Quantitative Assessment of Peritumoral Edema Surrounding Meningiomas Predicts Functional Outcomes in Older Patients

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RESULTS

A disproportionally higher incidence of meningioma exists in older adults, affecting up to 0.1% vs. 0.03% of younger adults. In older patients, surgical resection is associated with increased risk of complications and functional deficits.

Thus, there is a need for pre-operative prognostic markers that can identify those with the highest risk prior to tumor resection.

For instance, peritumoral edema (PTE), which has been implicated with poorer surgical outcomes and increased difficulty of resection, may represent such a pre-operative risk marker in older patients.

BACKGROUND

Medical records of 112 older patients (age ≥ 60 years) with an intracranial meningioma and evidence of PTE on MRI were reviewed.

Extent of PTE, measured as a ratio of edema to tumor volume (Edema index, EI) using image-processing software, was correlated with post-resection outcomes including surgical complications, tumor recurrence, and functional decline) using multivariate analysis.

A receiver operative curve (ROC) analysis identified cut-off EI values to predict post-operative outcomes.

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Table 1. Multivariate analysis on decreased KPS at each follow-up interval

<table>
<thead>
<tr>
<th>Follow-up Interval</th>
<th>Edema Index</th>
<th>Tumor Vol</th>
<th>Prior CVA</th>
<th>Proc. Status</th>
<th>EI Predicted Lower KPS (OR's)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 Months</td>
<td>1.97</td>
<td>1.34</td>
<td>3.07</td>
<td>1.01</td>
<td>1.34-2.53, p's &lt; 0.05</td>
</tr>
<tr>
<td>1 Year</td>
<td>2.00</td>
<td>1.94</td>
<td>3.07</td>
<td>1.50</td>
<td>1.34-2.53, p's &lt; 0.05</td>
</tr>
<tr>
<td>2 Year</td>
<td>2.00</td>
<td>1.94</td>
<td>3.07</td>
<td>1.50</td>
<td>1.34-2.53, p's &lt; 0.05</td>
</tr>
<tr>
<td>5 Year</td>
<td>2.00</td>
<td>1.94</td>
<td>3.07</td>
<td>1.50</td>
<td>1.34-2.53, p's &lt; 0.05</td>
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</tbody>
</table>

CONCLUSIONS

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Figure 1. Representative semi-automatic segmentation slicing for tumor and peritumoral edema volumes

Figure 2. ROC curve analysis on KPS score with associated optimal edema index (EI) at each follow-up interval

EI predicted lower KPS at each follow-up interval (OR's = 1.34-2.53, p’s < 0.05)

Optimal EI cut-off values ranged from 2.01-3.37 on ROC analysis. Sensitivities ranged from 68-89%, positive predictive values from 38-58%, and negative predictive values from 80-97%