An interesting case of Posterior Layering in the Urinary bladder on Fluorine-18 Fluorodeoxyglucose (F18-FDG) PET-CT study

Sharmin Farhana1, Taslima Sifat1, Shohag Mia2, Rahul Quddus3, Biva S. Khan4, Saiful Islam5, Raihan Hussain6, M. F. Kabir7

1. Sr. Specialist, Department of Nuclear Medicine & Molecular Imaging, Evercare Hospital Dhaka
2. Scientific Officer, National Institute of Nuclear Medicine and Allied Sciences (NIMAS), BSMMU, Dhaka
3. Principal Technologist, Department of Nuclear Medicine & Molecular Imaging, Evercare Hospital Dhaka
4. Sr. Consultant, Department of Interventional Radiology & Imaging, Evercare Hospital Dhaka
5. Sr. Consultant and Coordinator, Department of Interventional Radiology & Imaging, Evercare Hospital Dhaka
6. Sr. Consultant, Department of Nuclear Medicine & Molecular Imaging, Evercare Hospital Dhaka
7. Sr. Consultant and Coordinator, Department of Nuclear Medicine & Molecular Imaging, Evercare Hospital Dhaka

Address for Correspondence:
Dr. Sharmin Farhana
Sr. Specialist,
Department of Nuclear Medicine & Molecular Imaging,
Evercare Hospital Dhaka.
sharmin.farhana@evercarebd.com

CASE REPORT

This is a case of a 78 years old male, diagnosed as lung carcinoma with suspected mediastinal nodal metastases treated by oral chemotherapy. The patient underwent whole body F18-FDG PET/CT scan at Nuclear Medicine & Molecular Imaging department, Evercare Hospital Dhaka, for evaluation of treatment response.

Whole body PET/CT scan (from vertex to mid-thigh with 5 bed positions) was performed about 60 minutes after intravenous injection of 6.5 mCi of F18-FDG using a GE Discovery-IQ 5 ring PET/CT scanner. Fasting capillary blood glucose level was 7.8 mmol/L before FDG injection. CT scan of brain, head & neck, chest, abdomen & pelvis were acquired. Breath-hold CT thorax was also acquired. Transaxial, coronal, sagittal & 3D-MIP images of attenuation corrected PET, CT & fused PET-CT were reconstructed. Semi-quantitative analysis of FDG uptake was performed by calculating SUV values corrected for administered dose & patient’s body weight. PET/CT study was noted to have settling of F18-FDG in the posterior aspect of the overdistended Urinary Bladder (UB) in addition to the findings of hypermetabolic left lung mass with mediastinal lymphadenopathy. Corresponding CT as well as Ultrasonography showed no anatomical lesion within the bladder cavity (Figure 1,2).

DISCUSSION

Settlement of F18-FDG in the urinary bladder (UB) is often noted during PET/CT scanning. In case of PET/CT with intravenous contrast, the higher specific gravity of the contrast material displaces the excreted F18-FDG, resulting in anterior layering of the radiotracer1. Whereas, posterior layering of F18-FDG is hypothesized to be due to slow F18-FDG excretion in patients with a distended urinary bladder, resulting in delayed mixing with urine. In addition, urinary tract infection may be another potential cause2.

Figure 1(a): CT image in axial section showing no anatomical lesion within the UB
Several examples of layering within the UB have been reported in the literature with contrast PET/CT. The urine that contains contrast medium and has a high specific gravity is layered posteriorly in the dependent portion of the UB on CT scan, whereas lower-specific-gravity, non-opacified urine is layered at the uppermost part of the bladder\(^4\). The patient in our study underwent PET/CT evaluation without contrast, and there was settling of F18-FDG in the posterior aspect of the overdistended UB. In a big study with 567 patients, 24 (4\%) cases showed F18-FDG posterior bladder layering\(^4\). This may be due to the delayed urinary excretion of F18-FDG and the delayed mixing of urine-containing F18-FDG with non-radioactive urine. This layering is more likely to occur in patients with distended bladder \(^4\), frequently found in patients with inadequate voiding. This phenomenon is physiological and is very much important to recognize it for avoiding misinterpretation and unnecessary investigations\(^5\).

Another hypothesis suggests that the layering of F18-FDG in the UB is due to sedimentation of metabolically active cellular components such as inflammatory cells, malignant cells, or bacteria. During PET scanning, these components take up excreted F18-FDG in the urine for their metabolism and because of gravity these cells settle to the bottom of the bladder \(^2,6\). In our case, there was no symptom of urinary tract infection and for further evaluation urine analysis & renal function test were done after PET/CT scan, and all were found to be within normal limit. To the best of our understanding, there was no standard explanation for settling of F18-FDG in the UB.

**CONCLUSION**

The case demonstrates the interesting posterior layering of F18-FDG in the urinary bladder, the cause of which appears to be due to the distended bladder; however, the mechanism needs to be further investigated in a more comprehensive study. Images showing this layering demand careful evaluation of the urine by the clinician and hence should be reported.

**REFERENCES**