Bilateral Adrenal Metastases in Non-small Cell Lung Cancer Patient at Baseline ^{18}F-FDG PET-CT Scan– A Rare Case Report

Rashmi Kar, Pupree Mutsuddy, Tapati Mandal, Khokon Kumar Nath, Abu Bakker Siddique and Shamim MF Begum

National Institute of Nuclear Medicine and Allied Sciences (NINMAS), Dhaka, Bangladesh

Correspondence Address: Dr. Rashmi Kar, MD Resident (Nuclear Medicine), National Institute of Nuclear Medicine & Allied Sciences(NINMAS), BSMMU campus, Email: rashmikar.bd.ctg@gmail.com

ABSTRACT

Bilateral adrenal metastases at the time of initial diagnosis of non-small cell lung cancer is a rare phenomenon. In elderly patients with an extra-adrenal malignancy and other nodal metastases, it is difficult to diagnose the etiology of adrenal mass by invasive procedure. Fluorine-18 FDG PET-CT scan can be an effective alternative in this type of patient to characterize adrenal masses as metastatic using several metabolic and imaging parameters in a single setting. Here we present a rare case of synchronus bilateral adrenal metastatic masses found in an elderly gentleman with non-small cell lung cancer (NSCLC) diagnosed during his baseline evaluation by ^{18}F- FDG PET-CT scan.

Key words: **Adrenal metastases, NSCLC, ^{18}F-FDG PET-CT, SUVmax, Hounsfield Unit.**

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INTRODUCTION

The adrenal gland is one of the commonest site for metastases from a number of primary tumors originating from carcinomas of lung, breast and kidneys; melanoma and lymphoma (1). About 8%-10% people affected with non-small cell lung cancer (NSCLC) develop bilateral adrenal metastases in the course of disease process, but at the time of initial diagnosis the finding is rare with only 2%-3% incidence rate among NSCLC patients. Also presence of synchronous adrenal metastases in any lung cancer type is considered rare with 1%-6% incidence rate (2,3).

Integrated positron emission tomography-computed tomography (PET-CT) with the glucose analogue fluorine-18 fluorodeoxyglucose (F-18 FDG) has been recommended for first-line staging of patients with all stages of lung cancer because of its ability to integrate both anatomic and functional assessment of potential metastasis (4, 5). It is also recommended that, if FDG PET-CT scanning for any extra adrenal malignancy reveals adrenal mass, it can replace other imaging techniques for adrenal glands to evaluate the mass (6). The likelihood of malignity of adrenal mass found during ^{18}F-FDG PET-CT scanning is higher in patients with one or more of the following parameters: **i**) history or finding of any malignancy, **ii**) adrenal mass size >4 cm, **iii**) bilateral masses, **iv**) mass with irregular and unclear margins, **v**) calcifications within the mass, **vi**) high standardized uptake values (SUV), **vii**) attenuation values in terms of Hounsfield Unit (HU) >10 on nonenhanced adrenal CT portion of the study etc. (7).

This case report discussed the squamous cell type of non-small cell lung cancer with large bilateral adrenal masses found during the baseline staging evaluation by ^{18}F-FDG PET-CT scan in National Institute of Nuclear Medicine and Allied Sciences (NINMAS).

CASE REPORT

A 68-year-old, hypertensive, past smoker, gentleman suffering from chronic obstructive airway disease (COAD) was referred to PET-CT division of NINMAS back in November, 2021 for whole body ^{18}F-FDG PET-CT scan as part of staging evaluation for newly diagnosed NSCLC with a past history of carcinoma of larynx treated with radical radiotherapy three years back. He had pulmonary tuberculosis 21 years back and history of COVID-19 pneumonia 11 months back. He had no symptoms related to respiratory disease after recovery from COVID-19 infection. Patient had undergone fiber optic laryngoscopy and CT scan of neck as part of regular follow up for laryngeal cancer, which were

unremarkable. However, CXR revealed a definite mass with lobulated margin in upper zone of left lung. No further work up was done at that moment rendering the finding was incidental. Few days later, CT guided FNAC from left lung lesion was done as the patient was having sudden continuous high-grade fever. Cytology reported positive for malignant cell consistent with squamous cell carcinoma of lung, a variety of NSCLC. Diagnosis was confirmed by histopathology and immunohistochemistry (IHC) examination from the core biopsy sample of left lung lesion suggesting moderately differentiated squamous cell carcinoma with negative TTF1 and a small number of positive P63 cells (Figure 1).

