

Clinical note

Intense FDG uptake on PET/CT in the upper and lower respiratory system indicative of Wegener's granulomatosis

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ABSTRACT

Wegener's granulomatosis (WG) is an uncommon systemic vasculitis, which involves the upper and lower respiratory tracts and the kidneys. Because the patients generally present with clinical manifestations that are similar to common diseases, WG may be initially misdiagnosed as infection or malignancy. We report the case of a 55-year-old male presenting with weight loss, cough, hemoptysis, low-grade fever, and pulmonary nodules detected on the thoracic CT scan. Malignancy was initially suspected, so a PET/CT was performed. It demonstrated intense FDG uptake in the upper and lower respiratory system. The diagnosis of WG was based on PET findings, elevated serum levels of inflammatory markers, and the presence of c-ANCA. We consider that the knowledge of FDG-PET/CT findings may help to make an easier and earlier diagnosis of WG.

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Captación intensa de FDG en una PET/TC del tracto respiratorio superior e inferior indicativa de granulomatosis de Wegener

RESUMEN

La granulomatosis de Wegener (GW) es una vasculitis sistémica poco común que afecta principalmente a las vías respiratorias superiores e inferiores y a los riñones. Debido a que los pacientes generalmente se presentan con manifestaciones clínicas similares a las enfermedades comunes, la GW puede ser confundida inicialmente como una infección o una neoplasia. Se presenta un varón de 55 años de edad con pérdida de peso, tos, hemoptisis, febrícula y nódulos pulmonares detectados en una TC torácica. Inicialmente, se sospechó un proceso maligno, por lo que se realizó una PET/TC que identificó una intensa captación de FDG en las vías respiratorias superiores e inferiores. El diagnóstico de GW se basó en los hallazgos de la PET/TC, los niveles séricos elevados de marcadores inflamatorios y la presencia de c-ANCA. Pensamos que el conocimiento de los hallazgos FDG-PET/TC ayuda a realizar un diagnóstico fácil y precoz de la GW.

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Palabras clave:

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Introduction

Wegener's granulomatosis (WG) is a clinicopathologic entity that predominantly consists of necrotizing granulomatous inflammation of the upper and lower respiratory tracts, vasculitis of small arteries and veins, and glomerulonephritis. Other parts of the body such as the eyes, nerves, ear, and skin might be inflamed as well. There is no known cause for Wegener's granulomatosis and autoimmune etiology is considered.¹ Upper respiratory tract and otologic manifestations usually precede pulmonary and renal involvement, and are commonly misdiagnosed as infectious or allergic in etiology.² Pulmonary involvement is also misdiagnosed as cancer, infection, or rheumatoid nodules in etiology as well.^{3,4}

Positron emission tomography with ¹⁸F-fluorodeoxyglucose is considered to be useful in the evaluation of large vessel vasculitis.⁵ However, there are only few previously described case reports and

one retrospective study including eight patients in the setting of PET findings in WG.^{3,4,6–12} Because FDG PET/CT scan is used to distinguish benign from the malignant pulmonary nodules or to search the primary malignancy in case of metastatic disease, especially lung lesions of WG can mimic malignancy as seen in our patient who had multiple hypermetabolic pulmonary nodules.^{3,4} In our case, intense FDG uptake in the upper respiratory system associated with hypermetabolic pulmonary nodules pointed out a systemic disease, particularly WG. It is worthwhile to emphasize the possibility of WG, under these circumstances where concomitant FDG uptake in both upper and lower respiratory system lesions was present.

