

Bone Spect as a Valuable Diagnostic Tool for Evaluation of Backache

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Objective: The purpose of the study is to evaluate the role of Bone SPECT in the diagnosis of backache, in cases of normal radiographic picture.

Study Design: Descriptive study.

Place and Duration of Study: This study was conducted with the collaboration of Neurosurgery Department Holy Family Hospital, Rawalpindi and Nuclear Medicine Department, NORI Hospital, Islamabad. The study was carried out from January 2009-October 2009.

Method: The patients were selected from the Neurosurgical out patient department, Holy Family Hospital Rawalpindi, and were referred to Nuclear Medicine Department, NORI Hospital, Islamabad. A total of 36 patients with complaints of backache, and normal X-ray finding were scanned (Whole body and SPECT of spine) with a dual head Gamma Camera after injection of the radiopharmaceutical, Tc99m MDP (Technetium labelled Methylene diphosphonate) with a minimum of 3 hours wait after the radioisotope injection.

Results: Out of the 36 patients that were referred for the investigation, 10 patients had there scan results positive for any vertebral (bony/joint) pathology, the negative results (26) indicated musculoligamentous etiology for backache. In almost all positive cases the site of the disease focus was delineated.

Conclusion: Bone SPECT is a very useful diagnostic modality in case of backache when radiographs are normal and pain is persistent and can be made use of, for detection and localization of disease site, before referring the patient for other expensive diagnostic tests (e.g MRI)

KEY WORDS: Backache, SPECT (Single Photon Emission Computed Tomography).

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Introduction

The most commonly done scan at all nuclear medicine facilities is the whole body bone scan. BONE SPECT however is done in the same session, with a different technique of acquisition and reconstruction of images. The images are reconstructed in three planes (coronal, sagittal, and axial) as the images have been acquired by the camera rotated through 360° in a circular arc around the region of interest.

The role of this technique in case of facial skeletal pathologies and temporomandibular joint abnormalities is well established and anatomical localization of the pathological focus and evaluation of extent of local invasion can be done with almost 99.99% accuracy despite of complexity of the facial skeleton. Keeping in mind the same accuracy the vertebral bodies and pelvic skeleton can be commented upon. The greatest advantage of this modality is that it not only gives a fairly correct idea of the anatomical site involved but also quite satisfactorily shows how intense and severe the pathological process is, i.e. the experienced

eye can visually assess the amount of uptake in case of inflammation, infection and infiltration of bone by the metastasis process.

Materials and Methods

All the 36 patients selected for this study were from the neurosurgical out-patient department and the clinical symptoms were of backache with or without radiation. None of the patients had any known malignancy at the time of scan, autoimmune disease, or injury in the region of our interest. The ages of patients were between 28-52 years (Mean age 38years). The X-rays in all of the above cases were normal. Patients with history of surgical procedures on the spine in the past, posture or gait problems, and problems related to calcium metabolism like severe osteoporosis, osteopenia, renal osteodystrophy etc were excluded from the study.

Tc99m methylene diphosphonate (20-30mCi) was given to the patients intravenously and after a minimum of 3 hours of waiting time in an isolated room,

all patients were scanned, using a dual head Gamma camera fitted with a collimator of low energy and high resolution. Data was acquired through 360° rotation at 60 interval for 15 seconds per arc interval. The images were reconstructed in three planes, presented in coronal, transverse, and longitudinal sections.

Patients were instructed to drink a lot of fluid during the next 24 hours to increase the renal excretion of the radiopharmaceutical injected and were reassured of the safety of the procedure.

Results and Analysis

The results clearly show that the sensitivity of the bone SPECT for detection of vertebral causes of backache is almost 100%. As far as the specificity of the scan is concerned it is between 70-75% as the nuclear physician's comments about the nature of lesion (infection or inflammation) are based on the pattern of uptake which is very non specific in both the cases. Yet a provisional diagnosis can be made out safely which can be confirmed with further non-invasive diagnostic tools.

Table I: SPECT findings in patients where X-ray findings are normal

No of patients	X-ray	Clinical Symptoms	SPECT Findings
2	Normal	Dull pain at the thoracolumbar region, not relieved by analgesics.	Foci of increased uptake seen (a single focus in the first case at L1 and two in the second at T9, T11). Metastatic picture. The primary was not known.
5	Normal	Generalized ill health and severe pain at the thoracolumbar region, local tenderness present.	Diffuse area of increased tracer uptake in and around the vertebral bodies involved. Picture consistent with inflammation/ infection.(Caries spine was the diagnosis).
2	Normal	Post traumatic, but the pain did not settle even after use of analgesics	Mildly increased tracer uptake in the area of lumbar vertebral bodies, suggesting osteoblastic activity.
1	Normal	Pain at the coccygeal region which increases on sitting.	Mildly increased tracer uptake in the sacrococcygeal region with small area of increased uptake in the gluteal muscle region suggesting trauma.
26	Normal	Diffuse backache response to analgesics was variable.	No abnormal tracer uptake pattern detected. Bone SPECT was reported "Normal".

