

Scoring Systems in Vertebral Metastases –A Review

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Why is this important?

Cases of spinal metastases in Ireland have increased by 182% from 1994-2012

It's a big problem

On Whom Should We Operate?

Numerous systems have been developed attempting to identify those patients who would most benefit surgical intervention

Our Question:

"Is any one scoring system superior?"

Traditional vs. Innovative

- The traditional model for assessing surgical candidacy was estimating survival
- The Spine Oncology Study Group have more recently suggested quantifying instability as an alternative
- While the new Spinal Instability Neoplastic Score represents a novel approach to assessing surgical candidacy, its future role is as yet undefined

• Methods

- Systematic search of pubmed/google scholar/embase for all scoring systems for vertebral metastases
- Search terms included all combinations of:
 - "scoring system" or "score"
 - "metastatic" or "metastases"
 - "vertebral" or "spine"
- Selection criteria for detailed discussion are outlined in Table 1.
- Scoring systems selected for review are outlined in Table 2.

Table 1. Selection Criteria for Scoring Systems in Vertebral Metastases
Clinically Utility/User Friendliness
Contributes to Decision re: Surgical Candidacy
Validation in the Literature
Examined by Literature/Updated since 2006
Robust Derivation Methods & Data

Tokuhashi & Tomita

Both of these systems place a strong emphasis on the primary tumour and number of metastases

The Tokuhashi and Tomita scores have more literature examining their accuracy than any other

While the Tokuhashi score edges the Tomita in terms of accuracy, it has twice as many parameters and is resource intensive

Modified Bauer

This contains five parameters and is relatively simple to calculate

It has the best accuracy rates in the literature.

However, this is skewed slightly as its survival categories are broad, making it technically more accurate at categorising patients, but in reality less precise

OSRI

This is a more mathematically based model using sophisticated statistical methods to develop an "index of risk"

The authors propose it is better at accounting for variation between patients samples

While the OSRI is more complex to calculate, it demands minimum resources, requiring only primary tumour type and Karnofsky index for calculation

Van der Linden

This is a robustly validated score which considers Karnofsky performance index, primary tumour and visceral metastases within it calculation

However it was designed to select candidacy for radiotherapy and none of the derivation/validation cohort had significant neurological involvement or spinal instability

It therefore may be of limited value to Spinal Surgeons

Rades

Designed for patients with established cord compression
Helps identify patients who benefit from a longer course of chemotherapy

Katigiri

Predicts survival for patients with bony metastases at any site
Only score which includes patients who had prior chemotherapy
Only a small number from the derivation sample underwent surgery and therefore may be of limited application to patients with vertebral metastases

Spinal Instability Neoplastic Score

Represents a novel approach when considering surgical candidacy in patients with vertebral metastases
Derived from "best available" literature and expert opinion
Difficult to validate as predicts likelihood of an event which should ideally not occur

Table 2. Scoring Systems Selected for Detailed Review

Tokuhashi
Tomita
Modified Bauer
Oswestry Spinal Risk Index (OSRI)
Van der Linden
Rades
Katigiri
Spinal Instability Neoplastic Score

The Need for Scoring Systems

Modern practice demands scoring systems that can be used not only as a clinical adjunct in decision making but also for comparative audits and multi-centre research

The large number of scorings systems for a relatively specific pathology, reflects the desire for such an instrument and also the failure of any one scoring system to meet these requirements

A Move Towards Customised Scores

There has been a recent trend towards modifying any one of the above scoring systems for one particular primary subtype e.g. Renal, Lung
Ultimately each scoring system grapples with the task of developing a model that is both easily computable and also accurate across a myriad of scenarios

Staying Contemporary

Oncologic treatments and investigations continually evolve dynamically

It is challenging for any scoring system to remain current in this environment

Conclusion

The most consistent finding by the literature is that while individual scoring systems may not enjoy high accuracy across entirety of this spectrum, they are an invaluable resource when considering candidacy for surgical intervention

No one system has demonstrated superiority over any of other, however with regards to survival prediction the Tokuhashi, Tomita and modified Bauer have the most robust validation data and all have comparable predictive performance

The future role of the SINS has yet to be determined