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**Case Report**

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# Diagnostic value of FDG-PET/CT in the detection of synchronous cancers

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**ABSTRACT**

Synchronous cancer refers to a new primary cancer in a person with a history of malignant disease. It may be easily missed in early stages of its development. Besides its high sensitivity in the diagnosis of malignant disease, FDG-PET/CT has a technical advantage due to routinely performed whole-body scanning procedures in the detection of synchronous cancers. In this case report, we discussed two cases in which synchronous cancer was incidentally detected by FDG-PET/CT whole body examination.



## 1. Introduction

18F-FDG PET/CT is a functional multi-modality imaging technique used for diagnosis, characterization and staging of malignant disease. The term -second primary cancer- refers to a new primary cancer in a person with a history of malignant disease. This condition occurs in 5.2-13% of cancer patients and may be easily missed in early stages of its development (Dong and Hemminki, 2001; Ueno et al., 2003; Levi et al., 2014). Besides its high sensitivity in detecting and measuring cancer metabolism, 18F-FDG PET/CT has also the technical advantage to reveal such malignancies due to routinely performed whole-body scanning procedures.

## 2. Case 1

A 75-year-old male presented with cough and dyspnea. Torax Computed Tomography (CT) demonstrated a 59x40x60 mm mass lesion in the left lung with irregular margins. Endobronchial biopsy proved the mass as squamous cell carcinoma. F-18 FDG PET-CT was performed for staging purposes. After 60 minutes of intravenous injection of 11. 2 mCi of F-18 FDG, axial, coronal and sagittal images were obtained. There was an intense uptake in the lung lesion (SUV max: 29.7). No hypermetabolic lymph nodes were observed. PET-CT however detected a hypermetabolic mass in the cecum (SUV max: 14.7), that was unlikely to be a metastatic lesion.

