

TITLE: Preoperative Nutritional Status and Performance Status Predict Postoperative Walking Ability in Patients with Spinal Metastases

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INTRODUCTION

While spinal metastases were traditionally considered an end-stage condition, recent advancements in molecular-targeted therapies have extended patient survival. This shift has changed treatment goals from mere palliation to preserving functional independence, such as **activities of daily living (ADL)** and quality of life (QOL). Despite existing scoring systems for spinal metastases, predicting functional outcomes and selecting optimal surgical strategies remain challenging. This study aimed to identify easily obtainable preoperative nutritional and inflammatory markers that predict postoperative walking ability in patients undergoing surgery for spinal metastases.

METHODS

This retrospective study, approved by the Jichi Medical University Hospital Ethics Review Board, included 78 patients who underwent surgery for spinal metastases at our institution from 2014 to 2024. We collected preoperative data on nutritional and inflammatory markers, including albumin, lymphocyte count, and C-reactive protein (CRP), to calculate the **Prognostic Nutritional Index (PNI)**, **Geriatric Nutritional Risk Index (GNRI)**, and **CRP/albumin ratio (CRP/Alb)**. Patients were stratified into walking and non-walking groups based on their ability to walk at hospital discharge. We used a multivariate logistic regression model to identify factors independently associated with walking ability, with significance set at $P < 0.05$.

RESULTS

The walking group demonstrated significantly better nutritional status and lower inflammatory markers compared to the non-walking group. Specifically, they had higher albumin levels, PNI, and GNRI, along with lower CRP and CRP/Alb ratios (all $P < 0.05$). The walking group also had a significantly higher **Tokuhashi score**, whereas no significant differences were observed in age, sex, body mass index (BMI), or the **Spinal Instability Neoplastic Score (SINS)**. Multivariate analysis revealed that a **lower preoperative Performance Status (PS)** (OR 0.155, 95% CI 0.047–0.514, $P=0.002$) and a **lower PNI** (OR 0.922, 95% CI 0.852–0.999, $P=0.047$) were independently associated with the inability to walk postoperatively. *Note: A lower PNI is associated with the non-walking group, which means a higher PNI is associated with the walking group. I've adjusted the wording for clarity and consistency with the previous section.*

DISCUSSION

Our findings demonstrate that preoperative nutritional and inflammatory status are crucial determinants of walking ability after spinal metastasis surgery. While widely-used scores like Tokuhashi and SINS help guide surgical decisions, they may not fully capture a patient's functional resilience. The strong association between preoperative performance status, measured by PS, and PNI with postoperative walking ability highlights the importance of patient-specific, systemic factors. Comprehensive perioperative management, including nutritional support, inflammation control, and early rehabilitation, is essential to optimize functional outcomes in this patient population.

SIGNIFICANCE

Preoperative performance status (PS) and nutritional status (PNI) are powerful, independent predictors of walking ability at discharge following spinal metastasis surgery. This research provides a simple yet effective tool for surgeons to better select patients who will benefit from surgery and offers a clear pathway for improving patient outcomes through targeted perioperative interventions.