HEAD-TO-HEAD COMPARISON OF HYPER ITERATIVE AND OSEM RECONSTRUCTION ALGORITHM IN THE ASSESSMENT OF BONE METASTASIS AMONGST PROSTATE CANCER PATIENTS DURING A WHOLE-BODY ^{68}Ga-PSMA PET/CT EXAMINATION

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INTRODUCTION

- Prostate cancer is the most common cancer among men worldwide and often spreads to the bones. About 10% of patients have bone metastases at the time of diagnosis, and this increases to around 90% in advanced stages.
- Bone metastases in prostate cancer are associated with high mortality and poor survival outcomes.
- ^{68}Gallium-68-prostate specific membrane antigen Positron Emission Tomography (^{68}Ga-PSMA PET/CT) is an important imaging technique for detecting primary prostate tumors and bone metastases, and has become a standard tool in prostate cancer management.
- We present a case study of two different reconstruction methods, 3D-OSEM and HYPER Iterative from UMI 780 (United Imaging) in evaluating bone metastases in prostate cancer patients undergoing whole-body ^{68}Ga-PSMA PET/CT examination.

METHOD

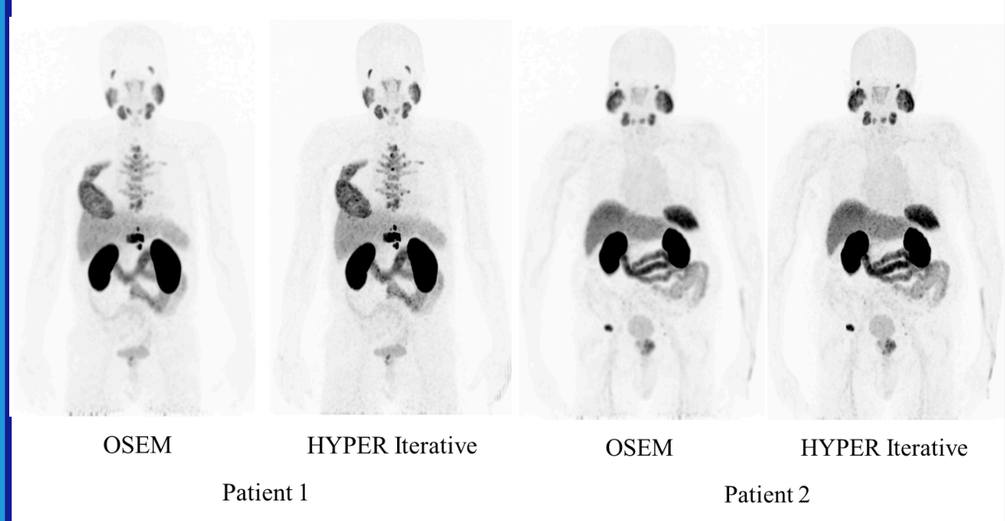
- In this retrospective case series, ^{68}Ga-PSMA PET/CT scans were performed on three prostate cancer patients using the standard 3D-OSEM reconstruction method, with an additional application of the HYPER Iterative reconstruction algorithm.
- Both reconstruction were individually fused with CT images for anatomical localization and attenuation correction

PET Reconstruction Parameter	**OSEM** (2 Iterations, 20 Subsets)
	HYPER Iterative (0.28 Regulization strength)

Table 1: PET Reconstruction Algorithm

CASE STUDY

In the evaluation of bone metastases, images reconstructed using the HYPER Iterative demonstrate diffusely intense skeletal tracer uptake with enhanced visual clarity compared to those generated using the standard OSEM.



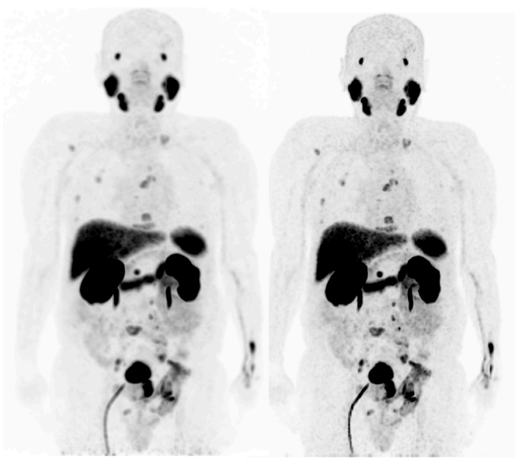


Figure 1. Anterior view of the Maximum Intensity Projection (MIP) from both OSEM and HYPER Iterative PET reconstructions, demonstrating PSMA-avid uptake. HYPER Iterative reconstruction provides sharper delineation of the patient's anatomical structures compared to the standard OSEM.

