

ABSTRACT

Accurate dosimetry of HDR Ir-192 sources is critical for safe brachytherapy. This study derives AAPM TG-43 dosimetric parameters for a microSelectron-HDR Ir-192 source using MCNP6.2 within a patient-based inhomogeneous model and compares results with reference data. Monte Carlo simulations tallied dose at radial distances (0.5–9.0 cm) and polar angles (0°–180°) with organ densities informed by a reference phantom and clinical TPS distances. The simulated geometry, radial dose, and anisotropy functions reproduce TG-43 trends; inclusion of tissue heterogeneities produced modest absolute deviations near interfaces. These results demonstrate that MCNP6.2 yields TG-43-compatible parameters while revealing clinically relevant dosimetric effects of patient-specific heterogeneity, supporting its use for TPS verification and improved dose assessment.

Keywords : Ir-192; High-dose-rate brachytherapy; AAPM TG-43; Monte Carlo (MCNP6.2); Radial dose & anisotropy functions