



ASSOCIATION OF PROSTATE SPECIFIC ANTIGEN LEVELS WITH POSITIVE BONE SCANS

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ABSTRACT

Introduction: Prostate cancer has become a common problem among men around the world. This study was conducted to determine the clinical profiles of patients for whose bone scanning could be eliminated due to a low probability of bone metastasis. **Materials and Methods:** This retrospective study was conducted among 56 patients who were newly diagnosed with prostate carcinoma at single tertiary referral centre in 2017 and 2018. All subjects had serum prostate specific antigen (PSA) levels, trans-rectal ultrasound guided prostate biopsies and bone scans within 3 months of one another. Statistical analyses were performed using chi-square test and level of statistical significance was considered as $p < 0.05$ for all analysis. **Results:** Bone scan was positive in 55.35% and negative in 44.64% patients. Of the 31 positive cases, 9.6% had PSA < 20 ng/ml. Majority (51.61%) of the patients with PSA > 100 ng/ml had multiple skeletal metastases. Of the 25 negative cases, 40% had PSA > 100 ng/ml. Of the 8 patients with serum PSA < 20 ng/ml, 3 patients showed bony metastasis. **Conclusions:** There is no significant association between bone scans and PSA levels. Therefore, as indicated in international literature we cannot assume, there will be bone deposits if the PSA level more than 20ng/ml.

KEYWORDS: Bone scan, metastasis, prostate carcinoma, PSA.

INTRODUCTION

Prostate carcinoma has become the second most common cancer among males. It is the fourth most commonly occurring cancer overall and 1.3 million new cases were diagnosed in 2018. France, Ireland, Barbados, Estonia, Norway and Sweden have been reported as the countries with the highest rates of prostate cancer in 2018.^[1] This trend can be seen even in Asian countries, where the incidence had previously been low compared to the others. The incidence of prostate carcinoma has increased significantly in Asian countries such as Japan, Taiwan, Singapore, Malaysia, the Philippines, and Israel.^[2]

When considering that the most frequent site of metastasis of advanced prostate carcinoma is bone.^[3] Skeleton is the most painful and debilitating site of metastasis. Therefore, detection of bone metastasis is very important to decide the treatment strategy of prostate carcinoma. Bone scan method is the most sensitive investigation for the detection of bone metastasis. But this is an expensive and time-consuming staging modality.^[4] According to the American Urologic Association (AUA) and European Association of Urology (EAU) guidelines, bone scanning is not necessary for patients with serum prostate specific

antigen (PSA) below 20 ng/mL when they show Gleason score (GS) 7.^[5,6] Apart from that, clinical guidelines for prostate carcinoma published by the Japanese Urological Association in 2006, also reported as same.^[7] Therefore, it is useful to seek a balance between cost and advantages.

Our objective was to evaluate the relationship between bone metastasis and clinical or pathological variables, including the serum PSA concentration. With this evaluation, we tried to determine the clinical profiles of patients for whose bone scanning could be eliminated due to a low probability of bone metastasis.

MATERIALS AND METHODS

Methodology

This is a retrospective study included 56 patients who were newly diagnosed with prostate carcinoma at single tertiary referral centre in 2017 and 2018. Patients, who had a history of 5-alpha reductase inhibitors treatment for benign prostatic hyperplasia or that of other malignant diseases with possible development of bone metastases, were excluded from the study. All subjects had serum PSA levels, trans-rectal ultrasound guided prostate biopsies and bone scans within 3 months of one another.

Data was analyzed using SPSS, version 20 statistical software. Statistical analyses were performed using chi-square test and level of statistical significance was considered as $p < 0.05$ for all analysis.

RESULTS AND DISCUSSION

Bone scan was found to be positive in 31/56 (55.35%) and negative in 25 (44.64%) patients. Of the 31 positive cases, 16 (51.61%) had serum PSA > 100 ng/ml, 12

(38.7%) had PSA of 20-100 ng/ml and only 3 (9.6%) had PSA < 20 ng/ml. Majority of the patients with PSA > 100 ng/ml had multiple skeletal metastasis. Of the 25 negative cases, 5 (20%) had a PSA < 20 ng/ml, 10 had between 20 and 100 ng/ml and 10 (40%) had PSA > 100 ng/ml. Of the 8 patients with serum PSA < 20 ng/ml, 3 (37.5%) patients showed bony metastasis. 28/48 (58.33%) patients with PSA > 20 ng/ml had bone metastasis.

