

AbstractID: 9673 Title: Characterization of relationship between number of shots allowed and conformity index, by simulated annealing optimization, for Gamma Knife

In recent years, the advent of intensity modulated treatment modalities has led to a subsequent development of computerized inverse planning approaches. In the radiosurgical (RS) environment, the long-standing gold standard Gamma Knife (GK) approach is still typically planned utilizing a forward planning methodology. Given the recent development of motorized systems allowing for the automated movement of the patient during GK treatment, it seems reasonable to explore the potential for delivering increased numbers of shots per treatment. We attempted to characterize the relationship between the numbers of shots allowed and the degree of conformity. We developed a simulated annealing (SA) algorithm to optimize the location and intensity of varying numbers of shots for a 13.1 cc, highly irregular arteriovenous malformation (AVM), treated in our clinic by intensity modulated RS. The relationship between number of shots and the Ian Paddick conformity index (IPCI) has been determined for plans allowing for 5, 10, 25, 50 and unlimited numbers of shots. IPCI's were 0.758, 0.796, 0.842, 0.881 and 0.955 for the 5, 10, 25, 50 and unlimited shot cases, respectively. The unlimited shot case was observed to utilize 935 shots. The ratio of 4, 8, 14 and 18 mm collimator utilization was 0%, 60%, 20%, 20%, respectively for the 5 shot case; 50%, 30%, 20%, 0%, for the 10 shot case; 64%, 28%, 4%, 4%, for the 25 shot case; 74%, 24%, 2%, 0%, for the 50 shot case; and 65.0%, 32.4%, 2.4%, 0.2%, for the unlimited shot case.