AbstractID: 13859 Title: Plan evaluation for treatment of malignant gliomas using Californium-252 neutron brachytherapy and compared with SRS

Purpose: The objective of this study is to perform a plan evaluation using Californium-252 neutron brachytherapy for the treatment of malignant gliomas and compare the neutron brachytherapy planning with photon Stereotactic Radiosurgery (SRS) therapy planning.

Materials/Methods: After a phase I trial of neutron brachytherapy (Cf-252 implant) for the treatment of malignant gliomas, there is renewed interest to evaluate the effectiveness of radiation therapy using neutron brachytherapy compared with SRS. Here we performed a dosimetric comparison of two treatment plans based on the same patient using equivalent prescribed dose. Isodose lines and dose volume histogram of brain tumor and adjacent critical structures were used for plan evaluation. Dose of neutron brachytherapy was calculated using CT-converted Monte Carlo model and simulated by Monte Carlo code (MCNPX V2.5). The tissue component of Monte Carlo model was adapted from the sectioned images of human cadavers of the Visible Human Project of NLM. Dose of SRS plan was calculated using BrainLab iPlan. A relative biological effectiveness of 6 was used to determine the neutron equivalent dose (ncGy) for central nervous system (CNS) tissues. An equivalent dose of 6000 cGy was prescribed for both plans respectively.

Results: The targets were covered by the 95% prescribed dose to 95% tumor volume in both SRS and neutron brachytherapy plans. Comparing the SRS and Cf-252 neutron brachytherapy, the mean dose was 6100 cGy and 6708 ncGy for target, 312 cGy and 177 ncGy for brainstem, 732 cGy and 311 cGy for chiasm, 255 cGy and 275 ncGy for pituitary, and 504 cGy and 420 ncGy for brain, respectively.

Conclusions: Cf-252 Brachytherapy provided conformal dose distribution to the brain tumor and reduced the dose to the surrounding critical organs compared to SRS. The implanted Cf-252 source provides high dose to brain tumor and reduces the radiation exposure of normal brain.