AuntMinnie Fluorodeoxyglucose Positron Emission Tomography-Computed Tomography Leads to Diagnosis of Immunoglobulin G4-Related Disease

Abstract

A 61-year-old male underwent fluorodeoxyglucose positron emission tomography-computed tomography (FDG PET-CT) for evaluation of fever and weight loss with clinical suspicion of occult malignancy or tuberculosis. The scan showed hypermetabolism in bilateral submandibular salivary glands, biliary radicles, pancreas, bilateral kidneys, prostate, and multiple lymph nodes. Based on the concomitant involvement of these sites, suspicion of immunoglobulin G4 (IgG4)-related disease was raised in PET-CT report. Further evaluation with serum IgG4 levels and histopathology of the submandibular salivary gland confirmed the diagnosis of IgG4-related disease. The ability of FDG PET-CT to evaluate the whole-body status of disease played a crucial role in this case.

Keywords: *Fluorodeoxyglucose positron emission tomography-computed tomography in evaluation of fever, fluorodeoxyglucose positron emission-tomography computed, immunoglobulin G4-related disease, submandibular salivary gland*

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Introduction

Although utilized extensively in oncological imaging, fluorodeoxyglucose positron emission tomography-computed tomography (FDG PET-CT) has proven to be an effective tool in infection and inflammation imaging as well. The ability of FDG PET-CT to image "whole-body disease status" and its exquisite sensitivity can provide clues to diagnosis, which are otherwise difficult to obtain in regional imaging. We present such an intriguing case, where the pattern seen on FDG PET-CT was instrumental in reaching the diagnosis of immunoglobulin G4-related disease (IgG4-RD).

Case Report

A 61-year-old male complained of intermittent fever, abdominal pain, and chronic weight loss. His history was significant for an episode of pancreatitis in the previous year and cholecystectomy for chronic cholecystitis 6 months ago. His laboratory investigations revealed leukocytosis (total leukocyte count, [TLC] = 19,700/mm^3 and normal range 4000–10000/mm^3), with raised eosinophil count of 30% of TLC (normal range –1%–6%) and high C-reactive protein levels (20.3 mg/L, normal value <10 mg/L). Urine examination was unremarkable, except for trace proteins. With clinical suspicion of occult infection or malignancy, he was referred for FDG PET-CT. The PET-CT scan showed hypermetabolism in bilateral submandibular salivary glands (red arrow marked in Figure 1a and 1b), biliary radicles (blue arrow marked in Figure 1a and 1c), pancreas [arrow marked in Figure 1d], bulky appearing bilateral kidneys [arrow marked in Figure 1e], prostate [arrow marked in Figure 1f], and multiple supra- and infradiaphragmatic lymph nodes [inguinal lymph nodes, arrow marked in Figure 1e-g]. Based on the concomitant involvement of salivary glands, pancreas, kidneys, and multiple lymph nodes and Gestalt impression of the study, we suggested multiorgan involvement by IgG4-RD in PET-CT report.[1] The other differential diagnoses were lymphoma and granulomatous pathologies. Based on PET-CT findings, further evaluation with serum IgG4 level and histopathology was recommended.

The IgG4 level was found to be markedly elevated (45 g/L, biological reference

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interval 0.03–2.0 g/L) correlating with diagnosis suggested on PET-CT. However, considering the rarity of diagnosis, biopsy of the left submandibular gland was performed for histopathological (HP) confirmation. The biopsy [Figure 2a and b, H and E ×100] revealed distortion of salivary gland architecture with lymphocytic infiltration [Figure 2a, arrow], storiform fibrosis [Figure 2b, arrows]), and acinar atrophy [white arrow in Figure 2c, H and E ×400] surrounded by dense chronic inflammation [Figure 2c, black arrow]. These HP features confirmed the diagnosis of IgG4-RD and the patient was started on steroid treatment for further management. During poststeroid treatment, there was a resolution of fever and abdominal pain within days and gradual weight gain over few weeks. The follow-up blood investigations 8-week poststeroid treatment revealed normal TLC (6400/mm^3) and normal percentage of eosinophils (2.8%).

