

Determination optimal gel dosimetry of the MAGIC-f and Tissue Mimicking composition using ultrasonic parameters in megavoltage energy

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Abstract

In this study, we used 5 types of combination of MAGIC-f polymer gel and tissue mimicking phantom to extract the optimal structure of gel dosimetry to increase sensitivity and reduce gel manufacturing costs. 5 types of new structure gels were irradiated by a dose of 36 Gy using a gamma ray (cobalt-60) source. Irradiated gels again, were refrigerated at 5 °C for about 24 hours before reading. The parameters: ultrasonic speed of sound, attenuation coefficient and quality index of 5 types of new structure gels were measured at 24 hours after exposure and at 25 °C with Sonost 2000 ultrasound system, variation of sensitivity of dose-response curve for ultrasound parameters of 5 new structure polymer gels were evaluated. The measurement results showed the D type of the new gel structures had the greatest change (34.6 m/s) in the speed of sound parameter. The change in A, B, C and E structures was measured to be 0, 20, 1 and 31.5 m/s respectively. Also, the obtained attenuation coefficient parameters for A, B, C, D and E structures were 0.2, 0.4, 0.2, 0.7 and 0.5 db/MHz respectively. Quality index parameter extracted for A, B, C, D and E structures, 0.4, 4.7, 0, 10 and 7.6 respectively. The D type structure had the greatest sensitivity among the 5 types of the new structure of the gels in this study. Also increasing the amount of gelatin in gel structure, increases the sensitivity. The ultrasound parameters had no significant changes for structures not containing ascorbic acid, copper sulfate and metacrylic acid.

Keywords: MAGIC-f polymer gel, Tissue Mimicking, Speed of sound, Attenuation coefficient, Quality index.

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