AbstractID: 1287 Title: Dosimetric Benefits of an Adjustable-Energy Electronic Brachytherapy Source

Introduction An xray tube was developed of sufficiently small size to allow its entry into HDR catheters. Three features distinguish this device from traditional HDR. Its spectrum is continuous with a 50 keV maximum energy. Low energies enable hospital staff to remain in the treatment room during irradiation. Secondly, radiation is produced only when the tube is activated. Thirdly, the tube's kVp can be finely controlled, providing highly conformal dose distributions. Using the tube, dwell kVp's and dwell times need to be optimized. This complexity is justified by the superior dose distributions this technology offers.
Methods Two programs were written. One program calculates point doses and the second calculates optimal dwell times and kVp's for meeting desired point doses. Optional constraint points and tolerance doses can be input. The optimizer then attempts to meet the desired point doses while keeping constraint point doses below tolerance.. Dosimetry calculations follow the TG-43 formalism using point source geometry. Since kVp is variable, families of radial dose functions and dose rate constants are required. The 2D source anisotropy was found to have minimal energy dependence. Depth dose data were acquired in 2 keV increments along the anode's bisector. The dose rate constants and radial dose functions were calculated. A single 2D anisotropy table is used for all energies.
Results The dose conformity favored the tube in all comparative tests with Ir-192 HDR sources.
Conclusion This xray tube has the potential of improving dose conformity of brachytherapy implants.
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