

Preliminary Result on The Use of Bone Scan and Plain X-rays in the Evaluation of Bone Metastasis From Breast Cancer in a Tertiary Institution: A Study of 30 Patients

¹Adewuyi SA, ²Chom ND, ³Shehu SM, ²Hamidu AU, ⁴Okoye IJ, ⁵Humera M

¹Radiotherapy and Oncology Center, Ahmadu Bello University Teaching Hospital, Zaria Nigeria. Departments: ²Radiology, ³Pathology, Ahmadu Bello University Teaching Hospital, Zaria Nigeria. ⁴Department of Radiology, University of Nigeria Teaching Hospital, Enugu Nigeria. ⁵Nuclear Medicine, Oncology & Radiotherapy Institute (NORI)

Islamabad Pakistan. **Correspondence:** Dr. S. A. Adewuyi, Clinical & Radiation Oncologist, Radiotherapy and Oncology Center, A. B. U. Teaching Hospital, Shika Zaria, P. M. B. 06.

E-mail: sadewuyi2003@yahoo.com

ABSTRACT

Title: Preliminary result on the use of bone scan and plain x-rays in the evaluation of bone metastases from breast cancer in a tertiary institution: a study of 30 patients.

Background: Bone scan is superior to plain x-rays in diagnosing early bone metastasis in management of cancer patients be made known and exploited, so as to manage such cases before irreversible damages are caused.

Objective: To evaluate the role of bone scan and plain x-rays in the management of bone metastasis from breast cancer as seen in a tertiary referral center.

Materials and Methods: Between January to December 2000, 30 consecutive patients with histologically confirmed breast cancer and bone pain presenting for the first time in the clinic or attending follow up clinic, were studied. All the patients were investigated with bone scan and x-rays of relevant bones at first presentation of pain, irrespective of duration of symptoms. Study was conducted at Nuclear Medicine, Oncology and Radiotherapy Institute (NORI), Islamabad Pakistan. Relevant patients' data on details of disease since onset were accessed from records.

Results: Six patients had painful bone metastases for ≤ 3 months; fourteen had pain for 4–6 months; two had pain for 7–9 months; three had pain for 10–12 months; and five had pain for more than 12 months prior to treatment with radiotherapy. Of the twenty patients presenting with pain for 6 months and below, all had radiological confirmation of bone metastasis on bone scan and only one had radiological confirmation of bone metastasis with plain x-rays at time of initial investigation. All the patients having bone pain for at least 9 months had confirmation of bone

metastasis with plain x-rays at initial investigations. All the patients with evidence of bone metastasis on bone scan were confirmed with plain x-rays after at least 9 months of onset of bone pain.

Conclusion: Although the number of patients was few, waiting for 9 months for radiological confirmation of bone metastasis will definitely have adverse effects on the quality of life of patients, performance status and chance of controlling the symptoms for a long time. Therefore, bone scan should be in the initial staging investigations of all patients. Facility for bone scan and nuclear imaging should be made widely available in tertiary institutions including those in resource poor countries.

Keywords: bone metastases, bone scan, plain x-rays, breast cancer.

INTRODUCTION

Cancer incidence is on the increase in most developing countries. For optimal management of cancer patients, there must be proper evaluation and adequate staging of the patients. In developed countries, nuclear medicine imaging is a routine investigation for most cancer patients but this is not so in many developing or resource poor countries. In Nigeria for example, one in every fourteen women is expected to develop breast cancer in her life time.¹ hence the need for bone scan facilities for their early evaluation for bone metastases. The most frequently encountered metastases during evolution of cancer are bone metastases, which involve painful syndromes which affect the patients' quality of life greatly and breast cancer is not an exception.² Not all patients with bone

metastases experience pain, but approximately two-thirds of patients have substantial pain. The skeleton is the most common site of metastatic disease in breast cancer and the site of first distant relapse in almost one-half of the patients.^{1,3} Bone metastasis is a significant cause of morbidity and of referrals from general practitioners, specialist physicians and surgeons.⁴ Early detection of bone metastasis before onset of symptoms will improve the quality of life of patients. All patients presenting with bone pain or with locally advanced and metastatic breast cancer should benefit from metastatic survey using bone scan so as to detect bone metastasis early.

METHODOLOGY

Between January and December 2000, a total of 30 patients at the Nuclear Medicine, Oncology and Radiotherapy Institution (NORI), Islamabad Pakistan presenting with bone pains with a background of breast cancer, histologically confirmed, were studied. Studied patients were either attending the follow-up clinic or presenting for the first time, irrespective of age, sex and performance status. Relevant patients' data on details of disease since onset were accessed from records. All the patients were investigated with bone scan and x-rays of relevant bones at first presentation of pain irrespective of duration of symptoms. MRI and /or CT scans were done only in few patients with positive bone scan and negative radiographs to rule out degenerative bone diseases, osteoporosis, and Paget's disease. Most patients were on analgesics for the bone pains prior to treatment of bone metastases with radiotherapy. In this study, no patient presented or developed pathological fracture.

RESULTS

Six patients had painful bone metastases for ≤ 3 months; 14 had pain for 4-6 months; 2 had pain for 7-9 months; 3 had pain for 10-12 months; and 5 had pain for more than 12 months prior to treatment with radiotherapy. Of 20 patients presenting with pain for 6 months and below, all had confirmation of bone metastasis on bone scan and only 1 had confirmation of bone metastasis with plain x-rays at time of initial investigation. All the patients having bone pain for at least 9 months had confirmation of bone metastasis with plain x-rays at initial investigations. All the patients with

evidence of bone metastasis on bone scan were confirmed with plain x-rays after at least 9 months of onset of bone pain. The radiological pattern on plain x-ray was osteolytic in 28 and mixed pattern (osteolytic & osteoblastic) in 2. The commonest site of bone metastases was lumbar spine (51.5%) followed by the thoracic spine (21.6). There was involvement of multiple, non-contiguous skeletal bones in 23.3% (7) of the patients.

