consisted of 65.75 Gy to the prostate gland+seminal vesicles (2.63 Gy/fx) and 45 Gy to the pelvic nodes (1.8 Gy daily) when needed, delivered in 25 fractions. All patients underwent daily image guidance with cone-beam computed tomography. Sixty-six percent of the patients received implanted gold markers (64/97). Acute and late gastrointestinal- and genitourinary toxicity was recorded according to the Common Terminology Criteria for Adverse Events 4.0. Chi-square test and univariate regression analysis were used to determine correlation of categorical and continuous data at the p<0.05 significance level.

Results: During a median follow-up of 23 (range: 4-44) months, 7/97 biochemical failures (7%) were observed. The frequency of ≥Gr. 2 acute gastrointestinal (GI) and genitourinary (GU) toxicities were 8% (8/97) and 45% (44/97) including 6% Gr. 3 bladder urgency and nycturia (6/97). Late ≥Gr. 2 GI toxicities of 14 % (13/97) were mainly rectal bleeding and chronic proctitits. Correlation was found between lymph node irradiation (p=0.008) and late rectal toxicities, while for other patient characteristics including the presence of gold markers (p=0.097) or smoking (p=0.99) did not appear to affect such adverse event. d univariate regression analysis were used to determine correlation of categorical and continuous data at the p<0.05 significance level.

Conclusion: Our experiences suggest that moderate hypofractionation with SIB technique is safe with moderate acute side effects. Longer follow-up and higher number of patients is warranted to confirm these results in long term. 8) and late rectal toxicities, while for other patient characteristics including the presence of gold markers (p=0.097) or smoking (p=0.99) did not appear to affect such adverse event. d univariate regression analysis were used to determine correlation of categorical and continuous data at the p<0.05 significance level.

EP-1367

IMRT from 70 Gy to 80 Gy in prostate cancer: clinical and dosimetric predictors of late toxicity

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Purpose or Objective: Evaluate grade ≥ 2 overall late rectal and bladder toxicity in patients (pts) with localized prostate cancer (CaP) treated by IMRT. Identify predictors of radiation-induced toxicity and analyze biochemical progression free survival (bPFS).

Material and Methods: A total of 276 pts were treated between 2000 and 2010 with 70Gy (10.8%), 74 Gy (63.9%) and 80 Gy (25.3%), using static 5-field IMRT without pelvic irradiation. Short or longue-course deprivation (ADT) was prescribed in 25.4 % and 20.7%, respectively. The toxicity was described using the Common Terminology Criteria for Adverse Events (CTCAE) v4.0 scale. Cox regression models addressed tumor (T stage, Gleason score, PSA) and patient characteristics (age, diabetes, previous abdominal or pelvic surgery, transurethral prostate resection, anticoagulation treatment, hypertension, coronary insufficiency and International Prostate Symptom Score-IPSS) as well as dosimetric predictors of late grade ≥ 2 overall toxicity.
An analysis of dosimetry data was only performed in the 74-Gy arm. Our institutional HDV constraints for rectal wall (maximal dose ≤74 Gy, V68Gy <25%, V45Gy <45%) and bladder wall (maximal dose ≤74 Gy; V50Gy <40%, V65Gy <25%) were tested as potential predictors for late toxicity.
Biochemical progression free survival was analyzed only in pts without ADT.

Results: The median follow-up was 53.1 months (range, 6-150). There was no grade≥ 4 toxicity. The use of ADT was not found to be predictive. The 5-year rectal and bladder toxicity-free survival was 93.8 % (95% CI, 89.8%-96.2%) and 75.2 % (95% CI, 68.7%-80.5%) respectively.
In multivariate analysis (MvA) only the dose (80Gy vs 74 Gy and 70Gy) increased the risk of overall rectal toxicity (hazard ratio [HR]=2.96; 1.07- 8.20). The non-compliance to our constraints on rectal wall was not a significant predictor of rectal toxicity.
IPSS at baseline ≥ 8 (hazard ratio [HR]=2.60;1.47 -4.62), delivered maximum dose (Dmax) ≥ 74Gy (HR=2.09;1.04 -4.17) and dose delivered ≥in 2% of bladder (D2%) ≥ 73Gy (HR=3.33;1.37-8.07) were found to be predictors of bladder toxicity.
The 5-year bPFS was 81.0% (74.5%; 86.0%). D'Amico low (HR=0.09; 0.01- 0.69]) and intermediate risk group (HR=0.49; 0.28-0.88) as well as PSA nadir≥ 0.2 ng/ml (HR =1.79; 1.01 - 3.21) were predictive of biochemical relapse.

