Dosimetric Verification of Cancer Patient's Treatment Plan Using Antropomorphic, 3D-Printed Phantom

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Ionizing radiation is commonly applied in cancer treatment with positive results, nevertheless, its usage is associated with threat of causing serious side effects. Precise distribution of therapeutic dose enables to significantly reduce such implications, therefore cancer patients' treatment plans are being verified not only with software but also incorporating dosimetric measurements performed on purpose-made phantoms. Currently, during crucial stage of radiotherapy planning, such devices oversimplify human body representing it as a water-filled cuboid. Considering the ubiquitous development of modern technologies it is worth putting forth a new type of phantom, which could be made individually for each patient, providing higher effectiveness and safeness of radiotherapy by improving its plan verification. Exact anthropomorphic phantoms served into handling dosimetric measurements are commercially available, however, their high purchase cost and relatively low universality make common usage of such solution unobservable. The main aim of this research is to formulate a method of creating an accurate, personalized anthropomorphic phantom, retaining efficient production at low cost. Project accomplishment contained selecting appropriate materials, designing and printing the phantom which was afterwards used in radiotherapy plan verification based on dosimetric measurements. Finally, data collected with radiotherapy film was then analyzed with the use of gamma index. Obtained results go to show that phantom created with proposed method provides an alternative for water phantom in terms of practical application in the verification of cancer patient's treatment plan.

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