

Notably, the time from RP to BR was not significant. The probability of 5-yr bRFS was significantly predicted by overall PSADT ( $p < 0.0001$ , by logistic regression), with the optimal cut-off set at 5.79 months (sensitivity=0.67, specificity=0.72) by ROC analysis. The PSADTs, computed at different time points or with a different number of observations were always significantly correlated to the overall PSADT, (Spearman's correlation). However, only the PSADTs computed at  $\geq 9$  months or based on  $\geq 4$  observations emerged as significant predictors of 5-yr bRFS (logistic regression) with most informative cut-offs of 4.6 and 6.58 months, respectively. Finally, the median PSADT increased as a function of time and number of observations, thus suggesting an effect of the dynamic selection of the patients (apparently, those with the poorer prognosis had started SRT earlier). **Conclusions:** Only PSADT calculated  $\geq 9$  months after the first value  $\geq 0.10$  ng/mL and/or on  $\geq 4$  observations resulted to be predictive of the risk of treatment failure following SRT. This may limit its role in selecting patients to be addressed to very early SRT. Of note, our optimal cut-offs ranged from 4.6 to 6.58 months.

#### PO-0709

##### Acute toxicity in post-operative prostate cancer: hypofractionation-vmat versus conventional-3DCRT.

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**Purpose/Objective:** To retrospectively evaluate and compare the incidence of acute genito-urinary (GU), upper gastrointestinal (uGI) and rectal (lGI) injuries of hypofractionation by volumetric modulation arc therapy or VMAT (Hypo-RapidArc group) and conventional fractionation by three dimensional conformal radiotherapy (3DCRT group) in patients with localized prostate cancer treated with prostatic bed irradiation, after radical prostatectomy.

**Materials and Methods:** Between 2007 and 2012, 84 consecutive patients with clinically localized prostate cancer patients submitted to radical prostatectomy were irradiated to prostate bed: 41 with 3DCRT and 43 with VMAT by RapidArc. The median age was 67 and 68.5 years for 3DCRT and Hypo-RapidArc group respectively. The median dose to the prostatic bed was 70 Gy (70 - 76) with 2 Gy per fraction in 3DCRT group and 70Gy (70 - 72,4) with 2.5Gy (2.5 - 2.55) per fraction in the Hypo-RapidArc group. After radical prostatectomy, the median time to RT was 15 and 16 months respectively in 3DCRT and Hypo-RapidArc group. Acute GU, uGI e lGI toxicities after radiation treatment were evaluated using RTOG/EORTC medical scoring system.

**Results:** Acute G2 GU toxicities were better in Hypo-RapidArc group compared to 3DCRT group: 12% versus 17% respectively in the two groups. Inversely, for Acute G2 intestinal toxicities, 3DCRT was well tolerated: for uGI no G2 were found in 3DCRT versus 7% in Hypo-RapidArc group; for lGI G2 toxicities 7% in 3DCRT versus 18% in Hypo-RapidArc group. No G3 or greater toxicities were found in both groups. In both groups the PTV coverage is suitable: PTV mean dose is 99.4 $\pm$ 1.0% and 99.8 $\pm$ 0.9% and V<sub>95%</sub> 96.3 $\pm$ 3.6% and 95.7 $\pm$ 8.9 for 3DCRT and RA group respectively. For 3DCRT group the Rectum received a mean dose of 42.1 $\pm$ 9.4 Gy (with V<sub>65Gy</sub> equal to 26.9 $\pm$ 10.0 %) and the Bladder received 69.3 $\pm$ 17.2Gy in mean (with the V<sub>65Gy</sub> equal to 45.0 $\pm$ 19.5%); and for RA group the dose decreased to 37.2 $\pm$ 5.2 Gy (V<sub>65Gy</sub> 9.6 $\pm$ 5.1%) and 39.2 $\pm$ 13.4 (V<sub>65Gy</sub> 25.2 $\pm$ 14.4%) for Rectum and Bladder.

**Conclusions:** The results of our study of 84 patients have shown that acute G2 GU are reduced using hypofractionation by RapidArc compared to conventional fractionation by 3DCRT, while acute G2 GI toxicities remains significantly better for the last one. Remarkable is the absence of G3 using hypofractionation by RapidArc as well as recorded previously with conventional fractionation by 3DCRT. Longer term data are awaited for late toxicity profiles and clinical efficacy in Hypo-RapidArc group of patients.

