found. Compared with the LA group, more patients in the AD group were treated with IMRT; 17% vs. 6% (p<0.01), and nodal boost - 22% vs. 13% (p<0.01). For brachytherapy, more patients in the AD group were treated with HDR BT; 66% vs. 52% (p<0.01), combined IC/IS technique - 47% vs. 4% (p<0.01), and MRI based dose planning - 97% vs. 66% (p<0.01). Compared with the LA group, average HR CRTV volume was 6cm³ larger and average D90 for HR CRTV was 9 Gy higher in the AD group (p<0.01). This target dose difference did not result in higher D2cm³, for rectum (p=0.12) or sigmoid (p=0.38) in the AD group. D2cm³ for bladder was on average 4 Gy lower in the AD group (p=0.07) (table 1). At a median follow-up of 40 (3-163) months no significant difference in late actuarial grade 2 to 5 bladder (p=0.03), gastro-intestinal (p=0.81) or vaginal morbidity (p=0.10) was found between the LD and AD groups.

Conclusions: Advanced adaptation with combined IC/IS technique enables delivery of significantly higher radiation doses to the HR CRTV D90 without increasing the D2cm³ to organs at risk or adding more late morbidity to treatment.

OC-0106
Evaluation of an adaptive radiotherapy approach for laryngeal cancer
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Purpose/Objective: In our department, an adaptive radiotherapy protocol is used for laryngeal cancer patients treated with IMRT on the larynx as well as the bilateral (elective) lymph nodes. The goal was to investigate the clinical feasibility and the impact of this protocol.

Materials and Methods: Twenty-seven patients were included. During fraction 1-4 in week 1, and in three fractions in the weeks thereafter, a CBCT was acquired. For each CBCT, an automatic gray value registration based on a fractions in the weeks thereafter, a CBCT was acquired. For each CBCT, an automatic gray value registration based on a

difficult to relate the position of the larynx relative to the PTV and the laryngeal bony structures, after the correction based on the vertebrae. If a displacement of 5 mm or more was seen, the physician was contacted to decide whether or not a new planning CT-scan and adaptive re-planning were required (CTV-PTV margin of 5 mm). The impact of this protocol on larynx set-up variations and resulting margins were assessed.

Results: In a recent study it was demonstrated that due to non-rigid motion in larynx cancer patients, applying the eNAL protocol with once a week follow-up imaging and omitting the above described approach for plan adaptation, a 5 mm CTV-PTV margin for the larynx was not sufficiently large in the cranial-caudal (CC) direction (see Table 1). In the new protocol, apart from three times a week imaging and adaptive re-planning, the patients also got swallowing instructions during CT, CBCT and irradiation. For 11/27 patients one or more new planning CTs were made. This resulted in smaller calculated margins than in the previous study (Table 1). Table 1: Population mean (m), random (s), and systematic (S) set-up errors and calculated CTV-PTV margins.¹

<table>
<thead>
<tr>
<th>Variable</th>
<th>All patients (N=27)</th>
<th>Advanced adaptive brachytherapy (N=900)</th>
<th>Limited adaptive brachytherapy (N=310)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume HR CRTV (cm³)</td>
<td>36±24</td>
<td>39±25</td>
<td>33±24</td>
</tr>
<tr>
<td>HR CRTV D90</td>
<td>88±14</td>
<td>92±13</td>
<td>83±14</td>
</tr>
<tr>
<td>D2cm³ Bladder</td>
<td>81±22</td>
<td>79±12</td>
<td>83±29</td>
</tr>
<tr>
<td>D2cm³ Rectum</td>
<td>64±8</td>
<td>65±7</td>
<td>64±10</td>
</tr>
<tr>
<td>ICRU Rectum</td>
<td>69±4</td>
<td>69±9</td>
<td>69±15</td>
</tr>
<tr>
<td>D2cm³ Sigmoid</td>
<td>65±10</td>
<td>65±7</td>
<td>66±12</td>
</tr>
</tbody>
</table>

Conclusions: Based on a clear decision protocol for the technologists, adaptive treatment of laryngeal cancer patients was successfully implemented in the clinical routine. The approach effectively reduced CTV-PTV-margins. New patients are currently being entered in the study and will be included in the final analyses.
1. IJROBP 2007, 1586-1595
2. IJROBP 2013, 401-406
3. IJROBP 1999, 905-919

OC-0107
Normal tissue sparing in a Phase II trial of daily adaptive plan selection in radiotherapy for urinary bladder cancer
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Purpose/Objective: Large changes in bladder shape and size during a course of radiotherapy (RT) make adaptive RT (ART) appealing in the treatment of this tumor site. We are conducting a multi-center clinical phase II trial of daily plan selection based ART for bladder cancer with the primary aim of reducing gastro-intestinal morbidity due to sparing of the bowel and the rectum. We here report early dose/volume outcomes from the first twenty patients treated in this trial.

Materials and Methods: All twenty patients received 60 Gy in 30 fractions to the bladder; in 13 of the patients the pelvic lymph nodes were simultaneously treated to 48 Gy. Cone-beam CT (CBCT) image guidance was used for daily set-up and treatment was delivered by volumetric modulated arc therapy (VMAT). The first five fractions were delivered using large, population-based margins; the bladder contours from the CBCTs acquired prior to the first four fractions were used to create a library of three plans, corresponding to a small, medium and large size bladder. All patients were from fraction no. 6 treated using daily online plan selection, where the smallest plan covering the bladder was selected prior to each treatment delivery. Volume ratios of PTV for ART vs. non-ART averaged over the treatment course were calculated. DVHs for bowel cavity and rectum were derived by summation of the selected dose plans on the planning CT and these were compared to standard non-adaptive RT plans using population-based margins (20 mm Sup/Ant, 15 mm Post and 10 mm LR and Inf).