

Distribution of bone metastases in prostate carcinoma; Isotope (Technetium 99m methylene diphosphonate) bone scans in a Sri Lankan population

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Abstract- Prostate cancer occupies a prominent place among malignant neoplasia of the genitourinary tract, and currently represents the most common neoplasia, being the second most frequent cause of death by cancer in men. Besides PSA, prostatic acid phosphatase, alkaline phosphatase, tumor ploidy, Gleason score, ultrasonography, computed tomography, magnetic resonance imaging, and bone scintigraphy are useful in the work-up of patients with prostate neoplasia. Bone is a preferred, and sometimes the only, site for prostate cancer metastases, which occur in more than 80% of men with advanced prostate cancer. The objective of current study was to study the characteristics of bone isotope scan findings in the evaluation of bone metastasis in patients with prostate carcinoma.

A retrospective observational study was conducted using 213 subjects at the surgical unit at Teaching Hospital Peradeniya in combination with Nuclear Medicine unit. All patients diagnosed with prostate carcinoma who underwent bone isotope scan for the evaluation of bone metastasis from January 2009 to June 2016 were included in the study. Each Patient's bone scan findings were documented. Analysis was carried out using 20.0 version of the statistical package for the social sciences (SPSS). The commonest site of bone metastasis of prostate origin was vertebral column.

Index items-prostate carcinoma, bone isotope scan, bone metastasis, genitourinary tract

I. INTRODUCTION

Prostate cancer occupies a prominent place among malignant neoplasia of the genitourinary tract, and currently represents the most common neoplasia, being the second most frequent cause of death by cancer in men. Besides PSA, prostatic acid phosphatase, alkaline phosphatase, tumor ploidy, Gleason score, ultrasonography, computed tomography, magnetic resonance imaging, the bone scintigraphy is also a useful investigation in the work-up of patients with prostate neoplasia (Kanthilatha et al., 2015). Bone is a preferred, and sometimes the only site for prostate cancer metastases, which occur in more than 80% of men with advanced prostate cancer (Fred et al., 2002). The objective of current study was to study the characteristics of bone isotope scan findings in the evaluation of bone metastasis in patients with prostate carcinoma.

II. PATIENTS AND METHOD

A retrospective observational study was conducted using 213 subjects at the surgical unit at Teaching Hospital Peradeniya in combination with Nuclear Medicine unit. All patients diagnosed with prostate carcinoma who underwent bone isotope scan for the evaluation of bone metastasis from January 2009 to June 2016 were

included in the study. Each Patient's bone scan findings were documented. Analysis was carried out using 20.0 version of the statistical package for the social sciences (SPSS).

III. RESULTS

The study comprised of 213 patients with mean age of 68.77 years (SD±8.92). In the study population 46 % (n=98) of the patients were found to have bone metastasis in isotope scan, 50.2 % (n=107) did not have bone metastasis in isotope scan and in 3.8 % (n=8) bone scan findings were inconclusive.

Of the sites of bone metastasis commonest site was vertebrae 83.7% (n=82), pelvis 62.2%(n=61), ribs 59.2%(n=58), sternum 30.6%(30), skull 21.4%(n=21), femur 29.6%(n=29), mandible 7.1%(7) and other sites 19.4%(n=19). Other sites included shoulder joint, tibia, clavicles, knee, scapula, sterno-clavicular joint, orbital area and zygomatic bone.

