Primary Thyroid Diffuse Large B-Cell Lymphoma: Diagnostic and Therapeutic Assessment Using ^{18}F-FDG PET-CT

[1]Pupree Mutsuddy, [2]Tapati Mandal, [2]Papia Akhter, [3]Md. Abu Bakker Siddique, [4]Fatema Tuz Zohra, [5]A. K. M. Fazlul Bari

[1]Principal Medical Officer, [2]Senior Medical Officer, [3]Chief Medical Officer, National Institute of Nuclear Medicine & Allied Sciences (NINMAS)
[4]Senior Medical Officer, Institute of Nuclear Medical Physics (INMP), AERE, [5]Professor & Director, NINMAS

Correspondence Address: Dr. Pupree Mutsuddy, Principal Medical Officer, NINMAS, Block-D, BMU Campus, Shahbag, Dhaka.
E-mail: pupreesomc40@gmail.com

ABSTRACT

Background: Primary thyroid lymphoma is an uncommon malignancy estimated to have an annual incidence of two cases per million population. Diffuse large B-cell lymphoma (DLBCL) is the most frequent histological subtype of primary thyroid lymphoma associated with Hashimoto's thyroiditis and is considered a curable disease when diagnosed and treated early. Precise diagnosis and staging are crucial, and ^{18}F-FDG PET-CT plays a vital role in both initial assessment and post-therapy response evaluation.

Case report: A 50-year-old woman diagnosed with non-Hodgkin lymphoma (NHL) involving the thyroid was referred to the PET-CT division to evaluate the extent of disease. Initially the patient presented with a neck swelling for five months. Neck ultrasound reported a nodular mass of the left lobe of the thyroid gland. Immunohistochemistry confirmed the germinal center type of DLBCL. Baseline PET-CT scan revealed a large lobulated hypermetabolic soft tissue mass involving the left lobe of the thyroid gland with a high SUVmax on ^{18}F-FDG PET-CT. The mass demonstrated extensive local invasion, including retrosternal extension with involvement of the epiglottis, vocal cords, and proximal trachea and erosion of the thyroid & cricoid cartilage. The right lobe of the thyroid gland was mildly enlarged with diffuse FDG uptake. After four cycles of systemic therapy, a follow-up PET-CT scan showed complete morpho-metabolic regression of the thyroid mass, indicating an excellent therapeutic response. Residual diffuse FDG uptake in the right lobe of the thyroid existed and was most likely a sequel of thyroiditis.

Conclusion: Reported case reflects the utility of ^{18}F-FDG PET-CT in initial staging and post therapy response assessment of thyroid lymphoma. PET-CT played a pivotal role in detecting the extent of the disease and guiding therapeutic response.

Keywords: Primary thyroid lymphoma, ^{18}F-FDG PET-CT scan, Response evaluation.

Bangladesh J. Nucl. Med. Vol. 29 No. 1 January 2026

DOI: https://doi.org/10.3329/bjnm.v29i1.89292

INTRODUCTION

Primary thyroid lymphoma is a rare extranodal malignancy arising from lymphoid tissue within the thyroid gland, accounting for less than 5% of all thyroid malignancies and approximately 2% of extranodal lymphomas (1). The estimated annual incidence is around two cases per million population. (2). It predominantly affects middle-aged to elderly women, with a strong epidemiological association with chronic autoimmune thyroiditis, particularly Hashimoto's thyroiditis (3). Long-standing lymphocytic infiltration is believed to predispose to lymphomatous transformation, with patients having Hashimoto's thyroiditis carrying a markedly increased risk compared to the general population (4).

Histologically, primary thyroid lymphoma is most commonly of B-cell origin, with diffuse large B-cell lymphoma (DLBCL) representing the most frequent and aggressive subtype, followed by mucosa-associated lymphoid tissue (MALT) lymphoma (1, 4). While DLBCL tends to present with rapid enlargement and compressive symptoms, MALT lymphoma usually follows a more indolent course (5). Clinically, patients often present with a rapidly enlarging neck mass, which may be associated with dysphagia, dyspnea, hoarseness of voice, or stridor due to compression or invasion of adjacent structures (2). These features may closely mimic anaplastic thyroid carcinoma, making accurate diagnosis crucial because the prognosis and management differ significantly (2).