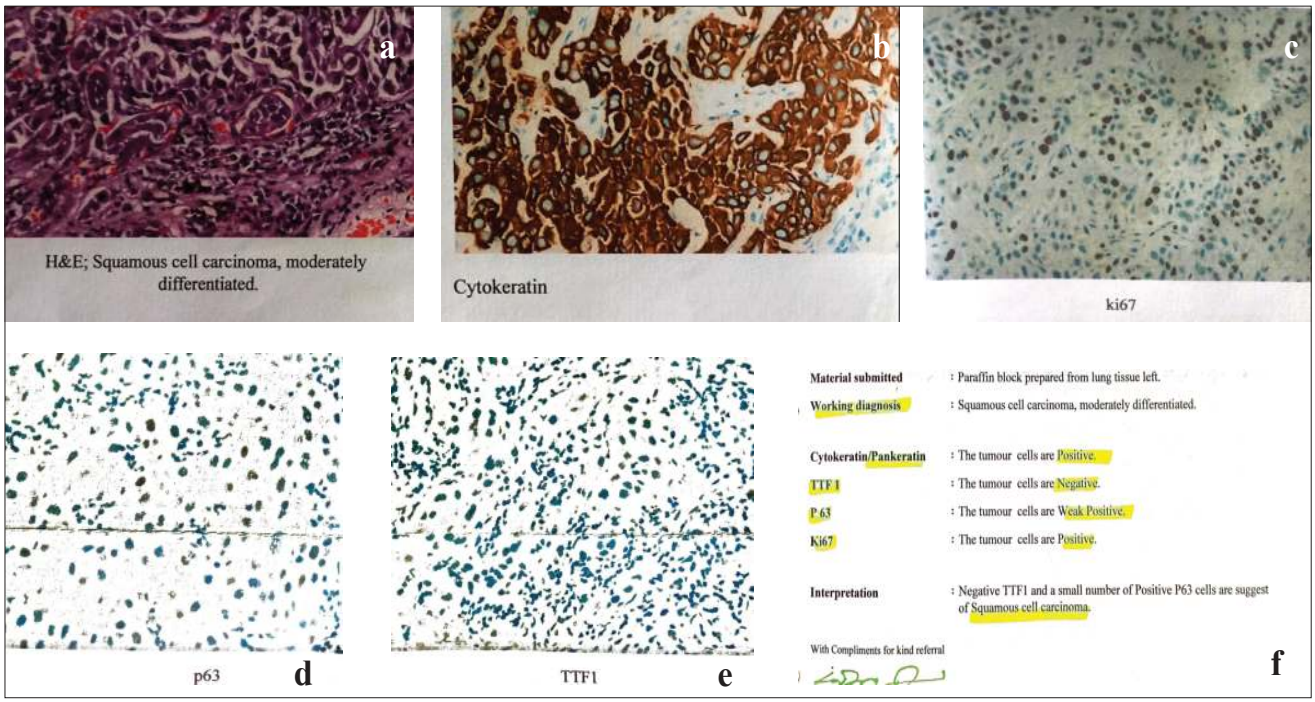
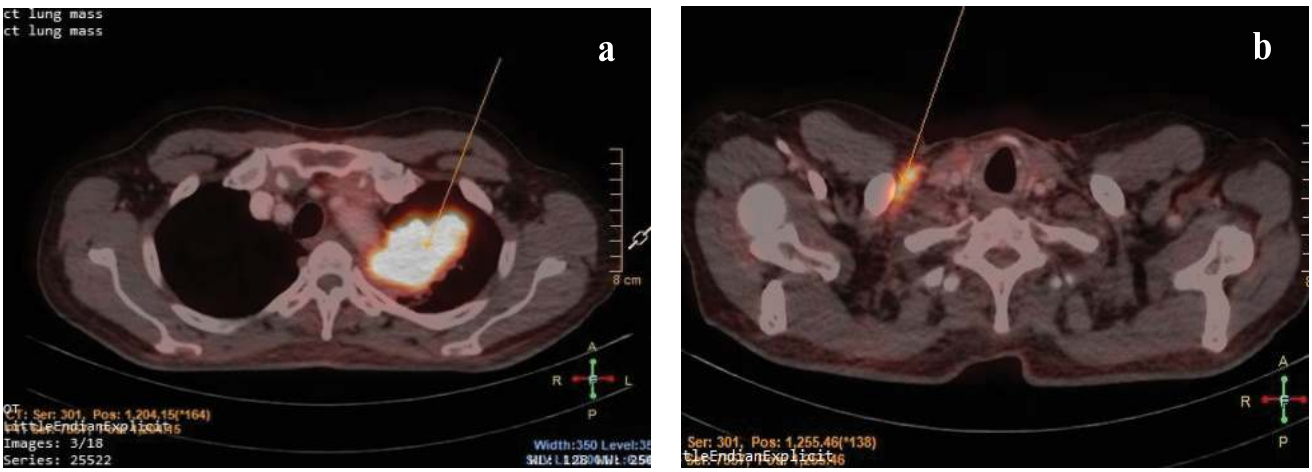