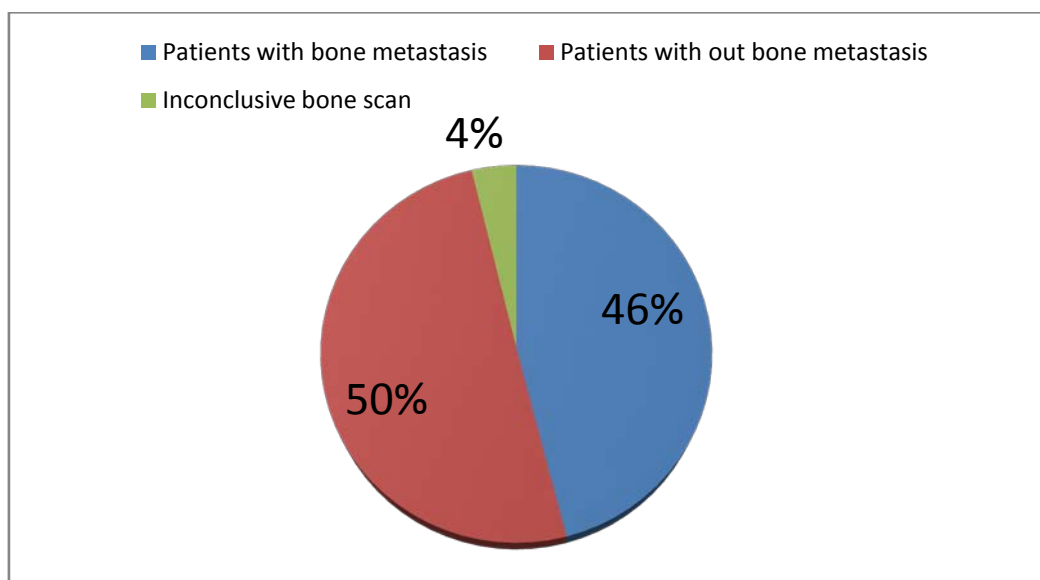


Figure 01- Obtained bone scan results

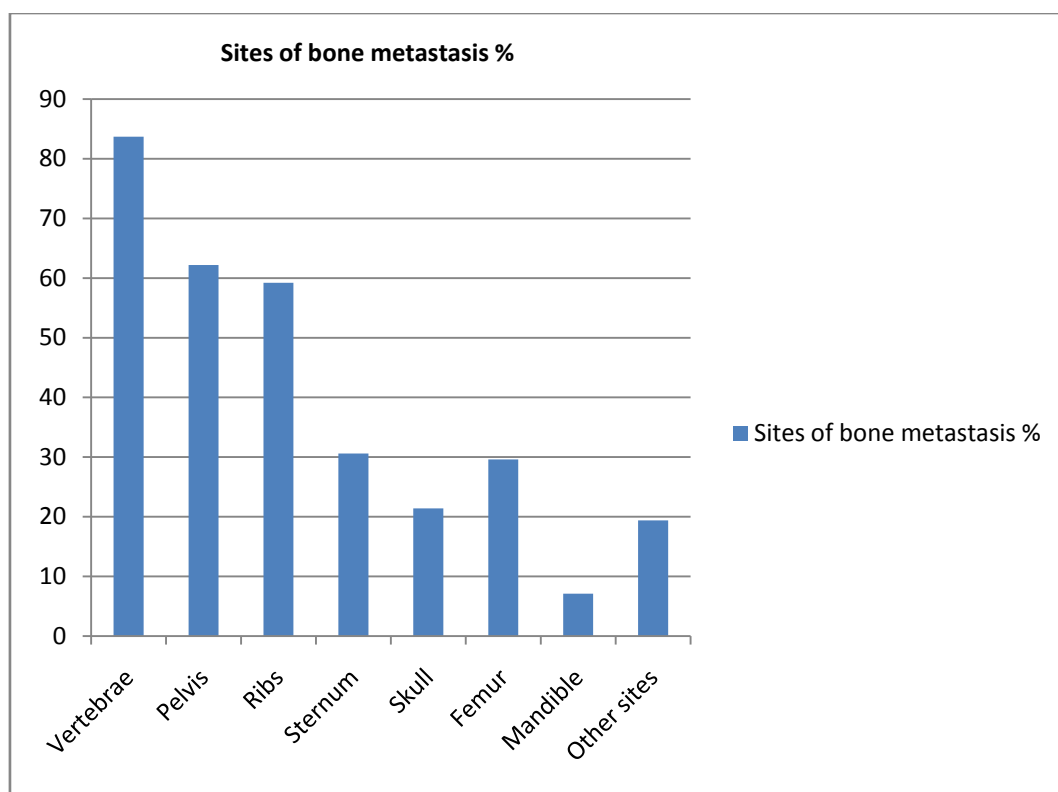


Figure 2- Sites of bone metastasis

IV. DISCUSSION

Bone metastases most commonly affect the axial skeleton, which contains red marrow in an adult. Properties of the circulation, cells, and extracellular matrix within this region could assist in the formation of bone metastases. Venous blood from the breasts and pelvis flowed not only into the venae cavae but also into a vertebral-venous plexus of vessels that extended from the pelvis throughout the epidural and perivertebral veins. The drainage of blood to the skeleton via the vertebral-venous plexus may explain the tendency of prostate cancers to produce metastases more commonly in the axial skeleton and limb girdles (Coleman, 2006).

Adenocarcinoma of the prostate spreads most commonly to the well vascularized areas of the skeleton such as the vertebral column, ribs, skull, and the proximal ends of the long bones. Prostate carcinoma cells have been believed to gain access to the vertebral column and ribs via the Batson venous plexus, which is a low pressure, high volume plexus of vertebral veins that join the intercostal veins. (Carlin, 2000).

Our study findings are also similar to the international literature. In our study the commonest site of prostate cancer metastasis were in the vertebrae followed by pelvis, ribs, sternum, skull, femur, mandible and other sites. Though literature showed that upper limb girdle is also a common site for metastases, our study has shown less number of patients with metastasis in shoulder joints, clavicles, scapulae and sternoclavicular joints.

V. CONCLUSION