Imaging plays a pivotal role in evaluation. Ultrasonography is typically the first-line modality and may demonstrate a hypoechoic, heterogeneous mass with increased vascularity, although findings are often nonspecific (6). Cross-sectional imaging with CT or MRI helps assess local extension and airway compromise (7). Recently, F-18 fluorodeoxyglucose positron emission tomography-computed tomography (FDG PET-CT) has become increasingly important due to its ability to provide combined anatomical and metabolic information (5, 7). FDG PET-CT is highly sensitive in detecting metabolically active lymphoma, allows accurate staging by identifying nodal and extranodal involvement, and is invaluable in response assessment following therapy (5, 8). Early diagnosis is essential, as primary thyroid lymphoma is one of the few aggressive thyroid malignancies that is potentially curable with appropriate chemoimmunotherapy (2, 9).

CASE REPORT

A 50-year-old woman presented with a progressively enlarging, painless swelling on the left side of the neck for a duration of five months. Over time, she developed mild dysphagia without significant respiratory distress. High resolution neck ultrasound revealed a large hypoechoic nodular lesion (measuring about 8.5 x 4.2 cm) in the left lobe of the thyroid gland with retrosternal extension and the nodule showed high vascularity without any calcification. The patient was euthyroid with TSH level of 4.10 µIU/ml, FT4 level of 1.9 ng/dL and normal Thyroglobulin (Tg) level (25 ng/ml). Subsequent ^{99m}Tc thyroid scintigraphy demonstrated a non-functioning (cold) nodule in left lobe, which corresponds with the left neck swelling and sonographically detected nodule. High grade non-Hodgkin lymphoma was reported by FNAC and biopsy revealed Diffuse large B cell non-Hodgkin lymphoma, germinal center type. Subsequent immunohistochemistry confirmed the diagnosis of diffuse large B-cell lymphoma of germinal center subtype

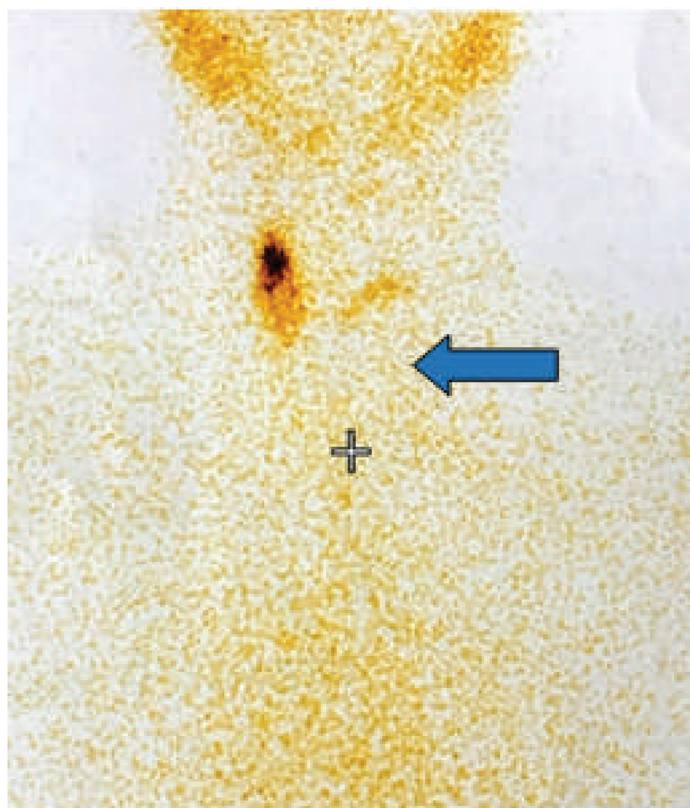

Figure 1: Thyroid scintigraphy showing a photopenic (cold) nodular area (blue arrow) in the left lobe region of the thyroid gland with relatively preserved tracer uptake in the right lobe

