Intense FDG Uptake in Thyroid: A Diagnostic Dilemma Between Subacute Granulomatous Thyroiditis and Aggressive Thyroid Lymphoma

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ABSTRACT

Background: [18]F-fluorodeoxyglucose (FDG) PET-CT is widely used in oncology but also detects inflammatory processes. Subacute granulomatous thyroiditis usually shows mild-to-moderate FDG uptake; however, intense uptake may mimic malignancy and create diagnostic confusion.

Case Report: A 57-year-old woman presented with anterior neck swelling and respiratory distress. Ultrasonography revealed a markedly enlarged, heterogeneous, hypoechoic thyroid with bilateral cervical lymphadenopathy. Contrast-enhanced CT suggested goiter. [18]F-FDG PET-CT demonstrated diffuse thyromegaly extending to the parapharyngeal region with intense FDG uptake (SUVmax 30.7) and multiple FDG-avid cervical lymph nodes, raising suspicion of aggressive malignancy. Initial histopathology showed atypical hyperplasia. Subsequent immunohistochemistry confirmed high-grade B-cell non-Hodgkin's lymphoma (double expressor: c-MYC and BCL2 positive). The patient showed significant clinical improvement after chemotherapy.

Conclusion: Intense FDG uptake in the thyroid can pose a diagnostic dilemma between inflammatory and malignant conditions. Histopathology and immunohistochemistry remain essential for definitive diagnosis.

Keywords: FDG PET-CT, sub-acute granulomatous thyroiditis, thyroid lymphoma, non-Hodgkin lymphoma.

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INTRODUCTION

[18]F-FDG PET-CT is a well-established imaging modality in oncology, offering high sensitivity for detecting metabolically active lesions (1). However, FDG uptake is not specific to malignancy and may also be seen in inflammatory conditions such as subacute granulomatous thyroiditis (2). Subacute thyroiditis typically presents with diffuse or patchy uptake of mild-to-moderate intensity on FDG PET-CT (3, 4). In contrast, primary thyroid lymphoma, a rare malignancy, may demonstrate intense uptake and rapid gland enlargement with compressive symptoms (5, 6). Differentiating these entities is crucial but can be challenging due to overlapping imaging features.

CASE REPORT

A 57-year-old woman presented with progressive anterior neck swelling, dysphagia, and respiratory distress. There was no prior history of thyroid disease. Laboratory evaluation revealed a thyroid profile consistent with thyrotoxicosis, accompanied by elevated inflammatory markers, suggesting an underlying inflammatory or hypermetabolic process.

Ultrasonography demonstrated a diffusely enlarged thyroid gland with heterogeneous hypoechoic parenchyma and bilateral cervical lymphadenopathy, raising suspicion for both inflammatory and infiltrative etiologies.

Subsequent contrast-enhanced computed tomography (CT) showed diffuse thyromegaly without a discrete focal mass lesion, and the findings were initially interpreted as suggestive of simple goiter.For further characterization, [18]F-FDG PET-CT was performed, which revealed a markedly enlarged thyroid gland extending into the parapharyngeal region with intensely increased FDG uptake, demonstrating a maximum standardized uptake value (SUV max) of 30.7 (Figure 1A & B). In addition, multiple hypermetabolic cervical lymph nodes were identified (Figure 2).

The degree and pattern of FDG uptake were highly suggestive of an aggressive malignant process, although inflammatory thyroid conditions such as subacute granulomatous thyroiditis are also known to exhibit increased FDG avidity, though typically of lower intensity (1, 7, 8); it was kept as a differential diagnosis.