Figure 1: Histopathology of core biopsy sample from left lung mass demonstrates-a) moderately differentiated squamous cell carcinoma. Immunocyto-histochemistry study from same sample reveals tumour cells positive for cytokeratin and Ki 67, weakly positive for P 63 and negative for TTF 1 demonstrated in figure b), c), d) and e) final interpretation of study shown in figure f) suggests squamous cell carcinoma of lung.

^{18}F-FDG PET-CT scan showed hypermetabolic contrast enhanced large irregular soft tissue density mass measuring about 49X65X57mm with SUVmax 8.4 involving upper lobe of left lung consistent with metabolically active primary malignancy (Figure 2). Multiple enlarged right supraclavicular, bilateral mediastinal and abdominal lymphnodes were found suggestive of nodal infiltrations (Figure 2).



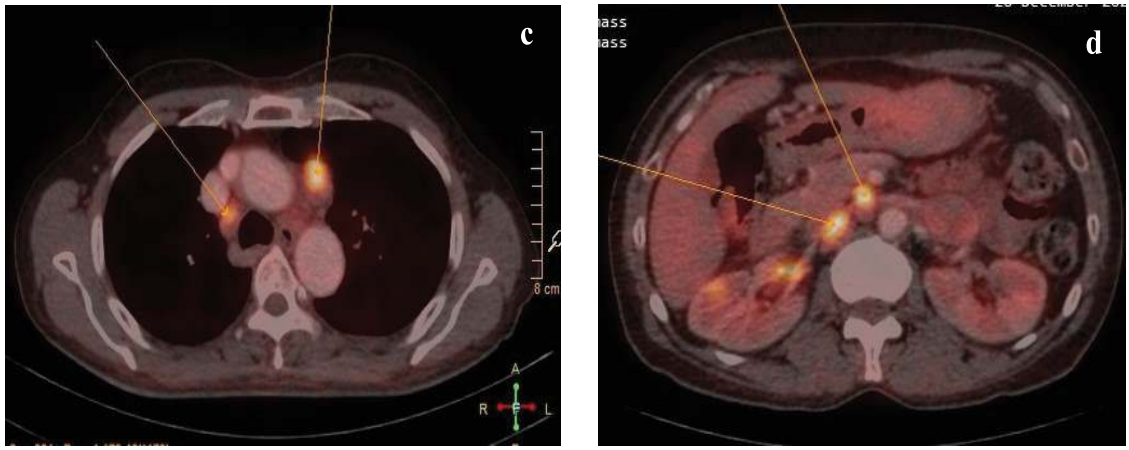


Figure 2: From left to right -transaxial ^{18}F-FDG PET-CT fused images of chest ,neck, mediastinum and abdomen demonstrating a) large, hypermetabolic, irregular, soft tissue density mass involving upper lobe of left lung consistent with metabolically active primary malignancy; b) lower part of neck showing hypermetabolic enlarged right supraclavicular lymphnodes (arrows); c) bilateral hypermetabolic enlarged mediastinal lymphnodes and d) abdominal lymphnodes (arrows).