Patient was referred to PET-CT division for baseline stating to see the extent of disease and to evaluate other nodal or extranodal sites of involvements. Baseline ^{18}F-FDG PET-CT demonstrated a large lobulated hypermetabolic soft tissue mass involving the left lobe of the thyroid gland with markedly increased FDG uptake with SUVmax of 33.1. The lesion showed extensive local invasion, including retrosternal extension and involvement of adjacent structures such as the epiglottis, vocal cords, proximal trachea, and erosion of the thyroid and cricoid cartilage. The right lobe of the thyroid appeared mildly enlarged with diffuse low-grade FDG uptake, suggestive of underlying thyroiditis rather than malignant involvement. No distant metastasis was identified at the time of staging.

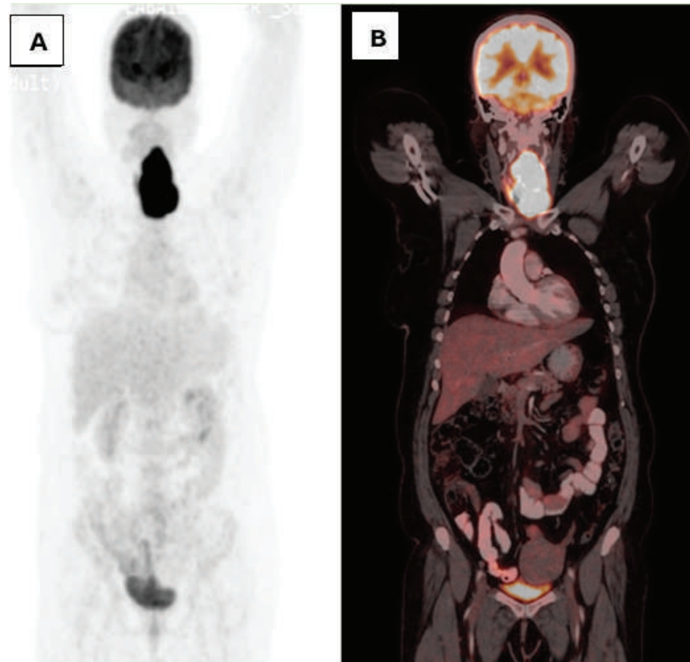

Figure 2: Baseline Maximum Intensity Projection (MIP) image (A) and fused ^{18}F-FDG PET-CT coronal view (B) showed a large lobulated hypermetabolic soft tissue mass involving the left lobe of the thyroid gland

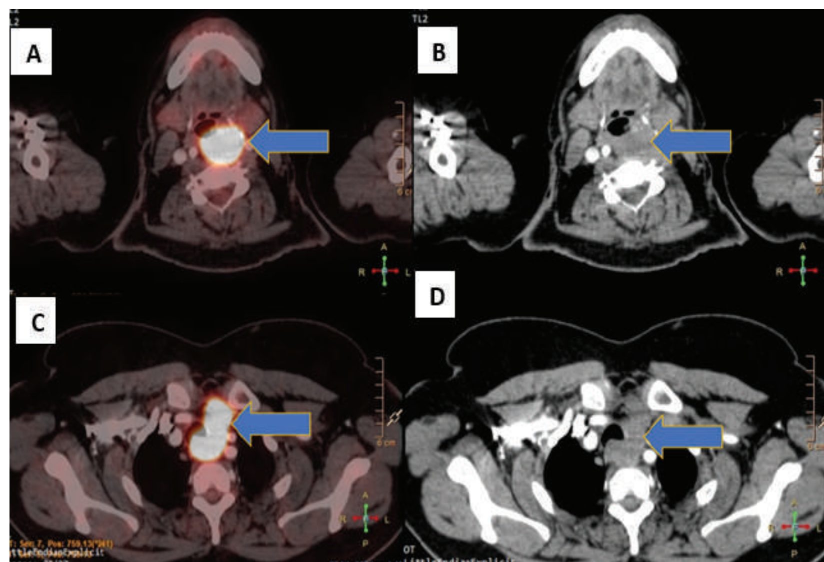

Figure 3: Baseline ^{18}F-FDG PET-CT fused axial images showing a large lobulated hypermetabolic soft tissue mass involving the left lobe of the thyroid gland (A, B) with SUVmax 33.1 (blue arrow). The lesion demonstrated extensive local invasion with retrosternal extension and involvement proximal trachea (C, D).