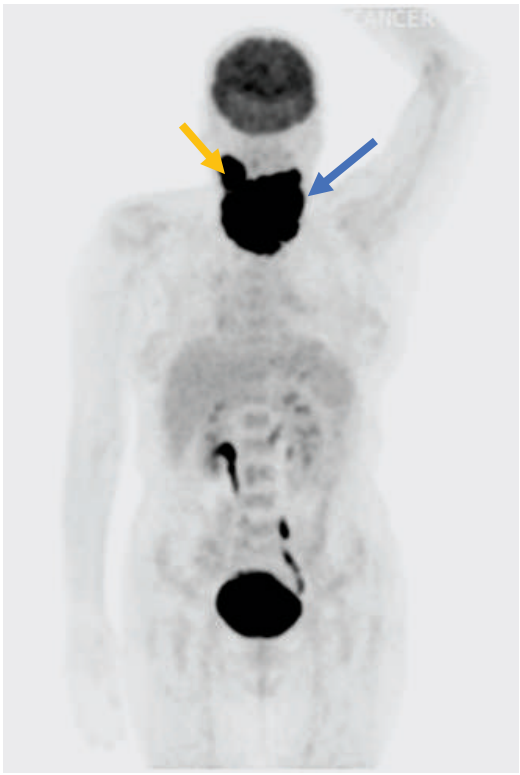

Figure: 1 A

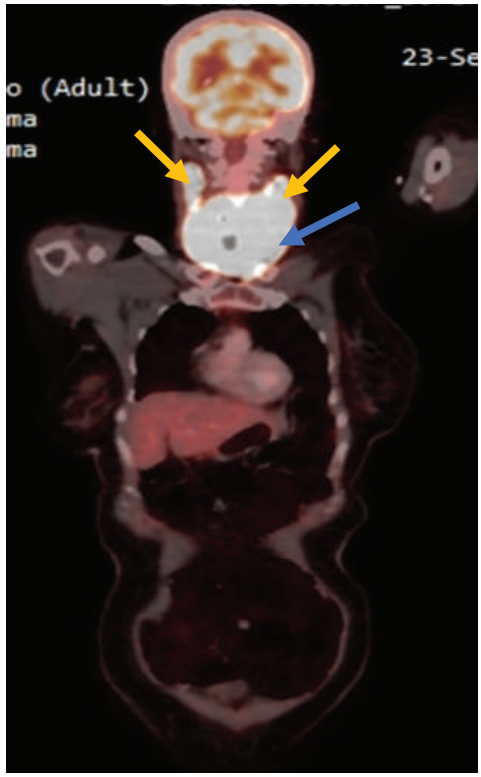

Figure: 1 B

Figure: 1 A. PET MIP Image and B. PET-CT fused image coronal view showing hypermetabolic enlarged thyroid gland (blue arrow) and cervical lymph nodes (yellow arrow)

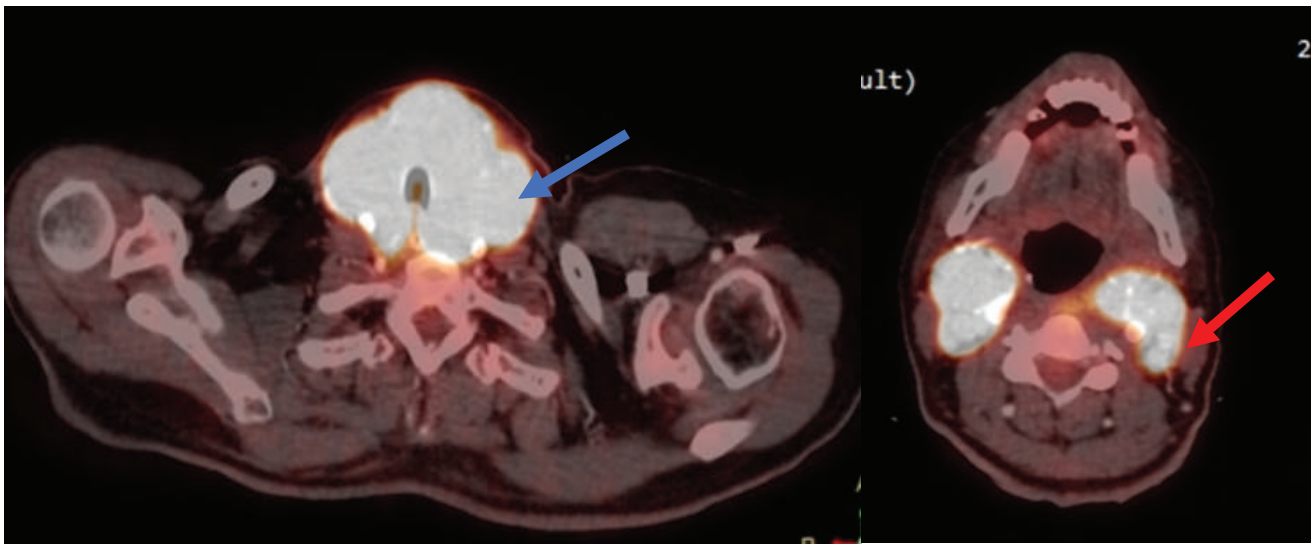

Figure 2: Axial view of fused PET-CT images of the same patient showing hypermetabolic thyroid gland (blue arrow) and cervical lymph nodes (red arrow)

Initial biopsy suggested atypical lymphoid hyperplasia. Due to discordance with imaging findings, repeat evaluation was performed. Histopathology reported diffuse lymphoid infiltration with destruction of thyroid architecture, suggesting sub-acute granulomatous thyroiditis.

