

AbstractID: 11484 Title: Alanine as a small field dosimeter - first tests in gamma knife radiosurgery fields

Introduction and purpose: An international working group on reference dosimetry of small and nonstandard fields has published a new formalism for the dosimetry of small and composite fields (Med. Phys. 35, 2008). Ionization chambers, which are the backbones of radiotherapy dosimetry, are not always suitable for measurements in regions of high dose gradients or where non-uniform beam distributions are encountered. It is important to identify and evaluate new dosimeters that are suitable for measurements of absolute dose in small and non-standard fields. The purpose of this study was to investigate whether alanine can be used as an absolute dosimeter for small field dosimetry of the Leksell Gamma Knife (LGK).

Methods and Materials: Alanine pellets (4.8 mm in diameter and 2.0 mm in height) were irradiated to 40, 100 and 150 Gy in the center of a LGK spherical polystyrene phantom (diameter 160 mm) using 16 mm collimator on the LGK Perfexion unit and 18 mm collimator on the LGK 4C unit. For each dose point three pellets were irradiated separately in three separate irradiations. The alanine dosimeters were measured with a Bruker ECS106 Electron Paramagnetic Resonance spectrometer using the protocol described in the NIST Division Quality System Manual. Results of alanine dosimetry were compared with ion chamber measurements performed with A16 Exradin ion chamber following AAPM TG21 protocol.

Results and Conclusions: Very good agreement was observed between the results obtained by alanine dosimetry and ionization chamber dosimetry. Mean deviations between both dosimetric methods for the LGK Perfexion were found to be -0.6%, 1.2% and 1.7% for doses 40, 100 and 150 Gy, respectively. Similarly, mean observed deviations for the LGK 4C were -0.2%, 0.7% and 1.2% for doses 40, 100 and 150 Gy, respectively. Measurements for the 8 mm collimator and composite field dosimetry are in progress.