was the most expensive. Over time, as rapid prototyping innovates, this method will become easier, more efficient, and increasingly available with a greater choice of materials and vendors. Until then, this process is useful now for a few small and irregular sites in the head and neck region, but routine and widespread application will not benefit most patients.

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### 3756

**Interobserver Variability and Dosimetric Impact in Structure Delineation of Organs at Risk on Cone Beam CT**

O. Wong,1 A.L. McNiven,1,2 B. Chan,3 J. Lee,3 J.L. Moseley,1 C. Ren,1 S.V. Bratman,1,3 A.J. Hope,1 J.P. Bissonnette,1,3 J.N. Waldron,1,2 B. Zhang,1,2 and M.E. Giuliani1,2

1Princess Margaret Cancer Centre, Toronto, ON, Canada, 2University of Toronto, Toronto, ON, Canada, 3University of California, Los Angeles, Los Angeles, CA

**Purpose/Objective(s):** The purpose of this study was to evaluate the feasibility of contouring organs at risk (OAR) relevant for potential adaptation decisions on cone beam CT (CBCT) and to determine the variability in inter-observer delineation and its dosimetric impact. The contours were compared to automatically deformed contours to assess the feasibility of utilizing deformed contours clinically. The accuracy of deformable registration has been highly investigated but how that may influence dose is rarely addressed yet important to consider prior to clinical utilization.

**Materials/Methods:** Images and contours from three patients were evaluated. The planning CTs with original contours and CBCT images (fraction 10) from two separate image guidance systems (XVI and OBI) were imported into RayStation v4.5.2. Five observers delineated 15 OARs on each image set, while blinded to all other delineated volumes. A 4-point Likert scale survey was administered for subjective confidence in contours.

**Results:** The mean DICE of automatically deformed contours is comparable to the DICE of contours delineated by observers. The brainstem, spinal cord and parotid glands achieved a DICE of 0.8 with automated contours. The dosimetric impact of contour delineation is small suggesting that it is feasible to use automatically deformed contours in the dose accumulation process. The interaction of site and dose distribution with these metrics warrants further investigation.


### 3757

**Cochlea-Sparing Acoustic Neuroma Treatment with 4T: Radiation Therapy**

K. Woods,1 T.B. Kaprelian,1 P. Lee,2 and K. Sheng1

1T. David Geffen School of Medicine at UCLA, Los Angeles, CA, 2Dept. of Radiation Oncology, UCLA, Los Angeles, CA, 3University of California, Los Angeles, Los Angeles, CA

**Purpose/Objective(s):** There are 2-3 thousand new cases of acoustic neuroma each year, about 25% of which are treated with radiation therapy. Following treatment many patients experience complications such as tinnitus, otitis, or sensorineural hearing loss, and there is some evidence that these side effects are associated with radiation dose to the cochlea.

This study investigates whether 4T radiotherapy can better spare the cochlea and consequently reduce normal tissue complications in acoustic neuroma patients.

**Materials/Methods:** Clinical radiotherapy plans for 30 acoustic neuroma patients were included in this study (14 SRS, 6 SRT, 10 IMRT). 4T plans were created for each patient consisting of 20 optimal beams selected using a greedy column generation approach, with the dose recalculated in Eclipse for accurate comparison. The planning goal was to reduce the cochlear dose while maintaining or reducing the dose to other organs at risk (OARs). The 4T plans were normalized to match the PTV coverage of the clinical plans (95-100% of the 12-54 Gy prescription doses). The average maximum and mean OAR doses were compared, as well as the the volume receiving 50% of the prescription dose (V50%), the homogeneity index (HI), and the van’t Riet conformity number (CN). The tumor control probability (TCP) was calculated using the Poisson-based model, and the Lyman-Kutcher-Burman normal tissue complication probability (NTCP) was calculated for tinnitus and sensorineural hearing loss (SNHL).

**Results:** The 4T plans significantly reduced the mean dose to both cochlea, as well as the mean and maximum brainstem dose. The mean doses to the chiasm, eyes, lenses, and optical nerves were reduced by 20-54% on average with 4T. The clinical and 4T plans had approximately the same average HI (0.93), CN (0.72), and TCP, but the average NTCP values for both tinnitus and SNHL were significantly lower with 4T.

**Conclusion:** Compared to conventional clinical planning methods, optimized 4T radiotherapy enables significant sparing of the cochlea in acoustic neuroma treatment. This could potentially reduce the risk of normal tissue complications such as tinnitus and sensorineural hearing loss in all radiation treatment modalities, but particularly with single fraction stereotactic radiosurgery.

**Author Disclosure:** K. Woods: None. T.B. Kaprelian: Honoraria; UCLA Medical Education Program Melanoma Management. P. Lee: Honoraria; ViewRay Medical Systems, Inc.; Committee Co-Chair. K. Sheng: Independent Contractor; Varian.

### Abstract 3757: Mean organ at risk doses (Gy) and treatment outcome probabilities

<table>
<thead>
<tr>
<th>Plan Type</th>
<th>Brainstem</th>
<th>Chiasm</th>
<th>Cochlea (SRS)</th>
<th>Cochlea (SRT)</th>
<th>Cochlea (IMRT)</th>
<th>V50% (cm²)</th>
<th>TCP</th>
<th>NTCP (Tinnitus)</th>
<th>NTCP (SNHL)</th>
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<tr>
<td>Clinical</td>
<td>6.56</td>
<td>2.16</td>
<td>5.8</td>
<td>17.2</td>
<td>25.9</td>
<td>24.88</td>
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<tr>
<td>4T</td>
<td>5.43*</td>
<td>1.31</td>
<td>4.1*</td>
<td>12.7*</td>
<td>16.6*</td>
<td>25.00</td>
<td>77.6%</td>
<td>12.5%*</td>
<td>0.3%*</td>
</tr>
</tbody>
</table>

*Statistically significant difference from the clinical plans (two-tailed t-test, p < 0.05)