# AbstractID: 10646 Title: Gradient Cumulative Index: A Method of Dose Gradient Evaluation in Radiosurgical Dosimetry

**Purpose: To retrospectively evaluate the normal tissue dose gradient in 94 Cyberknife radiosurgery treatment plans using the Gradient Cumulative Index (GCI) and compare similar evaluations performed using the Gradient Index (GI).**

**Method and Materials: Dosimetry planning data was collected from 94 Cyberknife patients. Prescription isodoses ranged from 65-90%. The $GCI_x$ is the definite integral of all of the ratios of any normal tissue isodose volume (NTIVx) to the prescription isodose volume (PIV). The GI is the ratio of the NTIV of the half-prescription isodose volume (half-PIV) to the PIV. NTIV/PIV ratios from the half-prescription isodose volume to the PIV were calculated for each treatment plan and plotted with the $NTIV_{PIV}$/PIV against the isodose line forming a dose gradient area. The GI defined dose gradient area of the NTIV/PIV ratios was compared to the same area defined by the GCI with the lowest NTIV being the half-PIV.**

**Results: The dose gradient area defined by the GI was consistently overestimated from the half-PIV to the PIV in all treatment plans. The average difference between the GCI and the area of the GI defined NTIV/PIV ratios between the half-PIV and the PIV was -9.7% ($p<0.002$). The overestimations of the dose gradient area defined by the GI compared to the GCI ranged from 3.25-27.1% overall the treatment plans.**

**Conclusion: Accurate assessment of the dose gradient in radiosurgical dosimetry can be crucial in predicting normal tissue toxicity. The simplistic GI uses only the static volumes of the half-PIV and the PIV. Therefore the transient dose gradient between the two volumes is ignored and is assumed to be linear from the half-PIV to the PIV, thus overestimating the dose gradient. The GCI includes the transient dose gradient in between the GI values, thus producing a more accurate measurement of the dose gradient outside the target.**