Conclusion: The rate of late rectal toxicity increased with higher doses, while Dmax≥ 74Gy, D2% ≥ 73Gy and baseline IPSS ≥ 8 increased bladder toxicity.

EP-1368

A novel decision support method to estimate the value of a rectum spacer: 'Virtual Rectum Spacer'

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Purpose or Objective: A relative new method to decrease the risk of rectal complications during prostate radiotherapy treatments consists of the implantation of a device, an absorbable hydrogel or saline filled balloon, between the prostate and the anterior rectum wall: so called rectum spacers (RS). Nevertheless the implantation of a RS is relatively expensive and invasive. Therefore a decision support system to identify beforehand whether a specific patient will benefit from a RS and whether it will be cost efficient would be very beneficial. We have developed a novel method to predict the CT images with a 'virtual' RS through non-rigid deformations based on a CT scan without RS to be integrated into a decision support system.

Material and Methods: A patient dataset consisting of 16 prostate cancer patients with CT imaging prior and 3-5 days after a gel RS implantation (SpaceOAR™ System, Augmenix Inc.) was used. The median inserted gel volume was 10.5 cc. Gel contours of the first 8 patients were used as a training set to derive the spatial deformation model of the RS. The contours of the RS were registered rigidly according to their centre and an average deformation map was created. The overlapping volumes of RS of different patients having a probability of >3 contour corresponded with a volume of 10 cc, and was used to derive the deformation model of the RS. From this model, a deformation field was calculated that mimics the expansion of the RS between the prostate and the rectum. The CT images of the remaining 8 patients were used to validate the virtual RS model, for this the distance between the rectum and the prostate was compared for the virtual RS and the actual RS .

Results: An example of the virtual RS is shown in the figure where the contours of the real RS and virtual RS show a good overlap (DICE = 0.63). The average minimum distances between the prostate and rectum of all 8 patients in the validation set increased with 3.7±2.4 (1SD) mm when the virtual RS was applied. For the real RS the average increase in minimum distance was 5.4±2.7 mm. The mean distances between the prostate and rectum without RS was 15.8±3.2 mm, with the virtual RS this was 19.5±3.3 mm comparable to the real RS 22.0±4.3 mm.

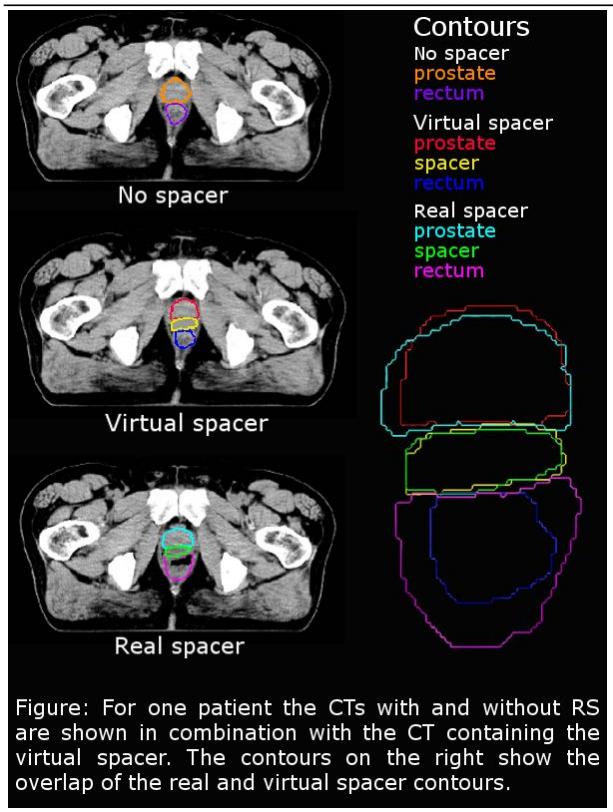

Figure: For one patient the CTs with and without RS are shown in combination with the CT containing the virtual spacer. The contours on the right show the overlap of the real and virtual spacer contours.

