

Phantom development and implementation for *Gamma Knife*® dosimetry

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Stereotactic radiosurgery is a procedure that primarily treats intracranial lesions to destroy tumor cells that are inaccessible surgically. *Gamma Knife*® is a stereotactic radiosurgery unit that treats exclusively cerebral lesions using ⁶⁰Co beams non-invasively. In order to ensure accurate dose delivery, this type of equipment requires adequate detectors to determine the dose is delivered accurately. The IAEA TRS 483 protocol is a standardized guide for dosimetric procedures and indication of detectors for reference dosimetry of small fields used in radiotherapy beams. Following TRS 483 recommendations in *Gamma Knife*® dosimetry, the measurements performed in this work used two ionization chambers; *Exradin* A16 and PTW Pinpoint 3D 31016, alanine as reference detector and phantoms indicated by Elekta, *Gamma Knife*'s® manufacturer, which are made of ABS and Solid Water®. An acrylic phantom was built with the same dimensions as those indicated by Elekta, and implemented for the *Gamma Knife*® dosimetry. The calibration of the ionization chambers used was performed in a primary standard laboratory and the calibration coefficient obtained was used to calculate the absorbed dose in the water for these chambers. The dosimetry and tests performed with the acrylic phantom showed results close to the existing phantoms. All the correction factors indicated by TRS 483 were considered for the absorbed dose to water calculation. The new phantom can be used in *Gamma Knife*® dosimetry and also for calibration of small volume ionization chambers, assuring a similar dosimetry and calibration configuration and providing a calibration close to the clinical dosimetry configuration for the user. The design and implementation of the simulator object used in this work aims to contribute to the TRS 483, for the use in *Gamma Knife*® dosimetry and in the calibration of small volume ionization chambers.

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