Discussion

IgG4-RD is an increasingly recognized clinicopathological disorder with immune-mediated inflammatory lesions mimicking malignancies.[2,3] The commonly affected organs include the pancreas, pancreatobiliary tract, lacrimal gland, salivary gland, lung, retroperitoneal region, lymph nodes, and kidneys.[4,5] However, virtually any organ can be involved. IgG4-RD is therefore considered a multiorgan systemic disease. The disease can be distinguished from other inflammatory, malignant, or infective conditions by characteristic pathologic findings.[6] These features include lymphocytic and plasmacytic infiltration with predominance of IgG4-positive plasma cells and a peculiar "storiform"

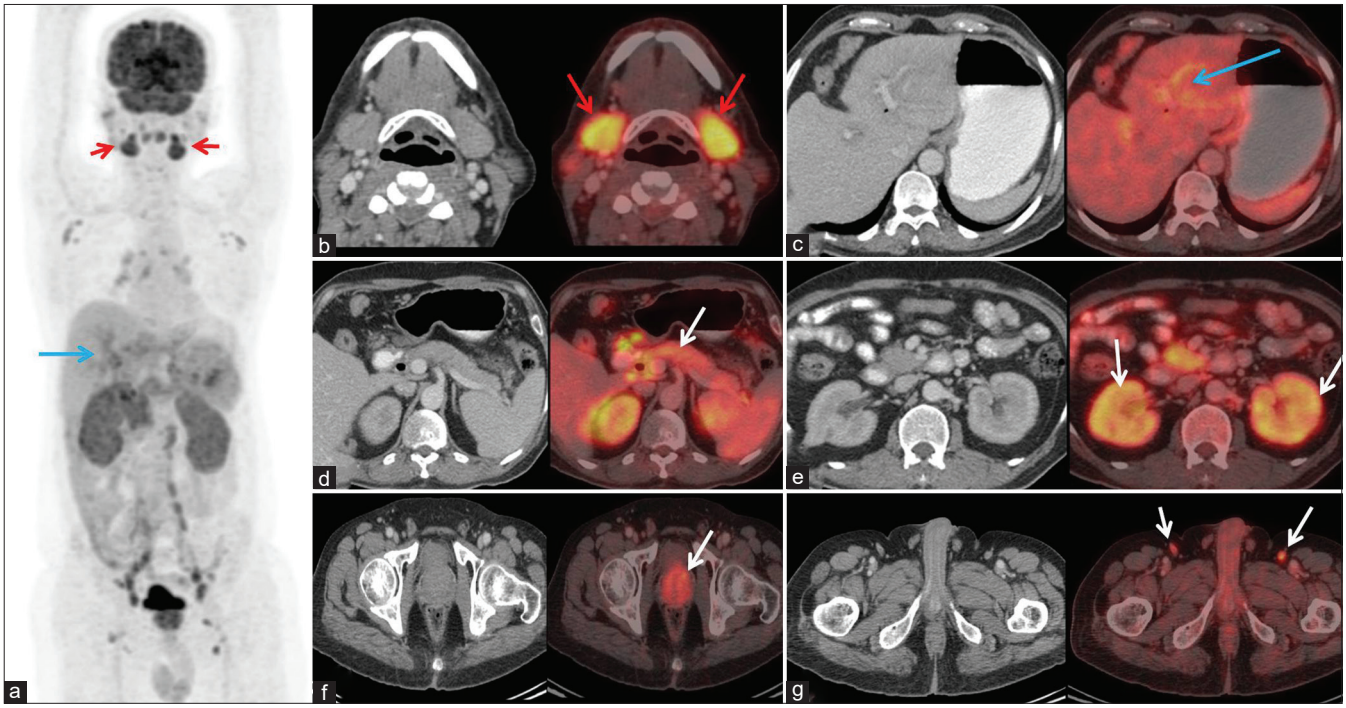

Figure 1: The FDG PET-CT scan showed hypermetabolism in bilateral submandibular salivary glands (red arrow marked in (a) MIP image and (b) fused PET-CT), biliary radicles (blue arrow marked in (a) MIP image and (c) fused PET-CT), pancreas (arrow marked (d)), bulky appearing bilateral kidneys (arrow marked (e)), prostate (arrow marked (f)), and multiple supra- and infradiaphragmatic lymph nodes (inguinal lymph nodes, arrow marked (g)). FDG PET-CT: Fluorodeoxyglucose positron emission tomography-computed tomography, MIP: Maximum intensity projection

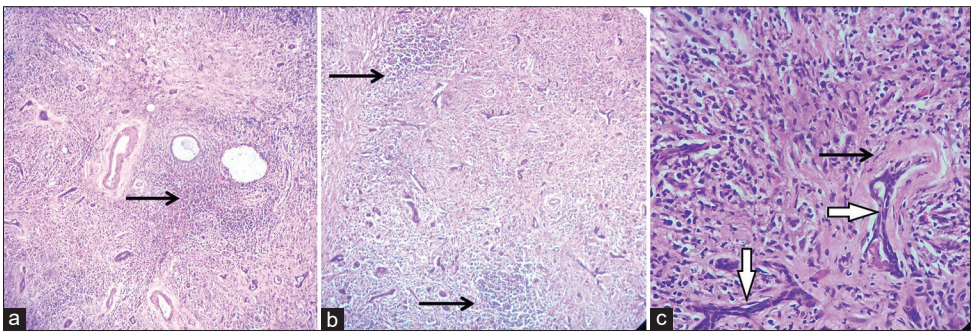

Figure 2: Biopsy of left submandibular gland revealed distortion of salivary gland architecture with lymphocytic infiltration ((a), arrow), storiform fibrosis ((b), arrows), and acinar atrophy (white arrow (c) H and E × 400) surrounded by dense chronic inflammation ((c), black arrow)