Out of 36 patients in which X-rays were reported to be normal, 10 patients showed abnormal radiotracer distribution in the spine and clearly delineated disease foci not previously diagnosed i.e 27% of cases pathological events were detected only with the help of SPECT, the site and level in vertebral column were localized and further investigations were carried out accordingly .

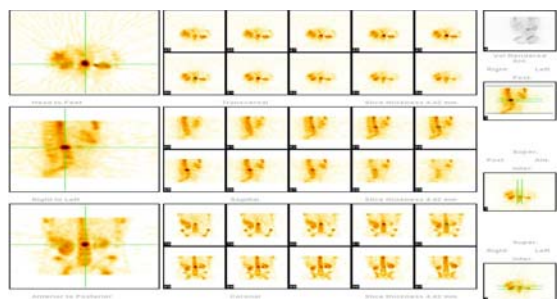


Figure I: SPECT view of metastatic focus at L1 level.

In 2 out of 36 (5.55%) of patients a metastatic picture was noted when the primary was undetected showing the sensitivity of the test in early detections of

metastatic disease when the primary neoplasm is undetected.

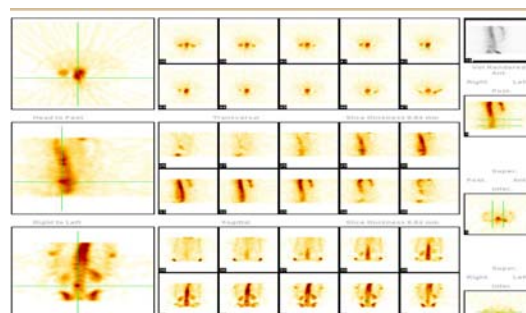


Figure II: SPECT showing increased uptake at facet joints at multiple vertebral level in thoraco lumbar spine. Pattern suggesting degenerative spine disease

Five patients in the series of 36 patients scanned i.e.13.88% showed a diffuse pattern of distribution of radiotracer that was reported as infection/inflammation, even when the pathological process had just begun, not causing any noticeable

change in the radiographs.

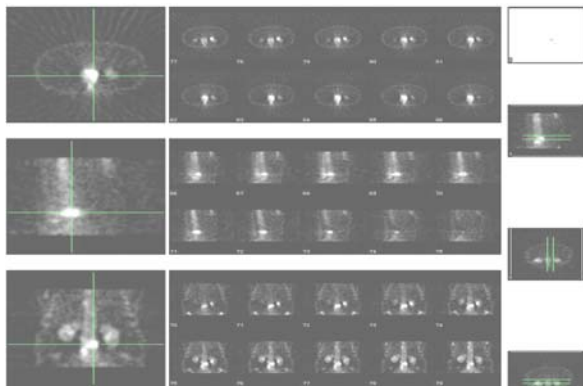


Figure III: Diffusely increased tracer uptake at L2/L3, attributable to infective pathology.

Discussion

Backache is a common complaint in the general population. Around 60-80% of people develop the symptoms during their life time. Backache can be caused by a variety of conditions including musculoligamentous disorders, bone and joint disorders and neurological disorders. Previous studies have investigated the use of X-rays, C.T, MRI and bone scan in back pain diagnosis however these examinations are still unable to determine the pathologic factors in some of the patients. Among these bone scan has the highest sensitivity for several disorders of bone and joints of vertebral column, e.g. vertebral bony fractures or defects, spondylodiscitis, active arthritis of the facet joints, tumors and infection.¹⁻⁴

In early stage of pathology X-rays of the spine may show scoliosis, narrowing of disc space, osteophytes, spondylosis and osteoporotic fractures, when the patient is not specifically suffering from any symptom of back discomfort, at the same time; the radiological examination may be reported normal when the patient complains of disabling pain. A potential advantage of bone SPECT is that it can show altered physiological activity of osseous lesions at an early stage of disease before any morphological changes can be seen radiographically, as X-ray changes appear later during the course of disease.

SPECT is particularly useful in such evaluations since it allows precise localization of lesions on the vertebral body, disc space, pedicle, pars interarticularis, facet joint, transverse process and spinous process.^{5,6} The sensitivity of SPECT in this regard approaches

100%, although the specificity is around 70-75%.^{7,8,9}

The role of whole body bone scan and bone SPECT in the detection and localization of metastatic foci in the spine can not be overemphasized as it has already been proved to be the best method for the detection of the process. The results of vertebral SPECT are comparable and complimentary to MRI in detecting vertebral metastasis. It is even superior to MRI in detection of extravertebral body metastasis.¹⁰

In case of inflammation and infection, the role of SPECT is important in diagnosis of disease, especially when the lesion is located at the posterior elements of the vertebrae.¹¹ Early detection of metastasis or infection is possible only with SPECT as it is sensitive to detect the process at an early stage when the evidence can not be visualized radiographically that only shows changes when there is considerable bone mineral loss (30-40%).

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