

عنوان مقاله:

Introduce a new three-dimensional dosimetry method of IMRT with radiochromic film and comparison results with Monte Carlo simulation and Full Scatter Convolution computational algorithm in the heterogeneous head phantom

محل انتشار:

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خلاصه مقاله:

Objective: The main idea of this research is to apply batch of radiochromic films, close to each other in a heterogeneous head phantom to assess the quality assurance of IMRT treatments. Introduced a new method for three-dimensional dosimetry in IMRT technique with the use of a set of radiochromic films in heterogeneous head phantom is the main objective of the current project. **Methods:** First, the dosimetric characteristics of LinaTech DMLC-H multi leaf collimator using different experimental measurement tools (EDGE detector and EBT³ film) and Monte Carlo simulations were determined. The Siemens Primus 6 MV head, together with the external MLC using a VARMLC module in the BEAMnrc code were simulated according to the specifications of their manufacturers. After making anthropomorphic head phantom, PTV and OAR areas, according to RTOG H-0022 protocol were defined within the phantom and then accordance with the provisions of this Protocol, the doses were applied with appropriate restrictions and ultimately IMRT treatment plan using the TiGRT treatment planning system (FSC algorithm) was performed. The phantom was irradiated by substituting batch of the radiochromic films at intervals of 3 mm and 1 mm. IMRT treatment plan in a heterogeneous environment was simulated by EGSnrc code. The results of the three-dimensional dose distribution obtained from FSC algorithm and MC calculations were compared with the measured dose distribution and were analyzed using conventional criteria (3 mm-3%) by γ index. **Results:** The good agreement was observed between experimental measurements and simulated MLC. The results showed that the dosimetric characteristics of DMLC-H are consistent with the criteria specified in international standards. Dose distributions obtained from the anthropomorphic head phantom showed that in axial, coronal, and sagittal planes, by improving the resolution (3 to 1 mm) γ pass rate of FSC algorithm and MC calculations respectively about 3% and 1.5% increase. Also, in these planes, the differences in the γ pass rate between the FSC algorithm and MC simulation with a resolution of 3 mm and 1 mm are about 8.5% and 7.4%, respectively. In general, the acceptance rate of γ index calculated by the FSC algorithm and MC simulation was obtained in the range of 89%-92% and 98%-99%, respectively. **Conclusion:** The

results of this study show that the 3D gamma passing rate obtained from the FSC algorithm in the heterogeneous head phantom is less than expected and desirable value ($\geq 95\%$), while Monte Carlo calculations showed excellent ... agreement with experimental result

کلمات کلیدی:

EBT³ film stack; IMRT; Quality assurance; Heterogeneous phantom; Gamma index

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