Conclusion: DWA combines direct machine parameter optimization with noncoplanar geometry, allowing additional flexibility in dose delivery, while preserving dosimetrically robust delivery.

Proffered Papers: RTT 5: Optimizing treatment planning and delivery in the pelvic region

OC-0467
Can a VMAT radiotherapy planning solution match brachytherapy in cervical cancers?
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Purpose or Objective: Radiotherapy treatment for cervical cancers typically involves external beam irradiation to the whole pelvis followed by an intra-uterine brachytherapy boost to the primary tumour site. The purpose of the current study was 1) to assess dose reduction to OARs using a VMAT treatment technique compared to a conformal four field brick and 2) whether VMAT using sequential or simultaneous integrated boost can provide coverage to the tumour and OARs similar to brachytherapy.

Material and Methods: Ten patients previously treated for cervical cancer were identified (age range 30-78 years). Four plans were retrospectively produced for each patient (3D conformal four field brick, VMAT to the whole pelvis, VMAT boost, SIB) providing a phase one dose of 50.4Gy over 28 fractions. The sequential boost dose varied between patients from 16.5Gy-27.5Gy over 3-5 fractions. An averaged boost dose of 31Gy over 32 fractions, corrected using biological equivalent dose calculations was used for all SIB plans. All data was corrected to EQD2.

Results: Results demonstrated significantly improved dose homogeneity between the VMAT and four field phase one techniques (p<0.01) but failed to find significant dose reductions to the bladder and rectum. Dose to the bowel was reduced at all dose points (p<0.01). Comparing the VMAT and brachytherapy boost, significantly increased doses to OARs were identified in the VMAT boost (bladder p<0.05; rectum p<0.01; bowel p<0.01). Dose homogeneity was decreased using an SIB compared to sequential but OAR doses were also decreased (p<0.05).

Table 2: Summary of the results of the target volume dose distribution and delivery parameters for all investigated scenarios. The data is presented as average values, standard deviations and p-test value

Conclusion: When treating cervical cancer, VMAT allowed significant improvement in dose homogeneity with overall reductions in doses to OARs. When comparing the feasibility of SIB or sequential EBRT boost instead of brachytherapy the SIB plan produced a better solution with respect to OAR doses. Whilst cervical surface doses with SIB to the high-risk CTV will not match brachytherapy a SIB may offer an alternative option for those patients who refuse/cannot access brachytherapy.

OC-0468
Validation of Mask Based Registration in CBCT pretreatment imaging of locally advanced cervix ca
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Conclusion: When treating cervical cancer, VMAT allowed significant improvement in dose homogeneity with overall reductions in doses to OARs. When comparing the feasibility of SIB or sequential EBRT boost instead of brachytherapy the SIB plan produced a better solution with respect to OAR doses. Whilst cervical surface doses with SIB to the high-risk CTV will not match brachytherapy a SIB may offer an alternative option for those patients who refuse/cannot access brachytherapy.
Purpose or Objective: Online CBCT pre-treatment registration (Elekta, XVI) for locally advanced cervix carcinoma (LACC) is performed by RTT's, using a cubic Clipbox-based Volume of Interest (C-VOI) algorithm. Consecutive manual adaptation in order to fulfill the predefined criteria for LACC-registration, implies large shifts. This is suboptimal regarding setup reproducibility, challenges PTV margins and strongly depends on RTT’s experience. The objective is to determine whether the use of a Mask-based VOI (M-VOI) reduces the magnitude of manual shifts and thus is a better starting point.

Material and Methods: Seventeen consecutive image sets (1 representative patient) and 14 sets among them were registered by 2 RTT’s and 1 experienced radiotherapist respectively, both using C-VOI and M-VOI methods (identical Gray Value T algorithm). The M-VOI was generated from the primary CTV which includes the uterus and cervix. Within predefined matching criteria, lymph node regions were not taken into account. Four 3D translations were recorded: after C-VOI and M-VOI autoregistration (AR) and after consecutive C-VOI and M-VOI manual registration (MR). Data was analyzed using SPSS software.

Results: M-VOI and C-VOI AR resulted in statistically significant different translations in all 3 directions (paired T-test p < 0.01). The manual shifts afterwards cancelled out the significance in all directions (ANOVA, pairwise comparison, Bonferroni corrected p > 0.05). All 3 readers converged towards each other. Nevertheless, values of maximal relative shifts between the readers stayed: x: 0.47 cm, y: 1.06 cm, z: 1.33 cm and x: 0.76 cm, y: 0.68 cm, z: 1.28 cm after C-VOI and M-VOI MR respectively. Plotting the data stresses the importance of the level of experience in LACC-CBCT registration. Comparison of the vector endpoints of C-VOI and M-VOI MR, shows that the experienced reader is able to move the CBCT towards one and the same endpoint, whereas the less experienced readers produce more fanned out point-by-point clouds and tend to vary around the given solution (which stresses the importance of a good starting point). Analysis of the manual shifts (Δ) reveals a better performance of M-VOI AR, i.e. smaller shifts are applied. This means that criteria for a ‘good’ match are here inherently taken into account in a better way. Paired T-tests for the shifts either after C-VOI and M-VOI AR should be avoided. Therefore Dual Registration (XVI, Elekta®) combined with a written procedure will be the next step in the study.

OC-0469
Genitalia contouring in anal cancer IMRT; comparisons of volumes with and without a genitalia atlas
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Purpose or Objective: Genitalia as an organ-at-risk in radiotherapy has received little attention in literature. Contours vary widely and IMRT dose constraints in anal cancer (AC) often not met without compromising PTV. Despite IMRT technological advances genitalia toxicity still exists. Study aim: apply a proposed genitalia atlas to a retrospective series of AC patients and quantify the genitalia dosimetric differences between the original genitalia contour as defined by the clinician and the new genitalia contour defined with the aid of the genitalia atlas.

Material and Methods: Sixty AC patients (females n=40, males n=20) previously treated with IMRT were retrospectively identified. Four sub-groups were defined: female node negative (FNN) (n=24), female node positive (FNP) (n=16), male node negative (MNN) (n=10) and male node positive (MPN) (n=10). ‘Node negative’ and ‘node positive’ groups are defined as MRI tumour staged with involved nodes. Original genitalia contours for the retrospective treated plan were defined by the clinical oncologist and their interpretation of the departmental protocol. Genitalia were re-contoured following proposed genitalia contouring guidelines, DVH data and genitalia volume of original and new genitalia contours were compared. Statistical significance level of P < 0.05* and 0.01** is reported.

Results: Table 1 shows the volume and dosimetric differences between original and new genitalia contours. New contours were significantly larger than original. F genitalia received more radiation than M genitalia. Patients with involved nodal disease received more genitalia irradiation than patients without nodal disease. The majority of genitalia contours failed to meet current genitalia dose constraints hence new achievable dose constraints are recommended (figure 1). Dose constraints are rounded to the