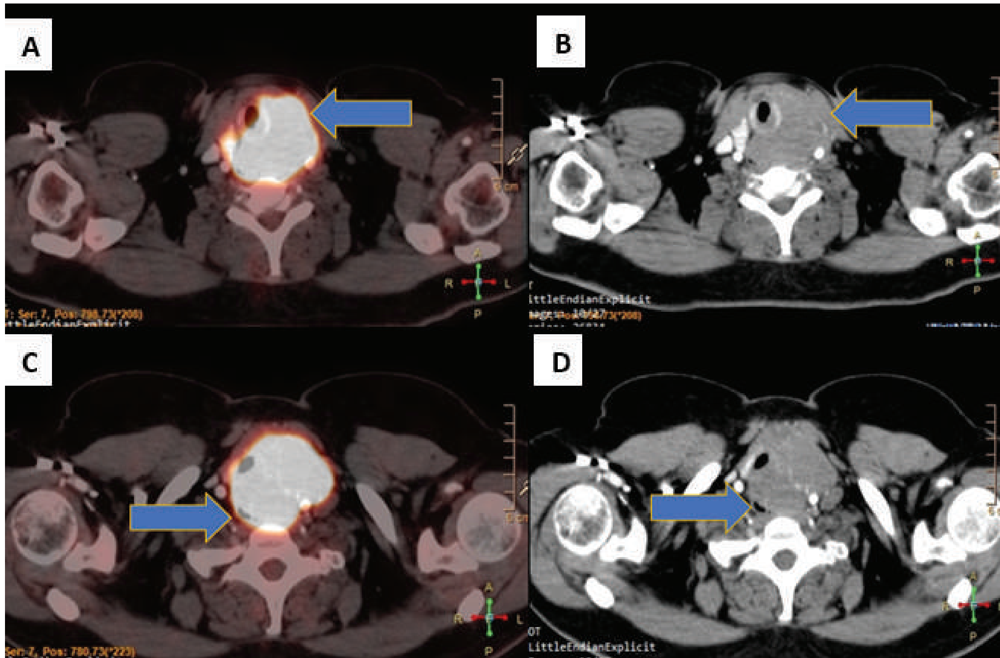

Figure 4: Baseline ^{18}F-FDG PET-CT fused axial images showing a large lobulated hypermetabolic soft tissue mass involving the left lobe of the thyroid gland with extensive local invasion and involvement of the epiglottis, vocal cords (A, B), proximal trachea, and erosion of the thyroid and cricoid cartilage (C, D).

The patient was treated with systemic chemotherapy using the R-CHOP regimen. Following four cycles of therapy, interim ^{18}F-FDG PET-CT was performed for response evaluation. The scan revealed complete resolution of the previously noted hypermetabolic mass with no residual abnormal FDG uptake, consistent with complete metabolic and morphological response. Mild diffuse uptake persisted in the right thyroid lobe, likely reflecting inflammatory changes rather than residual disease.