Conclusion: We have developed a novel method to simulate a model based virtual RS that is a useful tool to identify patients with a potentially high benefit of a RS implantation. The volume of the virtual RS can be estimated through the use of different deformation fields. In future, a dose comparison study is necessary to extend into a full decision support system using the virtual RS approach.

EP-1369

Toxicity profile with hypofractionated RT for localized prostate cancer: compared 3D-CRT vs VMAT

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Purpose or Objective: The escalation dose in the treatment of prostate cancer with external beam radiation therapy has proved the winning way in the biochemical control of the tumor. But the dose escalation to the whole prostate gland, which is considered as clinical target volume in external beam radiotherapy, is limited by the tolerance of the surrounding tissue. We have compared the toxicity profiles between patients treated with moderate hypofractionated 3-dimensional conformal radiotherapy (3D-CRT) collated with volumetric-modulated arc therapy (VMAT), both with image-guided radiotherapy (IGRT) by implanted fiducial markers in prostate gland (FMs) .

Material and Methods: Between 2009 and 2011, 41 patients with prostate cancer were treated with 3DCRT-IG to a dose of 70 Gy 2.5 Gy/fr with daily online correction of the target position based on MV/MV. This group of patients was compared with a similar cohort of 39 patients who were treated between 2012 and 2014 with VMAT-IG to the same prescription dose with daily online correction of the target position based on MV/KV imaging. The clinical characteristics of these two patient populations are shown in Table 1. Radiation Therapy Oncology Group/European Organization for Research and Treatment of Cancer late morbidity RTOG/EORTC scores were used for acute and late effects. The median follow-up time was 3 years (range, 1-6 years). The rectal and bladder dose parameters were also included in the statistical analysis.

Table. 1 Patient characteristics

	3DCRT-IG (n = 41)		IMRT-IG (n = 39)	
Patient demographics	n	%	n	%
Pretreatment PSA (ng/mL)				
< 10	30	73	32	82
10-20	11	24	4	10
>10	0		3	8
Total Gleason Score				
<7	13	31	11	28
7	28	69	21	54
>7	0		7	18
T stage				
T1c-T2a	28	68	25	64
T2b	7	17	10	26
>T2b	6	15	4	10
Age				
< 70	15	37	11	28
>70	26	62	28	72
NCCN risk				
Low	0		8	21
Intermediate	41	100	22	56
High	0		9	23
Neoadjuvant ADT				
Yes	37	90	32	82
No	4	10	7	18

ADT = androgen deprivation therapy; NCCN = National Comprehensive Cancer Network; PSA = prostate-specific antigen.

Results: The rectal acute and late toxicity was low for both treatment groups and no significant reduction was observed for VMAT-IG patients compared with the 3DCRT-IG patients (P = 0.33). The likelihood acute genitourinary toxicity for the VMAT-IG and 3DCRT-IG cohorts were 14.5% and 18.0%, respectively (p = 0.61). Only for ≥ grade 2 acute genitourinary toxicity, the analyses showed a trend better but non significative result on behalf of VMAT-IG (P=0,09). Finally, no significant correlation was observed between the dose parameters and genito-urinary and rectal late toxicity The PSA relapse-free survival in according to Phoenix criteria (nadir plus 2 ng/ml) for 3D-CRT and VMAT were similar (98% vs. 96%; p = 0.34).

Conclusion: Moderate hypofractionated IGRT is associated with a lower rate of genito-urinary and rectal toxicity for both treatment 3D-CRT and VMAT. These data suggest that, the placement of fiducial markers and daily online correction of target positioning may represent the preferred mode of external-beam radiotherapy delivery for the patients treated by definitive radiotherapy.

EP-1370

Stereotactic body radiotherapy in 117 oligometastatic lymph node recurrent prostate cancer patients

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