

AbstractID: 8771 Title: Analysis of Rectal Dose Variability due to Inter-fractional Variations of Rectal Marker Positioning in Film-based HDR Cervical Brachytherapy

Purpose: In film-based intracavitary brachytherapy for cervical cancer, rectal dose is usually computed using rectal markers. Position of the markers may not accurately represent the anterior rectal wall. The study is to retrospectively analyze the variability of rectal dose due to variations of marker placement in a multi-fractionated HDR treatment regimen.

Method and Materials: A cohort of five patients, total 18 applications, treated with multiple-fraction tandem/ovoid HDR brachytherapy was studied. To correlate the rectal points from different fractions to the same coordinate system, the cervical os point and the orientation of the applicators were manually matched. With the applicator matching, rectal points obtained from other fractions were input into the original treatment plan for each application. A rectal dose was then calculated from all the possible rectal points. The fractional rectal doses were summed as the new cumulative rectal dose for each patient, which was compared with the original cumulative rectal dose. The reproducibility of the results was also analyzed by repeating the matching procedure.

Results: The maximum inter-fractional variation of distances between rectal dose points and the closest source positions was 1.1 cm and the corresponding maximum variability of fractional rectal dose was 65.5%. The percentage difference in cumulative rectal dose estimation for each patient was 5.1%, 16.4%, 25.7%, 18.9%, 12.2%, respectively. Overall reproducibility of the results was within 1.8%.

Conclusion: Our results show underestimation of the rectal dose caused by variations of rectal marker positioning relative to the anterior rectal wall, which should be taken into consideration in film-based HDR cervical brachytherapy. By manually matching the rectal points into the same treatment plan, one may minimize the possibility of underestimating the rectal dose. We will also anticipate a more accurate approach for evaluating rectal doses in HDR intracavitary brachytherapy with the emerging 3-D volume imaging based treatment planning.