Quantifying Extent of Resection Thresholds for Increased Survival in Elderly Patients with Glioblastoma

Poster ID: 42582

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Disclosures

- The authors have no relationships to disclose and report no conflicts of interest concerning the findings specified in this abstract.
Introduction

- Although the extent of resection (EOR) in Glioblastoma Multiforme (GBM) patients has been confirmed as a significant prognostic factor, EOR and survival studies specifically in elderly patients is limited.
- According to the American Brain Tumor Association, over 12,000 cases are predicted to be confirmed in 2017 in the United States.
- The median survival time across various studies is 14.6 months, but the elderly population is reported to have shorter survival times - in one study reported to be 7.2 months.
- The goal of this study was to establish an extent of resection threshold of GBM in elderly patients for increased survival.
Methods

- This retrospective cohort study included 40 consecutive elderly patients (>70 years old) with glioblastoma who underwent index resection at the Hospital of The University of Pennsylvania between May 2013 and December 2016.

- Volumetric analysis was performed using semi-automated segmentation on all patients based on preoperative T1-contrast (T1c) and postoperative T1 & T1c MRI scans obtained within 48 hours after surgery.

- The following variables were analyzed using Univariate CPHM, Multivariate CPHM & Propensity Scores:
  - Age, gender, preoperative volume, postoperative volume, EOR, tumor location (graded by eloquence), preoperative KPS Score, postoperative KPS score, chemoradiotherapy, readmission status within 30 days of surgery, hypertension, diabetes, immunohistochemical staining of p53 (positive vs negative), epidermal growth factor receptor (EGFR, positive versus negative), GFAP protein (positive vs. negative), mutated isocitrate dehydrogenase 1 (IDH1-R132H, present versus absent), and MGMT methylation status.
Results

- The median overall survival was 6.18 months. The median overall survival for the individual EOR groups were as follows: < 70% - 5.45 months, 70 – 80% - 6.54 months, 80 – 90% - 6.85 months, 90 – 95% - 11.66 months, and >95% - 16.39 months.
While a survival advantage was seen between most EOR groups, no statistical significant survival advantage was found when the GTR (>95%) group was compared to the 90 – 95% EOR group. Multivariate analysis demonstrated the same trends.

<table>
<thead>
<tr>
<th>Extent of Resection</th>
<th>Survival Time (months)</th>
<th>Univariate CPHM</th>
<th>Multivariate CPHM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><em>Log-Rank Test</em></td>
<td><em>Univariate</em></td>
<td><em>Multivariate</em></td>
</tr>
<tr>
<td>&gt; 95%</td>
<td>Median (Range)</td>
<td>P-Value</td>
<td>HR (95% CI)</td>
</tr>
<tr>
<td></td>
<td>16.39 (4.7-27.7)</td>
<td>REF</td>
<td>1.0</td>
</tr>
<tr>
<td>90- 95%</td>
<td>11.66 (3.1 – 24.15)</td>
<td>.211</td>
<td>2.98 (.49 – 22.66)</td>
</tr>
<tr>
<td>80 – 90 %</td>
<td>6.85 (1.05-21.5)</td>
<td>.0268</td>
<td>4.96 (1.97 – 33.29)</td>
</tr>
<tr>
<td>70 – 80 %</td>
<td>6.54 (4.33-8.75)</td>
<td>.0028</td>
<td>11.14 (1.32 – 94.04)</td>
</tr>
<tr>
<td>&lt; 70 %</td>
<td>5.45 (4.07 – 6.18)</td>
<td>.0021</td>
<td>9.88 (1.83 – 74.49)</td>
</tr>
</tbody>
</table>
After univariate screening, a multivariate analysis was performed using a forward stepwise selection technique with $p = 0.05$ as the threshold for statistical significance. Chemoradiotherapy, postoperative KPS, EOR, and KI Index (inversely) remained as statistically significant variables for GBM survival in this analysis.
Additionally, this study found a survival advantage at resection threshold of 80%

Propensity score analysis was also used to predict the outcome of surgical treatment (i.e. EOR group) given underlying covariates and to confirm the comparability of different groups
- Box-plot charts and their corresponding overlap confirmed that the different categories were comparable
Discussion

- Outcomes following glioblastoma resection in the elderly have not been as extensively studied when compared to younger populations.

- In our study, 19 patients (47.5%) had postoperative KPS scores that were either the same or increased compared to preoperative measures. Our study showed a significant increase in survival with the presence of radiation and/or chemoradiotherapy, with the largest hazard ratio (HR= 19.75).

- We found a forward stepwise improvement in survival with greater extents of resection. Interestingly, our study showed no statistically significant improvement in survival between the 90 – 95 % group and the >95% EOR group.
Summary

- This study supports preexisting evidence that there is an association between extent of resection and survival time, and confirms that this association is valid in elderly patients.
- 80% resection is associated with a statistically significant association with increased survival, and a stepwise improvement in survival is seen with increased resection.
- In addition to the maximum resection of the enhancing portion of the lesion, chemoradiotherapy, postoperative KPS, EOR, and Ki index are associated with lengthened survival and should be considered when determining a treatment plan.