Patients. The plans allow geometrical ad-hoc adaptation to large interfractional 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 PTV in Beam Eye View to keep PTV conformally irradiated. The leaves of Step 1 segments follow the edges of the rectum to keep it spared. For Step 2 segments, the opening of each leaf pair is adapted to the geometry of the structures of interest (PTV and rectum), and fine-tuning of the form. 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.

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Results: Four adaptation cases have been considered. The ones having best and worst improvement of target coverage between relocated and adapted plan are shown in Fig.1a,b and Tab.1. The target coverage is measured by $S_D$ index which sums up violations of dose requirements for Boost and PTV-Boost:

$$S_D = \sum \left[ \text{if requirement is violated} \right] \left[ \text{otherwise} \right]$$

To characterize rectum sparing we measure absolute rectum volumes cut out by 95%, 80%, and 50%-isodose. The DVHs for the adaptation cases with the best (a) and worst (b) target coverage: dotted - relocation, thin - new optimization, thick - adaptation.

### Table 1. Evaluation for Fig.1.

<table>
<thead>
<tr>
<th>Required</th>
<th>Obtained</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dose (Gy)</td>
<td>56.1</td>
</tr>
<tr>
<td>V50 Gy</td>
<td>32.2</td>
</tr>
<tr>
<td>V50%</td>
<td>33.4</td>
</tr>
</tbody>
</table>

Conclusions: 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 interfractional changes of patient geometry.

### PROFFERED PAPERS: CLINICAL 2: LUNG AND HEAD & NECK

**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. Arm1 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 finished treatment 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 arms 1 & 2, respectively (p=0.224). Concerning toxicities of grade 2 or more in the arms 1 and 2, the white blood cell was 32/41 and 34/42 (p=0.224). Concerning toxicities of grade 2 or more in the arms 1 and 2, the white blood cell was 32/41 and 34/42 (p=0.224). Concerning toxicities of grade 2 or more in the arms 1 and 2, the white blood cell was 32/41 and 34/42 (p=0.224). Concerning toxicities of grade 2 or more in the arms 1 and 2, the white blood cell was 32/41 and 34/42 (p=0.224). Concerning toxicities of grade 2 or more in the arms 1 and 2, the white blood cell was 32/41 and 34/42 (p=0.224). Concerning toxicities of grade 2 or more in the arms 1 and 2, the white blood cell was 32/41 and 34/42 (p=0.224). Concerning toxicities of grade 2 or more in the arms 1 and 2, the white blood cell was 32/41 and 34/42 (p=0.224).

**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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