Clinical Case Report

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False positive ^{18}FDG PET-CT results due to exogenous lipoid pneumonia secondary to oily drug inhalation

A case report

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Abstract

Rationale: Exogenous lipoid pneumonia is a rare condition due to abnormal presence of oily substances in the lungs. It is a rarely known cause for false positive ^{18}FDG PET-CT results and can sometimes lead to invasive investigations. Searching and finding the source of the oily substance is one of the keys to the diagnosis. Inhalation of oily drugs during snorting has rarely been described.

Patient concerns: A patient with well controlled HIV infection was referred for an ^{18}FDG PET-CT to assess extension of Kaposi's disease, recently removed from his right foot. The patient had no particular symptoms.

Diagnoses: Abnormal uptake of ^{18}FDG was found in a suspicious lung nodule. An experienced radiologist thought the nodule was due to lipoid pneumonia.

Interventions: Bronchoalveolar lavage fluid did not contain lipid-laden macrophages but bronchoscopy showed violet lesions resembling Kaposi's disease lesions. Lobectomy was performed after a multidisciplinary discussion.

Outcomes: Anatomopathological analysis revealed the nodule was due to lipoid pneumonia. The patient's quality of life did not diminish after the operation and he is still in good health. The source of the oily substance causing lipoid pneumonia was found after the surgery: the patient used to snort oily drugs.

Lessons: The presence of a suspicious lung nodule possibly due to lipoid pneumonia in a patient with known Kaposi's disease was difficult to untangle and lead to invasive surgery. It is possible that if a source of exogenous lipoid pneumonia had been found beforehand, surgery could have been prevented.

Abbreviations: ^{18}FDG = ^{18}F-flurorodeoxyglucose, BALF = bronchoalveolar lavage fluid, FNA = fine-needle aspiration, HIV = human immunodeficiency virus, HRCT = high-resolution computed tomography, PET-CT = positron emission tomography–-computed tomography, SUV_{max} = maximum standard uptake value.

Keywords: lipoid pneumonia, PET-CT, pulmonary nodule

1. Introduction

Exogenous lipoid pneumonia was first described by Laughlen[1] in 1925. It is a rare condition due to the abnormal presence of oily substances in the lungs that create an inflammatory reaction. Searching and finding the source of the oily substance is one of the keys to the diagnosis. Many different sources of oily substances have been described of mineral, vegetal, or animal origin, but inhalation of oily drugs during snorting for a recreational use has only been described once, in a postmortem analysis.[2] We present a case of exogenous lipoid pneumonia, presenting as a solitary pulmonary nodule, suspected to be secondary to aspiration of oily drugs during snorting.

2. Case history

A 54-year-old man was addressed for an ^{18}F-flurorodeoxyglucose (^{18}FDG) positron emission tomography–computed tomography (PET-CT) to assess the extension of a Kaposi's disease with a lesion located on his right foot, surgically removed a few weeks beforehand. The patient had no clinical symptoms, his only medical condition was an infection by the human immunodeficiency virus (HIV), which was correctly treated (CD4 cell count was 475 cells/mm^3 and viral load was undetectable), and his general condition was good.

2.1. Physical examination revealed no respiratory symptoms

^{18}FDG PET-CT led to the discovery of a suspicious pulmonary nodule, located in the apical part of the right inferior lobe, and presented a moderate but a significant maximum standard uptake

