

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

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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).

ABSTRACT

Contrast PET/CT may show layering within the UB, and several examples of have been reported in the literature. But without using contrast this is rare. Our case demonstrates the interesting posterior layering of F18-FDG in urinary bladder in a 78 years old male without the use of contrast.

Key words: F18-FDG, PET/CT, Posterior Layering, Urinary Bladder.

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 radio-tracer¹. 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.

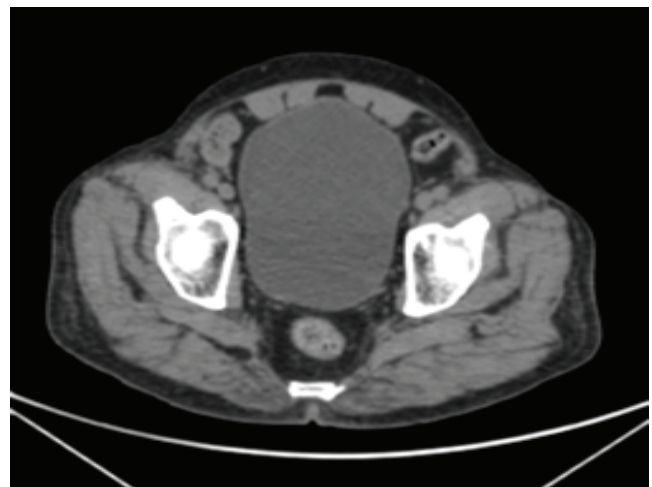


Figure 1(a): CT image in axial section showing no anatomical lesion within the UB

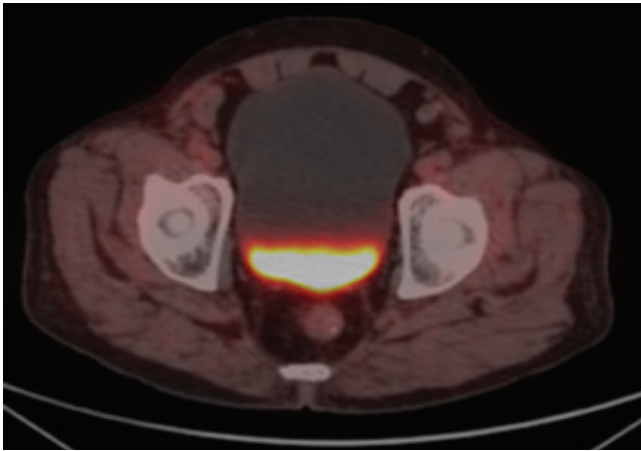


Figure 1(b): PET-CT fused image in axial section showing Posterior layering of UB



Figure 2(a): CT image in sagittal section showing no anatomical lesion within the UB.

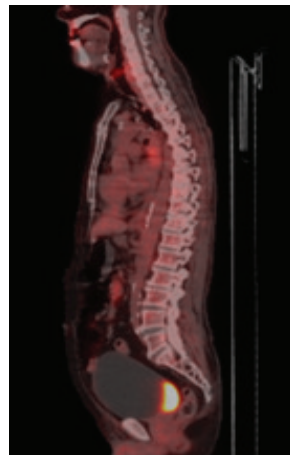


Figure 2(b): Figure 1(b): PET-CT fused image in sagittal section showing Posterior layering of UB

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 bladder³. 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 layering⁴. 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 bladder⁴, frequently found in

patients with inadequate voiding. This phenomenon is physiological and is very much important to recognize it for avoiding misinterpretation and unnecessary investigations⁵.

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.

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