

A rare non-small cell lung cancer ^{18}F -FDG PET/CT study in a young patient with genetic anomaly living in a highly polluted area. Metastatic lesions not shown by CT

To the Editor: In their paper "The importance of ^{18}F -FDG PET/CT, CT and X-rays in detecting primary stage IIIA lung cancer and the incidence of extra thoracic metastases" published in Hell J Nucl Med, Sharma et al explain the usefulness of functional imaging in staging advanced lung cancer in patients at various ages [1]. Nevertheless, they do not mention young lung cancer patients with genetic anomaly living in a high pointed area and having poor prognosis, that we now wish to emphasize.

A non smoker 30 years old lady, high school teacher, was diagnosed after biopsy of having non-small cell lung adenocarcinoma (NSCLC), stage IV with fatigue, weight loss low body mass index (BMI) of 19 ISU, intolerable back pain, mild anemia and increased γ -GT levels (107 U/L). Fluorine-18 fluorodeoxyglucose (^{18}F -FDG) positron emission tomography/computed tomography (PET/CT) demonstrated multiple "hot" foci involving different tissues (Fig. 1-3).

Lung adenocarcinoma has the highest incidence among all lung cancer types, with a sex-specific occurrence of about 30% and 37% in men and women, respectively [2]. Surveillance, Epidemiology and End Results (SEER) database, in individuals aged 40 years or less show that NSCLC is remarkably rare, with a rate of 1.2% between 1988 and 2003 [3].

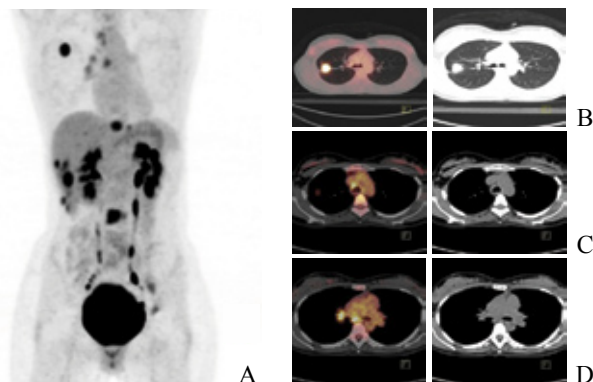


Figure 1. Maximum intensity projection (MIP) image (A), showing multifocal abnormal ^{18}F -FDG accumulation, indicating severe metastatic disease. Transverse images of the thorax (B) show increased uptake at the upper right lung lobe, corresponding to the primary lesion (SUVmax of 9.4). Hypermetabolic lymph nodes are observed in the mediastinum (paratracheally on the right and subcarinally) as well as in the right pulmonary hilum, with a SUVmax of 4.2 (C, D).

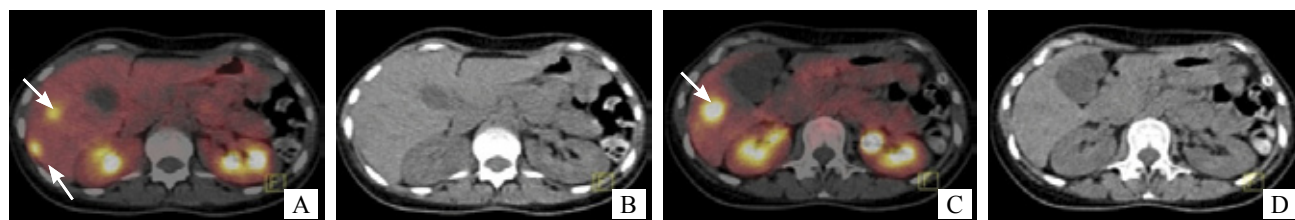


Figure 2. Transverse fused PET/CT images of the upper abdomen (A, C), showing three sites of abnormal ^{18}F -FDG accumulation in the hepatic parenchyma (SUVmax: 10.3). These foci are actually not detected by the low dose localizing CT (B, D).

