



Role of Skeletal Scintigraphy in Evaluation of Low Backache in Treated Cases of Carcinoma Cervix (Research Article)

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ABSTRACT

The presence of bone metastases indicates advanced disease in cervical cancer. Lumbar spine is the most common site affected followed by pelvis with rare involvement of distal extremities. Low back ache in these patients has wide spectrum of etiologies including benign conditions like musculoskeletal causes, inflammatory, Infectious and metastatic spread of disease. In this study, we evaluated the causes of low back ache in treated cases of carcinoma cervix based on different patterns of radio tracer uptake on 99m Tc Methylene diphosphonate (99m Tc MDP) bone scan. To evaluate the role of 99m Tc MDP bone scan in differential diagnosis of low back ache in treated cases of carcinoma cervix. 99m Tc MDP bone scans of treated carcinoma cervix patients presenting with low back ache were reviewed retrospectively from May 2012 to May 2016. A total of 120 patients were reviewed, 99m Tc MDP bone scan detected metastases in 69 (57.5%) patients, degenerative changes in 26 (21.6%) patients, insufficiency fractures in 13 (10.8%) patients, erosion from adjacent nodal mass in 4 (3.3%) patients. No abnormality was detected on bone scan in 8 patients (6.6%).

Skeletal scintigraphy plays a vital role in the evaluation of low back ache in carcinoma cervix and changes management in significant proportion of patients. Pattern recognition especially in identifying insufficiency fractures and erosion of bone from adjacent nodal mass is an important aspect in the interpretation of skeletal scintigraphy.

Keywords: Carcinoma cervix, 99m Tc MDP bone scan, low back ache.

Introduction

Bone is one of the few organs in body with capacity to regenerate and repair. It is a dynamic structure that undergoes constant remodeling to withstand mechanical forces and to replace the dead bone with newly formed mechanically stronger bone.

Metastasis from malignancy is the most common cause for tumor in bone with considerable incidence of morbidity and mortality^(1, 2). The most common presentation of bone metastases is severe bone pain. Others include disability, pathological fracture, hypercalcemia, myelosuppression, nerve root

compression, and the most dreaded spinal cord compression^(2,3). Early diagnosis and implementation of appropriate treatment strategies is essential in these patients for symptomatic relief to reduce the risk of complications and to improve the quality of life^(4,5).

Cervical cancer is the second most common cancer in women aged between 15–44 years⁽⁶⁾. Cervical cancer despite being potentially preventable remains an important cause of morbidity and gynecological cancer related deaths throughout the world. In India most of the patients are in advanced stage at the time of presentation and the prognosis is related directly to the stage⁽⁷⁾. Due to the development of varied treatment modalities, the number of patients living with metastatic disease has increased considerably over the past 2 decades⁽⁸⁾.

Presence of skeletal metastases in cervical cancer indicates advanced disease representing M1 (AJCC) or FIGO (International Federation of Gynecology and Obstetrics staging system) stage IV⁽⁹⁾. The standard treatment modality for local control is radiotherapy either in the form of External beam radiotherapy (EBRT), brachytherapy (BT) or a combination of the two^(10, 11, 12, 13). High-dose palliative radiotherapy provides significant symptomatic relief in 67% of cervical cancer patients⁽¹⁴⁾. Osseous fractures have a significant clinical and personal impact highlighting the need for early detection.

Metastases from cervical cancer are disseminated to bone through hematogenous route, or by direct infiltration of spine by soft tissue mass lesion.

Whenever there is an injury or insult of any form bone responds by increasing the turnover which forms the pathophysiologic basis of radionuclide bone imaging

The implementation of hybrid imaging technique SPECT-CT in addition to planar scintigraphy has increased the accuracy for differentiation of benign and malignant lesions and helps in precise localization.

Identification of patterns of metastases is essential for accurate management as the patients with infiltration of spine can be treated effectively with

local radiotherapy to prevent the spinal cord compression.

In this study we emphasize on the role of conventional radionuclide bone scintigraphy for the evaluation of bone metastases in carcinoma cervix and thus aid in further management.

Materials and Methods

This is a retrospective study of all the patients with carcinoma cervix confirmed by histo pathological findings at our institution from May 2012 to May 2016. All the included patients underwent optimal treatment as per the treating clinician's discretion and received follow up care at our institution. Patients who were referred for 99m Tc MDP bone scan to identify the cause of low back ache were included in the study. The duration between the completion of treatment and 99m Tc MDP bone scan was 3 weeks. Study population consisted of 120 women (Mean age: 46 yrs. Range: 35-71yrs). Informed consent was obtained for bone scan prior to the injection of radionuclide as a part of the institutional protocol.

