AbstractID: 11456 Title: A Dosimetric Analysis of IMRT Used to Replace and Mimic HDR Brachytherapy in the Treatment of Gynecologic Malignancy

Purpose: To evaluate the ability of intensity modulated radiation therapy (IMRT) to mimic the dose distribution of high-dose rate (HDR) intracavitary brachytherapy in the treatment of gynecologic malignancy, including regions of high dose in the target volume while limiting doses to organs at risk (OAR).

Methods: The HDR treatment planning CT scans of 4 patients with gynecologic malignancy were used in creating 3 different types of IMRT treatment plans. HDR dose levels were contoured and exported as volumes to the IMRT treatment planning system. The $IMRT_{300\%}$ and $IMRT_{100\%}$ plans were designed to mimic $V_{300\%(HDR)}$ and $V_{100\%(HDR)}$, respectively. No attempt was made to spare the OAR. Results of $IMRT_{300\%}$ and $IMRT_{100\%}$ were used to determine the limitations of IMRT in order to create $IMRT_{Tx}$: a compromised plan, designed to replicate the $V_{100\%(HDR)}$ and the highest isodose volume possible, while sufficiently sparing the OARs.

Results: The $IMRT_{300\%}$ and $IMRT_{100\%}$ plans showed an increase in $V_{50\%}$ by a factor of 10 and 2, respectively. The $IMRT_{Tx}$ plan mimicked $V_{200\%(HDR)}$ to within a mean of 16.4% while concurrently replicating $V_{100\%(HDR)}$ to within a mean of 79.7%. An associated mean $\frac{V_{50\%(IMRT)}}{V_{50\%(HDR)}}$ of 510% and a mean D_{2cc} increase of 61.7% and 102.7% for the bladder and rectum were realized. Moreover, for the patients who received supplementary conventional external-beam radiation therapy (CXRT), nodal treatment was integrated with $IMRT_{Tx}$ in order to replace CXRT. The nodal mean $D_{90(IMRT)}$ was within 3.9% of $D_{90(CXRT)}$. For all patients, $IMRT_{Tx}$ OAR doses were below the regions of interest (ROI) constraints used clinically.

Conclusion: The present study suggests that IMRT may be capable of mimicking HDR brachytherapy in the treatment of gynecologic malignancy. As $V_{200\%(HDR)}$ and $V_{100\%(HDR)}$ are mimicked, increased $V_{50\%}$ and OAR doses must be accepted. Compliance to clinical ROI constraints can be achieved.