#### PO-0710

##### The necessity and effectiveness of adaptive replanning of patients having large prostate rotations

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**Purpose/Objective:** To assess the effectiveness of online monitoring of prostate rotation as an indicator of the need for adaptive replanning in prostate patients treated with IMRT; to evaluate the possibility to predict large interfraction prostate rotations based on rectal filling on the planning CT.

**Materials and Methods:** From a population of 640 prostate cancer patients treated with IMRT combined with online marker-based setup correction, 26 patients who exhibited frequent and large ( $>10^\circ$ ) prostate rotations were selected for a repeat CT scan and adaptive replanning. The effectiveness of adaptive replanning of these patients was assessed by evaluating the relative decrease in the frequency of large prostate rotations. The correlation between rectal filling as determined on the planning CT and the frequency of large prostate rotations was analyzed. Also, for these 26 re-planned patients the second planning CT scan was imported in the initial IMRT plan and the target coverage was evaluated in order to assess the potential impact of no action on this group of patients.

**Results:** For the 26 patients that were re-planned, the frequency of large prostate rotations significantly decreased by 80.7% on average ( $p < 0.001$ ) during the fractions treated with the adapted plan. No significant correlation was found between the rectum volume, cross-section or diameter on the planning CT and the frequency of prostate rotations ( $p > 0.05$ ), however there seems to be a higher risk of large rotations in patients with a rectum diameter larger than 5 cm at the level of the prostate base ( $p = 0.03$ ). If these patients had not been re-planned, due to the systematic change in prostate orientation the PTV coverage would have decreased to 90.2% on average, although the CTV would remain adequately covered for all patients.

**Conclusions:** For prostate cancer patients treated with IMRT combined with fiducial-based online position verification, a relatively simple prostate rotation monitoring protocol is sufficient to select the patients in need of adaptive replanning. Rectal filling on the planning CT scan is not a significant predictor of the frequency of large prostate rotations, although patients with a large diameter of the rectum on the planning CT seem to have a higher chance of having large prostate rotations.

#### PO-0711

##### Radical radiotherapy for prostate cancer in octogenarians: A single centre experience

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**Purpose/Objective:** As male life expectancy increases throughout the developed world the incidence of prostate cancer is also increasing. Better diagnostics and raised public awareness has also contributed to this. A significant survival benefit favouring hormone therapy and radical radiotherapy over hormone therapy alone in locally advanced prostate cancer has been shown in recent studies. Radical radiotherapy technology for prostate cancer has evolved significantly aiming to reduce toxicity to normal tissues. Taking 10 year survival as the standard for assessing the use of radical treatment, we looked at the outcomes of patients who received radical radiotherapy for prostate cancer commencing after their 80<sup>th</sup> birthday.

**Materials and Methods:** Data was collected retrospectively of all patients treated with radical radiotherapy for prostate cancer after their 80<sup>th</sup> birthday at our centre. From 2001 to 2012 a total of 25 patients were suitable for inclusion. Complete data was available for 20 patients. Key measures were patient's prostate cancer risk category, predicted 10 year survival (based on Charlson comorbidity index) and actual disease free survival.

**Results:** The mean age of patients was 80.76 years (range: 80 to 84). Patients received external beam radiotherapy as per local guidelines at a dose of 74 Gray in 37 fractions (80% of cases). Patients treated earlier received treatment doses ranging from 64 Gray in 32 fractions to 70 Gray in 30 fractions. 84% of patients had stage T3 disease, PSA  $\geq$  20ng/ml or Gleason score of  $\geq$  8 making them high risk according to National Institute for Clinical Excellence (NICE) criteria. The remaining patients were categorised as intermediate risk. No patients had nodal or distant metastases on imaging. All patients had a predicted 10 year survival of  $\leq$  2.25%, based on the Charlson comorbidity index. It is known that 4 patients have died. In 2 cases, the cause of death was unrelated; one from primary lung cancer and one from oesophageal cancer. The median disease free survival was 24 months (range: 4 to 104). Median follow-up was 22 months.

**Conclusions:** Patients in this age group have a low 10 year survival even without the presence of prostate cancer. By including intermediate to high risk prostate cancer, as in this series, this becomes even less. However, this 12 year series demonstrates that with careful selection a reasonable disease free survival can be achieved in this group of elderly men. Rather than basing decisions on predicted 10 year survival, radical radiotherapy should be carefully discussed with men over 80 with potentially curable prostate cancer on a patient by patient basis. We intend to create a prospective database of such patients in the future to further investigate the

benefit and toxicity of the addition of radiotherapy over hormones alone in this group.

