

PSMA PET-CT in Bangladesh: Game Changer in the Management of Prostate Cancer

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INTRODUCTION

The cyclotron facility of the National Institute of Nuclear Medicine and Allied Sciences (NINMAS) has been providing ¹⁸F Fluorodeoxyglucose (¹⁸F FDG) commercially since 2021 to detect cancers, stage, restage, and monitor treatment response by PET-CT scan. But there are some limitations of ¹⁸F FDG, as not all cancers are sensitive to FDG, like carcinoma of the prostate, which has low glucose metabolism. Prostate-specific membrane antigen (PSMA), a protein, is overexpressed in most prostate cancer cells. This can be used for detection of cancer cells by using PSMA radioligands and as a target for radionuclide therapy in metastatic disease.

Prostate cancer is among the most prevalent malignancies affecting men worldwide, with significant morbidity and mortality. Accurate imaging plays a central role in staging, treatment planning, and the detection of recurrence. Traditional imaging modalities such as computed tomography (CT), magnetic resonance

imaging (MRI), and bone scintigraphy have long been used but suffer from limited sensitivity, particularly in detecting early metastatic or recurrent disease (1). Afterwards, PET imaging came into the scene to better visualize prostate cancer and its local recurrence. Still, there were limitations with conventional PET radiotracers like ¹⁸F/11C choline or ¹⁸F FDG.

The advent of PSMA PET-CT has dramatically altered this landscape. PSMA is a transmembrane protein highly overexpressed in prostate cancer cells, making it an ideal molecular imaging target (2). Radiotracers such as ⁶⁸Ga-PSMA-11 and ¹⁸F-labeled PSMA ligands have enabled highly sensitive whole-body imaging, ushering in a new era in prostate cancer management (3). A PSMA PET-CT scan does not require any specific patient preparation like prior fasting or stopping medication. Here is a comparative study between an 11C-Choline PET scan and a PSMA PET scan in a prostate cancer patient with biochemical recurrence, showing multiple metastatic foci detected by the PSMA PET scan (4).

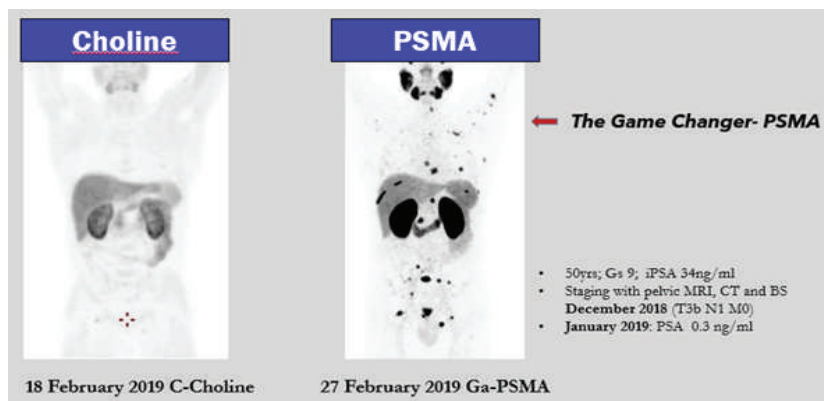


Figure 1: Compared to conventional imaging techniques, PSMA PET scans provide improved tumor detection and localization, marking a substantial progress in prostate cancer imaging. By using prostate-specific membrane antigen (PSMA) as a target, this method improves the precision of detecting malignant tumors. Because PSMA PET scans enable more accurate therapy targeting and better patient results, they are considered a revolutionary technique in the management and treatment of prostate cancer.

The unique features of PSMA PET-CT in comparison to other imaging modalities include:

1. Superior diagnostic performance: The landmark pro-PSMA trial demonstrated that PSMA PET-CT significantly outperforms conventional imaging in staging high-risk prostate cancer, with an accuracy of 92% compared to 65% for standard imaging approaches (5). Low glucose metabolism in prostate cancer makes the ¹⁸F FDG PET-CT scan less sensitive until the disease is de-differentiated. The enhanced accuracy of the PSMA PET-CT scan thus allows better identification of nodal and distant metastases, even when lesions are small or anatomically inconspicuous.

2. Early detection for biochemical recurrence: PSMA PET-CT has shown remarkable sensitivity in detecting disease recurrence at very low PSA levels. Detection rates remain clinically meaningful even when PSA levels are below 0.5 ng/mL, a range where conventional imaging is often non-informative (6, 7). This capability enables earlier intervention and more precise targeting of recurrent disease, significantly improving clinical outcomes.

3. Impact on clinical management: A major reason PSMA PET-CT is considered a “game changer” is its

substantial impact on patient management. Studies indicate that imaging findings lead to changes in management in approximately 27–60% of patients (8). These changes may include shifts from curative to palliative treatment, modification of radiation therapy fields, or selection of targeted systemic therapies.

In radiation oncology, PSMA PET-CT allows more accurate delineation of tumor burden, enabling dose escalation to affected areas while minimizing exposure to surrounding healthy tissues (9).

Considering all the advantages, the cyclotron division of NINMAS started to produce ¹⁸F labeled PSMA-1007 in 2023, and nowadays it is a routine procedure. ¹⁸F PSMA-1007 is supplied to other Institutes of Nuclear Medicine (INMASs) and also to some private institutes in Dhaka.

