TG-51 Dosimetry for Gamma Stereotactic Radiosurgery

This work was undertaken to examine the implications for the 50 or more gamma stereotactic radiosurgery units in this country of the report of Radiation Therapy Task Group 51. This protocol requires high energy photon beam calibrations to be performed in water. A new dosimetric quantity, N_{D,w} has been defined which permits transfer of a national standard for absorbed dose in water to clinical users. The clinical user's ionization chamber is calibrated at an ADCL in a water phantom using cobalt-60. For the special case of the Leksell Gamma Knife and the OUR RGS rotating gamma unit it is not possible to calibrate in an actual water phantom. Both companies supply end users with a 16cm diameter spherical polystyrene phantom. The University of Wisconsin Accredited Dosimetry Calibration Laboratory calibrated a Capintec PR-05P ionization chamber belonging to the San Diego Gamma Knife Center with the new protocol and provided a provisional N_{D,w} factor. The absorbed dose to water, calculated from the TG-21 protocol, was compared to that obtained using the new factor. Absorbed dose rates were found to be 1.0% higher using the TG-51 formalism. Formally, the product $N_{gas} * (L/\rho)$ Med-Air * (μ_{en}/ρ) Water-Med * P_{wall} for the Capintec chamber was found to represent the ratio of Absorbed Dose in water to Charge collected, just as the factor N_{D,w} * k_O does in the new protocol. The energy response factor k_0 in TG-51 is unity for these calibrations.