

AbstractID: 4673 Title: Dynamic IMRT treatments of sinus region tumors: Comparison of Monte Carlo calculations with treatment planning system calculations and ion chamber measurements

Purpose: To compare Monte Carlo (MC) calculations for dynamic IMRT treatments of tumors in the sinus region with Eclipse treatment planning system dose calculations (pencil beam, modified Batho correction), and ion chamber measurements.

Methods: The EGS4nrc MC code, BEAMnrc, was commissioned to simulate a Varian 21Ex Linac. The accuracy of the simulation for IMRT plans was evaluated using the RPC head phantom by comparing MC, Eclipse, RPC's TLD results, and ion chamber in solid water phantom measurements. The MC code was then used to simulate dose distributions for 5 patients who were treated using dynamic IMRT for tumors in the sinus region. The results were compared with absolute and relative dose distributions calculated using Eclipse (modified-Batho inhomogeneity correction). Absolute dose differences were also compared ion chamber results.

Results: Comparison of the doses calculated on the RPC phantom using MC, compared with Eclipse, ion chamber, and TLD measurements showed differences of -3.9%, -1.4%, and -2.0%, respectively (MC is colder). Relative dose distributions for the patient plans calculated using MC agreed well with those calculated using Eclipse with respect to targets and critical organs, indicating the modified-Batho correction is adequate. Average agreement for mean absolute target doses between MC and Eclipse was $-2.9 \pm 2.2\%$. Agreement between ion chamber and Eclipse for these patients was $-2.2 \pm 1.9\%$, compared with $0.2 \pm 2.0\%$ for all head and neck IMRT patients. When Eclipse doses were corrected based on ion chamber results, agreement between MC and Eclipse improved to $-0.7 \pm 2.0\%$.

Conclusions: (1) The effect of inhomogeneities in the sinus region is adequately accounted for by the modified-Batho correction in Eclipse. (2) Both MC and ion chamber results indicate a small systematic uncertainty in the doses calculated using the treatment planning system for this subset of patients.