Pathetic smoking increases [4] and regular exercise decreases prevalence [5]. Our young patient had a free family history but lived in a highly polluted area with four times above normal pollution limits containing black carbon particles and methane [6].

Exposure to air pollution can cause oxidative stress which plays a role in the pathogenesis of NSCLC as evidenced by

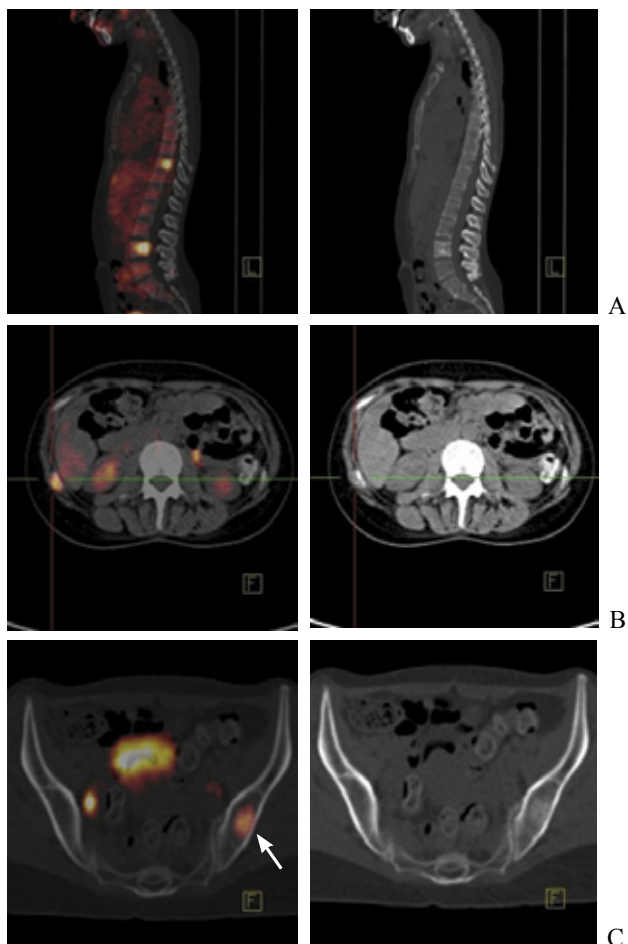


Figure 3. Several lesions are visualized by ^{18}F -FDG in the spine with a SUVmax of 6.8 (A), in the twelfth right rib (B) and in the left iliac bone (C).

failure in the oxidant/antioxidant balance in favor of lipid peroxidation and DNA damage [7, 8].

According to a recent European study, it is obvious that both fine particulate matter and nitrogen dioxide are associated not only with lung cancer but also with cardiovascular diseases [9].

Molecular analysis using nested polymerase chain reaction (PCR), confirmed the presence of genetic mutation in exon 19 of EGFR receptor, defining also the therapeutic pathway (erlotinib or gefitinib administration) as in this patient. The patient was treated with iressa (gefitinib) 250mg/day per os plus zoledronate injections every 28 days and palliative radiotherapy and showed some clinical improvement.

Consecutively, according to lately reported studies, PET/CT examination with fluorine-18-fluorothymidine as a tracer, may contribute to the selection of patients who may benefit from epidermal growth factor receptor (EGFR) tyrosine kinase inhibitors and provide clues about which patients with NSCLC may be candidates for a combination treatment with erlotinib and B-cell lymphoma-extra large inhibitors [10, 11].

Consistent with a newer analysis based on Cox's proportional hazard model, low BMI, stage IV disease, anemia at diagnosis and male gender are negative prognostic factors for young patients with advanced NSCLC [12]. As shown above, according to diagnostic tests, our patient had three out of four of these factors and additionally lived in a highly polluted area.

In conclusion, we describe an uncommon case of a never smoker young lady with NSCLC. Predisposing factors could be genetic mutation, in combination with high air pollution levels. Multiple metastatic disease was diagnosed by ¹⁸F-FDG PET/CT.

The authors declare that they have no conflicts of interest.

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