Interfraction Motion of the Vaginal Apex in Patients With Gynecologic Malignancies Treated with Post-operative Intensity Modulated Radiation Therapy (IMRT): Are We Missing the Target?

D. Rash, H. Wooten, J. Hunt, R. Valicenti, J. Mayadev, University of California, Davis Cancer Center, Department of Radiation Oncology, Sacramento, CA

Purpose/Objective(s): The RTOG consensus guidelines for the delineation of the clinical target volumes (CTV) in the postoperative treatment of gynecologic malignancies using IMRT is widely utilized. However, the guidelines do not detail a planning volume of the vaginal cuff due to changes in rectal motion and fill. We evaluated the impact of rectal distension on the vaginal cuff during external beam IMRT using daily image guidance.

Materials/Methods: 131 daily images from 5 patients treated with post operative IMRT to the pelvis were reviewed. A gold seed fiducial marker was placed into the vaginal apex of each patient prior to simulation. CT-simulation images with full and empty bladders were obtained. Using the 2008 ASTRO consensus guidelines for delineation of CTV for IMRT in postoperative gynecologic malignancies, treatment plans were generated to deliver 45-50 Gy to the target structures. Using daily cone beam CT image guidance, the position of the vaginal cuff fiducial markers was determined. The difference in position of the marker, as compared to the initial planning full-bladder CT scan was calculated in the anterior-posterior (AP), lateral, and superior-inferior (SI) dimensions. Also measured were changes in the maximum AP dimension of the rectum. These measurements were compared with shifts in the vaginal cuff fiducial marker to determine whether changes in rectal distension impacted vaginal cuff movement. Each daily image was also reviewed to assess the position of the fiducial marker in relation to the PTV.

Results: The mean shifts of the gold seed in the AP, lateral, and SI dimensions were 7mm (range, 0-28mm), 3 mm (range, 0-13mm) and 3 mm (range, 0-12mm), respectively. Distension of the rectum ranged from 20.5 to 60.1 mm (mean 36.9 mm). For 2 of the 5 patients, the vaginal cuff fiducial marker was located within 5mm of the anterior border of the PTV or outside the PTV altogether on multiple treatment days during their 5 weeks of treatment. These patients also demonstrated the greatest mean shifts in AP dimension of the vaginal cuff marker throughout the course of treatment (12.3 and 16.7 mm respectively), and the rectal distension on the daily images were more frequently greater than that of the initial CT-simulation scan.

Conclusions: Movement of the vaginal cuff fiducial marker observed on daily image guidance suggests significant interfraction movement of the target tissue due to organ motion. These shifts can actually exceed the margins of both the CTV and PTV as suggested by the ASTRO 2008 consensus guidelines. Our data suggests that rectal fill and subsequent organ motion must be incorporated into current guidelines for treatment volume margins or we risk under-treating the critical target tissues.