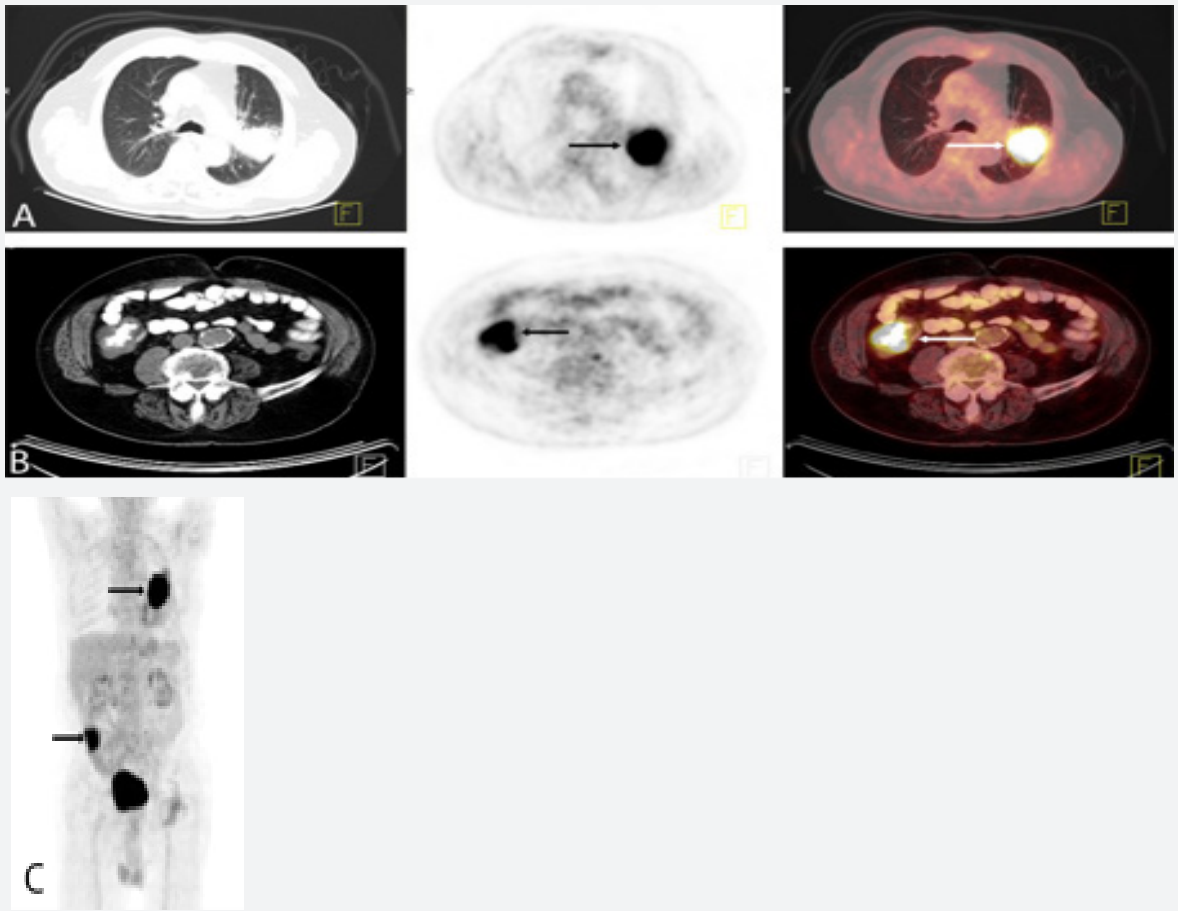


**Fig. 1.** Squamous cell carcinoma of the left lung (A) and adenocarcinoma of cecum (B) in the same patient. Axial CT, PET, PET/CT fusion images and MIP* image (C) demonstrate well defined hypermetabolic lesions corresponding to two different primary cancer sites (images of the first examination). **MIP :** Maximum Intensity Projection (whole body)

Colonoscopic examination identified a solid mass in the cecum surrounding the lumen and destructing the ileocecal valve. The following biopsy revealed primary colon adenocarcinoma. The local interdisciplinary council decided to focus primarily on the lung cancer and to observe the cecal adenocarcinoma in short term. During the chemotherapy (CTX) of the lung cancer lasting one year, 2 follow-up PET/CT scans were performed. The first scan, performed after 4 cycles of CTX, demonstrated decreased metabolic activity of both lung and cecum lesions (lung mass SUV max: 25.4; cecal mass SUV max:8.2). The second scan obtained after succeeding 2 cycles of CTX showed unfortunately a re-increment of malignant metabolism in both lesions (lung mass SUV max: 29.4; cecal mass SUV max:14.1).

### 3. Case 2

A 68-year old male presented with cough. Thorax CT demonstrated a 46x40 mm lung mass lesion at right lower lobe superior segment and a nodular lesion at left upper lobe anterior segment. Fine needle aspiration biopsy proved the mass as a squamous cell carcinoma. Patient underwent PET/CT imaging for staging the lung cancer. The whole-body scan showed intense FDG uptake both in the mass at right lower lobe superior segment (SUVmax: 14.37) and nodular lesion at left upper lobe anterior segment (SUVmaks:6.03). Besides lung lesions, focal hypermetabolic lesions in the transverse colon (SUV max:7.11) and ileocecal region (SUV max:14.35) were also detected. The patient underwent colonoscopy and the following biopsy revealed primary colon adenocarcinoma.

### 4. Discussion

Patients with one primary malignancy have 1.29 times the risk of developing another primary tumor compared with those that have no history of previous malignant disease (Schoenberg, 1977). Diagnosis of second or more primary malignancies in patients with known cancer may be of significant importance regarding the further therapeutic management (Chun-Sing et al.,

