A BONE SCAN INDEX TO QUANTIFY THE EXTENT OF SKELETAL INVOLVEMENT BY TUMOR CAN BE USED TO PREDICT SURVIVAL IN PROSTATE CANCER PATIENTS

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Introduction: Current diagnostic methods are insufficient when predicting survival in patients diagnosed with aggressive and/or generalized prostate cancer (PCa). Bone Scan Index (BSI) estimates the fraction of the skeleton that is involved by tumor, as well as the regional distribution of the metastases in the bones. BSI have previously been proven to be an additional parameter for patients with a large tumor burden. However, the current manual method is heavily time consuming and acquires special training. The objective of this retrospective study was to evaluate the prognostic power of BSI, obtained from a recently developed automated method, in relation and combination with digital rectal examination (DRE) and Prostate Specific Antigen (PSA).

Material and method: The Malmö Preventive Medicine (MPP) and the Malmö Diet and Cancer Study (MDCS) are two large population-based studies that were conducted between 1974 – 1986 and 1991- 1996, respectively. Men born 1921, 1925-1945, 1948-1949 were included in either one or both of the studies. Up to December 31st 2006, 1809 men were diagnosed with PCa. 75% patient charts were retrieved. 550 patients had a bone scan obtained < 3 month from date of diagnosis. 450/550 of the scans were eligible for automated BSI analysis. A PSA test was taken -3 month from the date of bone scan were retrieved for 314/450 patients. Due to PCa (n=57) was determined by review of patient charts. Univariable and multivariable Cox proportional hazards regression was used to evaluate the association between BSI and prostate cancer specific mortality. Kaplan-Meier was applied in order to estimate BSI specific survival. The predictive accuracy for different models was assessed by the concordance index (c-index).

Table 2. Univariable and multivariable Cox proportional hazards regression to evaluate the association between BSI and prostate cancer specific mortality.

Model | Overall (N=314; 57 events) | Positive BSI at diagnosis (N=105; 43 events)
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BSI | 0.754 | 0.753
PSA + BSI | 0.824 | 0.792
PSA + clinical stage | 0.810 | 0.789
PSA + clinical stage + BSI | 0.853 | 0.828

Table 3. Concordance index for various prediction models of prostate cancer specific mortality, with correction for overfit. PSA was entered into the models with log transformed values, and clinical stage was categorized as ≤ T2 or > T2.

Conclusion: Our investigation shows that an automated BSI obtained at diagnosis is an independent predictor of PCa death. Adding a BSI to common diagnostic staging parameters (PSA and DRE) importantly enhances prognostic disease information. Our current results strongly suggest that automated BSI should be included as a parameter in clinical practice.