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【 CASE REPORT 】

A Long-term Persistent Vascular Fluorodeoxyglucose Uptake in a Patient with Large-vessel Vasculitis

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Abstract:
We herein report a case of large-vessel vasculitis in a 57-year-old woman who developed an intermittent fever and weight loss. While contrast-enhanced computed tomography was noncontributory, positron emission tomography-computed tomography (PET-CT) revealed the diffuse, intense uptake of fluorodeoxyglucose (FDG) in the aorta and its branches. Although she had no signs of relapse after successful oral corticosteroid therapy, PET-CT at 30 months revealed a persistent FDG uptake in the large vessels, which warranted regular follow-up imaging for vascular complications. In cases with an intense FDG uptake at the diagnosis, PET-CT follow-up after clinical remission may help predict the risk of relapse and vascular complications.

Key words: large vessel vasculitis, Takayasu arteritis, giant cell arteritis, positron emission tomography-computed tomography, diagnosis, follow-up

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Introduction

Takayasu arteritis (TA) and giant-cell arteritis (GCA) are two major variants of large-vessel vasculitis (LVV), both of which are characterized by systemic granulomatous LVV. Recently, the clinical usefulness of fluorodeoxyglucose-positron emission tomography (PET)-computed tomography (CT) for the early diagnosis of LVV has been increasingly reported (1, 2). In addition, the use of PET-CT for diagnosing LVV was approved by the Japanese Ministry of Health, Labour and Welfare from 2018 (2). Thus, a prompt diagnosis and treatment of LVV using PET-CT before irreversible vascular changes can be observed has become widely available. However, the role of PET-CT in long-term follow-up of LVV and its prognostic value remain unclear (3).

We herein report an instructive case that illustrates the clinical usefulness of PET-CT in the early diagnosis and long-term follow-up of LVV.

Case Report

A 57-year-old Japanese woman with a history of atopic dermatitis and recurrent cystitis presented to our hospital with a 4-week history of an intermittent fever with chills, mild headache, appetite loss, and 6-kg weight loss. Four weeks earlier, she developed a fever without any localized symptoms, except for a mild headache. Her symptoms did not improve despite serial oral antibiotic treatments for a presumed urinary tract infection; she was therefore referred to our hospital for a further evaluation. Previously, she had not experienced similar episodes and did not have any family history of periodic fever syndrome. The patient denied any recent travel, sexual activity, animal exposure, or sick contact. She had no skin rash, arthralgia, vision change, chest pain, abdominal pain, jaw claudication, or upper and lower extremity claudication.

On her first visit, she appeared chronically ill but was not in acute distress. She had a body temperature of 36.4℃, pulse rate of 86 beats/min, blood pressure of 120/68 mmHg,

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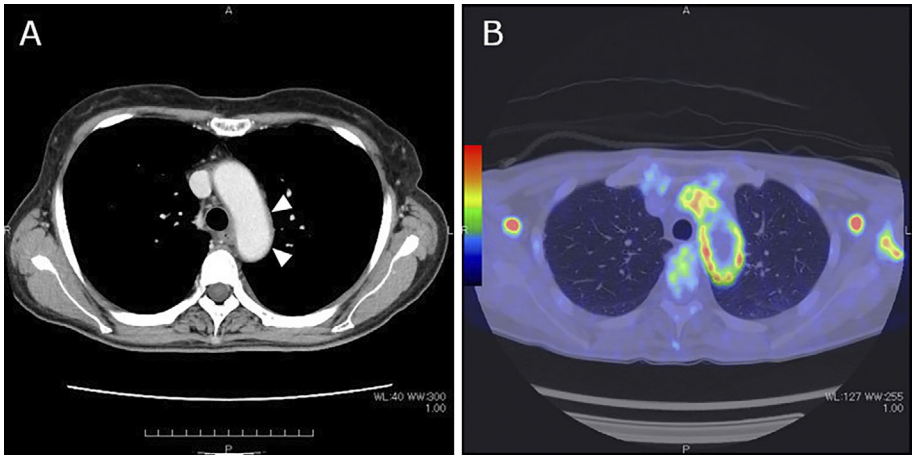

Figure 1. **(A) Contrast-enhanced computed tomography showing slight thickening of the aortic wall, which was non-contributory (arrowheads). (B) Positron emission tomography-computed tomography showing an intense fluorodeoxyglucose uptake in the corresponding aortic lesion.**

