Prognostic Value of Bone Scan Index in Patients with Prostate Cancer receiving Androgen Deprivation Therapy

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Background and Objective

- **Bone scintigraphy (Bone Scan):** Bone scans are image studies commonly used to assess metastatic spread to the skeleton.
- **Bone Scan Index (BSI)** is a quantitative measurement that reflects the extension of tumor in bone as a percent of the total skeletal mass calculated from Bone Scans.
- **What can we use it for?** BSI is a prognostic biomarker that can be used to prognose survival in prostate cancer (PCa) patients.
- **Why is it more interesting now?** Recently, an automated method to calculate BSI was developed, which makes it feasible to use in clinical routine.
- **Which is the purpose of this study?** To evaluate the prognostic value of BSI as an outcome measure in high-risk PCa patients during androgen deprivation therapy (ADT).

Bone Scan Index– BSI

BSI is an Imaging biomarker that reflects the tumor burden in bone as a percent of the total skeletal mass.

At diagnosis — BSI= 1.1
After hormonal therapy — BSI= 1.4
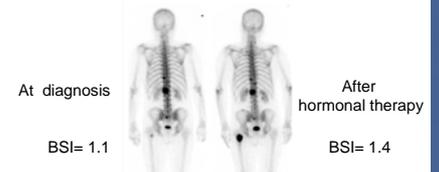
Patients and Methods

- **100 Prostate Cancer Patients**
- **Consecutive group**
- **Retrospective analysis**
- **High risk at the time of diagnosis:**
Clinical tumor stage (cT) T2c/T3/T4,
Gleason score (GS) 8-10 or
Prostate-specific antigen level (PSA) >20 ng/mL.

- **Whole-body bone scans**
- **At the time of diagnosis– before treatment**
- **At follow up -during hormonal therapy**
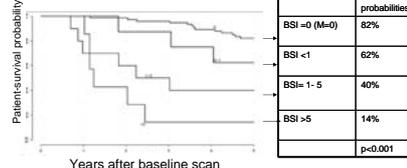- **BSI** calculated using the automated software EXINI Bone™

- **Clinical and Survival Data**
- cT stage, GS, PSA, treatment and survival data were collected from computerized medical records.
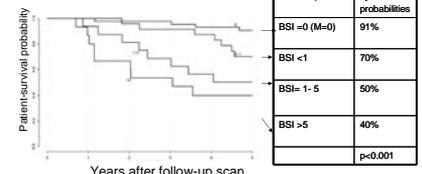
Results

A) **Both BSI at baseline and follow-up during treatment are significantly associated with survival** (p<0.001) .

Kaplan Meier curves showing patient-survival probability stratified by Bone Scan Index (BSI) groups at baseline (1) and at follow up (2):

1) BSI Vs Survival at baseline

Baseline BSI	5y-survival probabilities
BSI =0 (M=0)	82%
BSI <1	62%
BSI= 1- 5	40%
BSI >5	14%
	p<0.001

2) BSI Vs Survival at follow-up

Follow-up BSI	5y-survival probabilities
BSI =0 (M=0)	91%
BSI <1	70%
BSI= 1- 5	50%
BSI >5	40%
	p<0.001

B) **When adding follow-up BSI to a prognostic base model (age, cT, GS and PSA) the concordance index (C-index) increased both at baseline and at follow-up** (p=0.003 and p=0.012 respectively):

Prognostic model for prediction of overall survival AT BASELINE	C-index	Primary hormonal therapy	Prognostic model for prediction of overall survival AT FOLLOW UP	C-index
Classical model (Age, PSA, clinical tumor stage, Gleason score)	0.77		Classical model (Age, PSA, clinical tumor stage, Gleason score)	0.76
Classical model + BSI	0.81	→→→	Classical model + BSI	0.79
	p=0.003			p=0.012

Conclusions

- BSI is a useful imaging biomarker that adds prognostic value in outcome evaluation of PCa patients with bone metastases during ADT.
- Calculation of BSI values could thus help not only with risk stratification of PCa patients at the time of diagnosis but also with evaluation of the post-treatment prognosis during follow-up of high-risk patients.
- BSI could be a valuable complement to PSA and other traditional methods for risk stratification in the management of newly diagnosed PCa patients and during follow up process.
- To summarise, automated BSI is a promising new image biomarker that offers objective quantitative information that may be a useful tool in the decision-making process for personalised treatment of high-risk PCa patients during ADT.

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