

Comparison of prognostic scales for patients with metastatic spine disease

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Abstract

This is one-centre retrospective study with the aim to identify the scale, which provides the most accurate prediction of life expectancy in patients with metastatic lesions in spine. A retrospective analysis of clinical data of 138 patients with metastatic spinal tumors. Patients underwent spinal cord decompression and instrumented stabilization of affected area. We evaluated the general condition according to the Karnofsky and ECOG scales, the presence of metastases in the visceral organs, spine and other bones, the neurological status and conduction of the medical therapy before spinal surgery. Observed clinical parameters were converted to Tokuhashi, Tomita, and Katagiri scales. For statistical analysis, software environment R 3.4.1 was used. Assessment of prognostic accuracy was performed using ROC analysis. The Tokuhashi scale showed AUC 0.605 (95% CI 0.586-0.616), Tomita scale showed AUC 0.708 (95% CI 0.573-0.842), Katagiri scale showed AUC 0.650 (95% CI 0.508-0.792). The best results for survival rate predicting after surgical treatment for metastatic spinal lesions were shown the Tomita scale.

Introduction

Metastatic spine disease is a frequent complication of cancer. Metastases in the spinal column occur in 3–5% of all patients with cancer (breast, prostate and lung cancer are leading) and may cause pain, vertebral collapse and spinal cord compression.¹ It is consider that one of the main tasks of surgical treatment is should be local control of the tumor growth.² That is way, multidisciplinary approach is often used to

determine range of surgical intervention with participation of oncologists and spinal surgeons.³ At the same time, a number of prognostic scales have been developed to determine patient life expectancy with secondary changes in the spine column.⁴ Taking in account the life expectancy obtained by these scales, it helps with establishing of more appropriate surgical intervention.

The objective

To identify the scale, which provides the most accurate prediction of life expectancy in retrospective group of patients with metastatic lesions in spine.

Materials and Methods

A retrospective analysis of 138 patients with metastatic spinal tumors, whom were performed surgical treatment during the period from 2011 on 2014. Among them 36 men, 102 women. The median age was 57 (95% CI 56-59) years. Patients underwent decompression of nerve elements and column stabilization, which consisted in resection of the tumor compressing spinal cord, as well as instrumental stabilization of the spine (Figure 1).

We evaluated the general condition according to the Karnofsky and ECOG scales, the presence of metastases in the visceral organs, spine and other bones, the neurological status and conduction of the medical therapy before spinal surgery. Observed parameters listed were converted to Tokuhashi, Tomita, and Katagiri scales.

In addition, the overall survival rates of patients after spinal surgery were studied. To assess the prognostic accuracy of the scales, a patient survival period of 12 months was chosen. For statistical analysis, software environment R 3.4.1 was used. Assessment of prognostic accuracy was performed using ROC analysis.

Results

In our study, 64 of 138 patients lived more than 12 months after spinal surgery. The median of overall survival rate was 13 months.

Spinal metastases developed against the background of breast cancer (n=86), lung (n=16), colon (n=10), kidney (n=6), skin (n=6), uterine body (n=4), prostate (n=4), stomach (n=4), liver (n=2). General characteristics are listed in Table 1.

The Tokuhashi scale showed AUC 0.605 (95% CI 0.586 - 0.616). The Tomita scale

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showed AUC 0.708 (95% CI 0.573-0.842).The Katagiri scale showed AUC 0.650 (95% CI 0.508-0.792). The results are shown in Figure 2.

Discussion

Destruction of the spinal column elements against the background of metastatic damage can lead to loss of bone support and development of nerve elements compression. Clinically, it is manifested by intense pain and neurological deficit, which leads to daily activities limitation and decreasing of the life quality.¹ In addition, developing of the spine metastasis implies a common tumor process, life expectancy and possible treatment options in this situation are limited.⁵ Estimating of the life expectancy at this patients is crucial for surgical treatment consideration.³

Most authors believe, that for patients with survival rate more than 12 months, it is

more convenient to perform total tumor removal to minimize the risk of the local recurrence.⁶

In our study, 64 of 138 patients lived more than 12 months after spinal surgery. The median of overall survival rate was 13 months.

