

عنوان مقاله:

Monte Carlo Simulation for Treatment Planning Optimization of the COMS and USC Eye Plaques Using the MCNP4C Code

محل انتشار:

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خلاصه مقاله:

Introduction: Ophthalmic plaque radiotherapy using I-125 radioactive seeds in removable episcleral plaques is often used in management of ophthalmic tumors. Radioactive seeds are fixed in a gold bowl-shaped plaque and the plaque is sutured to the scleral surface corresponding to the base of the intraocular tumor. This treatment allows for a localized radiation dose delivery to the tumor with a minimum target dose of 85 Gy. The goal of this study was to develop a Monte Carlo simulation method for treatment planning optimization of the COMS and USC eye plaques. Material and Methods: The MCNP4C code was used to simulate three plaques: COMS-12mm, COMS-20mm, and USC #9 with I-125 seeds. Calculation of dose was performed in a spherical water phantom (radius 12 mm) using a 3D matrix with a size of 12 voxels in each dimension. Each voxel contained a sphere of radius 1 mm. Results: Dose profiles were calculated for each plaque. Isodose lines were created in 2 planes normal to the axes of the plaque, at the base of the tumor and at the level of the 85 Gy isodose in a 7 day treatment. Discussion and Conclusion: This study shows that it is necessary to consider the following tumor properties in design or selection of an eye plaque: the diameter of tumor base, its thickness and geometric shape, and the tumor location with respect to normal critical structures. The plaque diameter is selected by considering the tumor diameter. Tumor thickness is considered when selecting the seed parameters such as their number, activity and distribution. Finally, tumor shape and its location control the design of following parameters: the shape and material of the plaque and the need for collimation.

کلمات کلیدی:

Brachytherapy, Eye Plaque, I-125, Monte Carlo Simulation

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