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RADIATION OF PATIENTS IN RADIATION THERAPY

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Abstract

The problem of regulating medical workers' exposure to radiation has its own peculiarities. It is necessary to keep in mind that medical radiation is a powerful anthropogenic factor, causing 15-30% of the population dose [2], however, in radiation therapy, as in other medical exposures, the most important principle formed by the ICRP is at work: the benefit from radiation should be greater than the harm in the absence of radiation. Nevertheless, the maximum possible reduction of the dose without compromising the desired effect is important for both the patient and the staff.

Introduction

In X-ray diagnostic practice, attempts are being made to introduce some kind of “procedural standardization” of patient irradiation depending on the nature of the study being conducted [1], but in matters of radiation therapy, including intracavitary therapy, it is hardly possible to standardize patient irradiation doses. Most researchers working in this area believe that it is necessary to plan dose loads individually, taking into account the tumor location, its size, stage of the disease, treatment effectiveness, the nature of radiation complications, and other factors. However, patient irradiation doses are usually within 65-80 Gy [4].

The radiation doses to which patients are exposed depend on many factors (type of tumor, stage of the disease, equipment used and source), but in any case the goal is to ensure tumor regression and increase patient survival time.

When performing VPLT, as a rule, radiation doses are fractionated into 7-10 sessions, 3-5 Gy per session. Fractionation of the dose is also important from the point of view of the nature and level of radiation reactions - an undesirable, but obligatory consequence of VPLT. It is known that with internal irradiation, chronic exposure of tissue to radionuclides causes a significantly smaller effect per 1 Gy of absorbed dose than a single exposure [3].

When planning irradiation, the issue of the total absorbed dose is one of the most important. On the one hand, it is necessary to select a therapeutically effective focal dose, on the other hand, high doses of radiation are extremely undesirable, given the possibility of radiation complications. It should be noted that increasing the radiation dose does not always allow achieving a greater effect. Thus, Mironova M.A. and co-authors [6], having analyzed a large array of data (1783 cases), came to the conclusion that an increase in the 5-year survival of women with cervical cancer occurs only with an increase in the focal dose to 90 Gy. A further increase in the dose causes a decrease in the survival of women. Taking this into account, the most important part of effective VPLT is clinical dosimetry with the participation of experienced engineers and physicists.

The most important undesirable consequence of EPLT is various radiation injuries caused by both local and general effects of ionizing radiation on the patient's body. Radiation complications are a severe iatrogenic pathology that can dramatically reduce the quality of life of patients and even lead to their death.

Local radiation complications include skin and mucous membrane atrophy, indurative edema and tissue fibrosis, radiation ulcers and necrosis. General radiation complications include persistent changes in the morphological composition of the blood, decreased protective properties, persistent functional or organic disorders of other body systems. Radiation injuries can be observed immediately after irradiation and in the form of late damage. The main cause of radiation injuries is the administration of unjustifiably large doses of irradiated tissue during treatment. Patient protection during VPLT is based on several principles [5].

- accuracy of delivery of the radiation dose to the target;
- optimization of dose distribution in the patient's body;
- limiting doses to critical organs.

In addition, errors in irradiating patients may be due to insufficient professional training of personnel or their lack of conscientiousness, attentiveness, poor organization of work, a poor recording system, lack of proper control, etc. In general, the frequency and severity of radiation injuries can vary widely, but they are almost never avoidable, although attempts are made to reduce the level of radiation exposure to the entire body or to healthy tissue.

Thus, good results have been obtained using elastic screens inserted into the vagina of patients during sessions of VPLT for cervical cancer: the radiation dose to the bladder is reduced by 30 $\pm$ 17%, and to the rectum by 40%. The screens are placed around the endostats, since the walls of the endostat itself provide virtually no protection to adjacent healthy tissues from radiation, reducing the dose rate (^{60}Co) by only 4.2 $\pm$ 0.5% [2].

Oil applicators or inhalations (during oral irradiation) are recommended for the prevention of local lesions. Good nutrition and a rational daily routine play a major role in the prevention of general complications [3]. A broad search is also underway for drugs with radioprotective properties. In particular, dimethyl sulfoxide, pyrogenal, and metronidazole have been found to have a radiomodifying effect when applied locally. The immunomodulator timoptin helps maintain the immunological reactivity of patients during radiation therapy. Local radiation lesions heal more quickly when exposed to ethonium .

Pronounced radioprotective properties have been found in purified sulfur, prescribed to patients with cervical cancer at a dose of 0.5-1 Gy several hours before a session of VPLT [5].

An analysis of the publication allows us to highlight a number of points that were not reflected in scientific developments:

1) There are no works characterizing from a hygienic standpoint the equipment and protective gear used in the conditions of our republic.

2) Timing of work operations and radiation dose rate at different stages of the VPLT technology;
3) An in-depth scientific analysis and assessment of individual radiation doses of personnel conducting VPLT in the Republic of Uzbekistan was not carried out;
4) Radiation-epidemiological studies in relation to personnel of radiological departments in the Republic of Uzbekistan;
5) Insufficient study of the significance of low levels of personnel exposure in terms of identifying integral and specific indicators of radiation exposure to the entire organism;
6) Study of comparative assessment of radiation doses to patients, possibilities of their protection and reduction of negative consequences of EPLT in the Republic of Uzbekistan.

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