Evaluation of scoring systems and prognostic factors in patients with spinal metastases from nasopharyngeal carcinoma

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Introduction

- Treatment options for spinal metastases in Nasopharyngeal carcinoma (NPC) patients include chemotherapy, radiotherapy and surgery.
- Surgical treatment however is indicated for patients who are expected to benefit from surgery and in whom life expectancy is at least 6 months.
- Various prognostic scoring systems have been devised to guide the treatment of patients with spinal metastases.
- Prognostic Scoring systems include:
  - Modified Tokuhashi Score
  - Tomita Score
  - Baeur Score
  - Oswestry Risk Index
- None of the above scoring systems have been validated in NPC.
Aim

- To investigate whether survival in NPC with spinal metastases can be predicted by the above mentioned scoring systems
- To investigate Prognostic factors for survival in NPC

Data Collection

All patients, who were treated at our institution, with histologically proven NPC with Spinal Metastases
NPC was assigned a primary site of tumour score of:

- 2 in Tokuhashi A (others)
- 5 in Tokuhashi B

Modified Tokuhashi Score

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>General condition (performance status)</td>
<td></td>
</tr>
<tr>
<td>Poor (PS 10%-40%)</td>
<td>0</td>
</tr>
<tr>
<td>Moderate (PS 50%-70%)</td>
<td>1</td>
</tr>
<tr>
<td>Good (PS 80%-100%)</td>
<td>2</td>
</tr>
<tr>
<td>No. of extraspinal bone metastases foci</td>
<td></td>
</tr>
<tr>
<td>≥3</td>
<td>0</td>
</tr>
<tr>
<td>1-2</td>
<td>1</td>
</tr>
<tr>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>No. of metastases in the vertebral body</td>
<td></td>
</tr>
<tr>
<td>≥3</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Metastases to the major internal organs</td>
<td></td>
</tr>
<tr>
<td>Unremovable</td>
<td>0</td>
</tr>
<tr>
<td>Removable</td>
<td>1</td>
</tr>
<tr>
<td>No metastases</td>
<td>2</td>
</tr>
<tr>
<td>Primary site of the cancer</td>
<td></td>
</tr>
<tr>
<td>Lung, osteosarcoma, stomach, bladder, esophagus, pancreas</td>
<td>0</td>
</tr>
<tr>
<td>Liver, gallbladder, unidentified</td>
<td>1</td>
</tr>
<tr>
<td>Others</td>
<td>2</td>
</tr>
<tr>
<td>Kidney, uterus</td>
<td>3</td>
</tr>
<tr>
<td>Rectum</td>
<td>4</td>
</tr>
<tr>
<td>Thyroid, breast, prostate, carcincoid tumor</td>
<td>5</td>
</tr>
<tr>
<td>Palsy</td>
<td></td>
</tr>
<tr>
<td>Complete (Frankel A, B)</td>
<td>0</td>
</tr>
<tr>
<td>Incomplete (Frankel C, D)</td>
<td>1</td>
</tr>
<tr>
<td>None (Frankel E)</td>
<td>2</td>
</tr>
</tbody>
</table>

Criteria of predicted prognosis: Total Score (TS) 0-8 = ≥6 mo; TS 9-11 = ≥6 mo; TS 12-15 = 1 yr.
**Tomita Score**

- NPC was scored as
  - **Tomita A** - Moderate growth tumour
  - **Tomita B** - Slow growth tumour

<table>
<thead>
<tr>
<th>Scoring system</th>
<th>Prognostic factors</th>
<th>Treatment goal</th>
<th>Surgical strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Point</td>
<td>Primary tumor</td>
<td>Visceral mets.</td>
<td>Bone mets.</td>
</tr>
<tr>
<td>1</td>
<td>Slow growth (breast, thyroid, etc.)</td>
<td>Solitary or isolated</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Moderate growth (kidney, uterus, etc.)</td>
<td>Treatable</td>
<td>Multiple</td>
</tr>
<tr>
<td>4</td>
<td>Rapid growth (lung, stomach, etc.)</td>
<td>Un-treatable</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Modified Baeur

<table>
<thead>
<tr>
<th>Modified Bauer scoring system</th>
<th>Total score</th>
<th>Median OS (months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) no visceral metastases</td>
<td>0-1</td>
<td>4.8</td>
</tr>
<tr>
<td>(2) solitary skeletal metastasis</td>
<td>2</td>
<td>18.2</td>
</tr>
<tr>
<td>(3) no lung cancer</td>
<td>3-4</td>
<td>28.4</td>
</tr>
</tbody>
</table>

