EuroSciCon

World Congress on
Ophthalmology & Eye Surgery

August 16-17, 2018
Paris, France

Lori A Young et al., J Eye Cataract Surg 2018, Volume: 4
DOI: 10.21767/2471-8300-C2-005

DOSIMETRIC ANALYSIS OF LENS SHIELDING TO REDUCE THE RISK OF CATARACTS IN PATIENTS UNDERGOING ELECTRON RADIATION FOR OCULAR LYMPHOMAS

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Background: Radiation therapy with low energy electrons is particularly beneficial for treating ocular lymphomas involving the conjunctiva. The anterior lens, being a highly radiosensitive structure, has a dose tolerance range of 10 to 18 Gy. Lens shielding used in conjunction with electron beam therapy can reduce the risk of high-grade cataracts following treatment with prescriptive doses of 25 to 30 Gy. Bolus may be required in some clinical situations to ensure superficial tumour coverage. This work evaluates the effects of a suspended eye shield, placement of bolus, and varying electron energies.

Methods: GafChromic film dosimetry and relative output factors were measured for 6, 8, and 10 MeV electron energies. A customized 5-cm diameter circle electron orbital cutout was constructed with a suspended lens shield (8-mm diameter Cerrobend cylinder, 2.2-cm length). Point doses were measured using an electron diode in a solid water phantom at depths representative of the anterior and posterior lens. Depth dose profiles were compared for 0 mm, 3 mm, and 5 mm bolus thicknesses.

Results: At 5 mm (approximate distance of the anterior lens from the surface of the cornea), the percent depth dose under the suspended lens shield was reduced to 15%, 15%, and 14% for electron energies 6, 8, and 10 MeV, respectively. Applying bolus reduced the benefit of lens shielding by increasing the estimated doses under the block to 27% for 3 mm and 44% for 5-mm bolus for a 6 MeV incident electron beam. This effect is decreased with 8 MeV electron beams. For orbital lymphomas treated with 6 MeV electrons, the lens block and 3-mm bolus combination reduces anterior lens dose to 8 Gy, and incrementally less with higher electron energies.

Conclusion: Careful selection of electron energy, consideration of suspended lens shield effects, and bolus must be evaluated to ensure tumour coverage, while decreasing anterior lens dose to mitigate cataract formation.

Biography

Lori Young has completed her Doctorate Degree from the University of Washington in Biomedical Engineering. Her graduation studies examined the use of a targeted delivery of silver metalloporphyrin to localize in tumours to enhance the absorption of ionizing radiation dose and improve treatment outcomes. Her postdoctoral studies in the Applied Physics Laboratory of the University of Washington focused on High Intensity Focused Ultrasound for therapeutic medical applications. She is a Clinical Medical Physicist for the Seattle Cancer Care Alliance Department of Radiation Oncology, an Assistant Professor of Medical Physics in the Department of Radiation Oncology, and the director of the Brachytherapy Simulation and Training Laboratory at the University of Washington. She has published over 15 papers in reputed journals on various topics related to therapeutic radiological physics and dosimetry.

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