AbstractID: 1492 Title: Selective Source Blocking for Treatment of Trigeminal Neuralgia Based on Analytical Gamma Knife Dose Modeling

We have developed an automatic critical region shielding (ACRS) algorithm for Gamma Knife radiosurgery of trigeminal neuralgia. The algorithm selectively blocks 201 Gamma Knife sources to minimize the dose to the brainstem while irradiating the root entry area of the trigeminal nerve with 70-90 Gy. An independent dose model is developed for implementing the algorithm and verifying the treatment plan calculations. In the model, the dose distribution of a Gamma Knife plan is expressed in analytical functions and their parameters are obtained from generic measurement data that are applicable to all Gamma Knife units (Model U, B, & C). The accuracy of the dose model was tested and validated via comparison with the Leksell Gamma Plan (LGP) calculations. Agreements of 3% or 3 mm in isodose distributions were found for both single-shot and multiple-shot treatment plans. With ACRS algorithm, we found that the use of moderate number of source plugs (30-50 plugs) significantly lowered (as much as 40%) the dose to the brainstem for trigeminal neuralgia treatments. Considering small effort involved in using these plugs, we recommend source blocking for all trigeminal neuralgia treatments with Gamma Knife radiosurgery.