The Egyptian Journal of Radiology and Nuclear Medicine 49 (2018) 202–208

Contents lists available at ScienceDirect

The Egyptian Journal of Radiology and Nuclear Medicine

journal homepage: www.elsevier.com/locate/ejrnm

Original Article

Bronchioalveolar carcinoma: Role of Fluorine-18 fluorodeoxyglucose positron emission tomography/computed tomography in detection of its recurrence and verifying its subtypes

Mohamed Fouad Sherif[1,2]

Radio-diagnosis Department, Faculty of Medicine, Tanta University, Tanta, Egypt

ARTICLE INFO

Keywords:
Recurrent bronchioalveolar carcinoma
PET/CT
[18F]FDG
BAC subtypes verification

ABSTRACT

Aim: To clarify the role of fluorine-18 fluorodeoxyglucose positron emission tomography/computed tomography (18F-FDG) PET/CT in evaluating of bronchioalveolar carcinoma (BAC) recurrence and its ability to differentiate recurrent pure BAC type from recurrent adenocarcinoma containing BAC.

Methods: A prospective study included 24 PET/CT scans (22 patients with known BAC; 14 male; 8 female; age range 49:75 Y.). 15 PET/CT scans performed for suspicious of recurrence and 9 scans for post treatment re-stating.

Results: Among 15 cases with suspicious of recurrence; upstaging detected in 9 cases and downstaging in 1 case. In 9 cases underwent PET/CT scans for restaging after treatment; upstaging in one patient. Sensitivity = 100%, Specificity = 83.3%, PPV = 94.1%, NPV = 100% and accuracy = 95.4%. Statistically significant difference was found between FDG uptake in recurrent BAC and primary BAC ($P < 0.0001$) and between FDG uptake of recurrent pure BAC type and adenocarcinoma containing BAC ($P < 0.0001$).

Conclusion: In patients with known BAC, PET/CT proved high accuracy in detection of recurrence lesion sites and higher staging accuracy. [18F]FDG PET/CT scan was able to differentiate between recurrent adenocarcinoma containing BAC and recurrent pure BAC type.

1. Introduction

Bronchioalveolar carcinoma (BAC) is defined as a tumor with an absolute lepidic pattern of extension that has no signs of vascular, stromal or pleural invasion [1–4].

In 2004, BAC classification was definitely established as a carcinoma in-situ that cannot be diagnosed as BAC associated with lymphatic or systemic metastases [2,3,5].

Positron-emission tomography (PET) utilizing fluorine-18 fluorodeoxyglucose (18F-FDG) handles glucose analog then phosphorylate and capture it within tumor cells, thus allowing the glucose metabolism assessment with PET [6–8].

The majority of malignant neoplasms elicit higher glucose consumption than surrounding normal tissue and hence afford more FDG uptake than background normal tissue. The uptake of [18F]FDG always related to tumor grade in a broad spectrum of tumors depending upon histopathological type and neoplasm aggressiveness [7].

Now, [18F]FDG-PET/CT is establishing as the imaging tool of choice for meticulous staging of patients that have non-small cell pulmonary cancer. But in other studies [18F]FDGPET/CT showed a low ability in primary BAC detection due to its low metabolic activity [8]. So, false negative findings occurred when [18F]FDGPET/CT used to assess solitary lung nodules [9,10].

BAC is either pure BAC type or adenocarcinoma containing BAC components. The lower [18-F]FDG uptake of pure BAC in comparison to adenocarcinoma containing BAC components may occur due to different concentration of glucose transporter (Glut-1) which is the main glucose transporter. Previous researches proved that 85.6%of primary bronchoalveolar carcinoma had no Glut-1 at histological study while non BAC adenocarcinoma showed Glut-1 ratio of 4.3% [11,12].

Abbreviations: BAC, bronchioalveolar carcinoma; PET, positron–emission tomography; [18F]FDG PET/CT, Fluorine-18 fluorodeoxyglucose positron emission tomography/computed tomography; MDCT, multidetector computed tomography; IV, intravenous; mCi, millicurie; Cdc, decay–corrected tracer concentration; di, injected dose; w, body weight of patient; Bq/g, becquerel/gram

Peer review under responsibility of The Egyptian Society of Radiology and Nuclear Medicine.

E-mail address: mohamadsherif1000@Gmail.com.

[1] Work address: Radiology & Medical Imaging Department, Faculty of Medicine, Tanta University, Elbahr Street, Medical Compound, Tanta 31111, Egypt.

[2] Home address: 5 Ahmed Shawky street, Alzahra, Almahala Alkobra, Gharbeya 33333, Egypt.

https://doi.org/10.1016/j.ejrnm.2017.10.007
Received 11 July 2017; Accepted 19 October 2017
Available online 27 March 2018

Table 1
Patients data and PET/CT findings.