#### PO-0712

##### Early-stage prostate cancer in patients under 70 years: the curative role of radiotherapy

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**Purpose/Objective:** Prostate cancer patients (pts) under 70 years are more often candidates to surgery rather than radiotherapy (RT). We analyzed the results of  $\leq 70$  years patients with localized disease to demonstrate that RT is a valid alternative to surgery also in younger men.

**Materials and Methods:** From January 1988 to December 2009, 214 pts with T1-2N0M0 prostate cancer were treated with 3-5 fields conformal RT. The median baseline PSA level was 10.4 ng/ml (range 0.2-254), Gleason score (GS) was: 2-6 in 114 pts, 7 in 37 pts, and 8-10 in 18 pts. During the years the dose to the prostate was gradually increased from 60 Gy to 76 Gy. Forty-eight pts (22.4%) received 60-68 Gy and 166 (77.6%) 70-76 Gy in 2 Gy daily fractions. Biochemical failure was defined according to ASTRO consensus criteria. Acute and late toxicity were graded according to the RTOG and EORTC criteria. Moreover we investigated the effects of patient and treatment related risk factors on acute and late toxicity.

**Results:** The median follow-up was 105 months (range 14.2-180). Biochemical relapse occurred in 65 pts (30.4%), local failure in 8 (3.7%), regional failure in 2 (0.9%), distant metastases in 20 (9.3%).

The 5 and 10 year biochemical relapse free survival (bRFS) for all 214 pts were 80 and 61.9% respectively. In univariate analysis initial PSA ( $\leq 10$  vs  $>10$  ng/ml,  $p=0.006$ ) and PSA nadir ( $< 1$  vs  $\geq 1$  ng/ml,  $p=0.023$ ) but not age ( $\leq 65$  vs  $65-70$  years) were significant factors for biochemical relapse. The 5 and 10 years bRFS were 84.4% and 66.7% when PSA nadir was  $< 1$  ng/ml, 60.9% and 43% respectively, when it was  $\geq 1$  ng/ml ( $p<0.001$ ). In multivariate analysis risk factors for biochemical relapse were initial PSA value ( $p<0.001$ ) and radiation dose ( $p=0.05$ ). The mean cancer specific survival (CSS) of all pts was 231.05 months. The CSS rate at 5 and 10 were 98.4% and 93.2% respectively. In univariate analysis for CSS only PSA nadir was a significant factor ( $p<0.001$ ). PSA nadir ( $p=0.019$ ) and low radiation dose ( $p=0.037$ ) were predictive for distant metastases in univariate analysis, while in multivariate analysis only initial PSA was significant ( $p=0.041$ ). The median overall survival (OS) was 160.2 months (range 139.7-180.7). The OS rate at 5 and 10 were 91.8% and 75.8% respectively.

Acute genitourinary (GU) and gastrointestinal (GI) toxicities occurred in 105 (49%) and 98 pts (45.8%), respectively. There were no cases of Grade III or IV GU toxicity. There were 2 cases of Grade III GI toxicity. Late GU and GI toxicities occurred in 17 (7.9%) and 20 (9.3%) patients respectively. There was one patient with Grade III GI toxicity and 2 pts (0.9%) with Grade III GU. Risk factors for late toxicity were age and RT dose and technique while they were not related to acute toxicity.

**Conclusions:** Age  $\leq 70$  years does not consistently confer a negative prognosis in pts with localized prostate cancer. RT appears to be a viable alternative to surgery offering excellent long-term cancer control.

#### PO-0713

##### Salvage post-prostatectomy hypofractionated high dose Tomotherapy with prophylactic whole pelvic irradiation.

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**Purpose/Objective:** Theoretically, moderate dose escalation and prophylactic pelvic lymph-nodal area (PLNA) irradiation could reduce the incidence of treatment failures after salvage radiotherapy for biochemical failure (BF) following radical prostatectomy (RP). Aim of this study was to investigate the toxicity profile and the early clinical outcome of high dose moderately hypofractionated salvage Tomotherapy with PLNA irradiation.

