

Bone Scan Index validated using 18F-PET/CT in Prostate Cancer Patients

John Ly¹, Eskil Jönsson¹, Poul-Erik Braad², Peter Grupe², Poul Flemming Hoiland-Carlsen², Per Wollmer¹, Lars Edenbrandt¹

¹Dept. of Clinical Sciences, Skåne University Hospital, Malmö, Sweden

²Dept. of Nuclear Medicine, Odense University Hospital, Odense, Denmark

Objectives

Bone scan index (BSI) is a method to quantify the percentage of the skeleton affected by tumor mass on a whole-body bone scan. BSI can be used to predict survival and to monitor patients with prostate cancer. The analysis uses as input the two-dimensional bone scan images for the estimation of skeletal involvement, which is of three-dimensional nature. The purpose of this study was to validate the two dimensional BSI method using a corresponding analysis of 18F-PET/CT images in prostate cancer patients.

Method

Eleven prostate cancer patients who had undergone both a whole-body bone scintigraphy (750 MBq Tc-99m MDP) and an 18F-fluoride-PET/CT were studied. BSI was calculated using the automated software EXINI bone (EXINI Diagnostics AB, Lund Sweden). A custom program was developed for the quantification of skeletal involvement in the 18F-PET/CT images. The program uses the CT images to identify, segment and quantify the skeletal volume. Abnormal 18F-fluoride uptake is automatically detected, segmented and its involvement of the total skeleton is calculated. The metastases automatically detected by the EXINI bone program were used to calculate BSI, and the corresponding abnormal uptake in the 18F-fluoride-PET/CT images were manually selected for the calculation of a corresponding "PET/CT-BSI".

Results

BSI ranged from 0.03-1.88 (mean 0.51) and PET/CT-BSI from 0.04 to 1.49 (mean 0.43). Linear regression analysis showed a correlation of $r=0.98$. A total of 55 metastases were included from the eleven patients. For the individual metastases, linear regression analysis showed a correlation of $r=0.56$ between the two BSI methods.

Conclusions

The two dimensional BSI method based on whole-body bone scans correlate relatively well with the three dimensional PET/CT-BSI method on a patient level. A discrepancy in skeletal involvement between the two methods could be expected because of the added dimension in PET/CT. These findings show the feasibility of using the two dimensional bone scans to estimate BSI even though the tumor burden is three-dimensional by nature.