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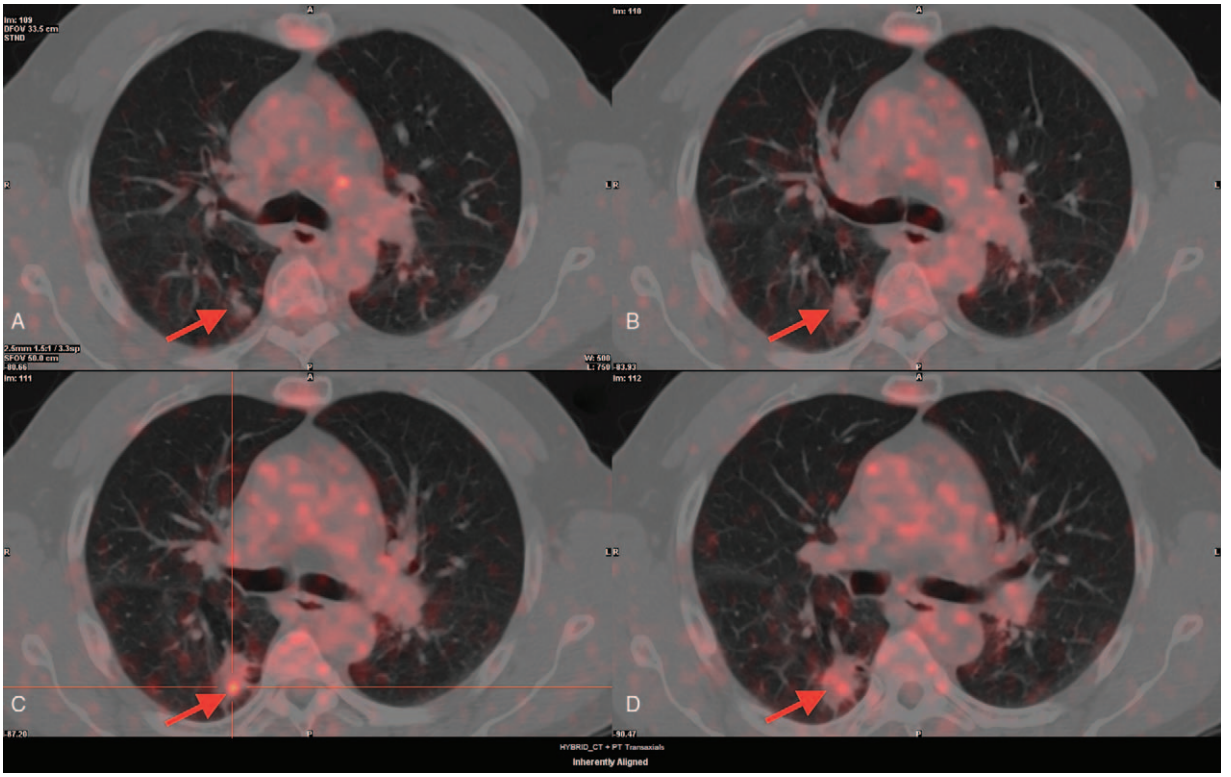

Figure 1. ^{18}FDG PET-CT revealing a pulmonary nodule with a moderately increased FDG uptake in the apical part of the right inferior lobe (SUV_{max} = 4.4) (red arrow on sub-images A–D). ^{18}FDG = ^{18}F-Flurorodeoxyglucose, PET-CT = positron emission tomography–computed tomography, SUV_{max} = maximum standard uptake value.

value (SUV_{max} = 4.4) (Fig. 1). No other suspicious lesion was found.

Concerning the assessment of the extension, a bronchoscopy showed lesions with red to violet limits which looked like bronchial Kaposi's disease lesions. Gastric endoscopy was negative and ileo-coloscopy was negative.

2.2. Biological results were normal.

A chest high-resolution computed tomography (HRCT) was performed and interpreted by an experienced radiologist. This revealed the pulmonary nodule had irregular limits (Fig. 2) and heterogeneous densities with mostly fat densities (Fig. 3). The radiologist suggested this nodule could be due to a lipoid pneumonia. There were no anterior chest HRCT results available for comparison.

2.3. Bronchoalveolar lavage fluid was negative for bacterial and cytological analyses

French guidelines recommend surgical treatment for pulmonary nodules with a high probability of malignancy. After a multidisciplinary discussion it was decided to consider that this pulmonary nodule had a high probability of malignancy given its characteristics (large size, irregular borders, and increased ^{18}FDG uptake) and the fact that bronchoscopy showed possible bronchial Kaposi's lesions. A lobectomy was performed during videothoracoscopy. The anatomopathological analysis showed lipid-filled vacuoles associated with lipid-laden macrophages finally confirming the diagnosis of lipoid pneumonia (Fig. 4).

There were no complications to surgery and pulmonary function tests were not modified 1 year after surgery. A second bronchoscopy was performed 4 months after surgery and revealed a regression of the previously described lesions.

The patient gave his consent for the publication of this case report.

3. Discussion

In most cases of lipoid pneumonia, an exogenous cause can be found. Regular exposure to oil substances (animal,[3] vegetal,[4] or mineral oils[5]) associated with a risk factor for aspiration (nasal aspirations,[4] deglutition impairment, tracheotomy,[5] gastric reflux etc.), is an important information in favor of the diagnosis of lipoid pneumonia. It is sometimes difficult to find this cause and it should be thoroughly researched. If no exogenous source of oily substance is found, the lipoid pneumonia can be endogenous or idiopathic. In our case, no exogenous source was found initially but once the diagnosis was made, a source of oily substance was researched more thoroughly. We asked the patient precisely if he practiced nasal inhalation in any way and the patient finally reported a habit of snorting oily drugs for a recreational purpose, he could not specify the drug's name but described it as a liquid, oily like substance. Moreau et al[2] described a case of lipoid pneumonia in a patient who had snorted Subutex. Nasal inhalation of drugs, legal or illegal, is not spontaneously reported by patients. Asking patients if they practice nasal inhalation in any way can be useful. The patient also reported a habit of smoking tobacco through a pipe, certain types of tobaccos can be relatively fat and this could also be a

