AbstractID: 7128 Title: Advantages of Intensity Modulated Stereotactic Radiosurgery Using a Mini-MultiLeaf Compared with Static Conformal Linac Radiosurgery

High precision beam shaping with mini-multileaf (mMLC) collimators has made it possible to deliver conformal dose distributions to radiosurgery targets using limited number of non-coplanar beams. However, in cases where tumor volume is either adjacent or abutting a critical organ, a compromise between adequate tumor coverage and normal tissue dose reduction has to be made, usually at the expense of tumor dose. Adding intensity beam modulation (IM) capability to a non-coplanar beam arrangement reduces the compromise between tumor coverage and normal tissue dose while delivering more conformal and uniform dose to tumor.

In this study, we investigated potential advantages of IM dose distribution dynamically delivered using a Brainlab m3 mMLC. Four patients were selected for this study; three patients had one or two critical organs near the treatment area, and one patient had a relatively large tumor but no critical organs nearby. Treatment plans were retrospectively generated using BrainSCAN 5.0 for static and IM beam delivery. The same non-coplanar beam arrangement was used in both static and IM dose calculations. IM treatment plans were performed using the dynamically penalized likelihood algorithm to produce an optimally uniform target dose.

mMLC IMRT consistently did better than static conformal modality. In instances of adjacent critical structures, dose uniformity has improved from 45% with static fields to 30% with IM fields, while critical organ dose has been reduced on average by 20% with IM fields. When there is no critical organ near tumor volume, dose uniformity with IM fields has improved by about 20%.