AbstractID: 5046 Title: Effects of Static Dosimetric Leaf Gap on MLC-based Small beam Dose Distribution for Intensity Modulated Radiosurgery

Purpose: To evaluate the impact of static dosimetric leaf gap on MLC-based small beam dose distribution and to compare the calculated results from planning system with actual measurement for intensity modulated radiosurgery. **Methods and Materials:** We determined the optimal dosimetric static leaf gap by comparing the profiles of MLC based small beam with those of the collimated fields. The applied leaf gaps were 0, 1, and 2 mm for comparison. The doughnut shaped PTV (6.1 cm^3) and inner OAR (0.3 cm^3) were delineated for delicate intensity modulated radiosurgery test plan. For the test, Millennium 120 leaf MLC and Eclipse Radiation Therapy Planning system (Varian) were used. For the measurement of dose, we used radiosurgery head phantom (model 605, CIRS, Norfolk, Virginia). **Results:** We found that 2 mm gap was optimal for the MLC based small beam. The maximum dose differences at the inside PTV, outside PTV, and inner OAR were 22.3%, 20.2%, and 35.2% for the 0 mm leaf gap, 17.8%, 22.8%, and 30.8% for the 1 mm leaf gap, and 5.5%, 8.5%, and 6.3% for the 2 mm leaf gap, respectively. In a humanoid head phantom study, the final dose distribution from the Eclipse planning system was significantly different from the measured values. The planned results were similar, while the measured showed large differences in dose according to the leaf gaps (range: 1.3 – 12.7%). **Conclusion:** An inadequate determination of the dosimetric static leaf gap during the RTP configuration can make errors from the final dose calculation, which can sometimes be confused with unwanted QA results of IMRS. An appropriate dosimetric leaf gap setting is critical during the commissioning of an inverse planning system and an incorrect setting can produce large dose delivery errors particularly in the delicate IMRS treatment.