Table 1: Categorized bone scan results.

PSA category (ng/ml)	Bone scan		Total
	Metastasis	No metastasis	
< 20	3	5	8
20 -100	12	10	22
100<	16	10	26

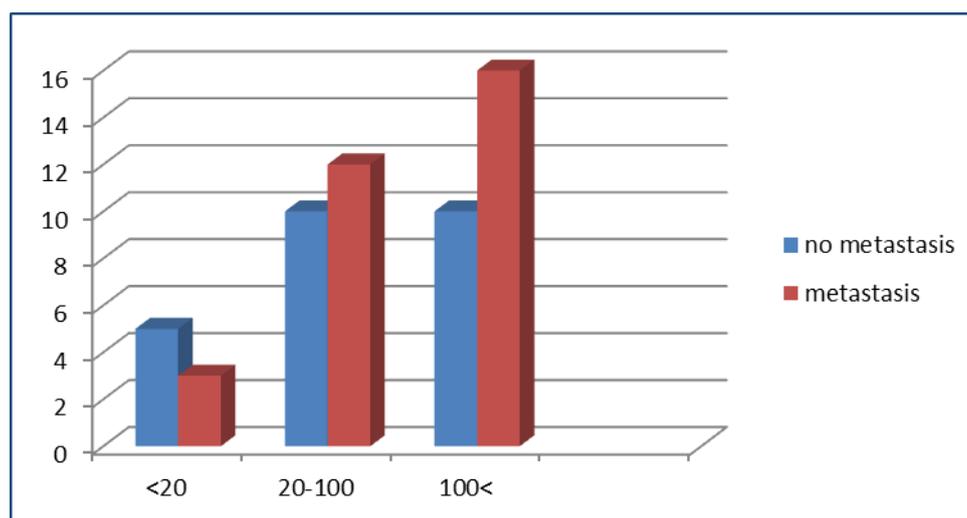


Figure 1: PSA category versus bone scan results.

Table 2: Association between bone scan and PSA levels in patients with prostate carcinoma.

	value	Degree of freedom	Significance (2-sided)
Pearson Chi-Square	1.440	2	0.487
Likelihood Ratio	1.440	2	0.487
Linear-by-Linear Association	1.298	1	0.255

Prostate carcinoma shows tremendous difference in incidence in various populations worldwide. Generally incidence and mortality of prostate carcinoma in Asian men is lower than Northern European, African and American populations.^[8,9] The Sri Lankan cancer registry data showed a low rate of prostate carcinoma, similar to other South Asian countries, but the actual incidence of prostate carcinoma in Sri Lanka is probably higher than reported.^[10,11]

Isotope bone scans are used as a staging investigation for prostate carcinoma. PSA is used to diagnose and monitor the response to the treatment in prostate carcinoma. Management of prostate carcinoma like in any other carcinoma depends on the stage. Hence appropriate staging is important to tailor the treatment. Isotope bone scan is an expensive investigation when compared with PSA, especially in a 3rd world country. If cheaper

investigation can correctly predict the presence of bone metastases that would reduce the cost of healthcare.

When compared with the world literature, our study did not show clear association of bone scans with PSA levels. A study done in Korea stated that bone scans might be necessary in men with a serum PSA between 10 and 20 ng/mL.^[12] Another study reported that bone scan seems to be impractical in newly diagnosed patients with prostate carcinoma whose serum PSA level <20 ng/ml and Gleason score up to 7. Furthermore, pre-treatment PSA is highlighted as the best predictor of the need for the bone scan.^[13]

CONCLUSIONS

Based on our findings, there is no significant association between bone scans and PSA levels. Therefore, as indicated in international literature we cannot assume,

there will be bone deposits if the PSA level more than 20ng/ml.

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