

The development of a human eye model for ophthalmic iodine-125 brachytherapy dosimetry

Arnaldo P. Mourão^{1,2} and Tarcísio P. R. Campos¹

¹*Programa de Pós-graduação em Ciências e Técnicas Nucleares, Universidade Federal de Minas Gerais, Av. Antônio Carlos, 6627, Pampulha - Prédio PCA1, Sala 2285, CEP: 31270-901, Belo Horizonte, MG, Brasil*

²*Núcleo de Engenharia Hospitalar, Centro Federal de Educação Tecnológica de Minas Gerais, Av. Amazonas 5253, CEP: 30480-000, Belo Horizonte, MG, Brasil*

E-mail: aprata@des.cefetmg.br and tprcampos@pq.gov.br

Abstract

Radiotherapy is used to treat malign tumors. Radiotherapy is an alternative to enucleation in ocular tumors. However, the irradiation of ocular region can bring damages due high doses, mainly in the crystalline lens and in the bone tissue in growth phase.

Brachytherapy instead of teletherapy looks for reducing doses in the crystalline lens and the adjacent tissues of the ocular globe (orbital region), minimizing side effects. Herein, some encapsulated radioisotopes in radioactive seeds applied to the ocular brachytherapy are available.

Thus, a three-dimensional computational voxel model of the ocular region with its heterogeneous tissues, globe and adjacent tissues is developed. This computational model is used to simulate orbital irradiation with radioactive seeds positioned on the sclera surface through the MCNP5 code. The computational simulation allows evaluating how doses are spatially distributed in the orbital volume in treatments with the radioactive seeds of iodine-125.

Therefore, the results allow comparing the spatial doses distribution obtained through the MCNP5 simulation for those two distinct types of radioactive seeds. Benchmarks from literature validates the proposed simulations.

KEYWORDS: *ocular brachytherapy; brachytherapy; eye model.*