Conclusions: High-dose IG-IMRT was associated with superior PRFS vs. low-dose RT for high-risk PCa. PRFS at 3 years can potentially be used to predict outcome at 4-7 years. The possibility of a minor effect on PRFS by reducing the treatment margin could be discerned. By extrapolation of our model, RT to ca 85-95 Gy in equivalent dose in 2-Gy fractions is predicted to improve PRFS for high-risk PCa, after which the local control plateaus and the benefit diminishes.

PD-0136
Hypoxia biomarkers for prognostic evaluation and the prediction of outcome following prostate radiotherapy
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Purpose/Objective: The dose-response relationship for prostate radiotherapy has been demonstrated in several clinical trials with an advantage for high dose treatments. Established prognostic factors; including tumour stage, Gleason score, and PSA explain only a moderate proportion of the variation in outcome following prostate radiotherapy. There are no reliable predictors to determine which patients are likely to benefit from the extra dose. Prostate cancer exhibits regions of hypoxia with oxygen partial pressures that are likely to have radiobiological significance. The concept of the oxygen enhancement ratio is well established and it is possible that hypoxia biomarkers may predict which patients require dose escalation. We aimed to study the predictive value of intrinsic biomarkers of tumour hypoxia (GLUT1, HIF1α and osteopontin (OPN)) in patients treated with radiotherapy for localised prostate cancer.

Materials and Methods: Paraffin embedded prostate biopsies were collected from patients enrolled into a trial of external beam radiotherapy (EBRT) versus combined EBRT followed by a high dose rate (HDR) brachytherapy boost. Immunohistochemical staining was performed for GLUT1, HIF1α and OPN using monoclonal antibodies. Tumours were assessed for biomarker expression by two independent investigators, blinded to patient outcome and scored as negative or positive depending upon the proportion of cells staining for the marker in question.

Results: 191 samples were included in the analysis. Hif1α, GLUT1 and OPN expression were all significantly associated with a shorter biochemical relapse free interval (see figure and table). High dose radiotherapy (EBRT plus HDR boost) was advantageous over conventional dose radiotherapy (EBRT alone) for patients that exhibited OPN expression (p=0.017) but not for patients with negative OPN staining (p=0.349). Conversely, for GLUT1, high dose radiotherapy was only advantageous over conventional dose radiotherapy for patients that lacked GLUT1 expression (p=0.006).

Conclusions: Overall, expression of OPN, HIF1α or GLUT1 confers a poorer prognosis for patients receiving prostate radiotherapy compared to those that do not express these hypoxia biomarkers. Furthermore, these data generate the following hypothesis: OPN becomes positive in the presence of mild/moderate hypoxia, GLUT1 only becomes positive under conditions of severe hypoxia. Therefore, if both OPN and GLUT1 are negative (i.e. minimal hypoxia), there is no benefit from dose escalation. If OPN is positive and GLUT1 is negative (moderate hypoxia), there is a benefit for dose escalation. However, if GLUT1 is positive (severe hypoxia), there is no benefit from dose escalation because patients will do badly despite very high doses of radiotherapy. Further evaluation using an independent data set is ongoing.

PD-0137
Generation of geometrically adaptable IMAT plans to treat prostate cancer treatment
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Purpose/Objective: Daily location of the target volume has become a usual clinical practice after introduction of portal imaging devices. The actual information on the day of treatment is used to relocate the patient to maximize target coverage. However, relocation is not capable to account for large deformations of structures of interest, and the therapeutic ratio remains lower then desired. We propose a method of generating triple-arc IMAT plans to treat prostate cancer...
patients. The plans allow geometrical ad-hoc adaptation to large interfractal deformations of patient geometry.

**Materials and Methods:** Patients with intermediate or high-risk prostate cancer are normally treated using VMAT technique with Simultaneously Integrated Boost at our department. The CTV is defined as the prostate and the base of seminal vesicles. The Boost (PTV) is obtained by expanding the CTV by 5 (10) mm. Prescription doses to PTV and Boost are respectively 60.1 and 74 Gy given in 33 fractions.

