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LETTER TO THE EDITOR

Dear Editor

Detection of Pulmonary Involvement in Eosinophilic Granulomatosis with Polyangiitis (Churg-Strauss, EGPA) with ^{18}F-fluorodeoxyglucose Positron Emission Tomography

Eosinophilic granulomatosis with polyangiitis (Churg-Strauss, EGPA) is a systemic necrotizing vasculitis in the small vessels associated with eosinophilic infiltration and granulomatous inflammation in various organs.[1] Eosinophilic inflammation and small-vessel vasculitis induce various disorders in organs, including the lung, heart, intestine, kidney, skin, central nervous system, and peripheral nerves.[2] The clinical manifestations of EGPA are bronchial asthma, eosinophilia, pulmonary infiltrates, parasinusitis, multiple mononeuritis, and extravascular eosinophils.[3]

Inflammation in various diseases has been assessed with ^{18}F-fluorodeoxyglucose (FDG) positron emission tomography (PET), but there have been few reports on the use of FDG PET in EGPA.[4,5] We describe a patient with EGPA who underwent FDG PET/computed tomography (CT) before treatment and is now in complete remission.

A 66-year-old man had been seen at a hospital for refractory chronic eosinophilic pneumonia since he was 63 years old. He had a history of asthma of Step 4 severity according to the 2006 Global Initiative for Asthma guidelines[6]; recurrent eosinophilic otitis media; sinusitis; and eosinophilia, with eosinophils accounting for 20%−30% of white blood cells. He was treated with a high dose of an inhaled corticosteroid, a leukotriene receptor antagonist, and a histamine H 1-receptor antagonist; nevertheless, he suffered from wheezing with chronic cough. In July 2010, when he was 66 years old, he developed diarrhea, purpura in the forearms, sensory disturbance with mild weakness in his lower extremities, and left tibial paralysis. He underwent FDG PET/CT as part of a medical examination for cancer in Musashimurayama Hospital, Tokyo, Japan in July 2010. With the patient in the fasting state, images were taken of the body from the head to the thighs at 1 hour (early images) and 2 hours (delayed images) after intravenous injection of 212 MBq of FDG. FDG PET/CT showed hilar and mediastinal lymph node swelling with increased FDG uptake (Fig. 1); the maximal standardized uptake value (SUV) was 3.44 in the early image (Fig. 2 A) and 5.77 in the delayed image. CT revealed a reticular shadow, ground-glass opacity, and bronchial wall thickening associated with atelectasis in the bilateral lower lobes of the lung. FDG accumulated in a lesion in the left lower lobe of the lung with a maximal SUV of 2.28 in the early image (Fig. 2B) and 3.56 in the delayed image. No abnormally high FDG accumulation was detected in other organs.

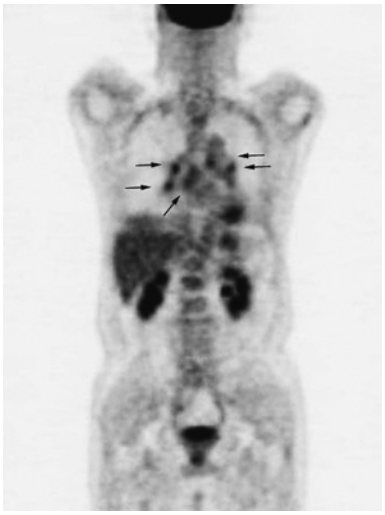

Fig. 1 An FDG PET image obtained 1 hour after administration of FDG (early image) shows multiple regions of FDG uptake with lymphadenopathy in mediastinal and hilar lymph nodes (arrows).

In August 2010, peripheral blood analysis revealed increases in total white blood cell (WBC) count (11,380/mm^3; normal, 3500 to 8500/mm^3) and eosinophil count (5804/mm^3, 51% of total WBC count; normal, 0% to 6%), and C-reactive protein (CRP) was elevated (1.11 mg/dL; normal, 0 to 0.4 mg/dL). Myeloperoxidase-specific antineutrophil cytoplasmic antibodies were not detected. The patient was suspected to have EGPA and was admitted to National Hospital Organization Sagamihara National Hospital, Kanagawa, Japan in September 2010. Bronchoalveolar lavage fluid contained numerous eosinophils, which comprised 75.5% of the total cell count (total cell count, 8.2 × 10^4/mL). Histologic examination of the bronchial tissue revealed prominent eosinophil infiltration and edema of the tunica propria under the bronchial epithelium. Lung biopsy demonstrated a thickening of the alveolar septum, which was infiltrated by eosinophils. Biopsy of the stomach and colon did not show eosinophilic infiltration. No granulomatous lesion or necrotizing angiitis was detected in specimens of the lung, stomach, and colon. He experienced no cardiac symptoms, such as chest pain, palpitation, and dyspnea on effort. Electrocardiography and echocardiography revealed no abnormal findings. The patient was diagnosed with EGPA according to the diagnostic criteria for allergic granulomatosus angiitis proposed by the research committee of intractable vasculitis in the Japanese Ministry of Health, Labor, and Welfare.[7] The EGPA of the patient in this report was complicated by advanced eosino-

