Original article

Automated Bone Scan Index as Predictors of Survival in Prostate Cancer

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Abstract

Prostate cancer (PCa) is the second most diagnosed cancer in men. Early diagnosis and right management of PCa is critical to reducing deaths; the life expectancy is the main factors to be considered in the management of PCa. Among patients who die from PCa, the incidence of skeletal involvement appears to be >85%. Bone scan (BS) is the most common method for monitoring bone metastases in patients with PCa. The extent of bone metastasis was also associated with patient survival until now there is no clinically useful technique for measuring bone tumors and includes this information in the risk assessment. An alternative approach is to calculate a BS index (BSI) and it has shown clinical significance as a prognostic imaging biomarker. Some computer-assisted diagnosis (CAD) systems have been developed to measure BSI and are now available. The aim of this study was to investigate automated BSI (aBSI) measurements as predictors' survival in PCa. Retrospectively cohort studied fifty patients with PCa who had undergone BS between January 2010 and December 2011 at our institution. All data collected was updated up to August 2016. CAD system analyzing BS images to automatically compute BSI measurements. Patients were stratified into three BSI categories BSI value 0, BSI value ≤ 1 and BSI value >1. Kaplan–Meier estimates of the survival function and the log-rank test were used to indicate a significant difference between groups stratified in accordance with the BSI values. A total of 35 subjects deaths were registered, with a median survival time 36 months after the follow-up BS of 5 years. Subjects with low aBSI value had longer overall survival in comparison with the other subjects ($P = 0.004$). aBSI measurements were shown to be a strong prognostic survival indicator in PCa; survival is poor in high-BSI value.

Keywords: Artificial neural networks, bone metastases, bone scan, bone scan index, computer-assisted diagnosis, prostate cancer, survival analysis

Introduction

Prostate cancer (PCa) has become the second leading cause of cancer death in the majority of western countries,[1] and there is also a trend toward an increasing number of PCa deaths in Indonesia. Among patients who die from PCa, the incidence of skeletal involvement appears to be >85%.[2]

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In patients with PCa, bone scan (BS) is the most frequently used imaging technique for detecting or identifying bone metastases, and it is also used to evaluate changes in metastatic spread involving bone tissues.[3] Scher showed that BS is more likely than other variables to identify bone lesion as stable disease, even when those variables indicate a beneficial response.[4,5]

The BS index (BSI) is a recently validated imaging biomarker and the most objective quantification method currently available for measuring tumor burden in

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