

Investigation of the Suitability of the MAGIC Polymer Gel Dosimeter for Small Field Dosimetry

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Abstract

Objectives: Dosimeters with having small sensitive volume and tissue-equivalency are preferred in small field dosimetry. These dosimeters are generally ion chambers, solid-state detectors which is giving point dose information and providing 2D dose distribution, such as film dosimeters. The only dosimeter that providing 3D dose distribution is gel dosimeters. The purpose of this study was to investigate MAGIC polymer gel dosimeter for small field dosimetry. **Methods:** In this study, MAGIC (Methacrylic and Ascorbic acid in Gelatin Initiated by Copper) polymer gel dosimeters were fabricated. Using with CyberKnife robotic radiosurgery treatment device and its 5, 7.5, 10, 12.5, 15, 20, 25, 30, 60 mm collimators, small field measurements taken by microDiamond detector, SRS Diode detector, PinPoint ion chamber, Gafchromic and MAGIC polymer gel dosimeter. Beam profiles at 15, 50, 100 mm depth and percent depth dose, relative dose factors are measured with all dosimeters. Penumbra widths, full width at half maximums, maximum dose depths and relative dose factors of MAGIC polymer gel dosimeter compared with other dosimeters and suitability of gel dosimeter is investigated. MR images of gel dosimeters are taken with 1.5T MRI device, at TR 4040 ms and TE 50-100-150-180ms with 1.5 mm slice thickness and 0.34 mm pixel size. MR images analyzed with PolyGeVero software. **Results:** PDD and output factors were found compatible with microDiamond and SRS diode detectors. The maximum dose points for SRS diode and microDiamond detectors were found within 1 mm difference. When penumbra, FWHM and beam flatness values were compared with all other dosimeters, unacceptable differences were observed. MAGIC polymer gel dosimeter FWHM values showed an expansion from all other dosimeters at a depth of 15 mm, and a narrowing at a depth of 100 mm. **Conclusions:** The polymer gel dosimeters should be cautiously used in small areas due to incompatibility with the reference dosimetry results and uncertainty it has.

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Abstract

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