AbstractID: 4566 Title: A novel phantom for use in 3-dimensional in vitro cell experiments

Purpose: To describe and characterize a novel IMRT phantom for use in 3-dimensional *in vitro* cell experiments.

Methods and Materials: A cylindrical IMRT phantom was designed and fabricated from a commercially available system (CIRS Inc., Norfolk, VA). The phantom is composed of water-equivalent plastic and contains a rectangular bore which, in combination with a set of water-equivalent plastic inserts, can be adjusted to fit 1-3 well plates. In these initial studies, the phantom was loaded with a stack of three well plates (96 individual wells/plate), and an IMRT plan was created for two separate PTVs, each receiving a scalable uniform dose. The ratio of doses between the PTVs was fixed at 2:1. Using PTV doses of 50 and 100 cGy, measurements from TLDs placed at five locations within each PTV were compared to the expected doses. For the same irradiation technique, dose distributions were acquired from films placed above and below each well plate and compared with the treatment plan using the γ–index. Head and neck tumor cell lines were also irradiated in this phantom and cell viability was assessed using the MTT assay.

Results: TLD measurements yielded doses of 100.3 +/- 4.6 cGy and 51.0 +/- 2.3 cGy for 100 cGy and 50 cGy PTVs, respectively. Calculations of γ were performed using a dose difference of 3.0 mm and distance to agreement of 3.0 %. The γ indices ranged from 0.18 +/- 0.13 to 0.51 +/- 0.35 in each of the PTVs. Cell irradiation experiments showed uniform viability within each of the PTVs.

Conclusion: The consistency between measurements obtained from the TLDs and film with the calculated dose distributions, along with uniform cell viability within each irradiation region, show that the phantom is a novel tool for 3-dimensional *in vitro* cell experiments.

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