(1) – (4): one point each if applicable

- NPC was scored as
  - Baeur A – 0 points for Primary Tumour
  - Baeur B- 1 point for Primary Tumour
Oswestry Risk Index

NPC was scored as a

- Oswestry A – Moderate growth tumour
- Oswestry B - Slow growth tumour 1
Outcome

- **Survival** – Median Survival of 13 months (1-120)
  - 0-6 months - 28 (32.18%)
  - 6-12 months- 7 (8.05%)
  - >12 months - 52 (69.77%)

- **Treatment**
  - Conservative- 50 (57.47%)
  - Radiotherapy- 30 (34.48%)
  - Surgery- 7 (8.05%)
## Univariate and Multivariate Analyses of Clinical Parameters

<table>
<thead>
<tr>
<th>Clinical Parameters</th>
<th>Univariate Analysis</th>
<th>Multivariate Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hazard Ratio</td>
<td>P-value</td>
</tr>
<tr>
<td><strong>General Condition (KPS)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate vs Poor</td>
<td>0.74</td>
<td>0.55</td>
</tr>
<tr>
<td>Good vs Poor</td>
<td>0.12</td>
<td>&lt;0.01*</td>
</tr>
<tr>
<td><strong>No. of extraspinal bone metastases foci</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solitary vs multiple</td>
<td>0.50</td>
<td>0.15</td>
</tr>
<tr>
<td>None vs multiple</td>
<td>0.35</td>
<td>0.03*</td>
</tr>
<tr>
<td><strong>No. of vertebral metastases</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two vs multiple</td>
<td>0.26</td>
<td>0.01*</td>
</tr>
<tr>
<td>One vs multiple</td>
<td>0.33</td>
<td>0.02*</td>
</tr>
<tr>
<td><strong>Metastases to major internal organs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Removable vs unremovable</td>
<td>0.57</td>
<td>0.44</td>
</tr>
<tr>
<td>No metastases vs unremovable</td>
<td>0.27</td>
<td>&lt;0.01*</td>
</tr>
<tr>
<td><strong>Palsy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incomplete vs complete</td>
<td></td>
<td></td>
</tr>
<tr>
<td>None vs complete</td>
<td>1.23</td>
<td>0.69</td>
</tr>
<tr>
<td>Pathological fracture</td>
<td>0.69</td>
<td>0.30</td>
</tr>
<tr>
<td>Age</td>
<td>0.99</td>
<td>0.77</td>
</tr>
<tr>
<td>Sex</td>
<td>1.06</td>
<td>0.89</td>
</tr>
<tr>
<td>Race</td>
<td>1.03</td>
<td>0.95</td>
</tr>
</tbody>
</table>
Modified Tokuhashi

Kaplan-Meier survival estimates

Survival Rate

Score 12-15
Score 9-11
Score 0-8

0.00 0.25 0.50 0.75 1.00

0 50 100 150

Months

Kaplan-Meier survival estimates

Survival Rate

Score 12-15
Score 9-11
Score 0-8

0.00 0.25 0.50 0.75 1.00

0 50 100 150

Months

Correlation between actual survival and predicted survival

Tokuhashi A $\rightarrow$ $p=0.034$

Tokuhashi B $\rightarrow$ $p=<0.001$
Correlation between actual survival and predicted survival

- **Tomita A** $\rightarrow$ $p = 0.091$
- **Tomita B** $\rightarrow$ $p=0.084$
Modified Baeur

Kaplan-Meier survival estimates

Survival Rate

Score 3-4
Score 2
Score 0-1

0.00 0.25 0.50 0.75 1.00

0 50 100 150
Months

Kaplan-Meier survival estimates

Survival Rate

Score 3-4
Score 2

0.00 0.25 0.50 0.75 1.00

0 50 100 150
Months

Correlation between actual survival and predicted survival

Bauer A → p = 0.017

Bauer B → p = 0.012
Oswestry Risk Index

Correlation between actual survival and predicted survival

Oswestry A → p= 0.017

Oswestry B → p=0.012
Predictive Probability

Modified Tokuhashi

Tomita

Modified Bauer

Oswestry Risk Index

p=0.07

p=0.007

p=0.033

P=0.013
Conclusion

- NPC is a primary tumour with a good prognosis
- Modified Tokuhashi score B appears to be the most predictive scoring system

Prognostic Factors for survival
- General condition of patient
- Number of Vertebral Metastases
- Number of spinal metastases

None of the authors has any potential conflict of interest