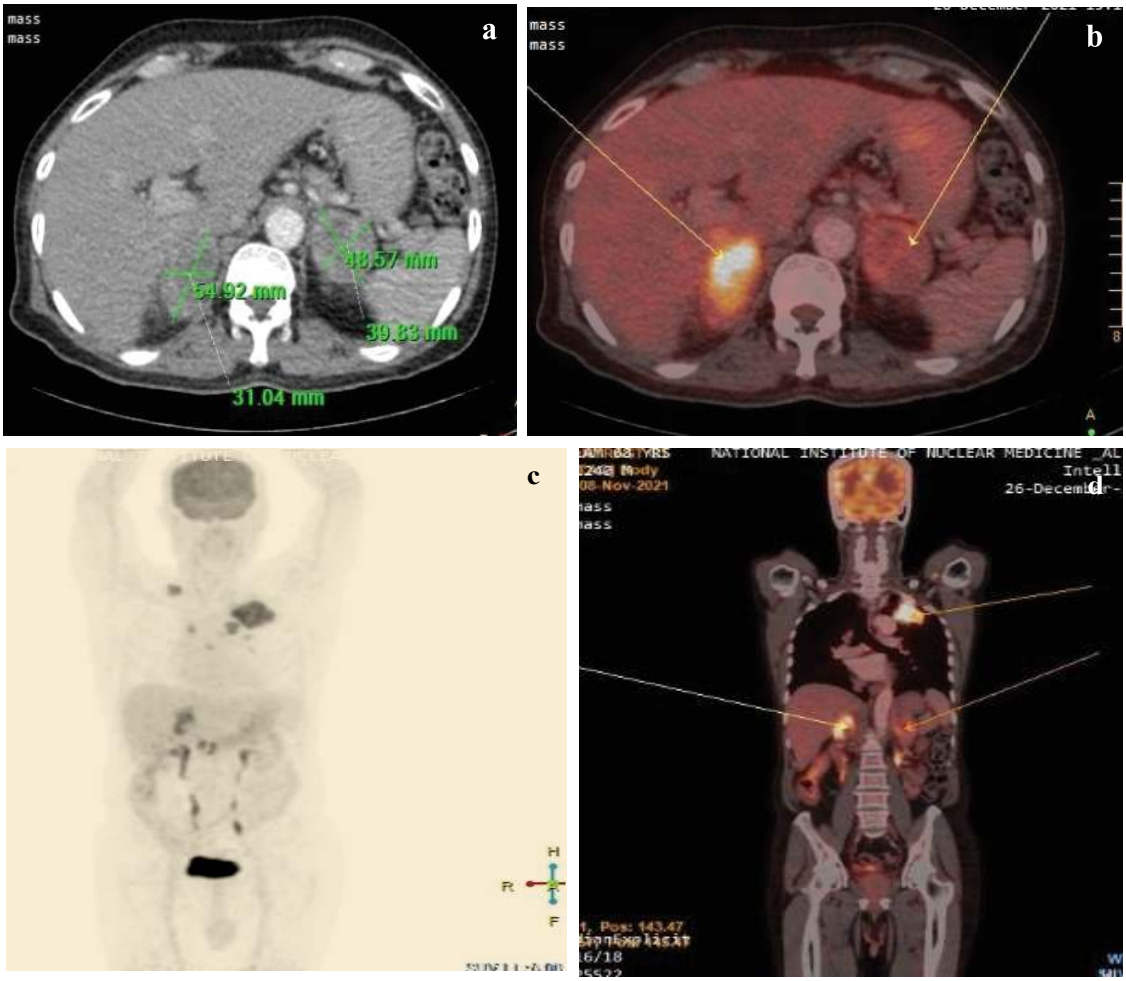


Figure 3: From left to right - upper row demonstrating a) transaxial contrast enhanced CT and b) fused ^{18}F-FDG PET-CT images of upper abdomen showing large, hypermetabolic, soft tissue density masses in both adrenal glands (arrowed) suggestive of bilateral adrenal metastases; lower row demonstrates c) whole body maximum intensity projection image of PET scan and d) fused coronal ^{18}F-FDG PET-CT image with visible lung and adrenal lesions (arrows).

Hypermetabolic, large, rounded, soft tissue density masses were found in both adrenal glands suggestive of bilateral adrenal metastases; the size of right adrenal gland was about 54X31mm with SUVmax 8.0 and that of left adrenal gland about 48X39mm with SUVmax 5.0 (Figure 3). Non enhanced CT portion of the study showed mean HU of 35 and 30 on right and left adrenal gland respectively (figure 4). Liver parenchymal background SUVmax was 2.9 (figure 4). No abnormal mass lesion or FDG uptake was noted at laryngeal area (Figure 4). The tumor was classified as clinical stage IV NSCLC, according to the TNM classification on the basis of ^{18}F-FDG PET-CT findings.