On the day of study, complete clinical history, previous history of trauma, fractures, surgery, relevant laboratory results, prior imaging studies such as conventional radiographs, computed tomography, magnetic resonance imaging, previous bone scan details if any were documented.

99m Tc MDP was administered intravenously in a dose of 18-20mci 3 hrs after the injection, image acquisition was done on a dedicated dual head gamma camera (SIEMENS SYMBIA E) with a dedicated sodium iodide (NAI) crystal doped with thallium. The couch moves at a speed of =12cm/min. Whole body bone scintigraphy was performed with continuous images obtained in anterior and posterior views with a low energy high resolution collimator on a 256 x 256 matrix. 3D acquisition with SPECT was done wherever there is a diagnostic dilemma on planar scintigraphy to improve the contrast, to provide a better anatomic localization and resolution. The typical acquisition parameters for SPECT included step and shoot mode collimator, rotating clockwise in a non

circular orbit, providing 16 views @ 20 sec/view. CT acquisition was done wherever necessary on a dedicated 6 slice CT machine. The bone scintigraphy images were analyzed by experienced nuclear medicine physician on a dedicated workstation. Areas with increased radiotracer concentration on bone scintigraphy were identified as those with increased osteoblastic activity.

Results

A total of 120 patients were reviewed, 99m Tc MDP bone scan detected metastases in 69 (57.5%) patients, degenerative changes in 26 (21.6%) patients, insufficiency fractures in 13 (10.8%) patients, erosion from adjacent nodal mass in 4 (3.3%) patients. No abnormality was detected on bone scan in 8 patients (6.6%) (Table1)

Discussion

The batson's plexus, a system of valve less communication between systemic veins and vertebral veins extends from the basiocciput to coccyx. These anastomoses act as channels for the spread of intra abdominal or pelvic malignancies to spine. Whenever there is an increase in intra abdominal pressure there is a free reflux of blood to vertebral veins through these plexus leading to deposition of malignant cells in the bone marrow. The rich blood supply of bone marrow acts as "fertile soil" for tissue colonization and further proliferation of malignant cells. This is in accordance with the "seed and soil" hypothesis given by Stephen Paget in the 19th century. Following their deposition in bone the malignant cells release adhesion molecules that bind to the bone matrix. After colonization of bone marrow, the cells release cytokines which up regulate growth factors promoting either osteoblastic or osteoclastic activity. This is the basis for coexistence of bone forming and bone destructive processes in most of the malignancies ⁽¹⁵⁾. An important point to remember is that tumor cell proliferation in the bone marrow invariably predates the bone destruction which is consequently a relatively delayed

manifestation of bone metastases and has an important implication in terms of diagnosis.

The most widely performed nuclear medicine procedure is bone scintigraphy with the major advantage of one time entire skeleton imaging. Lesions involving the vertebral body and extending towards the posterior column elements, pedicles are likely to be metastatic ⁽¹⁶⁾. Abnormal radio tracer concentration is appreciated when there is 5 to 10% alteration of lesion to normal bone ratio, hence Osteo sclerotic lesions can be detected as early as 18 months before they become obvious on plain radiographs ⁽¹⁷⁾. The initial involvement of bone marrow is difficult to be diagnosed on conventional planar bone scintigraphy because the invasion of trabecular bone is below the spatial resolution. Metastases become obvious once the cortex is involved.

Absent or relatively less amount of tracer concentration in osteolytic lesions can leads to false negative results. Correlation with SPECT - CT is useful in such setting ⁽¹⁸⁾. In the presence of a of focal area of radio tracer concentration, it is often difficult to decide between degenerative and malignant cause⁽⁸⁾. Appropriate history taking and correlation with other imaging modalities is helpful to rule out false positive results. When a patient with malignancy presents with low back ache the first suspicion to be raised is metastases. Low back ache in these patients has wide spectrum of etiologies including benign conditions like musculoskeletal causes, inflammatory, Infectious and metastatic spread of disease. The overall outcome in cervical cancer is directly related to the stage at presentation. The rate of recurrence after primary treatment ranges from 10-20% in stage IB-IIA to 70% in the presence of (both local and distant site) lymph nodal involvement or locally aggressive disease ^(19,20, 21, 22).

In a study done by Fagundes H et al. the incidence of distant metastases over a period of 10 yrs is 3% in stage IA, 16% in stage IB, 31% in stage IIA, 26% in stage IIB, 39% in stage III, 75% in stage IVA⁽²²⁾. The most common site of metastases is lung (21%), followed by bone (16%), para aortic nodes (11%),

abdominal cavity (8%), Supra clavicular lymph node (7%).