PSMA PET-CT IMAGING IN NINMAS

The very first PSMA PET-CT scan was done in NINMAS as well as in Bangladesh in 2023. Since 2024, NINMAS has been performing PSMA PET-CT scans routinely to date. Figure 2 shows the increasing number of PSMA PET-CT done in NINMAS from 2023 to April 2026. The two representative cases of the PSMA PET-CT scan done in NINMAS are shown in Figures 3 and 4.

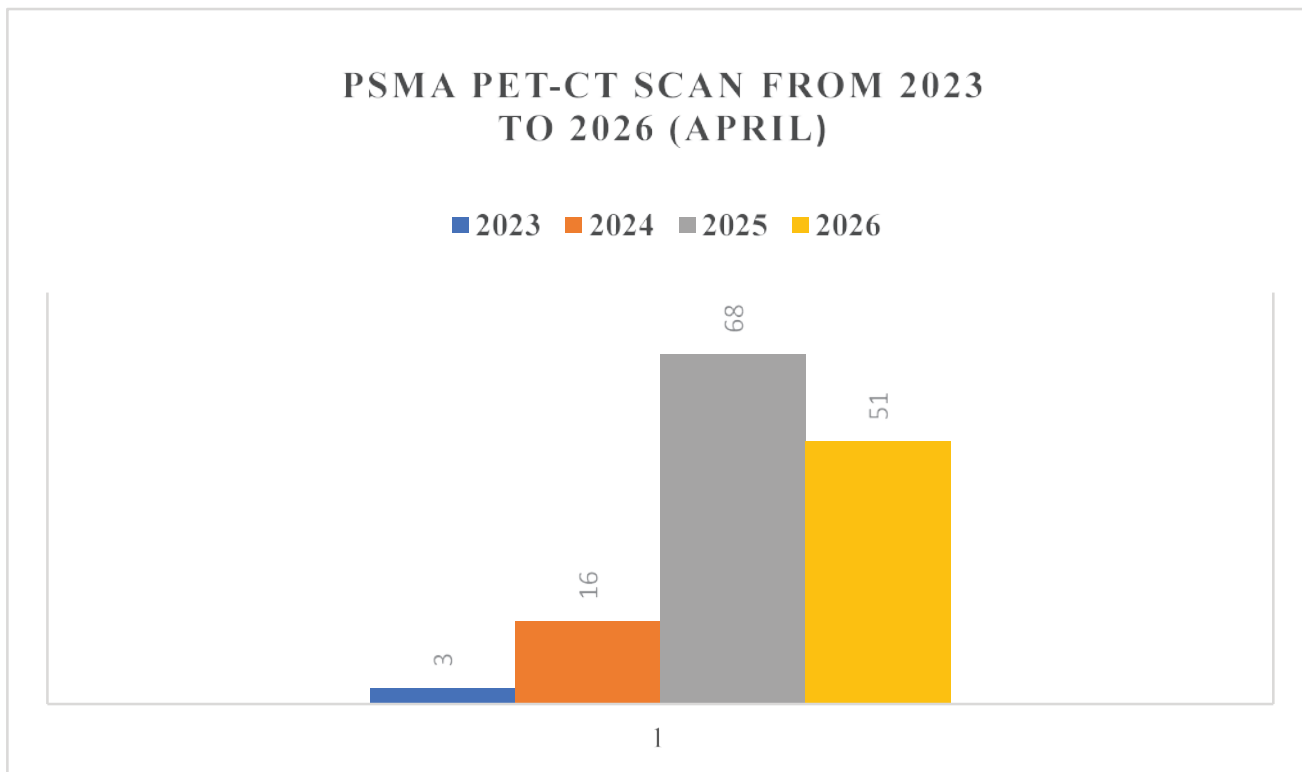


Figure 2: The rising number of PSMA PET-CT scans in NINMAS



Figure 3: PSMA expression in prostate and in multiple pelvic lymph nodes

Figure 4: Multiple skeletal metastases in a biochemical recurrent case

Theranostic Potential

Beyond diagnosis, PSMA PET-CT plays a central role in theranostics—combining diagnostic imaging with targeted therapy. Patients with PSMA-avid lesions can be selected for treatment with radioligand therapies such as ^{177}Lu -PSMA-617. The VISION trial demonstrated that this therapy significantly improves overall survival and progression-free survival in patients with metastatic castration-resistant prostate cancer (10). This integration of imaging and therapy represents a paradigm shift toward personalized medicine.

Limitations and Challenges

PSMA PET-CT has certain limitations. False-positive uptake can occur in benign conditions such as inflammation, fractures, or other malignancies (11). Additionally, some aggressive prostate cancer subtypes may de-differentiate and exhibit low PSMA expression, leading to false-negative results.

Practical challenges include limited availability, high cost, and the need for specialized infrastructure, particularly in developing countries. Furthermore, standardization of imaging protocols and interpretation criteria remains an ongoing need to ensure consistent results across institutions (12).

Future Prospective

To bring up PSMA based theranostic approaches are the next goal in the nuclear medicine and molecular imaging arena of Bangladesh. We dare to dream about radioligand therapy for biochemical recurrent prostate cancer patient

management.

Conclusion

PSMA PET-CT has redefined the imaging paradigm in prostate cancer, offering superior diagnostic accuracy, early detection of recurrence, and significant impact on clinical decision-making. Its role in theranostics further underscores its transformative potential. Despite certain limitations, the growing body of evidence supports PSMA PET-CT as a true “game changer” in prostate cancer imaging and management.

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