Conclusion: A substantial reduction of the dose to the contralateral hippocampus is technically feasible when VMAT is used instead of our standard 3D-CRT planning strategy. The amount of sparing that can be achieved strongly depends on the individual patient geometry. Whether this approach is able to conserve the neurocognitive status without compromising the oncological outcome for patients with glioblastoma needs to be investigated in the setting of prospective clinical trials.

EP-1674
Should VMAT be routinely applied to treat sacral bone metastases?
V. Soyer1, B. Corn1, Y. Meir1, N. Honig1, N. Straus1
1The Tel Aviv Sorsky Medical Center, Radiation Oncology, Tel Aviv, Israel

Purpose or Objective: Bone metastases are a frequent and disturbing complication of cancer. The challenge of optimizing dose coverage of the concave shape of the sacrum along with its close proximity to the rectum, intestines and femoral heads lead us to investigate whether the VMAT technique is advantageous when compared to 3D treatment.

Material and Methods: Twenty three consecutively treated patients with sacral metastases in 2013-2014 were included in a comparative treatment-planning study evaluating VMAT and 3-D planning. The statistical analyses included the T-test, assuming Unequal Variance (one tail). Calculation of the p-value for the comparative results applied. Our null hypothesis was that VMAT is better than 3D technique, and our alternative hypothesis was that 3D technique is superior to VMAT.

Results: The PTV coverage was identical in VMAT and 3D planning. Median values and V15 for the intestinal exposure showed no statistically significant difference between the 3D planning and VMAT: 9.28 Gy (SD 2.25) and 47.0 ml (SD 68.62) versus 8.97 Gy (SD 2.18) and 18.45 ml (SD 69.56), respectively. However, on an individual per case assessment it appears that the lower exposure of the bowel depends on the small bowel/sacrum volumes ratio. The benefit for VMAT emerges if such a ratio exceeds one. The median values for the rectum 3D and VMAT were 11.34 Gy (SD 5.14) and 7.7 Gy (SD 2.76), respectively. The median 3D and VMAT exposure of the femoral head were 1.78 (SD 2.94) Vs 4.006 (SD 2.1) on the left and 1.74 (0.9) Vs 4.26 (SD 1.8) on the right side for the 3D and VMAT, respectively.

Conclusion: Good sacral coverage is achievable with either 3D or VMAT approaches. VMAT is advantageous vis-à-vis the rectal exposure and when relatively large amounts of small bowel course through an individual patient’s fields. The 3-D approach, however, retains benefit for femoral protection, a finding that may have implications for patients with arthritis and osteopenia.

EP-1675
Total body irradiation with Tomotherapy
E. Simón1, 2,3, F. Izar1, G. Moliner1, M. Barides2,3, R. Ferrand1
1Institut Universitaire du Cancer de Toulouse - Oncopole, Department of Medical Physics, Toulouse, France
2INSERM, CRT-UMR1037, Toulouse, France
3Université Toulouse III Paul Sabatier, UMR 1037, Toulouse, France

Purpose or Objective: In Conventional Radiotherapy (CRT), Total Body Irradiation (TBI) is generally performed at long Source Skin Distance using diodes to drive the delivered dose. The dose distribution is usually not well assessed (measured only in a few points) and was shown to be strongly heterogeneous. This technique also leads to acute and late toxicity. Helical Tomotherapy (Accuray Inc., Sunnyvale, CA) for TBI is implemented in some centers. Compared to CRT, Tomotherapy allows the delivery of the prescribed dose with a high level of accuracy and homogeneity. Organs-at-risk can be spared and the dose distribution is known before the treatment. Two technical issues have to be solved. First, the patient must be treated using two plans, head first (HF) and feet first (FF) due to limited supero-inferior (SI) table motion. At the junction of these two plans, the dose must be delivered with particular care. Moreover, the planning target volume (PTV) is the entire body, including the skin. A safety margin in the air surrounding the body should be added to take into account setup errors. Using inverse planning, however, can result in over-fluctuation peaks in the skin region. The aim of this work is to present our solution for these two issues, our optimized planning protocol and our clinical results after one year of practice (outcome for 15 patients).

Material and Methods: Patient treatment position is shown hereafter. Thermoplastic masks are placed on the head and the thorax (not the legs). Two CTs are acquired (HF and FF). At the planning station, the whole body (cropped 3 mm under the skin) is divided into 10 PTVs. At the junction (halfway up the thighs), 4 PTVs (thickness 2 cm) are drawn to deliver the dose with the degraded penumbra methodology: decreased dose is delivered during HF plan and increased dose during FF plan. Different sets of doses were tested. The resulting dose distribution in the presence of simulated set-up errors (SSUE) is computed to find the combination that insures optimal dose coverage of the junction. Moreover, to insure dose coverage of legs in presence of SSUE, several Virtual Boluses (VB) were tested. A VB is a bolus added at planning, but not present during treatment. Several thicknesses and densities were tested on a phantom study: in presence of SSUE, the dose coverage and dose increase (due to the methodology) were assessed.

Results: The best combination of PTV doses at the junction is presented in table: V95% stays higher than 96% even in the case of a SSUE of 1 cm (SI). The optimal VB is an 8 mm thick VB (density=0.4). This allows a good coverage (V95%-95%) for a large lateral SSUE (up to 2.9 cm). Underestimation of dose using this VB (planning vs measure) is 1.5%.

<table>
<thead>
<tr>
<th>Dose plan HF</th>
<th>Dose plan FF</th>
<th>Total Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slice 1</td>
<td>10.74</td>
<td>1.26</td>
</tr>
<tr>
<td>Slice 2</td>
<td>7.56</td>
<td>4.44</td>
</tr>
<tr>
<td>Slice 3</td>
<td>4.44</td>
<td>7.56</td>
</tr>
<tr>
<td>Slice 4</td>
<td>1.92</td>
<td>10.00</td>
</tr>
</tbody>
</table>

Conclusion: This study presents our optimized planning parameters. Since November 2014, 15 patients were treated with a dose of 2 or 12 Gy. Dose to lungs was limited to 9 Gy.