Presence of is low back ache is not always an indication of skeletal metastases. In our study 42% of patients had non-metastatic causes of low back ache (Fig 1). Infiltration of vertebrae by para aortic nodal mass is a finding appreciated well on CT or PET/CT (Fig2,3). We have reported 4 cases of para aortic mass infiltration identified on SPECT. Further research is needed in this aspect.

The limitations of this study include it is a retrospective study. All the patients did not receive the same treatment and SPECT CT was not done in all the cases.

Table1: Causes of lowbackache in study population

Category of patients	Number (percentage)
Total No of patients included in the study	120
Metastatic disease	69 (57.5%)
Degenerative changes	26 (21.6%)
Insufficiency fractures	13(10.8%)
No abnormality	8 (6.6%)
Erosion from overlying nodal mass	4 (3.3%)

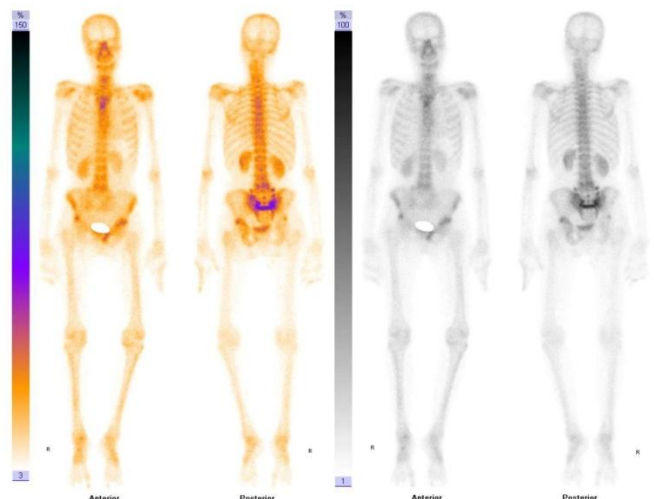


Fig1: Planar bone scintigraphy revealing Honda sign a diagnostic sign for insufficiency fracture presenting as low back ache

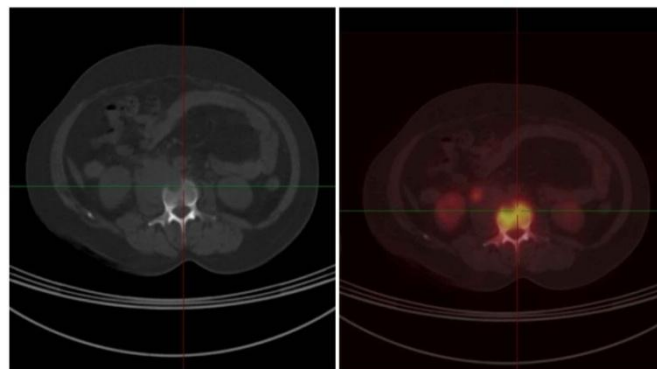


Fig 2: SPECT-CT reveals focal uptake in the vertebrae on anterior aspect in axial view corresponding to erosion by paraaortic lymphnodal mass in a treated case of carcinoma cervix

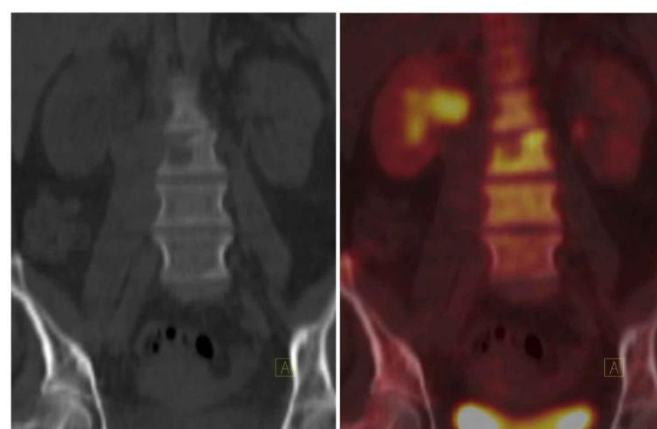


Fig 3: SPECT-CT reveals focal uptake in the anterolateral aspect in coronal view corresponding to erosion by paraaortic lymphnodal mass in treated case of carcinoma cervix.

Conclusion

Emphasis on pattern recognition is necessary for accurate diagnosis and early implementation of treatment in these patients. Skeletal scintigraphy plays a vital role in the evaluation of low back ache in carcinoma cervix and changes management in significant proportion of patients. Pattern recognition especially in identifying insufficiency fractures and erosion of bone from adjacent nodal mass is an important aspect in the interpretation of skeletal scintigraphy.

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