





BSI in Clinical Routine

Jens Kurth

Rostock University Medical Center, Rostock, Germany Department of Nuclear Medicine

Disclosure Slide

sultant: <u>none</u>	}				
ikers Bureau:	none				
	sultant: <u>none</u> kers Bureau:	sultant: <u>none</u> kers Bureau: <u>none</u>	kers Bureau: <u>none</u>	sultant: <u>none</u> kers Bureau: <u>none</u>	kers Bureau: none

Honoraria a/o Stockholder: none



EANM Executive Secretariat E-Mail: <u>office@eanm.org</u> Phone: +43.1.212 80 30 Fax: +43.1.212 80 309

7.4 Guidelines for the diagnosis and staging of PCa

Bone scan is recommended in asymptomatic patients only if the PSA level > 10 ng/mL or	2b	А
Gleason score \geq 8 or clinical stage \geq T3 (i.e. intermediate-/high-risk situations).		
Bone scan is indicated in patients with symptoms evocative of bone metastases.	3	А

19.8 Guidelines for imaging and second-line therapy after treatment with curative intent

Recommendations	LE	GR
Biochemical failure (BCF) after RP		
In case of BCF, bone scan and abdominopelvic CT should be performed only in patients with	3	Α
a PSA level > 10 ng/mL, or with high PSA kinetics (PSADT < 6 months or a PSA velocity > 0.5		
ng/mL/month) or in patients with symptoms of bone disease.		

Guidelines on Prostate Cancer, European Association of Urology, Update 2014

Flowchart of the potential therapeutic options after PSA progression following initial hormonal therapy



Guidelines on Prostate Cancer, European Association of Urology, Update 2014



Distribution of the tracks of α -particle

- microautoradiography from a dog injected with an α -emitting bone seeker ($^{\rm 223}{\rm Ra})$



spongious bone

zones with high osteblastic activity

How to describe and predict performance of therapy?

Bone scan index as a biomarker

Kalderstam et al. BMC Medical Imaging 2014, 14:24 http://www.biomedcentral.com/1471-2342/14/24

RESEARCH ARTICLE

Open Access

Medical Imaging

BMC

Analysis of regional bone scan index measurements for the survival C^fAnnals of Nuclear Me with prostate cancer

Jonas Kalderstam^{1*}, May Sadik², Lars Edenbrandt^{2,3} and Mattias Ohlsson

Kaboteh et al. EJNMMI Research 2013, 3:9 http://www.ejnmmires.com/content/3/1/9

ORIGINAL RESEARCH

Annals of Nuclear Medicine November 2013, Volume 27, Issue 9, pp 802-807

Date: 05 Jul 2013

Bone scintigraphy as a new imaging biomarker: the relationship between bone scan index and bone metabolic markers in prostate cancer patients with bone metastases

Hiroshi Wakabayashi, Kenichi Nakajima, Atsushi Mizokami, Mikio Namiki, Anri Inaki, Junichi Taki, Seigo Kinuya

Bone Scan Index: a prognostic imaging biomarker for high-risk prostate cancer patients receiving primary hormonal therapy

Reza Kaboteh^{1*}, Jan-Erik Damber², Peter Gjertsson¹, Peter Höglund³, Milan Lomsky¹, Mattias Ohlsson⁴ and Lars Edenbrandt^{1,5}

Bone scan index as a biomarker of systemic metastatic bone involvement in prostate cancer

11

- Aim correlation of BSI and NUM to Gleason score and therapy related change in these parameters to change in PSA after 11 months of chemotherapy (Docetaxel)?
- Methods 44 patients (69±6y) (median Gleason score: 8, range 5-10)
 - BSI as a measure of the extent of skeletal involvement and the number of metastases (NUM)
 - comparison of BSI and NUM
 - fully automated detection by EXINI-bone-software
 - individual selection and adaptation of lesions by a nuclear medicine physician

Results

- no statistical significant differences in calculation of BSI between software and user (BSI: r²=0,99, p<0,0001, NUM: r²=0,98, p<0,0001)
 - chemotherapy monitoring: the correlation to change in PSA was significant for change in BSI (r²=0,81, p<0,0001)
 - minimal time requirement \rightarrow program is most suitable for a clinical context

A. Namazian et al. Bone scan index as a biomarker of systemic metastatic bone involvement in prostate cancer can be easily obtained using an expert system, EANM Congress 2013 .