**Materials and Methods:** From 7/2007 to 12/2010, 65 patients (pts) with BF after radical prostatectomy underwent salvage Tomotherapy (TOMOSALV) to the prostatic bed (PB) and prophylactic PLNA irradiation. Patient characteristics: median age 67 years, iPSA 10.29 ng/ml, pathologic stage pT2/pT3a/pT3b 51/8/6; pN0/pNx 57/8, median number of pelvic LN removed 10, positive surgical margins 36, Gleason score 2-6/7/8-10: 17/38/10. Median interval from RP to PSA failure 33.73 months (range 7-127); median PSA doubling time (PSADT) 8.62 months (range 0.53-36.55), median pre-Tomotherapy PSA (PSA@RT) 0.36 ng/mL (range 0,17-8.49). In 6 patients local relapse was biopsy confirmed.

All pts were treated with moderately hypofractionated (28 fractions) simultaneous integrated boost (SIB) technique. The dose to PLNA was 51.8 Gy, 1.85 Gy/fraction. The seminal vesicles bed was always irradiated to 61.6 Gy (2.2 Gy/fraction), while the dose to the PB was 71.4 Gy (72.8 in the case of biopsy confirmed relapse). 21 pts also received adjuvant androgen deprivation (AAD) for a median of 24 months (range 3-37).

**Results:** Median follow-up was 41 months. To date, all pts except one (death from gastric cancer 14 months after RT completion, bNED) are alive. Seven pts (median PSA@RT 0.42 ng/mL, median PSADT 5 months) experienced BF (defined as a single PSA value  $>0.20$  ng/mL after a post-radiotherapy nadir or a continuous rise despite irradiation) 25 months after Tomotherapy end and underwent salvage hormone therapy. In 2 of these pts a clinical relapse (in both lumbosacral LN) was also observed. The 3-year biochemical relapse-free survival (bRFS) was 91%, with no difference between patients receiving or not AAD (91% vs 90%) and with 4/7 relapsed patients who had received AAD. Acute toxicity: 5 Grade 2 (G2) GU, 4 G2 bowel and 7 G2 proctitis. No G3 or G4.

Late toxicity: G $\geq 2$  GU in 19 (29%), 8 G2, 11 G3. Grade  $\geq 2$  proctitis 7 (11%), 3 G2 and 4 G3. Of note, thus far no Grade  $\geq 2$  bowel late sequelae have been observed.

**Conclusions:** This study suggests that timely moderately hypofractionated high dose (EQD2  $\geq 74-76$  Gy) TOMOSALV with prophylactic PLNA irradiation is feasible and burdened by only mild acute and late gastrointestinal side effects, while GU toxicity was not insignificant.

The  $>90\%$  3-year bRFS compares more than favourably with the literature data, suggesting a possible benefit deriving from both PLNA irradiation and moderate dose escalation, though a more refined modelling of factors influencing GU toxicity is needed.

#### PO-0714

##### Choline-pet guided radiotherapy planning in prostate cancer patients

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**Purpose/Objective:** To assess the impact of Choline-PET in treatment planning of prostate cancer (PCa) patients eligible for radiation therapy (RT).

**Materials and Methods:** We prospectively enrolled 20 consecutive patients (mean age 70.4 years, range 58-84) referred to our department for RT planning with radical intent (n=2) or assavage therapy (n=18). Patient were submitted to a single-day protocol, including dedicated CT scan of the pelvis and Choline-PET. Gross-tumor volumes (GTV), clinical-tumor volumes (CTV), planning-tumor volumes (PTV) and organs at risk (OAR) were outlined on CT with Eclipse Varian Medical System software, whereas GTV-PET was defined as areas with pathologic uptake and contoured with PETVCA software on Advantage GE workstation.

**Results:** According to the imaging findings, in 14/20 patients the indication for RT was confirmed: in 2 cases it was limited to the prostatic bed, in 7 cases RT was extended to the entire pelvis, and in 5 patients, treatment was performed on extra-pelvic organs. In 30% of cases (6/20), either a negative scan or evidence of extensive disease at PET addressed patients to other treatment options. Overall Choline-PET determined a modification in patient management in 75% of cases (15/20): in 7 patient the impact was exerted directly in treated volumes, whereas a specific boost in PET-positive lesions was given to 50% of all irradiated patients (7/14).

**Conclusions:** Choline-PET can have a significant impact on RT planning of PCa patients. The influence in therapeutic decision is seen up to 75% of cases, and in 1/3 of patients unnecessary RT can be avoided.