AbstractID: 11449 Title: Optimal Number of Blocking Beams for Plug-Modulated Gamma Knife Stereotactic Radiosurgery

Purpose: To investigate the optimal number of blocking beams for Gamma Knife(GK) Stereotactic Radiosurgery in treating large and complex target. **Method and Materials:** A Plugging Pattern Web-engine based on GK C-model was developed to generate the plugging pattern for the given contour of target. In optimizing the treatment plan and the number of shot, an optimal number of blocking beams for each shot was calculated. The volume of the target and critical structures was defined by the contour in each slice of image set. A C-shape target around a cylindrical critical structure in the center was used for the study. A treatment plan was first generated by 9 shots without plugging beams. Then different numbers of blocking beams were generated from 1 to 200. Both the DVHs from target and critical structure were used to analyze the optimal number of blocking beams for better target coverage and normal tissue sparing. **Results:** The effect of beam blocking was reflected in DVHs. Both absolute dose and normalized dose DVH curves showed that the plugging patterns improve the conformity of the treatment plans. With the increased number of blocking beams, both DVH curves showed the critical structure dose significantly decreased. The benefit of optimizing the number of blocking beams depends on the distance between the curves of the target and the critical structure in the DVHs. For the selected case, the optimal number of blocking beams is close to 50 in the range of 30 to 100. **Conclusion:** The optimization of the number of blocking beams for multiple-shot GK Radiosurgery is a complex problem which can be solved with the GK Plugging Pattern Web-engine embedded with an updated auto-shielding algorithm. This provides an option to generate a better conformal treatment plan for GK Stereotactic Radiosurgery.