was 74.2Gy and it ranged from 75.3Gy-77.2Gy in the deformed plans. V65 and V70 of bladder ranged from 7% - 28.3% and 5.7%-24.3% versus 13.7% and 11.5% in the pCT respectively. Prostate D98 and D2 were 75Gy-75.8Gy and 77.2Gy-77.9Gy versus 74.2Gy and 76.2Gy in the pCT. Mean deformed volume of the prostate ranged is 40.6cm³ (35.5-44.4cm³) versus 40.4cm³ in the pCT. Mean centre of mass (COM) shifts of the prostate in the x-y and z directions were -0.02cm, -0.16cm and -0.02cm respectively. Mean bladder volume is 171.4cm³ (83.3-268.9cm³) versus 195.9cm³ in the pCT. Mean centre of volume of contoured structures. The DIR algorithm had performed well in achieving DSC >0.8 for the prostate structure set. Daily dose statistics can also be analysed for evaluation of the delivered doses with consideration of anatomical changes.

Conclusions: SmartAdapt is a useful tool in generating various statistical parameters such as COM shifts, mass and volume of contoured structures. The DIR algorithm had performed well in achieving DSC >0.8 for the prostate structure set. Daily dose statistics can also be analysed for evaluation of the delivered doses with consideration of anatomical changes.

**Purpose/Objective:** Helical Tomotherapy (HT) has the capacity of treating multiple targets continuously in a treatment fraction. In conventional fixed jaw delivery mode, the choice of the field width determines the dose gradient in superior-inferior (SI) direction. A wider field width elevates the dose significantly to normal tissue superior and inferior to PTV. By using the new dynamic jaw technique of HT, there is a potential improvement in the dose gradient and the conformity in the cranio-caudal borders of targets. However, the effectiveness of this dose reduction between targets using dynamic jaw may possibly be affected by the distance between targets in SI direction. In this study, the dosimetric impact and the effectiveness of reducing dose between targets as a function of separation between targets in SI direction using dynamic jaw technique was investigated.

**Materials and Methods:** Two sets of HT plans in fixed and dynamic jaw settings were generated. In each plan, two identical cylindrical targets with 6 cm diameter and 4 cm length in solid water phantom images were used for planning. The targets were aligned along SI direction with separations varied from 3.5 to 1 cm with 0.5 cm decrement in each plan for each mode. All plans were optimized with identical prescription (2 Gy per fraction to 95% of both PTVs) and planning objectives using 2.5 cm fixed and dynamic jaw settings, respectively. The longitudinal dose profiles along the central axis in SI direction were measured for all the plans. The corresponding absolute and relative doses were calculated and compared. All plans were delivered and verified by film dosimetry. The dose distribution at the central coronal plane of the target was measured with EDR2 film sandwiched at the solid water phantom. Measured and calculated dose distributions for each plan were compared using Gamma analysis with criteria of 2% in dose difference and 2 mm in DTA were calculated.

**Results:** Measured dose distributions using films showed good agreements with those calculated by the TPS. The passing rates of Gamma analysis were higher than 90% for all plans. From Fig. 1, the minimum relative dose within the separation along the SI direction normalized with the prescribed dose were increased from 18.9, 32.6, 62.4, 77.8, 94.3 and 100.7 % for 3.5, 3, 2.5, 2, 1.5 and 1 cm separation between targets, respectively, using dynamic jaw mode. It showed that the effectiveness of dose reduction decreased with the decrease in the distance between targets in SI direction. For fixed jaw mode, the corresponding minimum relative dose were increased from 81.9 to 100.8 % for 3.5 to 1 cm separation between targets, respectively.

**Conclusions:** As rapid dose fall-off at the cranio-caudal borders of targets can be achieved using dynamic jaw delivery technique, dose between targets can be reduced significantly compared with fixed jaw delivery. However, it decreased significantly with the decrease in the separation between targets in SI direction.

**Purpose/Objective:** The aim of this study is to evaluate unwanted scattered dose to ovary by scattering and leakage generated from treatment fields of Tomotherapy for childbearing women with breast cancer.

**Materials and Methods:** The radiation treatment plans for childbearing woman with breast cancer were established using Tomotherapy planning system (Tomotherapy, Inc., USA). They were generated by using helical and direct Tomotherapy methods for comparison. The CT images for the planning were scanned with 2.5 mm slice thickness using anthropomorphic phantom (Alderson-Rando phantom, The Phantom Laboratory, USA). The measurement points for the ovary dose were determined at the points laterally 30 cm apart from mid-point of treatment field of the pelvis. The measurements were repeated five times and averaged using glass dosimeters (1.5 mm diameter and 12 mm of length) equipped with low-energy correction filter. The measures dose values were also converted to Organ Equivalent Dose (OED) by the plateau dose-response model.

**Results:** Scattered doses of ovary which were measured based on two methods of Tomo helical and Tomo direct
showed average of 64.94 ± 0.84 mGy and 37.64 ± 1.20 mGy in left ovary part and average of 64.38 ± 1.85 mGy and 32.96 ± 1.11 mGy in right ovary part. This showed when executing Tomotherapy, measured scattered dose of Tomo Helical method which has relatively greater monitor units (MUs) and longer irradiation time are approximately 1.8 times higher than Tomo direct method.