Case report

A 55-year-old man was admitted to the hospital with complaints of hearing loss, nasal discharge, low grade fever, coughing, hemoptysis, and weight loss of 10 kg within two months. Laboratory tests showed increased levels of white blood cell count, C-reactive protein, and erythrocyte sedimentation rate. CT scan of chest showed

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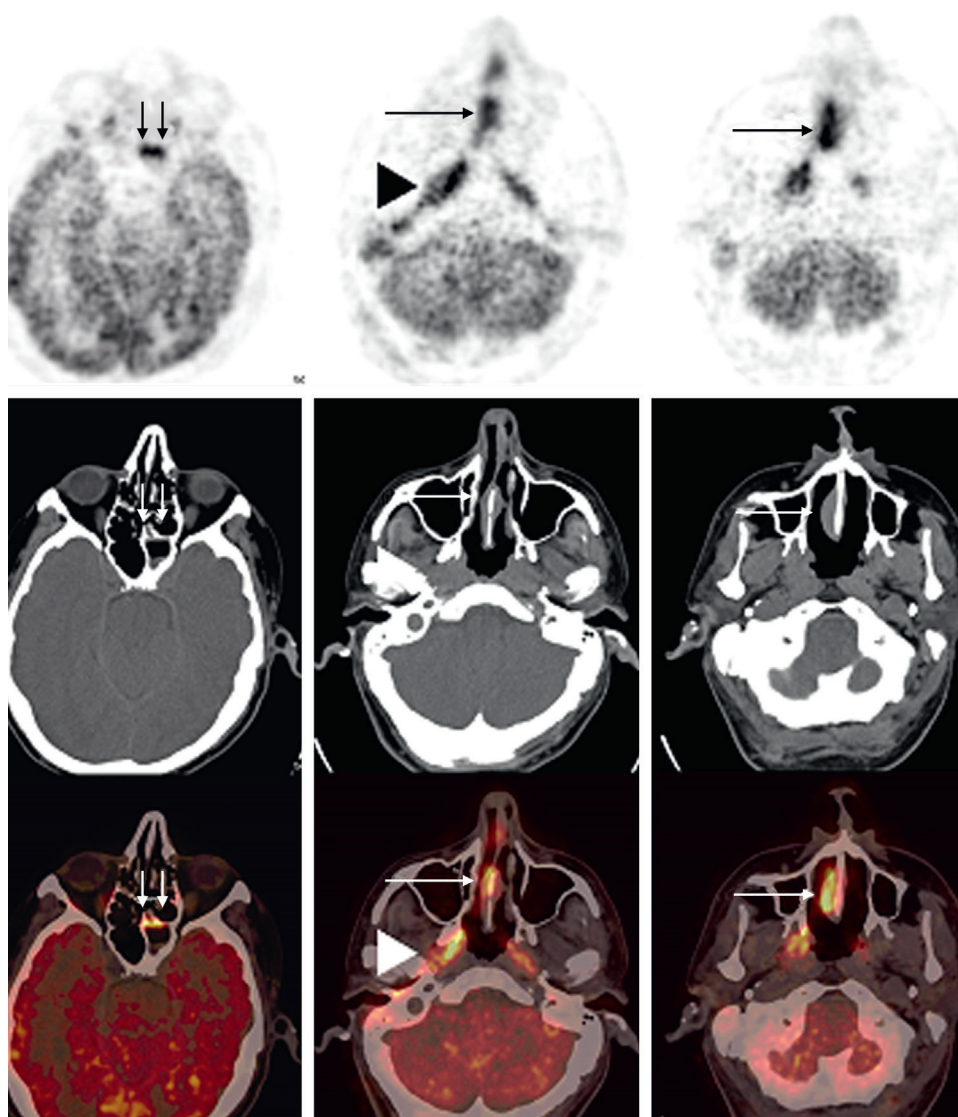


Fig. 1. PET/CT scan demonstrated hypermetabolic marked mucosal thickening in the nasal septum (arrow) and hypermetabolic mild mucosal thickening in the anterior wall of the left sphenoid sinus (double arrow). An intense FDG uptake in the nasopharynx, inner and outer tract of ears including eustachian tubes was noted and considered as inflammatory lesions (arrow head).

