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Application of the ethanol chlorobenzene dosimeter for intraoperative linear electron accelerator system

Mojtaba Barzegar¹, Alireza Shirazi¹ and Saied Rabi Mahdavi²

¹Tehran University of Medical Sciences (TUMS), Iran

²Iran University of Medical Sciences (IUMS), Iran

Objectives: Intraoperative radiation therapy (IORT) is an innovative treatment modality that the delivery of a large single dose of radiation to the tumor bed during the surgery. The radiotherapy success depends on the absorbed dose delivered to the tumor. The achievement better accuracy in patient treatment depends upon the measured dose by standard dosimeter such as ionization chamber, but because of the high density of electric charge/pulse produced by the accelerator in the ionization chamber volume, the standard correction factor for ion recombination k_{sat} calculated with the classic two-voltage method is overestimated so the use of dose/pulse independent dosimeters such as chemical Fricke and ethanol chlorobenzene (ECB) dosimeters has been suggested.

Material & Methods: Dose measurement is calculated and calibrated in the Zmax. k_{sat} calculated by comparison of ion chamber response and ECB dosimeter at each applicator degree, size, and dose. The relative output factors for IORT applicators have been calculated and compared with experimentally determined values and the results simulated by Monte Carlo software.

Results: The absorbed doses have been calculated and measured with statistical uncertainties less than 0.7% and 2.5% consecutively. The relative differences between calculated and measured OF's were up to 2.5%, for major OF's the agreement was better. In these conditions, together with the relative absorbed dose calculations, the OF's could be considered as an indication that the IORT electron beams have been well simulated.

Conclusions: These investigations demonstrate the utility of the full Monte Carlo simulation of accelerator head with ECB dosimeter allow us to obtain detailed information of clinical IORT beams.

tums.radiology@gmail.com

The use of DQA3 dosimeter for daily quality assurance of Neptune and compact linear accelerator in ramezanzade radiotherapy center

Zahra Hajikarimi, Mahboobe Darreshiri, Mehdi Dehestani, Kazem Vakili and Hamidreza Mazidi

Shahid Sadoughi University of Medical Science, Iran

Introduction and Purpose: Dosimetry has an important role in optimization of radiotherapy, so control and maintenance of linear accelerator (Linac) are seriously important. Dosimetry performs daily and periodically, as a result of development in quality control devices has an effective role in treatment efficiency. The purpose of this study was to investigate the feasibility of using DQA3 device for comprehensive, efficient daily QA of Neptun and Compact Linacs.

Material and Method: The Sun Nuclear Daily QA3 (DQA3) device was used to perform daily dosimetry and mechanical accuracy tests for Neptun (Zdaj, Poland, 1385, Energy= 9MV) and Compact (Elekta, China, 1391, Energy= 6MV) Linacs in Ramezanzade Radiotherapy Center during the year 1392. Both Linacs meanly expose 100 treatment fields a day. In this study, Data collecting contain of dose, symmetry, flatness and energy. Finally, data analyzed by Excel 2010.

Results and Conclusion: For photon beams tested over a period of one year, the outputs were verified to remain within 3%. Investigations show only photon energy variation of Neptun Linac is out of standard but all of the other tests are in the range. The total measurement time for all tasks took less than 15 minutes per QA session compared to 40 minutes with our previous procedure. The DQA3 can be used for accurate and efficient Linac daily QA. It shortens QA device setup time, eliminates errors introduced by changing phantoms to perform different tests.

hajikarimi.z@gmail.com