Our method of IMAT for prostate cancer uses three arcs. We analyze the geometry of the structures of interest (PTV and rectum), and generate segments to deliver three fluence steps: conformal (Step 0, first arc), sparing the rectum (Step 1, second arc), and narrow segments compensating for the underdosage in the PTV due to rectum sparing (Step 2, third arc). The width of Step 2 segments is calculated for every MLC leaf pair based on the PTV and rectum geometry in the corresponding CT layer to have best dose homogeneity. The segments are then fed into the DMPO engine of Pinnacle for weight optimization and fine-tuning of the form. We call this method 2-Step IMAT. 2-Step IMAT and reference VMAT plans show highly equivalent target coverage, rectum sparing, and dosimetric quality, with 2-Step IMAT taking on average 230 sec to deliver vs 100 sec for VMAT.

We adapt 2-Step IMAT plans to changed geometry preserving the number of Monitor Units (MU) calculated for each segment at initial geometry. The leaves of Step 0 segments follow the edges of the rectum to keep it spared. For Step 1 segments, the leaves of each MLC leaf pair are then fed into the DMPO engine of Pinnacle for weight optimization and fine-tuning of the form. We call this method 2-Step IMAT. 2-Step IMAT and reference VMAT plans show highly equivalent target coverage, rectum sparing, and dosimetric quality, with 2-Step IMAT taking on average 230 sec to deliver vs 100 sec for VMAT.

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The 2-Step IMAT method delivers prostate plans equivalent to the reference VMAT plans. On the expense of 2-3 longer delivery time 2-Step IMAT plans offer the possibility to adapt to large interfractal changes of patient geometry.

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**OC-0138**

Phase III study of concurrent cisplatin with pemetrexed or vinorelbine and RT for unresectable stage III NSCLC

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**Purpose/Objective:** Concurrent chemoradiotherapy has been a standard treatment for good performance status patients with unresectable stage III non–small cell lung cancer (NSCLC). However, the toxicities were not neglected. To evaluate pemetrexed in combination with cisplatin in these patients, a randomized phase III study of concurrent cisplatin with pemetrexed or vinorelbine and late course accelerated hyperfractionated radiotherapy (LCAHRT) was performed.

**Materials and Methods:** Total of 86 patients were randomly assigned to two concurrent regimens before March 2012. Arm 1 included cisplatin at 25 mg/m2 on days 1-3, 22-24 and vinorelbine at 25 mg/m2 on days 1,8 and 22,29 with concurrent late course accelerated hyperfractionated radiotherapy. Arm 2 used cisplatin at 25 mg/m2 on days 1-3, 22-24 and pemetrexed at 500 mg/m2 on days 1 and 22 with the same radiotherapy protocol. The primary endpoint was overall survival (OS), and secondary endpoints included toxicities. Kaplan-Meier analyses were used to assess survival, and toxic effects were examined using the Pearson Chi-Square test. All statistical tests were two-sided.

**Results:** 84 patients were analyzed for 2 patients in arm 1 were not treated according to the protocol. The mean radiation dose in arms 1-2 was 66.2±7.3 Gy and 67.9±7.4 Gy. 76 patients used 2 cycle concomitant chemotherapy, 4 cases 3 cycles, and 4 ones 1 cycle (3 in arm 1 and 1 in arm 2). Median OS were 23 and 25 months for arm 1 and 2, respectively. To characterize rectum sparing we measure absolute rectum volumes cut out by 95%- , 80%- , and 50%-isodose.

**Conclusions:** Concurrent cisplatin with pemetrexed and LCAHRT was as effective as with vinorelbine for unresectable stage III non–small cell lung cancer, however, the treatment compatibility was better.

**OC-0139**

SBRT for stage I NSCLC: patterns-of-care and outcome analysis in Germany and Austria between 1998 and 2011

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