The commonest site of bone metastasis of prostate origin was vertebral column.

REFERENCES

- Carlin, B. and Andriole, G. (2000).The natural history, skeletal complications, and management of bone metastases in patients with prostate carcinoma.*Cancer*, 88(S12), pp.2989-2994
- Charhon SA, Chapuy MC, Delvin EE, Valentin-OpranA, Edouard CM, Meunier PJ. Histomorphometric analysis of sclerotic bone metastases from prostatic carcinoma with special reference to osteomalacia. *Cancer* 1983; **51**: 918–24.
- Coleman, R. (2006). Clinical Features of Metastatic Bone Disease and Risk of Skeletal Morbidity.*Clinical Cancer Research*, 12(20), pp.6243s-6249s
- Fred, S, Donald, M. G, Robin, M, Simon, T, Peter, V, Louis, L, Joseph L. C, Jeferson J. V, Allen, G, Bee, C. (2002) A Randomized, Placebo-Controlled Trial of Zoledronic Acid in Patients With Hormone-Refractory Metastatic Prostate Carcinoma. *Journal of the National Cancer Institute*, 94, (19), pp.1458-1468
- Kanthilatha, P, Gauri, S, Ranjini, K and Padmaraj, H. (2015) Diagnostic Correlation between serum PSA, Gleason Score and Bone Scan Results in Prostatic Cancer Patients with Bone Metastasis. *British Biomedical Bulletin*. 3(01) pp. 001-007
- Landis SH, Murray T, Bolden S, Wingo PA. Cancer statistics, 1999. *CA Cancer J Clin* 1999; **49**: 8–29
- Lentle BC, McGowan DG, Dierich H. Technetium-99m polyphosphate bone scanning in carcinoma of the prostate. *Br J Urol* 1974; **46**: 543–8.
- Paulson DF. The impact of current staging procedures in assessing disease extent of prostate adenocarcinoma. *J Urol*1979; **121**: 300–2.
- Whitmore WJ Jr. Natural history and staging of prostate cancer. *UrolClin North Am* 1984; **11**: 209–20.