Purpose: Episceral eye plaque brachytherapy has been utilized in the treatment of intra-ocular malignancies, delivering large prescription doses to the apex of the tumor. Advances in dose calculation and image guidance, via calibrated fundus images, enable localization of the tumor and determination of dose to the macula, optic disc, and lens. A two-year post-implant study aims to correlate dosimetry with local tumor control and changes in visual acuity, as well as assess the need for plaque optimization with respect to critical structures.

Methods: A retrospective, two-year follow-up study of 21 patients who have received episcleral eye plaque brachytherapy at our institution was used to correlate dosimetry with clinical outcomes and evaluate the need for eye plaque optimization. BEBIG Plaque Simulator was used in treatment planning; fundus photographs were registered for tumor localization and the TG43-U1 formulism enabled dose calculation of I-125-loaded COMS plaques. Doses to the apex, macula, and optic disc were correlated to changes in apex height and visual acuity. Selected patients were replanned using optimization strategies to reduce dose to critical structures.

Results: A total of seven patients (33%) noted improved eyesight at two years. 11 (52%) patients lost at least two lines of vision at two years. Two patients saw increases in apical height (9%) within two years. Optimized eye plaque plans were able to reduce optic disc and macular doses (average 68Gy and 80Gy, respectively) by 36% and 25% on the average, while maintaining the prescribed dose.

Conclusion: Image guidance and optimization are important tools that can aid in treatment of intra-ocular malignancies, as these techniques provide physicists with the ability to spare critical structures while delivering the prescription dose, thus increasing the possibility of local control and vision sparing.