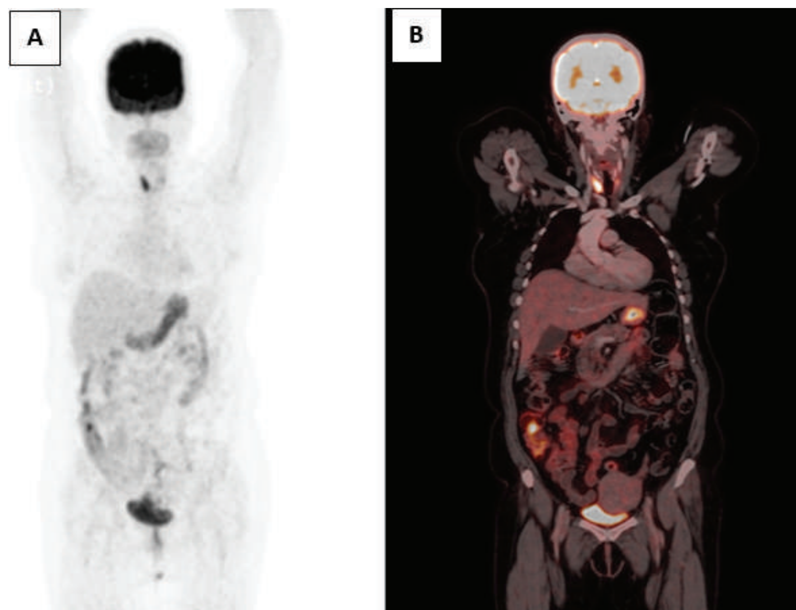

Figure 5: Post-therapy 18F-FDG fused PET-CT Maximum Intensity Projection (MIP) image (A) and fused 18F-FDG PET-CT coronal view (B) demonstrating complete morpho-metabolic regression of the previously noted thyroid mass, consistent with excellent therapeutic response. Residual diffuse FDG uptake in the right thyroid lobe is likely attributable to thyroiditis.

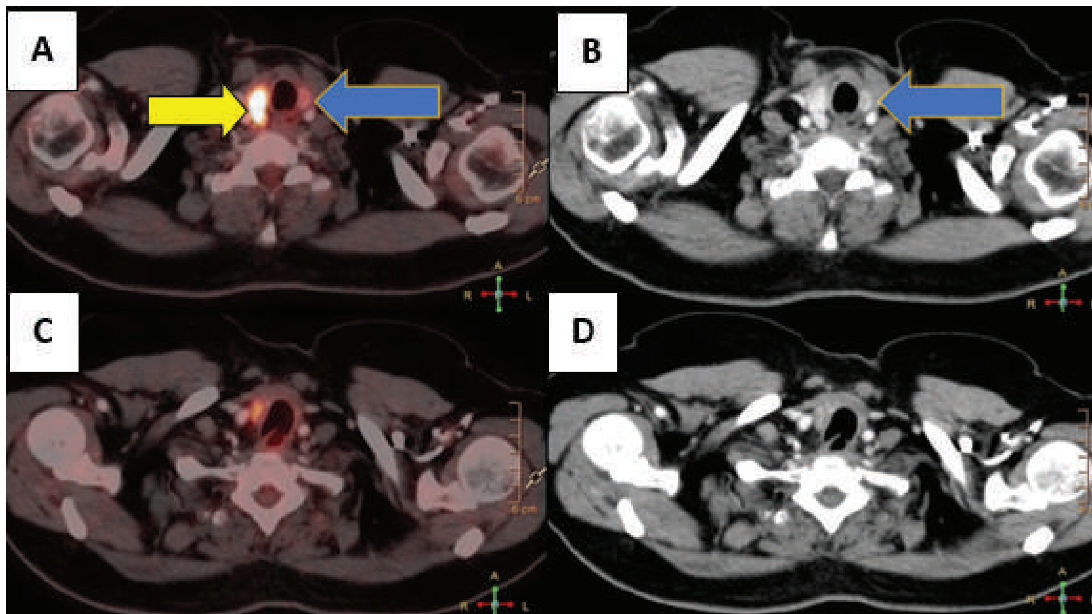

Figure 6: Post-therapy ^{18}F-FDG PET-CT fused axial images demonstrating complete morpho-metabolic regression of the previously noted thyroid mass (A, B, C, D), consistent with excellent therapeutic response. Residual diffuse FDG uptake (A, yellow arrow) in the right thyroid lobe is likely attributable to thyroiditis.

DISCUSSION

Primary thyroid lymphoma is an uncommon but clinically important entity due to its favorable prognosis when recognized early (1,2). The pathogenesis is closely linked to chronic autoimmune stimulation, particularly Hashimoto's thyroiditis, which leads to the accumulation of lymphoid tissue within the thyroid gland (3). Over time, this acquired lymphoid tissue may undergo malignant transformation (3). Among the subtypes, DLBCL is characterized by aggressive clinical behavior but also demonstrates a high degree of chemosensitivity, making early diagnosis crucial for optimal outcomes (4,9).

