but the position of the urethra was seen on some MRI slices and extrapolated on others. Prophylactic alpha-blockers were not given.

Results: Six patients experienced urinary symptoms resulting in an IPSS rise of 14 points or more. Maximal IPSS scores during the follow-up period ranged from 4-35. Mean DHI parameters are shown in the table below.

<table>
<thead>
<tr>
<th>Bladder</th>
<th>Urethra</th>
</tr>
</thead>
<tbody>
<tr>
<td>V40 Gy</td>
<td>V42 Gy</td>
</tr>
<tr>
<td>Mean</td>
<td>14.2 Gy</td>
</tr>
<tr>
<td>D40%</td>
<td>10.1 Gy</td>
</tr>
<tr>
<td>D10cc</td>
<td>38.0 Gy</td>
</tr>
</tbody>
</table>

Table 1: Mean DHI parameters in this series

A significant correlation was found between the volume of urethra receiving 40 Gy (P=0.011) and 42 Gy (P=0.0006) and the maximum IPSS after prostate SBRT. This association remains highly significant (P=0.002) even when adjusted for the baseline IPSS. Patients with a V42 Gy below the mean value (47%) rarely experienced toxicity (2/11 patients) compared with a V42 Gy>47% where 4/7 had a significant IPSS rise. The dose to 10% of the bladder was also correlated with maximal IPSS score (P=0.039). Volume of urethra receiving 45.6 Gy was often 0% and was not correlated with IPSS. For the other bladder parameters tested (D40%, dose to hottest 10cc and 3cc) no significant correlation was observed in this series. Bladder and prostate volume did not predict for symptoms and neither did the IPSS score at baseline.

Conclusions: Prediction of those who will experience acute GU symptoms after prostate SBRT is difficult but appears highly correlated with dose to the urethra. We suggest that keeping the urethral V42Gy<47% may reduce acute urinary morbidity or where this is not possible, the utility of prophylactic alpha-blockers could be examined.

EP-1090
Inter-/intrafraction prostate motion during image guided rapidarc therapy for prostate cancer
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Purpose/Objective: To quantify inter-/intrafraction prostate motion and patient setup variation using kV cone beam CT (CBCT) scans during the course of prostate RapidArc therapy.

Materials and Methods: 1288 weekly CBCT scans were obtained on 161 patients with prostate cancer [MRI stages: T1-2%, T2-22%, T3a-11%, T3b 65%] undergoing high- dose RapidArc therapy (mean total dose: 81.1Gy). Additionally, 528 weekly post-treatment CBCT scans of 66 of these patients were acquired. The CBCT scans were superimposed on the Planning-CT scans by using the Eclipse automatic registration and match algorithm of the EclipseTM planning module version (VARIS Vision 8.6.07). Inter-/intrafraction motion defined by CBCT consists of two components: the prostate movement and the patient setup displacement. Deviations were measured in anteroposterior (AP), right- left (RL), and superior- inferior (SI) directions, as well as rotation angles around the AP axis relative to the isocenter.

Results: The interfraction motion was most significant in AP direction, followed by SI and RL directions. The mean prostate deviation (mean: SD) was 1.7mm ± 1.5mm (max.:15mm), 1.5mm ± 1.4mm (max.: 12mm) and 0.9mm ± 0.8mm (max.:7mm) in the AP and SI and RL directions, respectively. The mean interfraction rotation was 0.8° ±0.6° (max.:4.7°) around the AP axis. The intrafraction motion was significantly smaller; the mean intrafraction displacements were 0.8mm ± 0.7mm (max.: 6mm), 0.7mm ± 0.6mm (max.:4.4mm), and 0.9mm ± 0.7mm (max.:6.6mm) in AP, SI and RL directions, respectively. The mean intrafraction rotation was 0.5°±0.5° (max.:4.7°) around the AP axis. The frequency of interfraction motion was more than 4mm in 5.2%, 5% and 0.7% and more than 5mm in 2.3%, 2.3% and 0.2% of patients in AP, SI and RL directions, respectively. An intrafraction displacement of more than 2mm occurred in 3.5%, 1.2%, 4.2% and more than 3mm in 0.8%,0.2%, 1.5% of measurements in AP, SI and RL directions, respectively. The frequency of inter-/intrafraction rotation was >2° & >3° & >4° & >2.5° in 6.8% / 3.6% and >3° in 2.7% / 1.7% of patients, respectively.

Conclusions: Our findings suggest that the interfraction motion was small and occurred predominantly in AP direction. In contrast, the intrafraction variability seems to be clinically insignificant. The use of cone-beam-CT guided RapidArc allows both an accurate prostate localization and shorter treatment times for dose-escalated irradiation, thus enabling significant margin reduction.

EP-1090
Evidencing prostate margin reduction using fiducial markers and real-time tracking during external beam RT.
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Purpose/Objective: With the development of real time tracking technologies we have the capabilities to conform radiotherapy directly to the target and to account for intra-fraction and during (intra-fraction) treatment delivery providing accurate and effective targeting , allowing us to respond and adapt accordingly. The Calypso™ tracking system is used to localise and track the prostate. This system has been clinical at the proposed site since January 2010 and to date has effectively treated more than 30 patients.

Materials and Methods: Calypso™ is a motion management system that involves inserting 3 Beacon electromagnetic transponders into the prostate. The systems array, tracks and transponders causing them to emit radiofrequency signals. It receives and uses these signals to map their exact location. This information gets sent to the tracking station which verifies treatment isocentre and tracks the movement of the transponders during treatment delivery. To improve treatment delivery, we conducted a study to determine new planning target volume margins for prostate patients’ implanted with fiducial markers and those implanted with electromagnetic transponders. We used the Calypso™ data from the first 20 prostate patients who we localised using 3 skin marker tattoos followed by transponder detection and auto couch repositioning. Intra-fraction organ motion was monitored continuously using the Calypso™ system recording sub-millimetre motion throughout.

Results: A total of 740 fractions were analysed and recommendations for new margins calculated using van Herks formula. The margins for fiducial marker patients are predictably greater than those of the transponder tracking, this takes into account we are unable to correct for intra-fraction motion on the fiducial group. The margin values are currently being verified by an independent statistician to ensure accuracy of calculation, formula use and the recommended guidelines.

Conclusions: Localisation and intra-fraction tracking with Calypso™ and fiducial localisation allows a marked reduction in PTV margins. Although fiducial localisation margins cannot be as tight due to the intra-fractional prostate motion being a limiting factor. Applying these new margins will undoubtedly reduce normal tissue toxicity and side effects commonly seen by this group of patients.

Limitations: The transponders cause voids on MRI follow up scans, tracking system cannot be used in conjunction with artificial hips/metal prosthesis around the pelvic area.

Future: Once the new margins are implemented outcomes data will be collected. Aim to utilise the Calypso tracking™ system on other areas of the body. Study proposal in the use of transponders in the pancreas in line with University Hospital of Pennsylvania.