



Improved Accuracy In Diagnosing Superscans Using Xspect Bone Scan In Prostate Cancer Patients

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INTRODUCTION

Prostate cancer is one of the most common cancers affecting men worldwide, and a bone scan is part of the staging modality used to evaluate asymptomatic bone metastasis. A bone scan with diffusely increased skeletal tracer uptake relative to soft tissue in association with absent or faint renal activity is known as a superscan (Manohar et. al., 2016). However, a primary concern is the false negatives associated with bone scans being diffuse metastases, where images are indistinguishable on 2D planar images (superscans). Furthermore, the criteria of a superscan can sometimes yield inconclusive results.

AIM

To evaluate the accuracy of standard whole body planar images (superscan) in conjunction with xSPECT reconstruction images in detecting and diagnosing bone metastases in patients with prostate cancer.

METHOD

In these retrospective case series, we performed SPECT with additional xSPECT reconstruction algorithm in four prostate cancer patients with high Prostate-Specific Antigen (PSA) levels, which initially showed relatively normal findings on planar images.

RESULTS AND DISCUSSION

These patients with relatively extensive bone metastases were missed on routine planar images, but demonstrated superscan attributes on SPECT and xSPECT images.

Uptake was further confirmed by the correlative diffused bone lesions on CT images. Our diagnostic images also revealed that xSPECT reconstructed images were far superior in delineating focal areas of osteoblastic bone metastases, when compared with whole body planar images and SPECT images alone.

As shown in Fig 1, whole body planar scans can be visually evaluated as superscans, but can demonstrate rather normal appearances on both anterior and posterior views, with inconclusive metastatic evidence in some cases. Certain unclear areas may demonstrate increased localised uptake due to osteo-degenerative diseases.

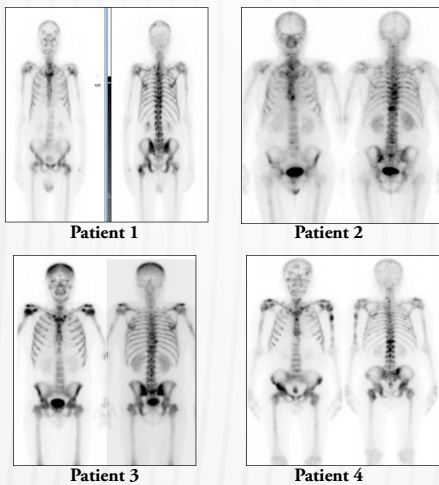


Figure 1. Patients 1-3 showing rather unremarkable whole body planar images (anterior and posterior) and Patient 4 indicating possible but inconclusive localised tracer uptake. All scans demonstrate overall increased uptake in the skeletal system, with low background and faint tracer uptake in renal system, suggestive of superscans.

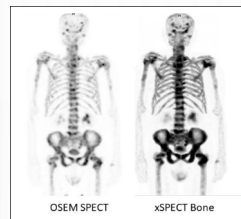


Figure 2. SPECT and xSPECT reconstruction clearly delineates widespread osteoblastic bone metastases. xSPECT images show diffusely intense uptake in axial and proximal appendicular skeleton.

As shown in Fig 2, xSPECT bone images sharply defines extensive osteoblastic bone metastases, demonstrating significant diagnostic value compared to the planar study and superiority in resolution when compared with SPECT reconstruction. This can further evaluate any discrepancies that may be evident in defining disease progression from metastases or osteo-degeneration.

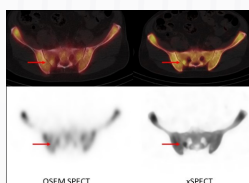


Figure 3. Focal tracer uptake is better delineated and appreciated with higher bone resolution on xSPECT/CT fusion images.

xSPECT/CT fusion images demonstrate significant clarification in delineating any discrepancies that may arise from uncertain tracer uptakes, whether it be from inflammation due to degenerative diseases, or metabolic uptake from metastatic disease progression. Generalised sclerosis with few focal uptake areas are noticed in the pelvis, correlated with high resolution on xSPECT/CT fusion images, allowing for accurate diagnosis (Fig. 3). Pin-point accuracy in defining sclerotic vertebrae lesions are demonstrated with high resolution in xSPECT/CT fusion images, allowing for more accurate overall assessment of osteoblastic metastases to the spine (Fig. 4).

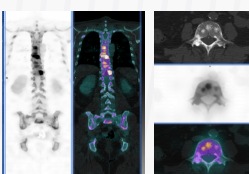


Figure 4. Sharp delineation and focal tracer uptake is sharply demonstrated along specific areas of the spine in xSPECT/CT fusion images

CONCLUSION

Despite visual evaluation of a superscan, planar images may demonstrate minor or inconclusive skeletal metastases in some cases, but exact extent of metastatic evidence is delineated with far superior clarification by xSPECT bone reconstruction algorithm. The corresponding lesions seen on CT fused with xSPECT images allow for more accurate diagnosis and the extent of disease progression.

We propose that along with normal planar images, whole body (skull vertex to pelvis) xSPECT/CT, or at least SPECT/CT, should be performed in patients with high PSA levels, in order to enhance the diagnostic accuracy of bone scans in staging prostate cancer.

REFERENCE

1. Manohar, P.R., Rather, T.A., Shoukat, H.K., Malik, D. (2016). Skeletal Metastases Presenting as Superscan on Technetium 99m Methylene Diphosphonate Whole Body Bone Scintigraphy in Different Type of Cancers: A 5-Year Retro-prospective Study. *World Journal of Nuclear Medicine*, 16(1), 39-44.