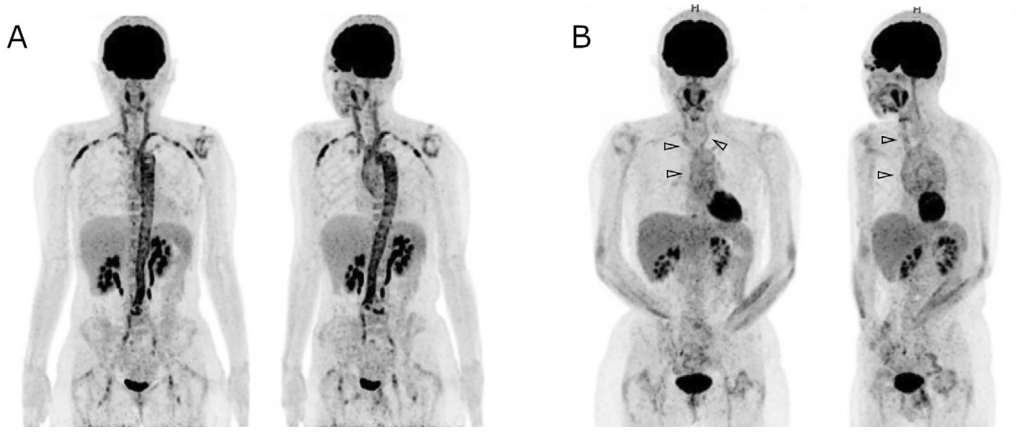

Figure 2. **(A) Baseline positron emission tomography-computed tomography: a diffuse, intense fluorodeoxyglucose uptake is observed in the thoracic and abdominal aorta and common carotid, subclavian, iliac, and femoral arteries. (B) The 30-month follow-up findings of positron emission tomography-computed tomography showing a mild fluorodeoxyglucose uptake in the aorta, common carotid arteries, and subclavian arteries (arrowheads).**

respiratory rate of 18 breaths/min, and oxygen saturation of 97% on ambient air. A physical examination revealed no oral lesions, genital ulcers, conjunctival congestion, lymph node swelling, hepatosplenomegaly, skin rash, or arthritis. No carotid bruit or diminished peripheral pulses were noted.

Laboratory tests were only notable for nonspecific inflammatory responses: C-reactive protein level, 9.55 mg/dL; erythrocyte sedimentation rate (ESR), 82 mm/h; and Hgb level, 10.3 g/dL (mean corpuscular volume 82 FL). Repeat blood culture tests were negative. Infectious serologies and autoantibodies, including rheumatoid factor, antinuclear antibody, and anti-neutrophil cytoplasmic antibodies, were negative. Her human leukocyte antigen (HLA) typing was positive for HLA-A24, A33, B44, and B55, none of which strengthened the odds of any particular disease.

Contrast-enhanced CT revealed a possible slight thickening of the aortic wall, which was noncontributory (Fig. 1). Further imaging with PET-CT demonstrated a diffuse, intense fluorodeoxyglucose (FDG) uptake in the thoracic and abdominal aorta, common carotid arteries, subclavian arteries, iliac arteries, and femoral arteries, consistent with diffuse LVV (Fig. 1, 2). Doppler ultrasonography and CT angiography of the large vessels revealed no signs of vascular stenosis or dilatation.

Although her clinical symptoms and radiological findings had a phenotypic overlap between TA and large-vessel GCA, she was diagnosed with TA according to the Japanese Guidelines for Management of Vasculitis Syndrome 2017 (4). Treatment was initiated with 0.5 mg/kg of oral prednisolone (PSL) per day. Her fever, serum C-reactive protein, and ESR levels gradually improved, and the PSL dose was successfully tapered over 16 months without any sign of recurrence. Since she had no signs of relapse at 30 months (14 months after discontinuation of PSL), follow-up PET-CT was performed to evaluate persistent vasculitis and the need for further regular follow-up imaging for vascular

complications. Despite a lack of signs of clinical and biological relapse, a mild FDG uptake persisted in the aorta, common carotid arteries, and subclavian arteries (Fig. 2). Since a persistent FDG uptake in the vessel wall has been suggested to indicate a risk of subsequent relapse and vascular complications, she was scheduled for regular imaging follow-up, regardless of symptoms or biomarkers.