multiple nodular lesions in both lungs suggesting infection and metastasis. The patient was referred for an FDG PET/CT scan with a suspected diagnosis of malignancy of unknown primary etiology. FDG PET scan was obtained after intravenous injection of 370 MBq (10 mCi) ^{18}F FDG, and standard whole body scan was acquired on a Biograph 16 PET/CT scanner (Siemens Medical Solutions, Knoxville, TN, USA). PET/CT scan demonstrated hypermetabolic significant mucosal thickening in the nasal septum and hypermetabolic mildly mucosal thickening in the anterior wall of the left sphenoid sinus. An intense FDG uptake in the nasopharynx, inner and outer tracts of ears including eustachian tubes was noted consistent with inflammatory lesions (Fig. 1). The upper respiratory tract lesions had a SUVmax of 11.9. The PET/CT showed widespread pulmonary nodules with intense FDG uptake located mostly subpleural areas and basal zones with a SUVmax of 15 (Fig. 2A and B). The differential diagnosis included metastatic disease, lymphoma involvement, infection or rheumatoid nodules. In the mediastinum, hypermetabolic lymph nodes were seen in the right paratracheal, subcarinal, and bilateral hilar region with SUVmax of 7.6 (Fig. 2A and B). Spleen had diffusely increased FDG accumulation with SUVmax of 7.3 (Fig. 2A).

Bronchoscopic biopsy revealed massive polymorphonuclear leukocytes, lymphocytes, macrophages, and rare epithelial cells. Subsequent CT-guided fine needle aspiration biopsy of lung nodules yielded the same histopathological results, but no evidence of malignancy. Blood cultures were negative for any specific pathogen.

In multidisciplinary discussion, FDG uptake in the upper respiratory system and in the bilateral pulmonary nodules was considered as systemic vasculitis or inflammatory disease rather than a malignancy. Therefore, c-ANCA (anti-proteinase-III) was studied and an increased level of 74 RU/ml was detected. The p-ANCA titer was in normal range. A revised diagnosis of WG was suggested and immunosuppressive treatment was given.

Discussion

Our initial differential diagnosis included infection and malignancy in this case. FDG PET/CT was used to seek the primary source of pulmonary nodules, which were detected by thorax CT. A primary neoplasm has not been discovered but findings of PET/CT with the presence of ANCA led us to suspect WG.