DISCUSSION

This case highlights large sized bilateral adrenal metastatic masses found during baseline ^{18}F-FDG PET-CT investigation of a patient of NSCLC who had no symptoms related to adrenal disease and also the superiority of the state of the art imaging with ^{18}F-FDG PET-CT in identifying metastatic lesions of adrenal glands.

Lung cancer is one of the common source for metastases to adrenal gland with bilateral adrenal metastases occurring in upto 10% patients of NSCLC, but at the time of initial diagnosis it is rare (2,3). More than 90% of all adrenal masses are found incidentally from any causes are nonfunctioning, the main issue is to understand whether those masses are benign or malignant (7).

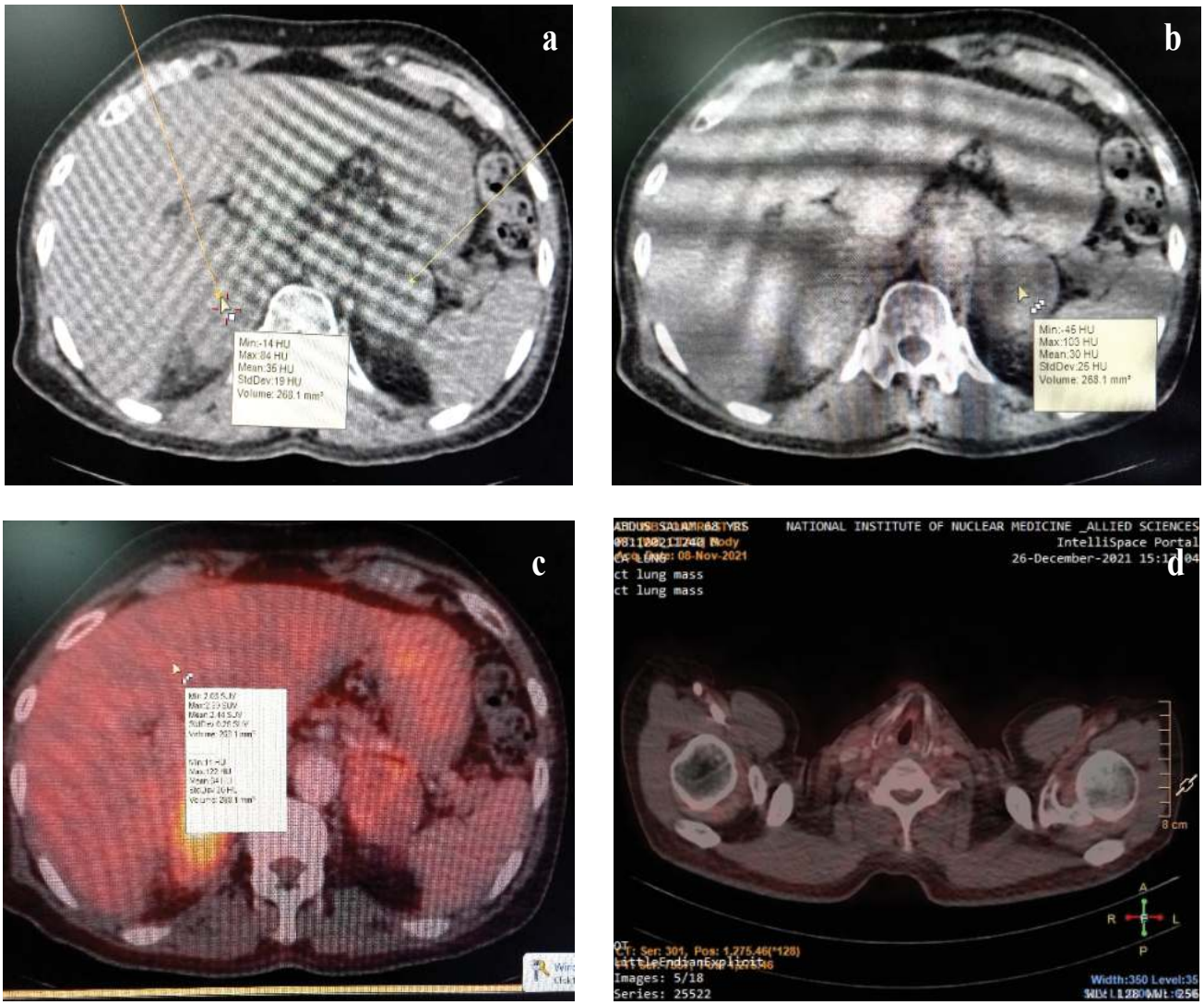


Figure 4: From left to right- upper row demonstrates non enhanced CT images of upper abdomen showing enlarged both adrenal glands (arrows) with HU mean of a) right gland 35 and b) left gland 30; Lower row demonstrates c) transaxial fused ^{18}F-FDG PET-CT image of liver showing SUVmax 2.9 and d) laryngeal area showing no mass lesion

Several studies have demonstrated that ^{18}F-FDG PET-CT can be used to differentiate benign from malignant adrenal masses in patients with primary extra adrenal malignancy, with a sensitivity and specificity ranging from 92% to 100% and from 80% to 100%, respectively (5). Authors reported several metabolic parameters to indicate masses found in adrenal gland during FDG PET-CT for another cancer as metastatic include – **i)** An adrenal lesion/liver ratio of 1.53-1.8 in terms of SUV max and **ii)** Adrenal masses with SUV max cut off value >3.1 together with a HU >10 on non enhanced adrenal CT portion – each of them with sensitivity 82%, 100% and specificity 96%, 98%, respectively (6,8). This reported case showed findings of lung cancer, bilaterality, large size of both glands, high SUVmax, HU> 10 in nonenhanced CT, SUVmax ratio between adrenal gland and liver (2.8:1.7), multiple lymphnode metastases on mediastinum and abdomen well proved the diagnosis of adrenal metastases from lung cancer by ^{18}F-FDG PET CT imaging and further intervention like adrenal biopsy deemed not essential (7).

