According to the literature sources, EPID has the following dosimetric advantages [4, 8]:

– fast imaging acquisition (comparable with patient irradiation time);
– good spatial resolution;
– digital format of output information;
– its potential for in vivo measurements and 3D dose verification.

Thus, based on the above capabilities, as well as due to the wide availability of EPIDs in our clinic, the authors consider the use of this devices will reduce the time spent by medical physicists for routine QA, without losing the quality of the procedures.

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TOTAL BODY IRRADIATION WITH VOLUMETRIC MODULATED ARC THERAPY: DOSIMETRIC DATA AND FIRST PRE-TREATMENT EXPERIENCE

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This article describes the end-to-end preparation for a total body irradiation (TBI) that has been performed in the N.N. Alexandrov National Cancer Centre of Belarus. The world experience of providing similar procedures was analyzed. Various methods of TBI were considered. According to the literature, therapeutic doses and constraints for organs at risk irradiation were chosen. Dosimetric planning and evaluation of the obtained plans were carried out.

Keywords: total body irradiation, TBI, volumetric modulated arc therapy, dosimetric treatment planning.

Total body irradiation (TBI) is used in the management process of hematologic malignancies prior to the transplantation of hematopoietic or bone marrow stem cells. The combination of irradiation and chemotherapy kills the malignant cells, increasing the likelihood of a successful transplant and suppresses the recipient's immune system to prevent immunologic rejection [1].

TBI provides a uniform dose of radiation to the entire body, penetrating areas such as the central nervous system (CNS) and testes, where traditional chemotherapy is ineffective. Additionally, it allows tailoring of therapy with the ability to shield or boost the dose to certain volumes if necessary. The purpose of TBI is threefold: to eliminate residual cancer cells, to provide space for stem cell engraftment through bone marrow depletion, and to prevent rejection of donor stem cells through immunosuppression [2].

The TBI objectives can be achieved using a variety of dosimetric irradiation methods: as a single large open radiation field from the large distance using blocks that shield organs at risk (OARs), or with the help of modern technologies with intensity modulation and rotational irradiation [3]. The latter method is most often

performed using either Tomotherapy [4-6] or conventional linear accelerators with VMAT and IMRT technologies support [1, 7, 8].

Currently, there are no protocols for contouring and dosimetric planning of whole-body irradiation using volumetric modulated arc therapy (VMAT) in the Republic of Belarus. Our goal was to try to conduct end-to-end preparation for TBI of real patients based on world experience and using the instruments available in our clinic.

Based on the literature information [2, 3, 9], the radiation dose is mainly in the range of 12 to 15 Gy. For test plans creation, the authors selected a dose of 12 Gy as the most often mentioned.

Test plans were created on computed tomography scans (CTs) of real patients, who were full-body scanned for diagnostic purposes in our clinic previously. In addition, for the first plan CT images of inhomogeneous, anatomically accurate Alderson phantom (torso+head) was used. All treatment planning activities were carried out using the Eclipse Treatment Planning System (Varian MS, Palo Alto) for Unique linac (Varian MS) with 6 MV photon beams.

The fields arrangement was as follows: 10 full arcs with different collimator rotation were applied to the up part of the patient body (or whole Alderson phantom) in head-first supine position. Another 6 arcs were planning on down part of patient body in feet-first supine position.

Clinical volume coverage was evaluated in accordance with international standards and recommendations [10]. OARs constraints were taken from literary description of other clinics experience [1, 4-8].

For Alderson phantom and two whole-body real patient CTs test plans were created. All constraints of clinical volume coverage and organs at risk tolerance dose were achieved. The authors have proposed the sequence of actions for dosimetric evaluation of the dose delivery accuracy, but now this issue needs further study.

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ANALYSIS OF SECONDARY RAW MATERIAL EXTRUCTION IN THE US, THE RUSSIAN FEDERATION AND THE REPUBLIC OF BELARUS

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We have analyzed the modern technologies of secondary raw material extraction regarding municipal solid waste (MSW) in the Federal Republic of Germany, the Russian Federation and the Republic of Belarus.