The patient was treated accordingly with steroids, but the symptoms persisted. Considering the findings of PET-CT imaging, the immunohistochemistry was done, which demonstrated positivity for CD20, c-MYC, and BCL2, along with a high Ki-67 proliferation index, confirming a diagnosis of high-grade B-cell non-Hodgkin's lymphoma (double expressor subtype), which is known for its aggressive clinical behavior (9).

The patient was treated with standard R-CHOP chemotherapy, which is the established first-line treatment for high-grade B-cell non-Hodgkin's lymphoma (6). Following the first cycle, there was a marked reduction in thyroid swelling, relief of compressive symptoms, and overall clinical improvement.

DISCUSSION

18F-fluorodeoxyglucose positron emission tomography–computed tomography (FDG PET-CT) is a highly sensitive functional imaging modality that detects increased glucose metabolism, a hallmark of many pathological processes. In thyroid disease, FDG uptake is commonly observed in malignant lesions due to the enhanced glycolytic activity of cancer cells, mediated by overexpression of glucose transporters (particularly GLUT-1) and increased hexokinase activity. However, this metabolic characteristic is not exclusive to malignancy (1).

A major limitation of FDG PET-CT lies in its relatively low specificity in distinguishing malignant thyroid lesions from benign inflammatory conditions. Activated inflammatory cells, including macrophages and lymphocytes, also demonstrate increased glucose metabolism, leading to significant FDG accumulation. Consequently, conditions such as thyroiditis (e.g., Hashimoto's thyroiditis or subacute thyroiditis) can exhibit diffuse or focal FDG uptake patterns that may mimic malignancy (2).

This overlap in metabolic activity between neoplastic and inflammatory processes often results in false-positive findings, complicating image interpretation. As highlighted by multiple studies, FDG PET-CT findings must therefore be correlated with clinical evaluation, biochemical markers, ultrasonography, and, when necessary, cytological or histopathological confirmation to improve diagnostic accuracy (1,2).

Multiple studies demonstrated that increased ^{18}F-FDG uptake indicates heightened cellular glucose metabolism, common in both neoplastic and inflammatory processes, thus reducing the diagnostic specificity of FDG PET-CT. Malignant cells show upregulated glycolysis (the "Warburg effect"), while activated inflammatory cells, such as macrophages and lymphocytes, also use more glucose during immune responses. Although certain uptake patterns aid diagnosis, they are not definitive; diffuse FDG uptake is often linked to benign conditions like autoimmune thyroiditis, while focal uptake typically correlates with malignancies. However, exceptions exist, making it essential to combine FDG uptake patterns with clinical findings, thyroid function tests, ultrasonography, and cytopathological assessments for accurate diagnosis (8). However, exceptions occur, as demonstrated in this case where intense diffuse uptake (SUVmax 30.7) was for aggressive lymphoma.

Inflammatory thyroid diseases, particularly subacute granulomatous thyroiditis, can demonstrate significant 18F-FDG uptake due to infiltration by metabolically active inflammatory cells, including macrophages and lymphocytes. Reported cases have described atypical presentations of subacute thyroiditis showing diffuse increased FDG uptake, although the intensity of uptake may vary across patients (3). In some instances, the degree of FDG avidity has been noted to be lower than that observed in more pronounced or active inflammatory states.

Similarly, FDG-avid thyroiditis has been documented in thyrotoxic patients, where imaging findings may initially raise suspicion for malignancy. However, correlation with clinical presentation and laboratory parameters, such as suppressed thyroid-stimulating hormone (TSH) levels and elevated inflammatory markers often supports

an underlying subacute thyroiditis etiology (4). These observations highlight the potential for inflammatory thyroid conditions to mimic malignant processes on FDG PET-CT, emphasizing the importance of multimodal assessment for accurate diagnosis.

In contrast to those studies, the reported case demonstrated markedly intense diffuse uptake (SUVmax 30.7), which is unusual for thyroiditis and more commonly associated with aggressive malignancies, highlighting a key point of diagnostic overlap. Whereas, focal FDG uptake is more frequently linked to malignant lesions, including primary thyroid carcinomas or metastatic disease, due to localized hypermetabolic activity. Nevertheless, this distinction is not absolute, as benign nodules or focal thyroiditis may also demonstrate focal uptake, and, in rare instances, malignancies may present with diffuse uptake patterns.