fibrosis.[7] Since the disease often presents with nonspecific symptoms and can affect any organ, the diagnosis is challenging and often delayed.[8] The diagnosis requires a high index of suspicion, correlation with imaging, laboratory investigations, and finally histopathology.

Although mainly utilized in oncological imaging, FDG PET-CT has shown its utility in the evaluation of infective and inflammatory disorders as well.[9] Ability to evaluate whole-body disease burden, to guide site for HP correlation and potential in treatment response evaluation, make FDG PET-CT an attractive option in the evaluation of IgG4-RD.[2,10,11] In our case, concomitant involvement of salivary glands, pancreas, biliary radicles, kidneys, and lymph nodes was an "AuntMinnie" FDG PET-CT pattern for IgG4-RD.[12] The Gestalt approach utilized in oncological imaging can lead to the correct diagnosis in selected cases of IgG4-RD, especially in those with multisystem involvement. Our case highlights the important role played by FDG PET-CT in pinpointing the pathology in this otherwise difficult-to-diagnose disease, identifying the systemic burden of disease, and guiding less invasive site for accurate tissue diagnosis. The knowledge of FDG PET-CT pattern of IgG4-RD can help nuclear medicine physicians in correct interpretation of scan findings of this relatively rare disease.

Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards**.**

Informed consent

Informed consent was obtained from all individual participants included in the study.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understands that his name and initials will not be published and due efforts will be made to conceal his identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Hofman MS, Hicks RJ. How we read oncologic FDG PET/CT. Cancer Imaging 2016;16:35.
2. Zhang J, Chen H, Ma Y, Xiao Y, Niu N, Lin W, *et al.* Characterizing IgG4-related disease with ^{18}F-FDG PET/CT: A prospective cohort study. Eur J Nucl Med Mol Imaging 2014;41:1624-34.
3. Carruthers MN, Stone JH, Khosroshahi A. The latest on IgG4-RD: A rapidly emerging disease. Curr Opin Rheumatol 2012;24:60-9.
4. Stone JH, Khosroshahi A, Deshpande V, Chan JK, Heathcote JG, Aalberse R, *et al*. Recommendations for the nomenclature of IgG4-related disease and its individual organ system manifestations. Arthritis Rheum 2012;64:3061-7.
5. Mitamura K, Arai-Okuda H, Yamamoto Y, Norikane T, Takami Y, Fujimoto K, *et al*. Disease activity and response to therapy monitored by [^{18}F] FDG PET/CT using volume-based indices in IgG4-related disease. EJNMMI Res 2020;10:153.
6. Deshpande V, Zen Y, Chan JK, Yi EE, Sato Y, Yoshino T, *et al.* Consensus statement on the pathology of IgG4-related disease. Mod Pathol 2012;25:1181-92.
7. Maire F, Le Baleur Y, Rebours V, Vullierme MP, Couvelard A, Voitot H, *et al*. Outcome of patients with type 1 or 2 autoimmune pancreatitis. Am J Gastroenterol 2011;106:151-6.
8. Xu VY, Bell M, Zahirieh A, Hsiao J, Higgins K, Ghorab Z, *et al.* A challenging diagnosis of IgG4-related disease when understanding limitations of laboratory testing was pivotal. Case Rep Med 2017;2017:8748696.
9. Vaidyanathan S, Patel CN, Scarsbrook AF, Chowdhury FU. FDG PET/CT in infection and inflammation-current and emerging clinical applications. Clin Radiol 2015;70:787-800.
10. Nakatani K, Nakamoto Y, Togashi K. Utility of FDG PET/CT in IgG4-related systemic disease. Clin Radiol 2012;67:297-305.
11. Vauchot F, Bourdon A, Hay B, Mariano-Goulart D, Ben Bouallègue F. Therapeutic response to rituximab in IgG4-related hypophysitis evidenced on 18F-FDG PET and MRI. Clin Nucl Med 2019;44:e362-3.
12. Hall FM, Griscom NT. Gestalt: Radiology's aunt Minnie. AJR Am J Roentgenol 2008;191:1272.