

# Renal Metastasis of Primary Lung Carcinoma is Associated with Death and Progression Predicted by F-18 FDG PET/CT

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## Abstract

**Aim:** The renal metastasis of primary lung carcinoma is not infrequent. However, the imaging modalities usually underestimate this important finding. The aim of this study was to firstly to investigate the imaging and follow up findings associated with renal metastasis of a primary lung carcinoma in F-18 Fluorodeoxyglucose Positron Emission Tomography/Computed Tomography (FDG PET/CT) and secondly underline the importance of this finding that usually is not detected with imaging methods.

**Materials and Methods:** The F-18 FDG PET/CT images of 17 patients (1 F, 16 M; mean: 61,6±9,3 years old) with renal metastasis of the primary lung carcinoma were evaluated retrospectively. The findings were compared with gold standard patients oncologic follow up.

**Results:** The renal lesions maximum dimensions were mean: 40,7±25,7 mm and SUVmax level was mean: 17,1±6,5. The lesions of the patients were confirmed with CT and US imaging and pathology results in six patients which of one patient underwent nephrectomy. Six of 17 patients died and others were diagnosed as progressive metastatic disease during the follow up period (mean: 6,4±6,6 months).

**Conclusion:** In this series the renal metastasis of lung carcinoma was associated with progressive disease or death in the follow up. Further studies with long term follow up in larger series are warranted.

**Keywords:** kidney, metastasis, lung carcinoma, FDG, PET.

## Introduction

Renal metastasis of a primary malignancy is not rare in autopsy series (1). However, the incidence of detection of renal metastasis of a primary malignancy is very limited. Unfortunately, the F-18 FDG PET/CT imaging of kidneys is hampered because of urinary excretion of the radiopharmaceutical. There is limited number of cases

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with determined renal metastasis of a primary tumor detected by F-18 FDG PET/CT (1, 2). Aim of this study was to analyze the outcome of the patients with the renal metastasis of lung cancer determined by F-18 FDG PET/CT.

### **Materials and Methods**

Eight patients (1 F, 16 M; mean: 61,6±9,3 years old) with incidentally detected renal metastasis of lung carcinoma were subject of this study. The informed consents of the patients were obtained prior to the imaging study. The initial and follow up F-18 FDG PET/CT images of the patients as well as outcome results were analyzed retrospectively. Since the study was conducted in a retrospective manner according to Helsinki Declaration and the ethics committee approval was obtained from local ethics committee (Mersin University Ethics committee; Date: 2/6/2021, Number:2021/352).

### **Imaging**

The patients fasted at least 4 hours prior to the F-18 FDG PET/CT. The imaging was performed after injection of the radiopharmaceutical (approximately 5-10 mCi according to the body weight) via venous line from vertex to the proximal thigh in craniocaudal direction with additional low dose CT scan for attenuation correction with oral contrast administration by the PET/CT scanner (Siemens MCT).

### **Results**

The patient and lesion characteristics as well as additional metastatic sites are summarized in Table 1. BT and/or Ultrasound examination was performed after the suggestion in the PET/CT report. Biopsy confirmation was required in five cases with oligo-metastatic involvement and one patient underwent nephrectomy operation. The pathology revealed severe involvement of the kidney (Figure 1). The follow up PET/CT examination of the patients have shown progressive disease despite proper treatment.

**Table 1. Patient characteristics and imaging features.**

Patients	Lateralization	Size (mm)	SUVmax	Prognosis/ Mortality	Follow up (Month)
1	Right	42	17,2	Ex	4
2	Right	15	30,9	Ex	1
3	Left	58	20,2	Progression	6
4	Left	32	19,9	Progression	6
5	Right	51	6,7	Ex	1
6	Left	10	10,2	Progression	5
7	Left	97	14,8	Progression	3
8	Right	15	14,3	Progression	3
9	Bilateral	79	17,7	Progression	3
10	Left	49	18,2	Progression	4
11	Right	13	4	Ex	30
12	Left	22	20,8	Ex	4
13	Right	62	25,8	Ex	9
14	Right	20	23,8	Progression	10
15	Left	33	18,4	Progression	3
16	Right	69	17,8	Progression	9
17	Right	25	12,9	Progression	5