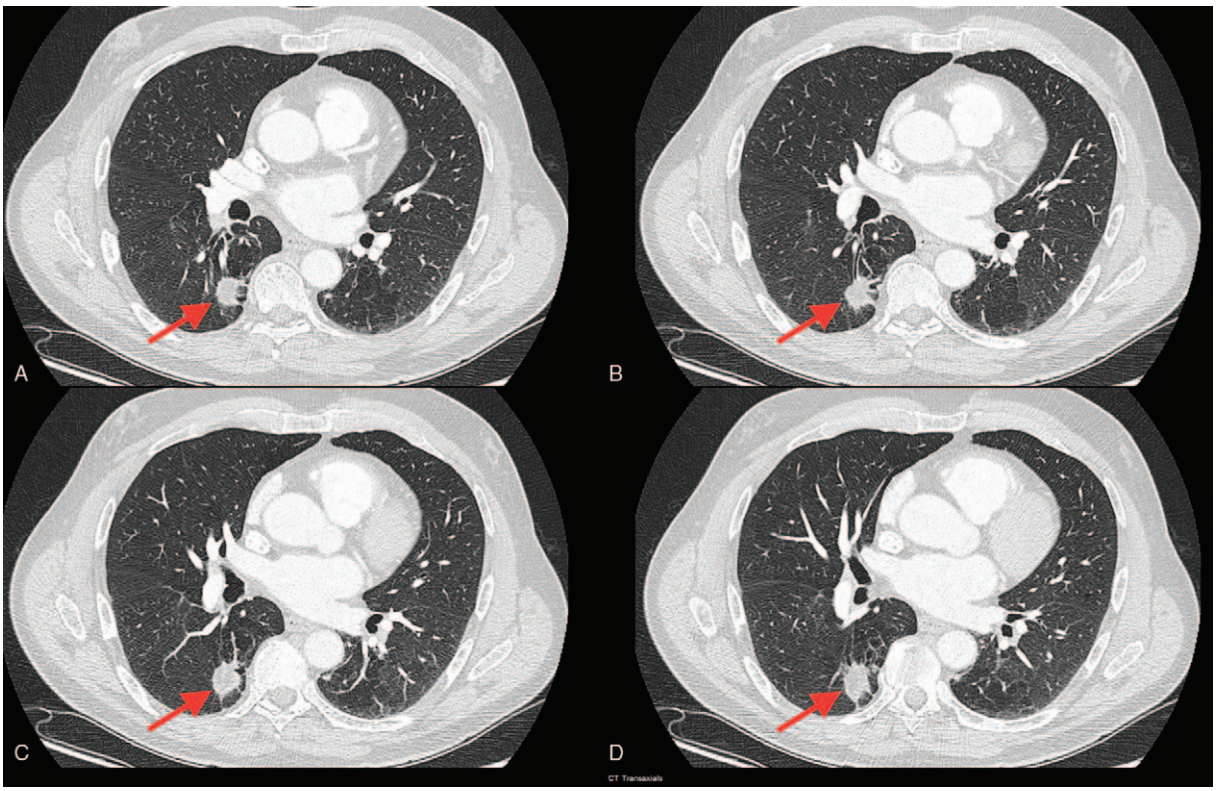

Figure 2. Chest HRCT revealing the pulmonary nodule had irregular borders (red arrow on sub-images A–D). HRCT = high-resolution computed tomography.

potential source of exogenous lipoid pneumonia, but in our case the nasal inhalation of drugs seemed a more probable source.

The clinical manifestations of lipoid pneumonia are various. The usual symptoms are cough, expectorations, and dyspnea, whereas less common symptoms are mild fever, hemoptysis, chest pain, and extrathoracic symptoms.[6] Lipoid pneumonia usually progresses slowly and any new symptom can be a sign of an added bacterial or mycobacterial infection. In our case, the patient was strictly asymptomatic.

Lipoid pneumonia can take many forms on chest HRCT.[7] It can appear as peribronchal opacities, consolidations nodules, or a crazy paving pattern. The most frequent and specific radiological characteristic is the presence of fat attenuation tissue. There was a very small portion of fat attenuation on chest HRCT for our patient.