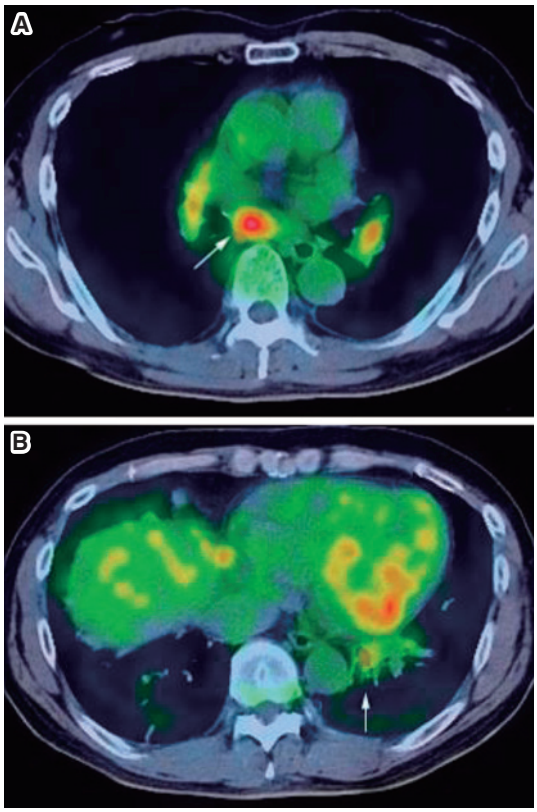

Fig. 2 Early FDG PET/CT images of the chest show increased FDG uptake in the mediastinal and hilar lymph nodes (**A**) and in an infiltration in the left lower lobe of the lung (**B**).

philic pneumonia with lymph node adenopathy, multiple mononeuritis, paranasal sinusitis, otitis media, and purpura.

The patient was treated with intravenous methylprednisolone (1 g/day for three consecutive days) followed by oral prednisolone (60 mg/day for the first month and then a gradually decreasing dose), intravenous cyclophosphamide (700 mg given three times at intervals of three weeks), and intravenous immunoglobulin (25 g/day for five consecutive days). His symptoms improved after the treatment. Blood analysis revealed that total WBC count, eosinophil count, and CRP had decreased to the normal range at ten weeks after treatment was started (WBC count, 8240/mm^3; eosinophil count, 40/mm^3, 0.5% of total WBC count; CRP, 0.25 mg/dL). CT was performed again in October 2010 and demonstrated improvement of the lung infiltration and disappearance of mediastinal and hilar lymph node swelling. In April 2013, the patient was in complete remission and underwent FDG PET/CT at Musashimurayama Hospital. The CT images and FDG uptake were normal.

In this patient, FDG PET/CT detected severe pulmonary involvement associated with EGPA. FDG PET showed advanced eosinophilic inflammation affecting the lung and mediastinal lymph nodes in a patient with EGPA before treatment. However, the ability of FDG PET to detect pulmonary inflammation may be lower than that of CT because FDG did not show abnormal uptake in the right lower lobe, in which CT found pulmonary inflammation. FDG PET did not reveal otitis media and sinusitis, perhaps because the inflammation of the middle ear and paranasal sinus were mild. FDG appropriately did not accumulate in the stomach and colon, in which neither eosinophilic nor necrotizing inflammation was detected in histological examination. In this case, FDG PET did not exceed conventional examinations in detecting inflammation in EGPA, although FDG PET has reportedly detected active myocardial inflammation in patients with EGPA both before treatment and after remission.[4,5] FDG PET has also been used to evaluate the degree and extent of inflammation in large-vessel vasculitis and Wegener granulomatosis.[8,9] Prospective clinical trials are needed to confirm the utility of FDG PET in patients with EGPA.

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