AbstractID: 7348 Title: Aperture eccentricity minimization concept for beam angle optimization

Purpose: A technique for beam angle optimization based on minimization of field aperture eccentricity is introduced. A proof of concept of this new technique is presented.

Methods and Materials: By selecting beam angles with minimal aperture eccentricities one can improve the likelihood of achieving a well optimized dosimetry plan. A test of our hypothesis requires a method for quantifying beam aperture eccentricity. We introduce a new concept based on the major and minor axes of the beam's eye view (BEV) projections of the field apertures. A coefficient of variance defined as the ratio of standard deviation and mean of the major and minor axes of apertures for any set of fields utilized for dose optimization is defined as a way to quantify field aperture eccentricity. To prove our concept we rank 21 stereotactic radiosurgery treatment plans utilizing a unified dosimetry index (*UDI)* presented in a separate paper. We then correlate the dosimetry scores to the coefficient of variance that quantifies aperture eccentricity for the selected set of beam angles utilized for dose optimization of the respective treatment plans.

Results: The *UDI* scores of 21radiosurgery treatment plans are plotted as a function of corresponding coefficient of variance (of aperture eccentricities of field sets utilized for dose optimization in each case). The computed linear correlation coefficient value of 0.377, is high enough to indicate that the *UDI* scores are somewhat correlated to *CV*. There is not a complete positive correlation (R^2 value of 1.0) between the *UDI* scores and the beam aperture eccentricity.

Conclusion: There is not a complete positive correlation (R^2 value of 1.0) between the *UDI* scores and the beam aperture eccentricity. However, because other factors such as the number of beams utilized and planning technique also impact the quality of the dosimetry plan, a perfect correlation is not expected.