- additional bone scans with Tc-99m-DPD were performed, blood samples were taken
- aBSI was calculated using Exini Bone ™ (EXINI Diagnostics AB, Sweden)
- changes of BSI, number of lesions, levels of PSA and alkaline phosphatase (AP) were compared pre- and post-therapeutically
- correlation between BSI and PSA as well as AP

<u>patient</u> :	ð ¹ , 72 years
<u>diagnosis</u> :	metastatic castration-resistant prostate cancer (mCRPC) lymphatic and osseous metastasis (Gleason-Score: 9)
<u>case history</u> :	- 08/11 ED; PSA > 8000 ng/ml - 08/11 androgen-deprivation therapy (ADT) - 2012/13 chemotherapy (Docetaxel)

- pronounced osseous metastasis
- therapy with ²²³Ra (Xofigo[®]): 6 x 50 kBq/kg p.i.

Case 1: ^{99m}Tc-DPD-SPECT (MIP images)



14

Case 1: ^{99m}Tc-DPD-SPECT/CT



baseline

after therapy



Case 1: aBSI



<u>patient</u> :	♂ ¹ , 68 years
<u>diagnosis</u> :	 prostate cancer lymphatic and osseous metastasis (Gleason-Score: 6)
<u>case history</u> :	 - 04/08 ED (Gleason 6); prostatectomy with regional lymphadenectomy - 12/08 Radiatio pelvis - 03/113 – 09/13 Docetaxel-therapy - osseous metastasis

therapy with ²²³Ra (Xofigo[®]): 6 x 50 kBq/kg p.i.

Case 2: ^{99m}Tc-DPD-SPECT/CT

baseline



after therapy



Case 2: aBSI



Universitätsmedizin Rostock

19

patient: d, 64 years

<u>diagnosis</u>:

- prostate cancer
- lymphatic and osseous metastasis
- (Gleason-Score: 8)

<u>case history</u>: - 08/09 ED (Gleason 8); prostatectomy with regional lymphadenectomy

- 01/12 Radiatio pelvis
- 12/12 07/13 Taxotere-therapy
- osseous metastasis

- therapy with ²²³Ra (Xofigo[®]): 6 x 50 kBq/kg p.i.

Case3: BSI



BSI as biomarker for ²²³Ra-therapy

- first evaluation of a small group of patients (preliminary)



- (retrospective study) 10 patients with mCRPC
- correlation between $\triangle aBSI und \triangle AP$ (p = 0,093) between $\triangle aBSI und \triangle PSA$ (p = 0,014)

The BSI might be a useful and promising additional imaging marker for evaluation of therapy response of radium-223-dichloride (²²³Ra) therapy.

22

BSI and Exini bone[™] in clinical routine

- concept of BSI is easy to understand for clinicians and patients
- calculation of BSI is easy to integrate into daily clinical routine using Exini bone[™]
 - DICOM import
 - many predefined and freely configurable import filters (fits study header of nearly every vendor)
 - easy to use (1-click report)
- provides an excellent reproducibility
- high level of standardization in the interpretation of bone scans



Scelatal atlas also works in difficult situations



Conclusion

- bone scintigraphy is standardized on a global level, inexpensive and quantifiable
- BSI calculation using EXINI-bone is easy and fast
- integration into clinical routine is easy
- in clinical routine, BSI-calculation in prostate cancer provides excellent reproducibility due to inter-observer variability and intra-patient variablity¹⁾
 → high level of standardization
- correlation between Δ BSI und Δ AP and between Δ BSI und Δ PSA
- BSI could play an important role as imaging biomarkers that allow us to easily monitor the results of (expensive) new drugs in the treatment of metastatic prostate cancer patients







Contact

Rostock University Medical Center, Rostock, Germany Department of Nuclear Medicine

Dr. Jens Kurth *E-Mail:* jens.kurth@uni-rostock.de