

AbstractID: 14220 Title: MLC leaf size effects on single and multiple lesion radiosurgery treatment plan conformality and normal brain dose as evaluated by equivalent uniform dose (EUD)

Purpose: To investigate the dosimetric effects of 3mm and 5mm MLC leaf size on single and multiple lesion radiosurgery treatment plan conformality and normal brain dose. **Methods:** Dosimetric effects of MLC leaf size on plan conformality and normal tissue dose were evaluated retrospectively using both 3mm (BrainLAB M3) and 5mm (Varian Millennium) MLC based conformal planning for metastatic brain tumors. Eighteen patients had single lesions with a median volume of 2.21cc (range 0.21-13.23cc) and 12 patients had two or more lesions with median total tumor volume of 4.05cc (range 1.23-9.57cc). Identical beam geometries using 10-13 non-coplanar beams with optimized collimator angles were used for both MLC types with a 1mm margin around the tumor volume. All plans were normalized at 20Gy covering 99% of the tumor volume. Conformality Indices as per RTOG (CI) and by Paddick (CI_{Paddick}), and equivalent uniform dose (EUD) for normal brain tissue were calculated for both MLC plans after normalizing the single-fraction dose to 2Gy/fraction dose using $\alpha/\beta=3$. **Results:** While normal brain mean EUDs for M3 and Millennium MLC plans were respectively 17.5 ± 4.1 and 18.3 ± 3.9 Gy for single lesions, 20.5 ± 3.5 and 21.3 ± 3.7 Gy for multiple lesions, these differences were statistically significant ($p<0.001$). The mean EUD differences between M3 and Millennium plans were 5% and 3% for lesions smaller and larger than 5cc, respectively, regardless of number of lesions ($p<0.05$). The mean CI for M3 and Millennium plans were 1.52 ± 0.13 and 1.59 ± 0.15 ($p<0.001$) for single lesions, and 1.73 ± 0.26 and 1.84 ± 0.31 for multiple lesions ($p<0.01$). The mean CI_{Paddick} for M3 and Millennium MLC plans were 0.66 ± 0.06 and 0.62 ± 0.06 ($p<0.001$) for single lesions, and 0.58 ± 0.08 and 0.53 ± 0.08 for multiple lesions ($p<0.001$). **Conclusion:** Plan conformality and normal brain EUD improved consistently with 3mm over 5mm MLCs. Additionally, the clinical advantage of 3mm MLC planning may be important for lesions smaller than 5cc.