

Comparison of Dose Rate and Energy Dependence of Soft Tissue Equivalence Dosimeter with Electron and Photon Beams Using Magnetic Resonance Imaging

Authors : Bakhtiar Azadbakht, Karim Adinehvand, Amin Sahebnaasagh

Abstract : The purpose of this study was to evaluate dependence of PAGAT polymer gel dosimeter $1/T_2$ on different electron and photon energies as well as on different mean dose rates for a standard clinically used Co-60 therapy unit and an ELECTA linear accelerator. A multi echo sequence with 32 equidistant echoes was used for the evaluation of irradiated polymer gel dosimeters. The optimal post-manufacture irradiation and post imaging times were both determined to be one day. The sensitivity of PAGAT polymer gel dosimeter with irradiation of photon and electron beams was represented by the slope of calibration curve in the linear region measured for each modality. The response of PAGAT gel with photon and electron beams is very similar in the lower dose region. The R2-dose response was linear up to 30Gy. In electron beams the R2-dose response for doses less than 3Gy is not exact, but in photon beams the R2-dose response for doses less than 2Gy is not exact. Dosimeter energy dependence was studied for electron energies of 4, 12 and 18MeV and photon energies of 1.25, 4, 6 and 18MV. Dose rate dependence was studied in 6MeV electron beam and 6MV photon beam with the use of dose rates 80, 160, 240, 320, 400, and 480cGy/min. Evaluation of dosimeters were performed on Siemens Symphony, Germany 1.5T Scanner in the head coil. In this study no trend in polymer-gel dosimeter $1/T_2$ dependence was found on mean dose rate and energy for electron and photon beams.

Keywords : polymer gels, PAGAT gel, electron and photon beams, MRI

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