عنوان مقاله:

Investigation of Collapsed-cone Algorithm Accuracy in Small Fields and Heterogeneous Environments

محل انتشار:

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خلاصه مقاله:

Background: The use of small fields has increased by the emergence of advanced radiotherapy. Dose calculations of these fields are complex and challenging for many reasons such as lack of electrical equilibrium even in homogeneous environments, and this complexity will increase in presence of heterogeneity. According to the importance of delivery the accurate prescription dose to the target volume in the patient's body, the dose calculation accuracy of used commercial algorithms in clinical treatment planning systems (TPS) should be evaluated. Objective: The present study aims to evaluate the accuracy of Collapsed-Cone dose measurement algorithm in Isogray treatment planning system.Material and Methods: In this analytical study, the measurements were made in tissue equivalent solid water phantom with lung and bone heterogeneities by Pinpoint dosimeter (۰.۰۱۵ cm۳ sensitive volume) in several radiation fields (۱×۱ to ۵×۵ cm۲). The phantoms were irradiated with ۶, ۱۰ and ۱۸ MV photon beams and finally, the results of experimental calculations were compared with treatment planning outputs. Results: In all setups, the maximum deviation occurred in the field of ۱×۱ cm۲. Then, the maximum deviation was observed for ۲×۲ cm۲ field size; however, it was up to ۵% for homogeneous water phantom and lung heterogeneity. In ۳×۳ cm۲ and larger fields, there was a good agreement between the results of the TPS and experimental dosimetry. The maximum deviation was observed in water-bone heterogeneity. Conclusion: This algorithm was able to pass the standard audit criteria, but it is better to be used more cautiously in bone heterogeneity, especially in low energies.

کلمات کلیدی:

Radiotherapy, Dosimetry, Small Field, Algorithms, Phantoms, Imaging, Absorbed Dose