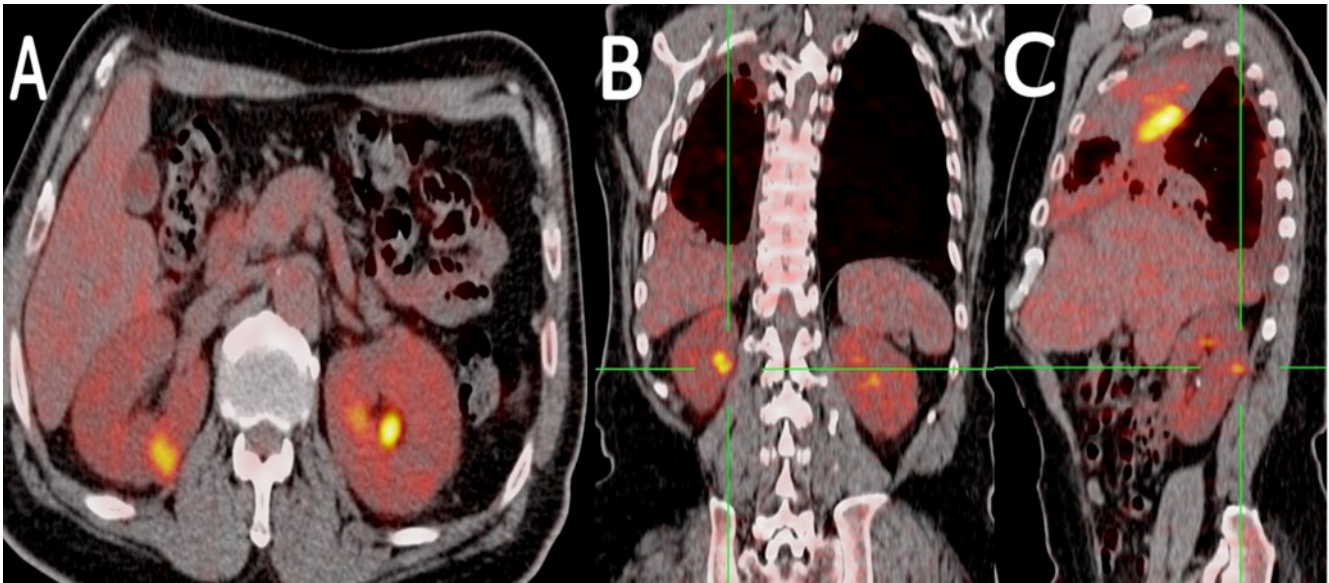
## Discussion

The kidney metastasis is not a rare phenomenon however diagnostic methods usually underestimate this finding. The kidney metastasis usually presents with other metastatic sites thus the definition of the lesion might be ignored in usual. In case of suspicion of a second primary tumor of the kidney lesion diagnostic workup and histopathological examination is required. This was the case in one of our patients whose results confirmed metastasis. The kidney tissue in that patient showed severe metastatic lesions. Previous observations about the kidney involvement of another primary tumor have suggested the same finding (3).

Kidney metastasis previously has been reported in usually lymphoma, lung, breast and gastric cancers (4). The diagnostic facility of the F-18 FDG PET/CT which is the most important modality in staging of the most of the cancer types is limited in the renal lesions due to the renal excretion of the radiopharmaceutical (5). Aras et al. have shown that the number and existence of metastatic lesions might be more severe compared to the expected frequency (6). In their case who was presented with multiple metastatic lesions determined by F-18 FDG PET/CT follow up showed more lesions than expected (6). They concluded that the metastatic lesions as determined by F-18 FDG PET/CT might be underestimated (6). A case series including two patients with primary esophageal squamous cell carcinoma was presented previously (7). The most common cancer type that metastasizes to the kidney is the lung carcinoma which is usually present as multiple metastatic disease (8, 9). The FDG accumulation associated with renal metastasis of lung carcinoma has been previously reported in case basis (10). However, the imaging features of the renal metastatic lesions might be similar with primary tumors (11). Previous studies have supported to perform diagnostic CT imaging additional with F-18 FDG PET/CT to increase the diagnostic sensitivity in malignant renal tumors (12). Previous studies have demonstrated sensitivity of as high as 100% in renal metastasis in series including also renal cell carcinoma and lymphoma (13).

The limitations of this study are the small number of patients with retrospective design and lack of pathology confirmations in most of the patients. However, it is impossible to perform biopsy in case of multiple metastatic disease just for confirmation. This case series includes a specific pathology thus this series is the highest number of patients with renal metastasis of lung cancer involvement in the literature as far as we know.

The results of this study indicate the prognostic features of the patients with renal metastasis of lung carcinoma indicated with FDG PET/CT. The worse prognosis of the patients with this finding might indicate more aggressive treatment regimens and strict follow up by means of metabolic imaging. Previous observations that indicate insufficiency of FDG PET/CT in determination of renal lesions-metastasis might be further reconsidered.



**Figure 1.** Cross sectional (transaxial (a), coronal (b), sagittal (c) planes) F-18 Fluorodeoxyglucose Positron Emission Tomography/Computed Tomography images of a 54 years old patient with diagnosis of lung carcinoma. PET/CT imaging showed intrathoracic diseases as well as single hypermetabolic lesion (15 mm) in the right kidney (SUVmax=14.6).

**Ethics Approval And Consent To Participate:** This manuscript reports studies involving human participants, human data or human tissue and thus includes a statement on ethics approval and consent (even where the need for approval was waived) includes the name of the ethics committee that approved the study and the committee's reference number if appropriate. (Mersin University Ethics Committee; Date: 28/4/2021, Number:2021/352)

**Peer-review:** Externally peer-reviewed.

#### Authorship Contributions

**Concept:** Z.P.K., P.P.O., **Design:** Z.P.K., **Supervision:** Z.P.K., P.P.O., V.E., Y.Y.K., **Data Collection and/or Processing:** Z.P.K., P.P.O., V.E., Y.Y.K., **Analysis and/or Interpretation:** Z.P.K., P.P.O., V.E., Y.Y.K., **Literature Review:** Z.P.K., **Writer:** Z.P.K.

**Conflict of Interest:** No conflict of interest was declared by the authors.

**Financial Disclosure:** The authors declared that this study has received no financial support.

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