

AbstractID: 11070 Title: INVESTIGATION OF PAGAT GEL DOSIMETER APPLICATION IN LOW DOSE RATE BRACHYTHERAPY BY DETERMINATION OF TG-43 PARAMETERS OF SELECTRON Cs-137 SOURCE

Purpose

Nowadays, medical physicists need a dosimeter that can detect three-dimensional (3-D) dose distributions with high spatial resolution. To date, in combination with Magnetic Resonance Imaging (MRI), polyacrylamide gel (PAG) polymers are the most promising gel dosimetry systems that have the potential to verify 3-D dose distributions delivered by clinical radiotherapy equipment. The purpose of this research is to investigate the application of PAGAT gel in dosimetry of a low dose rate (LDR) brachytherapy source, by simulation and experimental measurements of TG-43 report parameters.

Material and method

Selectron Cs-137 source, an LDR brachytherapy used in remote afterloading systems, is composed of active and dummy spherical pellets 2.5 mm in diameter. The gel was manufactured using the PAGAT gel dosimetry recipe of Venning et al. (2005). The gel dosimeter was manufactured inside a fume hood and under normal atmospheric conditions. Dosimetry of a spherical active source was done by means of the PAGAT gel.

Results

The results of Monte Carlo simulations are in good agreement with measurements and simulations of other investigators. The results of a 36 hour irradiation of PAGAT gel for measurement of $F(r, \theta)$ and $g(r)$ showed that the measured R2 parameters were almost the same for different distances although the near points had been expected to receive more dose than the far points. In this experiment, 5 vials containing PAGAT gel were placed at different distances from the Cs-137 teletherapy source and exposed to an equal dose (5 and 20 Gy). The results indicated that in dose rates less than 0.98 Gy/hr, the gel dosimeter did not respond while in high dose rates, the response of the gel dosimeter was reliable.

Conclusion

The experimental results of gel dosimetry suggest that PAGAT gel dosimeter does not have a suitable response in low dose rates.