TRAK correlated with LN dose, however, with linear regression R2 was less than 0.3 for all LNs which indicates that TRAK cannot be used to predict LN dose.

Table 1: Comparison between the EQD2 doses in Gy for the lymphnodes in standard- and optimised plans in PDR-BT.

	Mean +/- sd		Diff EQD2 (Gy)	Diff.p
	STANDARD-PLAN	OPTIMISED PLAN		
Para-aortic, D98%	0.37 ± 0.08	0.29 ± 0.09	0.08 ± 0,10	<0.01
Para-aortic, D50%	0.62 ± 0.21	0.46 ± 0.13	0.16 ± 0,17	<0.01
Para-aortic, D2%	1.37 ± 0.75	0.97 ± 0.36	0.40 ± 0,51	<0.01
Common iliac, D98%	1.48 ± 0.80	1.05 ± 0.41	0.39 ± 0,48	<0.01
Common iliac, D50%	2.71 ± 1.40	1.91 ± 0.79	0.74 ± 0,87	<0.01
Common iliac, D2%	5.69 ± 3.83	3.64 ± 1.86	2.12 ± 2,72	<0.01
External iliac, D98%	2.48 ± 0.75	2.07 ± 0.70	0.40 ± 0,45	<0.01
External iliac, D50%	5.00 ± 1.87	4.06 ± 1.35	0.87 ± 1,39	<0.01
External iliac, D2%	9.41 ± 4.62	7.84 ± 4.00	1.43 ± 2,83	<0.01
Internal iliac, D98%	3.52 ± 1.43	2.98 ± 1.02	0.64 ± 1,14	<0.01
Internal iliac, D50%	5.73 ± 2.40	5.13 ± 2.62	0.55 ± 1,29	<0.01
Internal iliac, D2%	11.17 ± 6.02	11.38 ± 13.20	-1.65 ± 14.03	0.88
Presacral, D98%	2.63 ± 0.88	2.42 ± 0.73	0.21 ± 0,59	0.09
Presacral, D50%	4.08 ± 1.28	3.77 ± 1.25	0.31 ± 0,66	0.03
Presacral, D2%	8.69 ± 4.31	6.94 ± 3.87	1.75 ± 2,59	<0.01
Obturatorial, D98%	4.03 ± 0.95	3.82 ± 1.14	0.27 ± 0,70	0.03
Obturatorial, D50%	6.37 ± 1.74	6.16 ± 2.07	0.34 ± 1,33	0.29
Obturatorial, D2%	10.13 ± 4.19	9.80 ± 4.51	0.48 ± 2,94	0.35
Inguinal, D98%	0.95 ± 0.21	0.88 ± 0.23	0.07 ± 0,18	<0.01
Inguinal, D50%	1.61 ± 0.35	1.46 ± 0.35	0.17 ± 0,30	<0.01
Inguinal, D2%	3.93 ± 1.14	3.40 ± 1.00	0.53 ± 0,67	<0.01

Conclusions: BT contributes with considerable dose to pelvic LNs, and should be considered in the evaluation of total LN dose,in particular when pathological LNs are boosted. In our study the optimised BTcontributed with a range of 3.8 - 6.2Gy (D50%) to pelvic LN and 0.5-1.9 to PAN,CI and ING (D50%). Image guided BT plan optimization had minor impact on BT contribution to LN dose.

OC-0358

MRI guided adaptive cervical cancer brachytherapy: Impact of repeated intrafractional imaging.