Conclusions: Scattered dose of left and right ovary of childhood cancer patients is lower than ICRP recommended dose which is not seriously worried level against the infertility and secondary cancer occurrence. However, as breast cancer occurrence ages become younger in the future and radiation therapy using high-precision image guidance equipment like Tomotherapy is developed, clinical follow-up studies about the ovary dose of childhood cancer patients would be more required.

EP-1639
Dosimetric comparison of techniques and impact of displacements in lower limb sarcoma radiation therapy
M. Arthurs1, C. Gillham2, E. O'Shea3, E. McCrickard4, M. Leech4
1Applied Radiation Therapy Trinity Research Group, Discipline of Radiation Therapy School of Medicine Trinity College Dublin, Dublin, Ireland Republic of
2St. Luke's Radiation Oncology Network, Radiotherapy Department, Dublin, Ireland Republic of

Purpose/Objective: Radiation therapy (RT) is frequently used as an adjunctive treatment for soft tissue sarcoma of the lower limb. RT carries a risk of long term side effects including limb fibrosis, joint stiffness, lymphoedema and bone fractures. This study compared dosimetric data between 3DCRT and IMRT plans in a population of lower limb sarcoma patients immobilised with an in-house device and quantified the impact of systematic and random errors on these techniques. The dosimetric effect of translational displacements on target coverage and organs at risk (OARs) were considered.

Materials and Methods: Eleven anonymised patients CT data were acquired. Patients had previously been treated with postoperative radiotherapy. A 3DCRT and IMRT plan was created for each patient. Total doses ranged from 60-66 Gy, prescribed at 2 Gy per fraction. The techniques were dosimetrically compared. Population-based systematic errors were applied to 3 fractions of each 3DCRT and IMRT plan. Population-based random errors were applied to 5 fractions of each 3DCRT and IMRT plan. The dose metrics were analysed and the results were compared to the initial plans.

Results: Higher target D95, D2, D98, D50 and the best homogeneity index resulted with IMRT compared to 3DCRT (p<0.01). Maximum bone dose was higher in IMRT than 3DCRT (p=0.0001). Systematic errors increased target D2 in IMRT (p=0.05). Random errors decreased target homogeneity in IMRT (p<0.05), decreased mean dose to bone in both 3DCRT and IMRT, and decreased bone V40 in 3DCRT. Neither random nor systematic errors increased OAR dose for IMRT or 3DCRT plans.

Conclusions: IMRT could become the favoured lower limb sarcoma radiation therapy technique due to superior target coverage and homogeneity. However, higher bone Dmax seen with IMRT compared to 3DCRT potentially increases the risk of late bone toxicity. Offline imaging can accurately correct for systematic translational errors in these patients when an in-house immobilisation device is used. Results would indicate that to maintain target homogeneity in IMRT, daily online imaging would be required to reduce the effects of random displacements as well as quantifying daily rotations. Rotational displacements should be simulated in further study, as rotations may potentially have a further dosimetric effect on target coverage and OARs if not corrected for.

EP-1640
Comparison of time-benefit ratio between in vivo dosimetry and pre-treatment verification in IMRT breast treatment
S. Bermejo1, N. Ventosa1, X. Domenech1, R. Flores1, G. Gómez de Segura1, J. Jimenez1, X. Nolla1, L. San Martin1, P. Carrasco1, A. Latorre2
1Hospital de la Santa Creu i Sant Pau, Servei d’Oncologia Radioteràpica, Barcelona, Spain
2Hospital de la Santa Creu i Sant Pau, Servei de Radiologia i Radioprotecció, Barcelona, Spain

Purpose/Objective: Pre-treatment verifications of IMRT treatments are routinely performed by measuring the absorbed dose at a representative point in a water-equivalent phantom using an ionization chamber. We evaluated the added value of performing entrance dose in vivo dosimetry (IVD) using diodes in breast treatments delivered using a SIB-IMRT technique.

Materials and Methods: We studied 14 breast treatments delivered by a Clinac 2100C/D using a 6MV photon beam SIB-IMRT technique and the RPM system (Varian) for respiratory motion management. For pre-treatment verifications, we recorded ionization chamber measurements and treatment planning system calculations (Eclipse; Varian) both for per-beam and integral dose at the measurement point. We also measured the time it took to perform the verifications. For each radiation field, the physicist selected 2 representative points at high and/or homogeneous fluence regions. We recorded the coordinates of these points and corresponding calculated entrance doses. Entrance dose IVD was performed

Table 1: Dosimetric comparison of 3DCRT and IMRT plans

<table>
<thead>
<tr>
<th>Variable</th>
<th>3DCRT</th>
<th>IMRT</th>
<th>Planned therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>DVH (cGy)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D95</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D98</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V40</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: DVH = dose-volume histogram; IVD = in vivo dosimetry; IMRT = image-guided radiation therapy; SIB = stereotactic body radiotherapy; 3DCRT = 3-D conformal radiotherapy; D2 = dose received by 2% of the volume; D95 = dose received by 95% of the volume; D50 = dose received by 50% of the volume; DO = dose received by 0.1% of the volume.

Conclusions: The time-benefit ratio between in vivo dosimetry and pre-treatment verification in IMRT breast treatment is beneficial, as IVD can confirm the accuracy of the treatment plan and reduce the time required for pre-treatment verifications.