In the ROC analysis, the area under the curve (AUC) was calculated for each prognostic scale. The Tokuhashi scale showed AUC 0.605 (95% CI 0.586 - 0.616). The Tokuhashi scale contains 6 items: general condition, histology type of the tumor, the presence of the visceral metastases and in other parts of the skeleton, as well as a neurological deficit. The Tokuhashi *et al.* (2005) established that the sensitivity of the scale was 87.9%, that is slightly below of the data, which we got.⁷

The Tomita scale showed AUC 0.708 (95% CI 0.573-0.842), which we considered the best result. The Tomita *et al.* (2001) is based on an analysis of outcomes in 67 patients and proposed a system for survival rate prognosis.⁶ His scale provides an assessment of the tumor histological type, the presence of visceral and spinal metastases.

The Katagiri scale showed AUC 0.650 (95% CI 0.508-0.792). In addition to assessing the general state, the tumor histology structure, the presence of metastasis in other parts of the skeleton, Katagiri *et al.* (2005) suggested evaluating drug therapy.⁸ Systemic therapy is the basis

for the cancer treatment with a common process in the body. However, the Katagiri scale showed the worst result in our study. Due to the fact, that only one third of patients (32%) received no medication prior to surgery on the vertebral column.

surgical treatment for metastatic spinal lesions were shown the Tomita scale. We are not pretending to use the Tomita scale as the best tool for accurate prediction of life expectancy in patients with metastatic lesions in spine. The main reason of this study is to make an emphasis for this neoplastic life-threatening condition and the need for conducting future multicenter studies. We hope this article will provoke the interest of this problem and international cooperation for detecting precise tools for managing this type of patients.

Conclusions

In our retrospective study we observed best results for survival rate predicting after

Table 1. General characteristics of patient population. With numerals are marked amount of patients, except the median age (is shown with 95%CI).

		Median age 57 (95% CI 56-59)	
Male		Female	
36		102	
Type	Tomita classification Patients		
1		3	
2		44	
3		31	
4		33	
5		22	
6		5	
7		0	
Primary tumor localization	Patients	Tumor stage	Previous systemic therapy
Breast	86	IV	27
Lung	16	IV	7
Colon	10	IV	3
Kidney	6	IV	1
Skin	6	IV	1
Uterine body	4	IV	1
Prostate	4	IV	2
Stomach	4	IV	1
Liver	2	IV	1

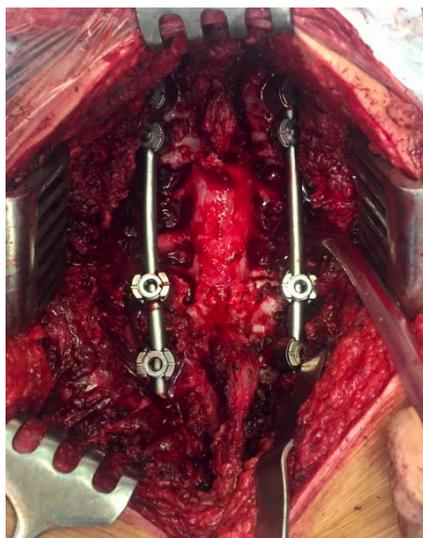


Figure 1. Intraoperative photography. Spinal decompression Th10, Th11, Th12 segments and transpedicular fixation. Patient male, 47 years, with multiple metastasis of renal carcinoma.

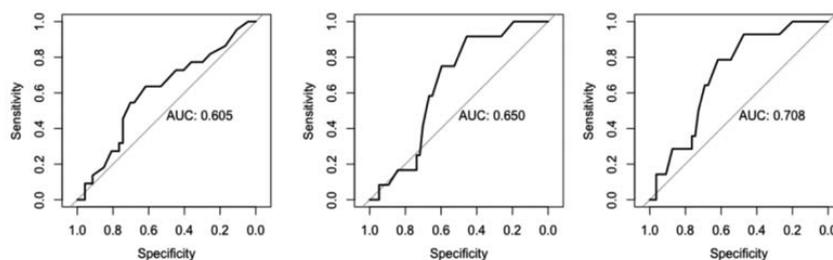


Figure 2. ROC analysis of Tokuhashi (first), Katagiri (second), Tomita (third) scales.

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