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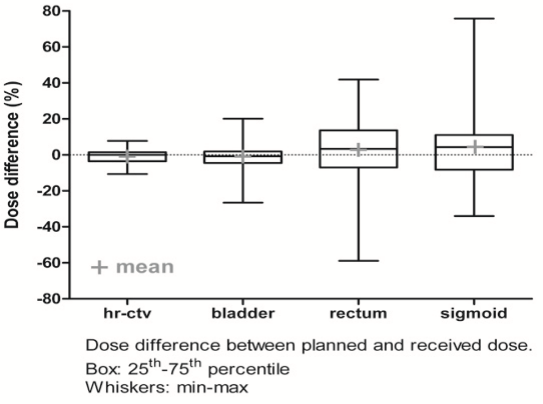
Purpose/Objective: To assess the impact of organ movement and deformation on tumour and organ at risk (OAR) dose parameters by repeating MR imaging during individual brachytherapy (BT) fractions.
Materials and Methods: Multiple MR scans during BT were performed in 12 patients treated with external beam radiotherapy (EBRT), chemotherapy and high dose rate (HDR) image guided adaptive BT. The BT schedule consisted of two HDR applications delivering two fractions each (2 times 2 fractions of 7Gy). A set of T2-weighted transversal, sagittal and coronal MR scans was acquired after insertion of the applicator (MRplan). High risk clinical target volume (HR-CTV) and the organs at risk (bladder, rectum, and sigmoid) were delineated and treatment planning was conducted directly on MR images. Prior to irradiation a second MRI set (MRprerad) was obtained. An onset applicator based registration with MRplan made evaluation of OAR position and volume changes before irradiation possible. Adaptations, e.g. deflating gas from the rectum, were applied to several patients to keep the rectum at MRprerad similar to the planned situation (MRplan). Applicator insertions, MR imaging and HDR dose delivery were performed in an adapted BT operation theatre, with afterloader secured to the wall.
For research purposes the treatment plan was evaluated on the contours of MRprerad. Calculated dose differences between MRplan and MRprerad indicate changes between planned and received dose. These differences were evaluated and compared to the data obtained in a group of 10 patients that received repeated MR imaging during pulsed dose rate (PDR) BT.
Results: The planned mean total dose (EBRT + BT) for the D90 HR-CTV and D2cc of bladder, rectum, and sigmoid were 86±6, 84±9, 64±9, and 62±6 Gy EQD2, respectively. The mean differences between the planned dose and the received dose calculated on MRprerad were 0.6±1.9, -0.7±3.6, 0.7±4.7, and 1.2±2.9 Gy EQD2, respectively. Analyses per HDR fraction (n=48) showed variety in physical mean dose differences; -1.0±3.7, -1.5±7.5, 2.6±18.6, and 4.7±21.8 %, respectively. The mean differences were small, but large ranges occurred especially for rectum and sigmoid of (-59-42) and (-34-76) %, respectively (figure1). However, despite these differences OAR constraints were exceeded in only 3 patients. Comparison with the PDR data showed a reduction of mean and standard-deviation of the calculated dose differences of the OAR. In particular for rectum and sigmoid, during PDR the mean differences increased systematically 20-30% compared to only 3-5% in HDR treated patients.
Conclusions: The introduction of MRprerad results in a more accurate estimate of the dose delivered to the patient. Visualization of anatomical changes prior to irradiation allows individualized interventions and adaptations which can reduce dose uncertainties in rectum and sigmoid.



OC-0359

Bladder volume variation reduces long-term toxicity of image-guided brachytherapy for cervical cancer

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Purpose/Objective: Little data exists on the effect of variations of bladder volume (BV) on toxicity outcomes for image-guided intracavitary brachytherapy (ICB) for cervical cancer. Limited data has shown that variable bladder filling at each fraction can vary the position of hot spots within the bladder. Recently, it has become our center's policy to alternate between small (60cc) and large (300cc) bladder filling with the assumption that this might reduce long-term bladder toxicity. Objective of this study was to determine if there was a correlation between BV variation and long-term bladder toxicity.
Materials and Methods
Data for patients treated with ICB from 2008 to 2012 in 3 centers was prospectively collected. Patients received 45 Gy in 25 fractions of pelvic ± para-aortic EBRT with concurrent chemotherapy followed by 4 to 5 fractions of ICB. Patient-reported toxicity was measured with LENT-SOMA questionnaires at the time of follow-up visits. Dose parameters including HR-CTV D90 Bladder D2cc, ICRU bladder dose points and BV (based on CT contour) were recorded for each ICB fraction. A total dose in EQD2 was generated for each dose parameter. Standard deviation for bladder BV between the 4-5 fractions in each patient was used as a surrogate measure of bladder volume variability. Univariate linear regression analyses were completed to determine if there was significant correlation between dose parameters or BV variabilty and LENT-SOMA bladder scores.
Results: 79 patients were treated between 2008 and 2012 with ICB for cervical cancer with CT-based planning. 45 had stage I, 24 stage II, 9 stage III and 1 stage IV. ICB dose was 30 Gy in 5 fractions of 6 Gy for 85% of patients, 26Gy in 4 fractions of 6.5Gy for 7,5% and various 5 fraction schedules of 26 to 32 Gy for 7.5%. Median follow-up was 22.4 months. 42 patients had a LENT-SOMA bladder score of 0, 31 had grade 1 toxicity, 5 had grade 2 toxicity and 1 had grade 3 toxicity. Median total HR-CTV D90 EQD2 was 46.6 Gy_{10} for ICB alone and 90.6 Gy_{10}including contribution of EBRT. Median total bladder 2cc EQD2 for ICB was 36,9 Gy_3. Median interfraction standard deviation (SD) of BV was 45.3cc (range: 3.7-178.6). All tests for HR-CTV D90, Bladder D2cc and ICRU bladder dose point were not statistically significant for correlation with LENT-SOMA bladder scores. Regression analysis for bladder volume SD vs.LENT-SOMA scores was statistically significant