Hormonal status is another important issue in a patient with newly diagnosed adrenal masses as it may lead to adrenal insufficiency (AI) on rare occasions and should be clinically evaluated to rule out the condition (6,7). Adrenal functions may be preserved until >90% of the cortex is destroyed even in the presence of bilateral adrenal metastases, but undiagnosed AI can result in adrenal crisis with a potentially fatal outcome (9). Recommendation is to measure a morning serum cortisol and plasma ACTH as in case of insufficiency, plasma ACTH gets elevated in addition to low cortisol demanding ACTH stimulation test as the gold standard for confirmation (6, 9). This reported patient had a morning serum cortisol level of 319.69nmol/L (normal=145-619) and serum ACTH level of 119.8pg/mL (normal= 4.7-48.8) during follow up. No further workup was recommended and he was treated with palliative chemotherapy.

A noticeable fact about this case is that there is a history of right sided laryngeal cancer 3 years back treated with radical radiotherapy followed by a newly diagnosed second malignancy (NSCLC) which may be termed as metachronous cancer (10). According to recent NCCN guideline 2021 for lung cancer screening, index case had multiple high risk factors for developing lung cancer in age group > 50 years, past H/O smoking, H/O cancer in head and neck region, H/O radiation exposure and H/O COAD. Recommended screening tool for high risk patients for lung cancer like this case is low dose thoracic CT scan to be performed periodically every 3-6 months (11). In this case, patient was never screened properly for lung cancer and the possibility was overlooked until a mass lesion was found radiologically. Our observation is, metachronous primary malignancies are becoming increasingly common because of an increase in the number of elderly cancer survivors and improved diagnostic modalities. Early diagnosis and management of this patient would have been easier if only the patient was screened at right time.

CONCLUSION

In elderly patients with bilateral adrenal masses with a primary diagnosis of any extra-adrenal malignancy, the first diagnosis to be considered is metastasis. In these patients, ^{18}F-FDG PET-CT scan not only efficiently used to identify adrenal masses, but also can effectively characterize those masses as benign or metastatic by using several imaging and metabolic parameters with a single noninvasive study. This state of the art hybrid imaging with ^{18}F-FDG PET-CT reduces the necessity for further confirmation of metastases by hazardous invasive procedure like adrenal biopsy and also helps in clinical decision making about early selection of appropriate treatment in a cost effective way.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interests regarding publication of this paper.

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