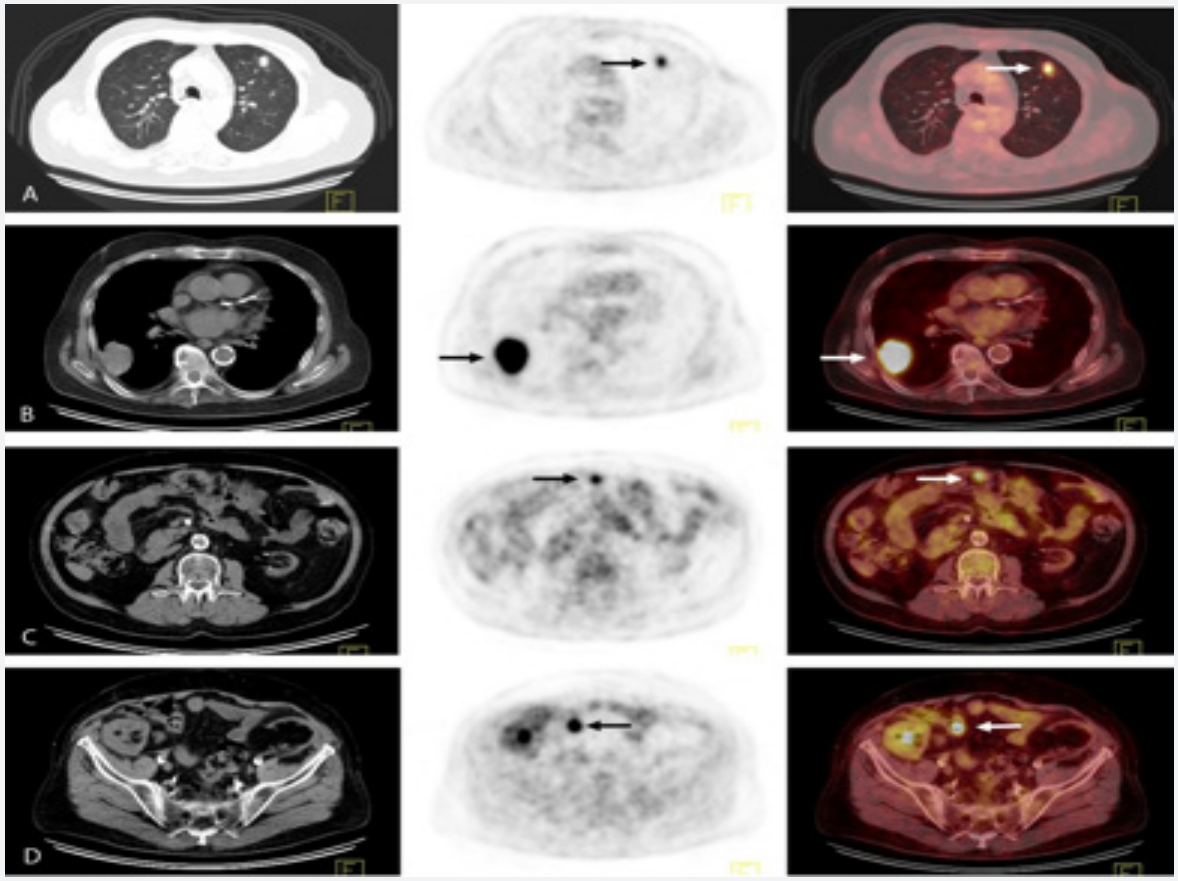


**Fig. 2.** Simultaneous detection of squamous cell carcinoma of the lung and adenocarcinoma of colon in the same patient: Hypermetabolic lesions of the left lung (A), right lung (B), transverse colon (C), ileocecal region (D) and MIP* image (E) are shown on PET/CT images. **MIP:** Maximum Intensity Projection (whole body)

2014). In oncology patients, conventional methods such as ultrasonography, CT and magnetic resonance have in general the restriction of regional imaging. In the absence of significant indicators, additional acquisitions are usually not performed in the routine work-up of these patients. In contrary, the rationale of the use FDG-PET/CT imaging in oncology is based on whole-body scanning of glucose metabolism and detection of the increased rate of glycolysis in tumors compared to normal tissue. Several studies found that PET/CT is more accurate than CT in detecting unexpected metastatic foci (Kazama et al., 2005; Czernin et al., 2007). In this technic, occult extra-thoracic cancers can be shown incidentally and colonic carcinoma was not a rare finding (Gill et al., 2012).

Tatlidil et al. (2002) retrospectively reviewed the colonic uptakes on FDG-PET/CT in patients without known colorectal carcinoma and described multiple abnormal patterns. They reported that high nodular uptake in the colon is a remarkable and should be followed up (Tatlidil et al., 2002). Zhuang et al reviewed 500 patients with pulmonary nodules and showed 5 colon cancers as a second primary malignancy (Zhuang et al., 2002). In another study, 9.2% of suspected or known lung cancer patients had an incidental pathologic focus on PET/CT. The most common site was gastrointestinal tract and large bowel as a part (Chopra et al., 2012). Other organs developing synchronous cancers in the presence of primary lung carcinoma are: Lung, kidney, stomach, thyroid, pharynx, larynx and bladder (Teppo et al., 2001; Liu et al., 2002; Duchateau and Stokkel, 2005; Surapaneni et al., 2012).

Regarding overall incidence of synchronous cancers, most frequent occurence is observed in the presence of initial colon/rectum, breast, lung, prostate and urinary bladder tumors, respectively. Less commonly, non-Hodgkin lymphoma and tumors of uterus, melanoma, oral cavity/pharynx, bone marrow (leukemia), kidney/renal pelvis, ovary, thyroid, brain, cervix uteri, myeloma, esophagus and liver are also complicated by synchronous tumor occurrence (Hayat et al., 2007).

The additional diagnostic value of FDG-PET/CT in the detection of synchronous cancers should be kept

in mind in the evaluation of most oncology patients. Further clinical investigation of suspect-reported lesions on FDG PET/CT scans should be ensured by clinicians to avoid missing possible multiple primary lesions in cancer patients.

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