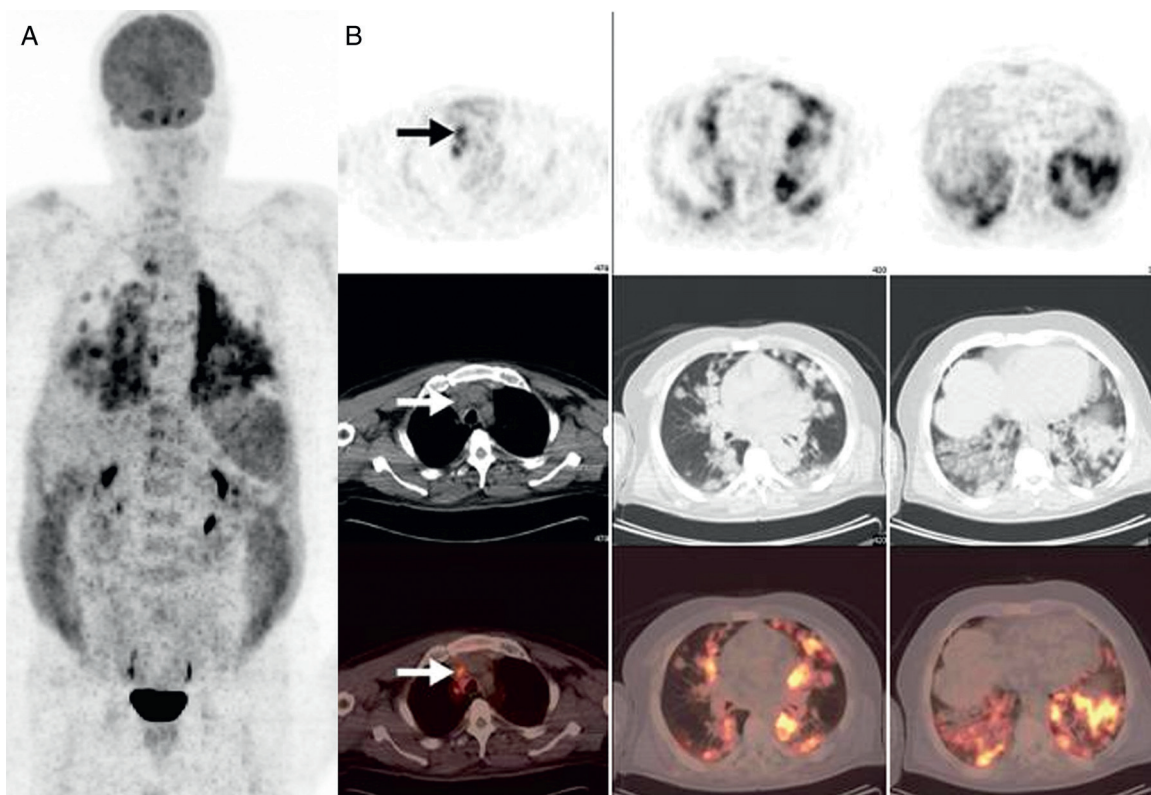


Fig. 2. Maximum intensity projection (MIP) image show hypermetabolic lesions of the upper and lower respiratory tract, and diffusely increased FDG uptake in the spleen (A). Axial slices of PET/CT showed intense FDG uptake of widespread pulmonary nodules located mostly near subpleural areas and basal zones with a maximum standardized uptake value of 15 (B). In the mediastinum, hypermetabolic lymph nodes were seen in the right paratracheal, subcarinal, and bilateral hilar regions (arrow).

FDG is well known to accumulate in malignant tissues as well as at the sites of infection and inflammation. PET/CT has been established as a new imaging technique with promising results in various forms of vasculitis.⁵ Increased FDG uptake in WG has only been shown by case reports.^{3,4,6–12} FDG-PET scanning may give false-positive result as tumor-like activity in multiple pulmonary nodules. Therefore, FDG-PET might be valuable in establishing the diagnosis of difficult cases. WG can be detected initially by integrated FDG PET/CT. In addition, PET/CT can be helpful for determining a site appropriate to obtain biopsy samples and making earlier diagnosis.^{3,4}

Almuhaideb et al. reported an interesting case of WG with multiple sites of involvement such as the maxillary sinus, nasal cavity, parotid mass with local extension to the middle ear cleft, a large anterior mediastinal mass with few mediastinal and hilar nodes, bilateral cavitating pulmonary nodules, a single peritoneal nodule and the prostate gland with intense increased FDG uptake.⁶ van Durme et al. presented a patient with pulmonary, nasal, pituitary, and focal thyroidal involvement.⁷

Umemoto et al. described a case of relapsed WG that presented with abdominal pain, peri-iliac arterial inflammation resulting urethral obstruction and hydronephrosis. They concluded that FDG-PET/CT was very helpful in diagnosing the relapse of WG in the absence of the classical triad of symptoms, which included involvement of upper and lower respiratory tract and kidneys, based on routine examinations and the lack of an elevated PR3-ANCA level.⁹ In our case, intense FDG uptake in both upper and lower respiratory tract, two components of the typical triad of WG, have been demonstrated by PET/CT and laboratory results were also very helpful to diagnose the WG.

FDG PET/CT has also a potential role in the monitoring of therapy and in defining disease activity during the follow-up of WG.^{8,9}

Levin et al. reported a case with known WG who presented with severe back pain. FDG PET was helpful to demonstrate the involvement of aorta and the spinal cord and to support the diagnosis of reactivation.¹⁰

Jouret et al. reported a tumor-like expansion of a severe nasosinusal WG into the brain and hypermetabolic lung nodules.¹¹ Recently, auditory tube involvement was also described with FDG PET/CT.¹²

While interpreting the whole body PET, it should be kept in mind that all findings may belong to the same disorder as well as to various conditions appearing at the same time. Although the upper respiratory system findings were consistent with infection, hypermetabolic lesions both in the upper and lower respiratory tract pointed a systemic inflammatory disorder. Additional laboratory and clinical findings established the diagnosis of WG.

As a conclusion, PET study led us to suspect a systemic inflammation in a case in which malignancy or metastasis was suspected initially. Although these findings are not specific, WG should be considered in the differential diagnosis of hypermetabolic upper and lower respiratory tract lesions.

Conflict of interest

The authors declare no conflict of interest.

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