The clinical presentation of primary thyroid lymphoma often overlaps with other aggressive thyroid malignancies, especially anaplastic carcinoma (2). This case reflects aggressive nature of the tumor with local invasion mimicking thyroid cancer without any nodal or other extranodal involvements. However, unlike anaplastic carcinoma, which carries a dismal prognosis, primary thyroid lymphoma responds well to chemotherapy and radiotherapy (2,9). Therefore, distinguishing between these entities is essential and relies on a combination of imaging, cytology, and histopathology with immunohistochemistry (1,4).

FDG PET-CT has emerged as a cornerstone in the management of lymphoma (7,8). Its high sensitivity for detecting metabolically active disease allows for accurate staging, including identification of nodal and extranodal involvement that may not be apparent on conventional imaging (5,7). In primary thyroid lymphoma, PET-CT is particularly valuable in assessing the full extent of local invasion, as demonstrated in this case with involvement of adjacent aerodigestive structures and cartilage erosion.

In addition to staging, FDG PET-CT plays a crucial role in treatment response assessment (6,7). The use of standardized criteria, such as the Deauville five-point scoring system, enables objective evaluation of metabolic response (6). Complete metabolic response on interim or post-treatment PET-CT is strongly associated with improved progression-free and overall survival (6,7). In the present case, the absence of residual FDG uptake following chemotherapy indicated an excellent therapeutic response, supporting the effectiveness of the chosen regimen.

Another important consideration is the differentiation between residual disease and inflammatory changes (5). Mild diffuse FDG uptake in the contralateral thyroid lobe, as seen in this patient, is often attributable to

thyroiditis rather than malignancy (5,8). Recognizing such patterns is essential to avoid misinterpretation and unnecessary intervention.

Overall, this case underscores the importance of a multimodality approach in the diagnosis and management of primary thyroid lymphoma, with FDG PET-CT playing a central role in both initial evaluation and follow-up (10).

CONCLUSION

This case highlighted the significant value of FDG PET-CT in both the initial staging and post-therapy assessment of primary thyroid lymphoma. Early diagnosis combined with appropriate systemic therapy can lead to excellent clinical outcomes even in cases with locally advanced disease. The integration of metabolic imaging into routine clinical practice enhances diagnostic accuracy, guides therapeutic decisions, and improves prognostic assessment.

REFERENCE

1. Derringer GA, Thompson LD. Primary thyroid lymphoma. Ann Diagn Pathol. 2000; 4(1):24–36. DOI: 10.1016/S1092-9134(00)90004-3
2. Graff-Baker AN, et al. Prognosis of primary thyroid lymphoma. Ann Surg Oncol. 2009; 16:343–349. DOI: 10.1245/s10434-008-0217-3
3. Pedersen RK, Pedersen NT. Primary thyroid lymphoma. Histopathology. 1996; 28:25–32. DOI: 10.1046/j.1365-2559. 1996.d01-358.x
4. Ansell SM, Grant CS. Primary thyroid lymphoma. Semin Oncol. 1999; 26:316–323. DOI: 10.1016/S0093-7754(99)80085-8
5. Ota H, et al. FDG PET in thyroid lymphoma. J Nucl Med. 2001; 42:198–201. DOI: 10.2967/jnumed.42.2.198
6. Cheson BD, et al. Revised response criteria for lymphoma. J Clin Oncol. 2007; 25:579–586. DOI: 10.1200/JCO.2006.09.2403
7. Barrington SF, et al. Role of imaging in lymphoma. Blood. 2014; 123:3048–3058. DOI: 10.1182/blood-2013-09-524843
8. Jadvar H. FDG PET in oncology. J Nucl Med. 2016; 57:1449–1456. DOI: 10.2967/jnumed.115.170142
9. Wirth LJ, et al. Thyroid lymphoma management. Thyroid. 2012; 22:123–131. DOI: 10.1089/thy.2011.0254
10. Ngeow J, et al. Primary thyroid lymphoma review. Clin Endocrinol. 2009; 70:521–525. DOI: 10.1111/j.1365-2265.2008. 03370.x