Primary thyroid lymphoma, although uncommon, remains an important differential diagnosis in cases of marked FDG avidity within the thyroid gland. FDG PET-CT has demonstrated considerable utility in identifying and staging thyroid lymphoma, which typically exhibits intense FDG uptake due to the high proliferative and metabolic activity of malignant lymphoid cells (9). This entity is particularly relevant in the setting of underlying chronic autoimmune thyroiditis, which is a known predisposing factor (5).

Primary thyroid lymphoma often presents with rapidly enlarging thyroid masses, compressive symptoms, and cervical lymphadenopathy—features that may overlap with severe thyroiditis (6). Fine needle aspiration cytology (FNAC) can sometimes be inconclusive in such cases due to overlapping cytological features between lymphoma and chronic inflammatory conditions (7).

Histopathological confirmation therefore remains the gold standard for diagnosis and emphasized the importance of immunohistochemistry in distinguishing thyroid lymphoma from reactive lymphocytic infiltration, particularly in cases with ambiguous morphology (9). Many studies highlighted the clinical value of FDG PET in thyroid disease while underscoring the necessity of tissue diagnosis for definitive differentiation (10).

This case underscores several important considerations. First, although diffuse FDG uptake is typically regarded as benign, markedly intense uptake can rarely occur in inflammatory conditions, mimicking aggressive malignancy. Second, correlation with clinical presentation, biochemical parameters, and disease progression is essential. Finally, when initial cytological or histopathological findings are inconclusive, repeat biopsy and adjunctive immunohistochemical analysis are crucial to avoid misdiagnosis and ensure appropriate management.

CONCLUSION

Intense FDG uptake in the thyroid gland can present a considerable diagnostic dilemma. Distinguishing between severe thyroiditis and an aggressive thyroid lymphoma cannot be achieved based on imaging alone. Definitive diagnosis requires histopathological evaluation, with immunohistochemical analysis playing a crucial supportive role in guiding appropriate management.

REFERENCES

1. Schöder H, Larson SM, Yeung HW. PET/CT in oncology: integration into clinical management. J Nucl Med. 2004;45(Suppl 1):72S–81S.
2. Kwee TC, Basu S, Cheng G, Alavi A. FDG PET/CT in infectious and inflammatory diseases. Clin Radiol. 2010;65(8):626–36.
3. Kraus T, Hacker M, Langsteger W, Li S, Calabretta R. Diagnostic value of 2-[18F]FDG PET/CT in atypical subacute thyroiditis: a case report. Life. 2022;12(8):1217.
4. Yoshida K, Yokoh H, Toriihara A, Fujii H, Harata N, Isogai J, et al. 18F-FDG PET/CT imaging of atypical subacute thyroiditis in thyrotoxicosis: a case report. Medicine (Baltimore). 2017;96(30):e7535.
5. Ota H, Ito Y, Matsuzuka F, Kuma S, Fukata S, Morita S, et al. Usefulness of FDG-PET for diagnosing thyroid lymphoma. Ann Nucl Med. 2007;21(3):157–62.
6. Stein SA, Wartofsky L. Primary thyroid lymphoma: a clinical review. J Clin Endocrinol Metab. 2013;98(8):3131–8.
7. Gupta N, Nijhawan R, Srinivasan R, Rajwanshi A, Dutta P, Bhansali A. Fine needle aspiration cytology in thyroid lymphoma. Diagn Cytopathol. 2005;32(2):123–7.
8. Chen YK, Ding HJ, Chen KT, Chen YL, Liao AC, Shen YY, et al. Prevalence and clinical significance of incidental thyroid uptake on FDG PET. Eur J Nucl Med Mol Imaging. 2005;32(4):403–7
9. Derringer GA, Thompson LD, Frommelt RA, Bijwaard KE, Heffess CS, Abbondanzo SL. Malignant lymphoma of the thyroid gland: a clinicopathologic study. Am J Surg Pathol. 2000;24(5):623–39.
10. Nishiyama Y, Yamamoto Y, Monden T, Sasakawa Y, Ohkawa M. Clinical usefulness of FDG PET in patients with thyroid disease. J Nucl Med. 2003;44(11):1789–96.