Discussion

TA, also known as "pulseless disease," is a type of granulomatous LVV that predominantly involves the aorta and its proximal branches. In addition, GCA is a subtype of LVV whose clinical and pathological features warrant debate as to whether or not they are a spectrum of the same disease (5). The early diagnosis of LVV is particularly important in order to prevent irreversible vascular complications. However, non-specific systemic signs and symptoms of LVV in the early phase pose diagnostic and therapeutic challenges.

The most widely used classification criteria for TA are the American College of Rheumatology 1990 Criteria, which includes the following: 1) onset age <40 years old; 2) claudication of an extremity; 3) decreased brachial artery pulse; 4) a difference of >10 mmHg systolic pressure between two limbs; 5) bruit over subclavian arteries or the aorta; and 6) angiographic evidence of narrowing or occlusion of the aorta, its primary branches, or large arteries in the proximal upper or lower extremities (6). Although the current case did not meet any of the above-mentioned criteria, the PET-CT findings and evidence of systemic inflammation enabled the early diagnosis and treatment according to the Japanese Guidelines for Management of Vasculitis Syndrome 2017 (4).

Recent advances in diagnostic modalities show promise for the diagnosis of LVV. In particular, the clinical usefulness of PET-CT for the early diagnosis of LVV has been reported increasingly frequently (7). As shown in the current case, there are an increasing number of reports of PET-CT showing large-vessel inflammation in cases where CT did not lead to a definitive diagnosis (8). In addition to its high sensitivity, some studies have suggested that PET-CT can detect active LVV more specifically than magnetic resonance imaging (MRI) (9). The European League Against Rheumatism task force recently recommended an early imaging test in the diagnosis of LVV, with ultrasound for GCA and MRI for TA, while mentioning PET-CT as an alternative imaging modality (10). Similarly, the Japanese Circulation Society also recommends the use of PET-CT for possible LVV patients when other imaging studies are noncontributory (11).

Evidence is emerging regarding the role of PET-CT in the follow-up of LVV. Several studies have shown that an FDG uptake can persist in patients with clinical remission, potentially reflecting remodeling or smoldering inflammation of arterial walls (12). In fact, a clinicopathologic review of aortitis patients reported chronic inflammation in the aortic wall (13). The duration between the LVV diagnosis and follow-up PET-CT varies among reports. A 2004 case series of aortitis patients reported that 45% of FDG-PET-positive vascular regions remained positive at a mean of 13.3 (standard deviation, 4.7) months (14). More recently, Grayson et al. conducted a prospective cohort study including 56 LVV patients with a mean follow-up of 6.3 (±6.7) months (15). An observational study of clinically stable large-vessel GCA patients reported a positive vascular FDG-PET uptake at up to 25 months (12). However, to our knowledge, the present study describes the case with the longest duration of a persistent FDG uptake without clinical signs of relapse (30 months from the diagnosis).

The high baseline arterial FDG uptake was associated with an increased incidence of subsequent relapse and vascular complications (15, 16). In particular, a higher FDG uptake in the aorta than in the liver, as seen in the current case, carries a risk of aortic complications (17). Since there is no correlation between the vessel wall thickness and the maximum FDG uptake during LVV relapse (18), follow-up of LVV by biological markers and conventional imaging modalities, such as CT, MRI, and ultrasound, may be insufficient to assess the risk of relapse.

The role of imaging in distinguishing TA and large-vessel GCA is yet to be determined. A study involving 13 patients with TA and 15 with GCA found that entire aortic involvement was present only in TA (19). Grayson et al. found that patients with TA were more likely to have inflammation in the carotid and mesenteric arteries, whereas GCA tends to involve the axillary arteries (20). In the current case, we established the diagnosis of TA based on the involvement of the entire aortic and bilateral carotid arteries. However, the relatively old age of onset and the involvement of axillary arteries hindered explicit subtyping. More studies are required to distinguish TA and large-vessel GCA in such cases with phenotypic overlap.

In conclusion, we encountered an instructive case that illustrates the clinical usefulness of PET-CT in the early diagnosis and follow-up of LVV. In cases with a high FDG uptake in the vessel wall in the early disease stage, PET-CT follow-up even after clinical and biological remission may help predict the long-term risk of relapse and vascular complications.

Informed consent for publication was obtained from the patient prior to submission.

The authors state that they have no Conflict of Interest (COI).

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