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Poster

Improving cervical volumetric dosimetry with combined intracavitary/interstitial brachytherapy

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Abstract

Purpose. Standard curative treatment of locally advanced cervical cancer involves external beam radiotherapy (EBRT) +/-chemotherapy followed by intracavitary brachytherapy (ICB). Interstitial brachytherapy (ISB) techniques may be a consideration for large tumors, extensive parametrial residuum, or unfavorable topography. With volumetric planning, GEC-ESTRO planning aims for tumor target and organs-at-risk (OAR) are the norm. Further dosimetric optimization could be important for improved local control and decreased toxicity. A broader application of combined ICB+ISB for cervical cancer, regardless of clinico-anatomical factors, may facilitate such dosimetric optimization.

Methods. We reviewed the EBRT+ICB plans generated at our institution from 2012- 2015, including for 28 women treated on a study of MRI-guided brachytherapy. We identified cases where GEC-ESTRO recommendations were met, but total D90 HR-CTV <90Gy10. HR-CTV volume and dose data were collected for D 90 HR-CTV, rectum, bladder, and sigmoid (expressed as total dose for EBRT+brachytherapy, in EQD2). Cases were categorized by volume. Using Oncentra 4.3 (Elekta, Sweden) planning software, virtual ISB needles were retrospectively added to these plans and further optimization undertaken. Needle (n=2-5) positions and depths were tailored to anatomy, with fixed conformation modelled on our tandem+ring+needle system. Dosimetry for ICB and ICB+ISB was compared.

Results. Eleven cases were identified (46% FIGO stage IB, 18% IIA, 36% IIB) (median 29.5cc [18.1 - 78.2cc]). For ICB, median D90 HR-CTV was 86.9Gy10 [81.0 - 89.9Gy10], and D2cc for rectum 58.3Gy3 [49.2 - 66.8Gy3], bladder 64.3Gy3 [57.9 - 90.3Gy3], and sigmoid 64.3Gy3 [52.6 - 74.9Gy3]. For ICB+ISB, median D90 HR-CTV was 90.8Gy10 [88.4 - 94.9Gy10], with D2cc rectum, bladder, and sigmoid of 58.5Gy3 [49.8- 71.6Gy3], 64.8Gy3 [58.5 - 83.0Gy3], and 67.5Gy3 [52.6 - 73.8Gy3], respectively. D90 HR-CTV was increased by 0.7 - 10.0Gy10, slightly higher for larger (⩾30cc) volumes (median 7.2, vs. 3.9Gy10). Minimal changes in median D2cc were seen for rectum (0.1Gy3 [-1.9 - 4.8Gy3]), bladder (0Gy3 [-9.6 - 3.7Gy3]), and sigmoid (0.9Gy3 [-2.2 - 4.2Gy3]) overall. Our institutional planning aims were met in all but one ICB+ISB cases. Needle positions were observed to be a factor: those placed on the opposite side to the dose-limiting OAR helped mitigate OAR doses. Conclusion. In this planning exercise, combined ISB+ICB can increase D90 HR-CTV while simultaneously improving the ability to minimize OAR doses. Knowledge gained of the relationship between needle positions, anatomy, and relative

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weighting can assist in making an informed decision prior to an ICB+ISB implant. Clinical feasibility for individual patients requires further investigation.

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