Correlation of Local Failure with Measures of Dose Insufficiency in the High-dose Single-fraction Treatment of Bony Metastases

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Purpose:
The probability of local control of metastatic spinal and paraspinal lesions using high dose single fraction image-guided radiotherapy has been shown to be dependent on the prescription dose, with a dose response between 18 Gy and 24 Gy reported.

Methods and Materials:
• Between 7/2003 and 01/2011, 419 single fraction treatments were given to 329 patients with metastatic spinal and paraspinal tumors.
• We examined the correlation of local failure with measures of dose insufficiency: the minimum dose delivered to the hottest 95%, 98% and 100% of the GTV (D95, D98, Dmin) and the percent vol receiving at least 95% of the prescription dose (V95).
• In this preliminary analysis, 18 failures and 207 randomly chosen from 401 locally controlled cases have been analyzed.

Results:

<table>
<thead>
<tr>
<th>Histology</th>
<th>Dmin (cGy)</th>
<th>D98 (cGy)</th>
<th>D95 (cGy)</th>
<th>V95 (%)</th>
<th>GTV Vol cc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Failure</td>
<td>1341</td>
<td>1809</td>
<td>1994</td>
<td>89.9</td>
<td>35.9</td>
</tr>
<tr>
<td>Local Control</td>
<td>1637</td>
<td>2013</td>
<td>2179</td>
<td>94.3</td>
<td>28.5</td>
</tr>
<tr>
<td>P-value</td>
<td>0.0032</td>
<td>0.012</td>
<td>0.008</td>
<td>0.002</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Conclusions:
• Indicators of dose insufficiency Dmin, D98, D95, and V95 may be important risk factors for local failure.
• Risk of local failure with Dmin < 15 Gy is approximately 4X that with Dmin ≥ 15 Gy.