



## Predicting Survival in Patients with Spinal Metastatic Disease: A New Survival Index

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### Introduction

Spinal metastases have high variability in morbidity and mortality. Existing prognostic scoring systems, including the Tomita and Tokuhashi scores, have limited predictive value for survival of these patients. To improve the prediction of outcomes from treatments, for patients with spinal metastases, we have developed a survival index with superior prognostic value.

### Methods

A retrospective analysis on 81 surgically treated patients with similar pre-operative parameters [inclusive of cord compression causing symptoms, excluding those with more than two levels locally symptomatic, and more than two discrete sites causing spinal cord compression] who received surgery for metastatic tumors to the spine. A survival index (Jenkins Survival Index, JSI) was derived from several preoperative assessments, including ambulation and functional indices and tumor burden assessments of six organ systems, to determine predictive value, compared to the scores of Tomita and Tokuhashi.

### Results

Pre-operative lung tumor burden (a 0-3 score) and Hauser ambulation index (HAI, 0-9 score) were predictors of survival ( $p=.0025$ ,  $p<.0001$ ). Using a "machine learning" algorithm, the JSI was found to be optimized by combining the HAI score and four times the lung tumor burden score (JSI, 0-21). The JSI was most significantly associated with survival time ( $Rho=0.588$ ,  $P<0.0001$ ) with superior positive predictive value compared to either Tokuhashi and Tomita scales as well as several other existing indices of tumor, tissue diagnosis, or co-morbidities.

### Conclusions

The JSI predicts survival for patients with a subset significant spinal metastases. This will allow physicians treating this subset of patients to better make treatment decisions and to identify the factors that are most influential in their care. We will validate our system to patients in a larger pool of oncology patients suffering from a more broad degree of metastatic disease, with or without spinal involvement, but in the interim, for patients with a similar degree of spinal involvement, this index can be more predictive than any other existing index.

#### Learning Objectives

What factors predict survival in patients with symptomatic spinal metastatic disease?

#### References