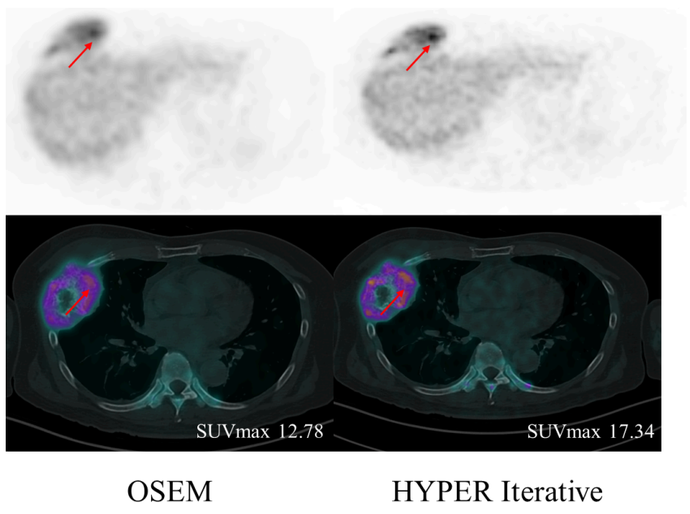


Figure 2 highlights a clearly defined area of focal uptake in the right lateral rib of patient 1, presented with improved contrast and resolution on HYPER Iterative PET/CT fused images.

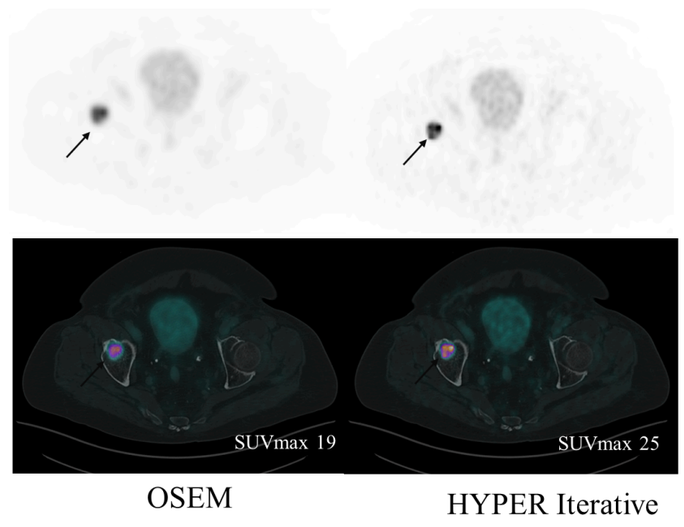


Figure 3 illustrates generalized sclerosis with focal uptake in the right acetabulum of patient 2, correlating well with the high-resolution PET/CT images and supporting an accurate diagnosis.

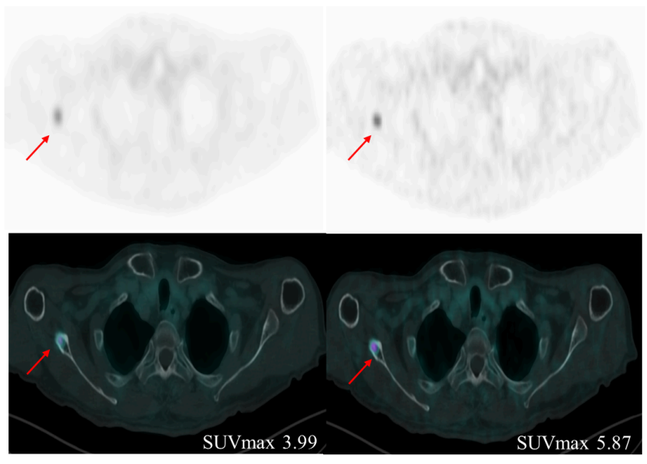


Figure 4 shows that HYPER Iterative PET/CT images are significantly superior in detecting focal uptake in small bone lesions. In Patient 3, a small sclerotic lesion in the right scapula exhibited focal uptake on the HYPER Iterative PET/CT image, which appeared only faintly on the OSEM PET/CT image.

Incorporation of HYPER Iterative reconstruction also leads to increase the SUVmax of lesions, thus improving the lesion quantification accuracy of ^{68}Ga-PSMA compared to OSEM

CONCLUSION

HYPER Iterative supersedes standard OSEM algorithm for image reconstruction, by delivering image with greater resolution and contrast; improve small lesion detection, and enable more accurate quantification of radionuclide uptake that can improve patient management.

LIMITATION & RECCOMMENDATION

- Case study series were acquired from a single institution in a smaller sample size.
- HYPER Iterative can only be used for ^{68}Ga-PET/CT study
- HYPER Iterative reconstruction is still relatively new and is not included in the EANM Accreditation standard range of values.
- Further investigation is warranted

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