

Dosimetric Comparison of Water and Complete Eye Definition Phantoms for ^{125}I and ^{103}Pd Brachytherapy Plaques

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Abstract

Introduction: In this paper, by complete definition of human eye containing the various parts and their materials, the difference between this model and a homogeneous water phantom are compared for two ophthalmic plaques using ^{125}I and ^{103}Pd .

Material and methods: The simulation of the two phantoms were performed in the MCNP-4C code and by using the geometry of a three-dimensional eye, different parts of the eye including the lens, cornea, retina, choroid, sclera, anterior chamber, optic nerve and tumor were defined in the eye phantom. Also, for two ophthalmic brachytherapy sources, 20 mm COMS plaques containing 24 ^{125}I or ^{103}Pd sources were simulated. The depth dose and doses in different parts of the eye were calculated by using the *F8 tally in the MCNP code.

Results: The results showed that the doses in different parts of the eye in the two phantoms were different and depended on the ophthalmic plaques. The dose increased in the tumor and decreased in some parts of the eye such as the lens.

Discussion and Conclusion: Complete definition of human eye in simulation of ophthalmic brachytherapy leads to better results. As the effects of eye definition are different in the tumor and healthy tissues, the results for the eye phantom provide more accurate information for calculation of treatment time and the type of ophthalmic brachytherapy used.

Keywords: Brachytherapy, Dosimetry, Melanoma, Monte Carlo Simulation, Ophthalmic Plaques