ABSTRACT

Background: For patients with few metastatic brain lesions, management options include surgical resection or GammaKnife Radiosurgery (GKS). For lesions >2cm, it is unknown whether surgery or radiosurgery is more effective. We performed a retrospective review to assess outcomes of patients treated with either surgery or radiation using GKS.

Methods: We assessed patients from 2008 to 2017, treated at our institution for intracranial metastases ≥ 4cc (~2cm diameter). Information collected included age, performance status, primary site of malignancy, lesion volume, dates of intervention, relapse at treated intracranial site, and last follow-up or date of death. There were 173 patients, with a total of 196 lesions treated. Fifty-four patients (29%) underwent surgical resection, while 142 (72%) were treated with GKS. The median age of patients was 61 years. The median tumor volume was 7.65cc (range: 4.0 – 49.1cc). The most common primary site was lung (54%), followed by breast (13%), other, which included but was not limited to kidney, skin, liver, colon (21%) and unknown (12%). Outcomes assessed were local brain recurrence, distant brain failure, and overall survival.

Results: Median follow-up times were 5.6 months for surgery and 6.2 months for GKS. The patient characteristics were well balanced. There was no significant difference in local recurrence between the two arms (GKS: 15%, surgery: 19%, p=0.60). Median survival favored GKS, but was not statistically significant (GKS: 10.2 months, surgery: 7.3 months, p=0.28). Patients with low ECOG performance status (≤1) were more likely to be treated with GKS (71% vs. 29% respectively, p=0.0044). Percent of distant intracranial failures was higher in patients treated with GKS as compared to surgery, albeit not significant (26% vs. 11% respectively, p=0.07).

Conclusions: We did not find any difference in treatment failure or survival between surgery and GKS for patients with brain metastases over 4cc. However, there was a trend of better local control and survival for GKS over surgery. Our data shows GKS preference in patients with favorable performance status.

BACKGROUND

• Treatment options for patients with larger metastatic lesions include surgical resection or GammaKnife Radiosurgery (GKS).
• However, the survival benefit and outcomes of one over the other have yet to be elucidated for patients with large brain metastases.

OBJECTIVE

Assess and compare outcomes and prognostic factors for patients with brain metastases >2 cm in diameter treated with either surgical resection or GKS.

METHODS


Excluded patients with primary brain cancers and/or no follow-up data available.

Two cohorts were created:
- Patients treated with surgical resection: n=54
- Patients treated with GKS: n=142

Primary malignancies included lung (54%), breast (13%), other, which included but was not limited to kidney, skin, liver, colon (21%) and unknown (12%).

Maximum tumor volume in either cohort was 41.6cc for GKS arm and 40.1cc in surgical arm.

SURVIVAL ANALYSIS

<table>
<thead>
<tr>
<th></th>
<th>GKS</th>
<th>Surgery</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median Survival (in months)</td>
<td>10.2</td>
<td>7.3</td>
<td>0.28</td>
</tr>
<tr>
<td>ECOG Performance Status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low (0,1)</td>
<td>10.3</td>
<td>8.5</td>
<td>0.67</td>
</tr>
<tr>
<td>High (2,3,4)</td>
<td>3.6</td>
<td>7.3</td>
<td>0.21</td>
</tr>
</tbody>
</table>

ANALYSIS OF TREATMENT GROUPS

Patient Characteristics
- No SS difference seen with regard to:
  - Age (p=0.15)
  - Extracranial extent of disease (p=0.50)
  - Performance status (p=0.24)
  - Primary site of disease (p=0.37)
- Mean tumor volume was slightly higher for lesions treated with surgery:
  - 11.8cc versus 9.6cc for GKS (p=0.12)
- Patients undergoing GKS more likely to have lower ECOG PS (0,1)
  - 71% versus 41% of surgery patients, p=0.008***

Survival and Recurrence Outcomes
- Trend for higher percent recurrence at other intracranial site for lesions treated with GKS than surgery: 26 + 11%, respectively (p=0.07)
- No statistically significant differences seen with regard to:
  - Percent deaths between cohorts (p=0.89)
  - Rates of local, treated site recurrence between GKS and surgery (p=0.52)

RESULTS

CONCLUSIONS

Our institutional review of 200+ patients with metastatic brain lesions 4cc treated with either surgical resection GKS revealed:

1. Trend for larger tumors more likely to be treated with surgery.
This may be due to higher risk of brain radionecrosis for larger lesions treated with GKS.

2. 3 month increase in median survival for patients treated with GKS.
While not statistically significant, survival curves begin to separate after ~ 10 months.

3. Patients undergoing GKS more likely to have lower ECOG PS.
This could be due to the fact that patients who have significant decrease in PS due to neurologic sequelae from their metastases usually require urgent decompressive surgery.

4. No difference in recurrence rates at treated intracranial site.
GKS appears to be no different than surgery with regard to control of the treated lesions.

Figure 1: Survival Probability for Patients with Low ECOG Performance Status.