Case	Age/sex	B.W, (kg)	Height (cm)	Reference reason	(18-F) FDG findings	SUVmax.	PET/CT Vs CT
1*	49/F	55	156	Recurrence	Mediastinal L.Ns.	2.5	PET/CT detect 3 more lesions with no changes in staging
					Brain	7.2	
2	55/M	58	177	Recurrence	Negative	–	Down staging
3	58/M	80	158	Recurrence	Lung hilar L.Ns.	17.6	Upstaging
					Mediastinal L.Ns.	3.5	
					Axillary L.Ns.	4.2	
4*	70/M	77	181	Recurrence	Pulmonary nodules	6	Upstaging
					Mediastinal L.Ns.	6.4	
					Hepatic metastasis	8	
5*	50/F	65	169	Recurrence	Pulmonary nodule	3.9	Same findings
6*	66/F	69	159	Recurrence	Multiple pulmonary nodules	4.9	PET/CT detect 5 more lesions with no changes in staging
					Lung hilar L.Ns.	7.1	
					Mediastinal L.Ns.	7.6	
7*	69/F	51	157	Recurrence	Axillary L.Ns.	4.7	Upstaging
					Hepatic metastasis.	4.1	
8	68/F	66	160	Recurrence	Pulmonary nodule	10	Upstaging
					Mediastinal L.Ns.	6	
9	70/M	55	162	Recurrence	Local recurrence	9.9	Upstaging
10*	60/M	90	159	Recurrence	Cervical L.Ns.	4	Upstaging
					Supraclavicular L.Ns.	3.8	
					Axillary L.Ns.	11.5	
					Subcutenous nodules	2.9	
11*	66/F	94	171	Recurrence	Local recurrence	7.6	Same findings
					Pulmonary nodules	9	
12	74/F	54	177	Recurrence	Local recurrence	10	Upstaging
					Pulmonary nodule	2.6	
					Mediastinal L.Ns.	5.1	
13*	51/M	52	178	Recurrence	Lung hilar L.N.	3.9	Upstaging
14	67/M	89	179	Recurrence	Endobronchial mass	11	Upstaging
					Cervical L.Ns.	11.5	
					Mediastinal L.Ns.	7.5	
					Supraclavicular L.Ns.	10.7	
					Hepatic focal lesion	9.5	
15	73/M	79	166	Restaging after chemotherapy	Negative	–	Same findings
16	75/M	88	180	Restaging after chemotherapy	Negative	–	Same findings
17	74/F	90	181	Restaging after chemotherapy	Negative	–	Same findings
18*	68/M	90	159	Restaging after chemotherapy	Pulmonary nodule	3.5	Upstaging
					Mediastinal L.Ns.	5.6	
19*	70/M	63	165	Restaging after chemotherapy	Lung nodules	3.3	Same findings
20 a*	64/M	67	170	Restaging after chemotherapy	Cervical L.N.	3.3	Same findings
20b				Restaging after chemotherapy	Negative	–	Same findings
21 a	67/M	77	161	Restaging after chemotherapy	Negative	–	Same findings
21b*				Restaging after chemotherapy	Local recurrence	6	Few lesions with no change in staging
					Mediastinal L.Ns.	7	
					Adrenal	9	
					Bones	5	
22	69/M	80	163	Recurrence	Pulmonary nodules	17.1	Same findings

The pure BAC type was tagged by (*).

Few researches had worked about value of PET/CT in assessment of BAC recurrence rather than primary BAC.

The aim of this study is to clarify the role of (18F-FDG) PET/CT in discovering and restaging of BAC recurrence after treatment and its ability to differentiate between recurrent pure BAC type and recurrent adenocarcinoma containing BAC components.

2. Patients and methods

2.1. Patients

A prospective study included [18F] FDG-PET/CT scans done for 22 patients with known histopathologically proved BAC (either pure BAC type or adenocarcinoma containing BAC) in the period between March 2015 and March 2017. The study was approved by our medical ethics committee and patient consents were waived. At this study, 24 [18F] FDG-PET/CT scans were done on 22 patients (14 male; 8 female; age range 49:75 Y., mean age 66.5 Y. ± 9 Y.). Among 24 [18F]FDG-PET/CT scans, 15 scans were done as routine follow-up to assess recurrence possibility in cases with indeterminate findings in other imaging methods; 9 for post treatment restaging (5 cases after surgical procedures and 4 cases after chemotherapy).

In our 22 cases, conventional imaging tools were done 8–30 days before PET/CT scans to confirm any suspicious of diagnosis and comparative follow-up, including 27 multi-detector computed tomography (MDCT) scans of chest, 7 abdominal MDCT, 5 bone isotopes studies and 6 cases of brain MRI.

2.2. Inclusion criteria

- Known case of histologically confirmed BAC either pure BAC or adenocarcinoma containing BAC.

2.3. Exclusion criteria

- Any other type of lung tumor
- Primary cases of BAC
- Recent chemotherapy less than 6 weeks earlier to PET/CT scans
- Recent radiotherapy less than 8 weeks earlier to PET/CT scans