The diagnosis of lipoid pneumonia is usually confirmed by the presence of lipid-laden macrophages (foamy cells) in respiratory

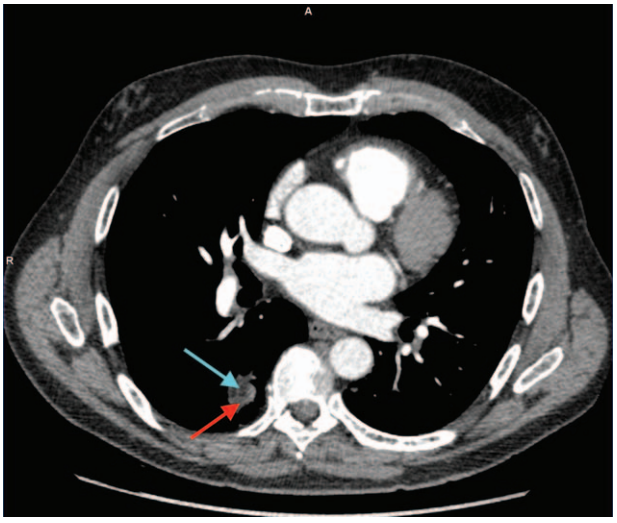

Figure 3. Chest HRCT revealing the pulmonary nodule had heterogeneous densities with mostly fat densities (–30 Hounsfield units on blue arrow; 40 Hounsfield units on red arrow). HRCT = high-resolution computed tomography.

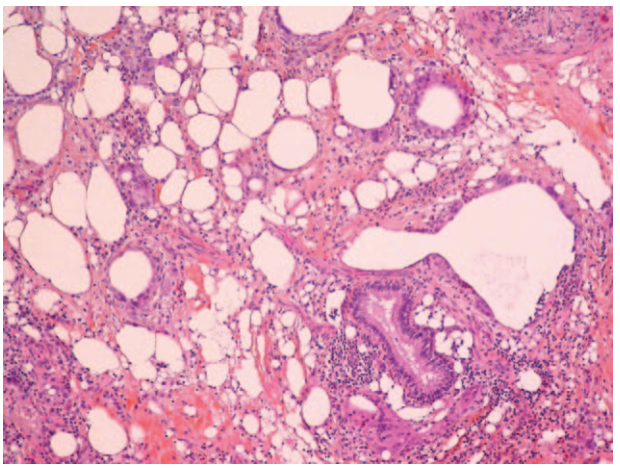

Figure 4. Pathology micrograph of the pulmonary nodule showing lipid-filled vacuoles associated with lipid-laden macrophages and a lymphocytic infiltration.

samples such as sputum, bronchoalveolar lavage fluid (BALF), or fine-needle aspiration cytology/biopsy from lung lesions.[8] In our case, the patient was confirmed as lipoid pneumonia by postoperative pathological examination, and BALF analysis was negative. BALF was not reanalyzed in our case, perhaps a second analysis, specifically searching for lipoid pneumonia signs could have been positive.

It has already been reported that lipoid pneumonia can show an increased ^{18}FDG uptake in ^{18}FDG PET-CT.[9] This is due to inflammation secondary to abnormal presence of oily substances in the lungs with intervention of macrophages and lymphocytes. Standard uptake value was significantly raised but still was relatively low (SUV_{max} = 4.4) in the case we present. This is possibly due to a chronic evolution of this nodule; intra-alveolar oils can coalesce in the alveoli and become encapsulated by fibrous tissue, resulting in a nodule or mass.[10]

This cause of false positive result can lead to invasive procedures. In our case, the fact that the patient presented with a Kaposi syndrome, that bronchoscopy showed lesions resembling Kaposi lesions, the pulmonary nodule had CT-characteristics compatible with malignancy, and bronchoalveolar lavage was negative led to the decision of a radical treatment without a preliminary lung biopsy. This did not lead to complications and the patient is presently in good health but the radical approach should stay a last resort decision, for diagnosis.

Treatment of lipoid pneumonia relies mainly on avoiding ongoing exposure. The other course of treatment is poorly defined and discussed in the literature. According to some authors, prolonged corticosteroids may be effective.[11] Supportive measures, such as oxygen, respiratory therapy, and whole-lung lavage, should be considered[12] or even antibiotics if a secondary infection complicates the lipoid pneumonia, but no consensus exists. In our case no further treatment was necessary after surgery.

Lipoid pneumonia is a rare condition that can be a source of false positive results of malignant lesions in ^{18}FDG PET-CT. The diagnosis can be confirmed without invasive procedures with a good knowledge of the causes and manifestations of this condition when history, clinical, radiological, and cytological findings are concordant. The sources of oily substance inhalation are sometimes hard to find and are extremely various. We suspect nasal inhalation of oily drugs in a recreational purpose can be a source of exogenous lipoid pneumonia.

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