AbstractID: 3448 Title: IMRT and Brachytherapy for Cervical Cancer

Purpose: Radiotherapy of cervical cancer is usually delivered through a combination of external-beam and intracavitary-brachytherapy treatments. A portion of the external-beam treatment is often delivered with a midline block, either straight or tapered at the edges, to avoid overdosing the brachytherapy dose distribution. This study investigates the replacement of the midline block with intensity-modulated-radiation-therapy (IMRT), matching the IMRT dose to the biologically-equivalent brachytherapy dose distribution, while additionally achieving optimized target coverage and minimized critical organ doses.

Method and Materials: CT scans of a female pelvic phantom were imported into a commercial treatment planning system (TPS) to calculate the dose distribution of a high-dose-rate (HDR) tandem and ovoid treatment delivering 650cGy to point A. A planning target volume (PTV), the rectum, and the bladder were segmented. The brachytherapy dose distribution was converted to its biologically-equivalent dose distribution, at 180cGy daily fractions, using the linear-quadratic equation and an α/β ratio of 10, by modifying the HDR source's radial-dose function (RDF) values. A set of IMRT fields, at 180cGy/fraction, was planned to deliver a dose of 720cGy to the target for each HDR fraction while accounting for implant dose. The IMRT fields geometry included two scenarios; AP/PA parallel-opposed fields, mimicking the conventional split-field pelvis treatments with a midline block, and a 5-field coplanar beam arrangement that had the potential to improve target coverage and reduce critical-organ doses.

Results: The single-source RDF values were successfully modified to compute the biologically-equivalent dose distribution of the HDR treatment. The TPS was able to calculate IMRT field fluence maps, in both scenarios, to obtain dose volume histograms of the target and the critical organs as prescribed.

Conclusion: It was demonstrated that IMRT doses distributions for cervical cancer treatment can be biologically matched to brachytherapy dose distributions, thus improving target coverage and sparing critical structures.