Survival Patterns of 5750 Stereotactic Radiosurgery-Treated Patients with Brain Metastasis as a Function of the Number of Lesions

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Disclosure

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Introduction

- Brain metastases are the most common form of intracranial malignancy
- Treatment is accomplished with stereotactic radiosurgery (SRS), whole-brain radiotherapy (WBRT), or surgery
- Choice of therapy depends on the size, location, and number of brain metastases (BMs)
- The number of BMs is especially important in choosing between SRS and WBRT
- Limited information is currently available on the relationship between the number of BMs and survival in patients receiving SRS
Methods

- This is a multi-institutional retrospective cohort study of BM patients treated with SRS without surgical resection.
- We aimed to assess the relationship between survival and number of SRS-treated BMs.
- We categorized the number of BMs as 1, 2-4, 5-10, and >10 BMs.
- We used Kaplan-Meier and multivariable Cox proportional hazards analyses to assess survival.
- We controlled for age, sex, race, year of diagnosis, cumulative intracranial tumor volume (CITV), and tumor location.
Results

- There were 5,750 patients treated with SRS for BM between 1994 and 2014 at four institutions.

- Median overall survival (mOS) was affected by number of BMs:
  - Best with 1 BM (1 BM 7.1: months vs. 2-4 BM: 6.4 months, P=0.009)
  - No difference between 2-4 and 5-10 (2-4 BM: 6.4 months vs. 5-10 BM: 6.3 months, P=0.170)
  - Worst for >10 BMs (2-10 BM: 6.3 months vs. >10 BM: 5.5 months, P=0.025)

- Multivariable Cox proportional hazards models:
  - Step-wise increase in the hazard of death by 5% for every increment of 5-6 BMs (P < 0.001)
### Table 1

**Table 1. Median OS as a function of the number of BMs**

<table>
<thead>
<tr>
<th>Number of BMs</th>
<th>Median OS (months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7.1</td>
</tr>
<tr>
<td>2-4</td>
<td>6.4</td>
</tr>
<tr>
<td>5-10</td>
<td>6.3</td>
</tr>
<tr>
<td>&gt;10</td>
<td>5.5</td>
</tr>
</tbody>
</table>

### Table 2

**Table 2. Results of multivariable Cox proportional hazards model adjusted for age, sex, race, year of diagnosis, CITV, and tumor location**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Comparison (reference to non-reference)</th>
<th>Hazard ratio</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of BMs</td>
<td>1 to 2-4</td>
<td>1.103</td>
<td>0.005</td>
</tr>
<tr>
<td></td>
<td>2-4 to 5-10</td>
<td>1.015</td>
<td>0.692</td>
</tr>
<tr>
<td></td>
<td>5-10 to &gt;10</td>
<td>1.117</td>
<td>0.014</td>
</tr>
</tbody>
</table>
Figure 1

Figure 1. Kaplan-Meier curves as a function of the number of BMs. The best survival is seen in patients with 1 BM, followed by 2-10, and the worst is with >10 BM.
Discussion

- The contribution of BM number to overall survival is modest
- The number of BMs should be considered when deciding between SRS and WBRT
  - It should not take precedence over other established factors
  - It should be considered in the greater clinical context when making treatment decisions
- Poor survival with many BMs was independent of CITV
  - CITV was the more important predictor of survival
  - However, given the same CITV, a patient with few tumors is expected to survive longer than a patient with many tumors
Summary Points

- Patients with many BMs have poorer survival compared to those with fewer BMs.
- This effect is modest, but should be taken into consideration in treatment planning.
- Even for patients with the same intracranial tumor volume, a greater number of BMs portends a worse prognosis.