Figure 1: Osteolytic bone metastasis from breast cancer as seen on plain x-rays affecting L5 vertebra



Figure 2: Bone scan showing multiple non-contiguous bone metastases.



DISCUSSION

The results show that one-third of the patients with bone pain had symptoms for more than 6 months. The pattern of late presentation seen in these patients, was not different from the pattern established in most undeveloped and developing countries, especially in Africa and Asia.⁵ In developed countries, especially in North America and Europe, most patients with bone metastases were asymptomatic at the time of diagnosis because bone scan was a routine investigation for patients with malignancies.^{6,7} Bone scan together with radiography of abnormal foci shown on bone scans, is used as the primary evaluation of patients suspected with bone metastases (see figure 1 & 2). A bone scan is more sensitive than x-rays for detecting metastases because it detects functional rather than structural changes. An increased uptake of 5% to 10% higher than that of surrounding bone is readily detected on scan, whereas a minimum of 30% - 50% trabecular bone destruction is required for radiographic detection.^{7,8} This may explain the limitation of plain x-rays in detecting asymptomatic patients. Of 20 patients with pain for 6 months and below, all had confirmation of bone metastasis on bone scan and only one had confirmation of bone metastasis with plain x-rays at time of initial investigation. All the patients having bone pain for at least 9 months had confirmation of bone metastasis with plain x-rays at initial investigations. All the patients with evidence of bone metastasis on bone scan were confirmed with plain x-rays after at least 9 months of onset of bone pain. The inability of the plain x-rays to pick bone metastasis early compared to bone scan may be related to the mechanism of bone metastasis and the aggressiveness of the disease with respect to the time taken to destroy the integrity of the bone.⁸ Technetium diphosphonate bone scans are extremely valuable in identifying asymptomatic lesion and in diagnosing metastatic disease and potential source of referred pain. One limitation of this technique is that it merely measures metabolic activity and does not evaluate the structural integrity and strength of the skeleton.^{7,8} All bone scan findings must be evaluated in parallel with plain radiograph, CT scan or both to assess the risk of pathologic fracture. Computed tomography Scans have been used in the evaluation of bone metastases for the diagnosis of equivocal lesions in patients with abnormal bone

scan and normal bone x-rays findings, particularly if the areas of abnormalities are in the spine or other region that are difficult to evaluate by conventional radiographs (e.g. craniovertebral junction, sacrum, sternum)^{9,10} although this is difficult in this environment due to prevailing poverty.

The radiological pattern on plain x-ray was osteolytic in twenty eight and mixed pattern (osteolytic & osteoblastic) in two. The radiological pattern conforms to the pattern seen in studies from different parts of the world.^{11,12} Plain x-rays give information of the extent of bone destruction and risk of pathologic fracture. This is difficult to assess from bone scan. The radiographic appearance of bone metastases can be osteolytic, osteoblastic or mixed depending on which process (bone destruction or bone formation) predominates, although usually both are present. In breast cancer, the predominant feature often is osteolytic bone lesion (bone destruction).¹³ Bone loss secondary to menopause, therapeutic castration, senility, prolonged immobilization, and medications (e.g. corticosteroids) may also have adverse effects on the bone integrity.¹⁴ Despite this limitation of plain x-rays, it is the fastest, least expensive, and the most readily available technique to diagnose bone metastases. It gives the best integration of overall bone structure, alignment and strength.

The commonest site of bone metastases was lumbar spine (51.5%) followed by the thoracic spine (21.6%). There was involvement of multiple, non-contiguous skeletal bones in 23.3% (7) of the patients. Multiple, non-contiguous bone metastasis is not uncommon and bone scan has an advantage over plain x-ray in diagnosing multiple, non-contiguous bone metastasis. It is extremely sensitive and practical because it can screen the entire body at one time (whole body scan) and very useful in situation of multiple non-contiguous bone metastasis.⁷ Certainly, any abnormality found on bone scan should be assessed with plain radiographs. Only when the diagnosis cannot be discovered from clinical information and these baseline tests, should CT scan or / and MRI be obtained.^{15,16}

Specialists involved in evaluation and management of cancer patients should incorporate bone scan into the diagnostic workup of the patients in order to guarantee adequate staging and optimal care of the patients. The

financial implication of bone scan as an additional burden on cancer patients is yet to be evaluated but presently it is affordable. Similarly, for easy accessibility by patients, bone scan isotope, Technetium-99m should be produced within the country unlike the present situation of importing it from developed nations.

CONCLUSION

Despite the very small number of patients, plain x-ray for diagnosing and confirmation of bone metastasis was useful in patients with at least nine months duration of bone metastasis compared with bone scan which can pick bone metastasis earlier. Waiting for 9 months for radiological confirmation of bone metastasis will definitely have adverse effects on the quality of life of patients, performance status and chance of controlling the symptoms for a longer time. Therefore, bone scan should be in the initial staging investigations of all patients with locally advanced and metastatic breast cancer. Nuclear Medicine facilities should be established in all teaching hospitals including those in resource poor countries. This will facilitate adequate staging, quality care and improvement in quality of life from prompt management of patients having malignancies with bone metastasis.

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