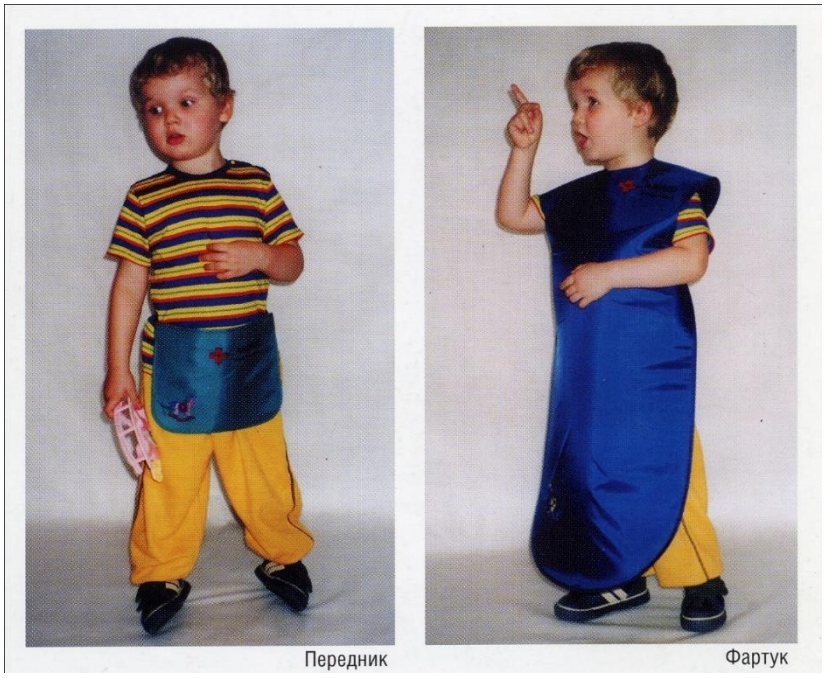
Silicone gloves with tungsten filler.

gloves are made of natural rubber. Can
used by surgeons.

A set of X-ray protective plates to protect various organs of the child in pediatric research

One-sided apron to protect the front surface of the body.
Skirt to protect the gonads.

Thyroid **Collar**



An essential factor in radiation safety is the rational arrangement of workplaces with their maximum possible distance from the radiation source.

- ***this is the so-called defense by distance*** .

Powerful radiation sources accepted

- install in large rooms and away from walls:

- in the offices, the place of work of the doctor is as far as possible from the points of the highest level of radiation.

- during X-ray diagnostic procedures, they strive for large distances between the focus of the X-ray tube and the patient.

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Dosimetry control is one of the most important health and safety factors.

- in all rooms where work with radioactive substances is carried out, it is necessary to install dosimeters that signal the excess of permissible

radiation levels.

- all employees must carry individual dosimeters with them at all times in order to determine the radiation doses they receive.

Test questions.

1. Organization of the radiological department.
2. Classification of methods of radiation therapy.
3. Electrophysical generators of ionizing radiation /medical accelerators/, their device.
4. The device of the gamma therapeutic apparatus.

5. The device of the X-ray therapeutic close-focus apparatus.
6. Radioactive preparations of open and closed type.
7. The chain of technological support of contact methods of irradiation.
8. Methods of intracavitary gamma, beta - and neuronal therapy, indications for them.
9. Methods of application radiation therapy and indications for it.

10. Production of dummies for application therapy.
11. Methods of interstitial gamma, beta and neutron therapy , indications for them.
12. Prebeam period.
13. Statistical and mobile irradiation.
14. Selection of irradiation fields, their number.
15. Beam period. Formation of the working beam and its guidance on the patient.
16. General reactions of the body to radiation.
17. Local reactions of the body to radiation.

Possible Complications of Radiation Therapy

Test tasks:

1. The threshold dose for the development of acute radiation sickness is

. 0.5 gray

. 1 Gr

. 2 Gr

.3 Gr

.4 Gr

2. After irradiation of the male gonads, the most characteristic changes are

. violation of sexual potency

. hypospermia

. hydrocele

. hereditary diseases in children

. decrease in blood testosterone

3 . **The clinical symptom that occurs most early in acute radiation sickness is**

. nausea and vomiting

. leukopenia

. skin **erythema**

. hair loss

4. The preferred bone marrow donor for the treatment of a patient with acute radiation sickness are

. the patient's parents

. siblings

. children of the patient

other family members

5. The earliest changes in the clinical analysis of blood in acute radiation sickness are

. erythrocytes

leukocytes

. neutrophils

. lymphocytes

. platelets

6. **In acute radiation sickness, clinical changes necessarily take place in the following system**

CNS

. cardiovascular system

. digestive system

. hematopoietic system

. immune system

7. What is "interstitial radiotherapy"?

. Oral administration of radioactive isotopes for therapeutic purposes
. Introduction of the radiation source directly into the pathological focus.
. Intravenous administration of a radioactive substance for therapeutic purposes.

8. What type of radiation therapy is the introduction of radioactive preparations into the cervical canal?

. Close focus therapy.
. To application therapy.
. To intracavitary therapy.

9. What explains the greater radiosensitivity of malignant tumors compared to benign ones?

. The ability to metastasize.
A feature to grow into the surrounding tissues.
. A feature of rapid growth and less differentiation of their tissue.
. Slow metabolic rate.
. Absorption of more radiant energy.

10. What is the "standard" or "classic" mode of fine fractionation?

. 2 Gy x 5 times a week with a break of 2 days, lasting 5-6 weeks.
. 1 Gy x 2 times a day daily, lasting 6-8 weeks
. 2 Gy every other day without interruption, lasting 10 weeks.