Case Report

A Case Report on Thyroid Metastasis from Primary Breast Cancer: An Unusual Secondary Site Demonstrated by FDG PET/CT scan

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ABSTRACT

Metastasis to the thyroid gland from non-thyroid sites is an uncommon clinical presentation despite its rich blood supply. On the other hand, breast cancer frequently metastasizes to the bones, lungs, brain and liver, rather than thyroid gland which represents a rare target site for secondary disease. Metastasis to thyroid is clinically rare, with an incidence of 0.36% in all thyroid malignant tumors. We report the case of a 62-year-old woman with HER2-positive breast cancer, in whom lung and liver metastases were detected at initial diagnosis. Nearly four years later, follow-up imaging revealed a thyroid nodule, and ultrasound-guided core biopsy confirmed metastatic carcinoma consistent with the breast primary. With this breast cancer case with thyroid metastasis, we suggest that physicians involved in the follow-up care of breast cancer patients should consider a differential diagnosis of secondary thyroid malignancy when incidental lesions are diagnosed during radiological evaluations or local symptoms affect the cervical region, even many years after the diagnosis of primary cancer.

Key Words: *Breast cancer, Thyroid metastasis, Core biopsy.*

INTRODUCTION

Breast cancer is the highest occurring type of cancer among women in the world, affecting 1 in 8 females[1]. It is the second highest cause of cancer-related mortality in women worldwide[2]. Till 2015, breast cancer has been the number one cancer among Bangladeshi women[1]. In Bangladesh, 22.5 out of 100000 women are affected by breast cancer1. The highest affected are in the age range of 15-44 years[1]. Bones and visceral organs, such as the lungs, liver and brain are the frequent sites of metastasis in breast cancer [3]. Although the thyroid gland has a rich blood supply, which is second only to the adrenal gland metastasis to the thyroid is rare[4], and the reason for this is not clear. It is usually derived from primary malignancy of the kidney, gastrointestinal system, lung, skin and rarely from breast[5]. In this case report, we present a rare case of a patient with breast cancer metastasis to the thyroid gland almost 4 years after the primary cancer diagnosis.

CASE SUMMARY

A 62 years old female patient with diabetes mellitus and hypothyroidism was diagnosed with breast cancer in November/2019. Tru-cut biopsy from right breast mass revealed invasive ductal carcinoma, grade II and estrogen receptor (ER) negative, progesterone receptor (PR) negative, and human epidermal growth factor receptor 2 (HER2) positive. Contrast-enhanced CT chest showed multiple bilateral lung nodules, and CT abdomen showed multiple liver lesions, suggesting metastases. Fine-needle aspiration cytology (FNAC) of a liver lesion confirmed metastatic ductal carcinoma. Bone scan was negative for skeletal metastasis. Based on these findings, the patient was finally diagnosed as carcinoma of the right breast, stage IV, with lungs & liver metastases.

The patient underwent serial positron emission tomography–computed tomography (PET/CT) scans for disease monitoring. Scan was performed from the vertex to mid-thigh using a GE Discovery-IQ 5 ring PET/CT scanner with 5 bed positions, and each position lasted 2 min in a two-dimensional mode. Contrast CT scans of the brain, head & neck, chest, abdomen & pelvis were acquired. Breath-hold CT thorax was also acquired. The CT was performed with an x-ray tube voltage peak of 120 kv, 350 mA, a slice thickness of 2.5 mm, and a rotation speed of 7.5 seconds per rotation. PET images were reconstructed with CT-derived attenuation correction using the Ordered-Subset Expectation Maximization (OSEM) software. Semiquantitative analysis of FDG uptake was performed by calculating SUV (standardized uptake value) values corrected for administered dose & patient's body weight. The PET-CT images were reviewed using the automatic PET-CT fusion software on the workstation. A volumetric region-of-interest (ROI) around the outline of the abnormal uptake was placed on the axial PET images using the semi-automatic software. Then, SUVmax (maximum standardized uptake value) was automatically calculated by the PET-CT fusion software, and the value was recorded from the workstation.

Until February 2023, PET/CT studies showed a good treatment response. However, in September 2023, PET/CT revealed an FDG-avid hypodense nodule in the right thyroid lobe with an SUVmax of 5.9 (Figure 1). Then a USG-guided core biopsy of the thyroid nodule was done and revealed metastatic carcinoma with ER & PR negative, and HER2 positive. When evaluated comparatively with the primary breast cancer pathology, immunohistochemical findings were interpreted as consistent with breast cancer metastasis.

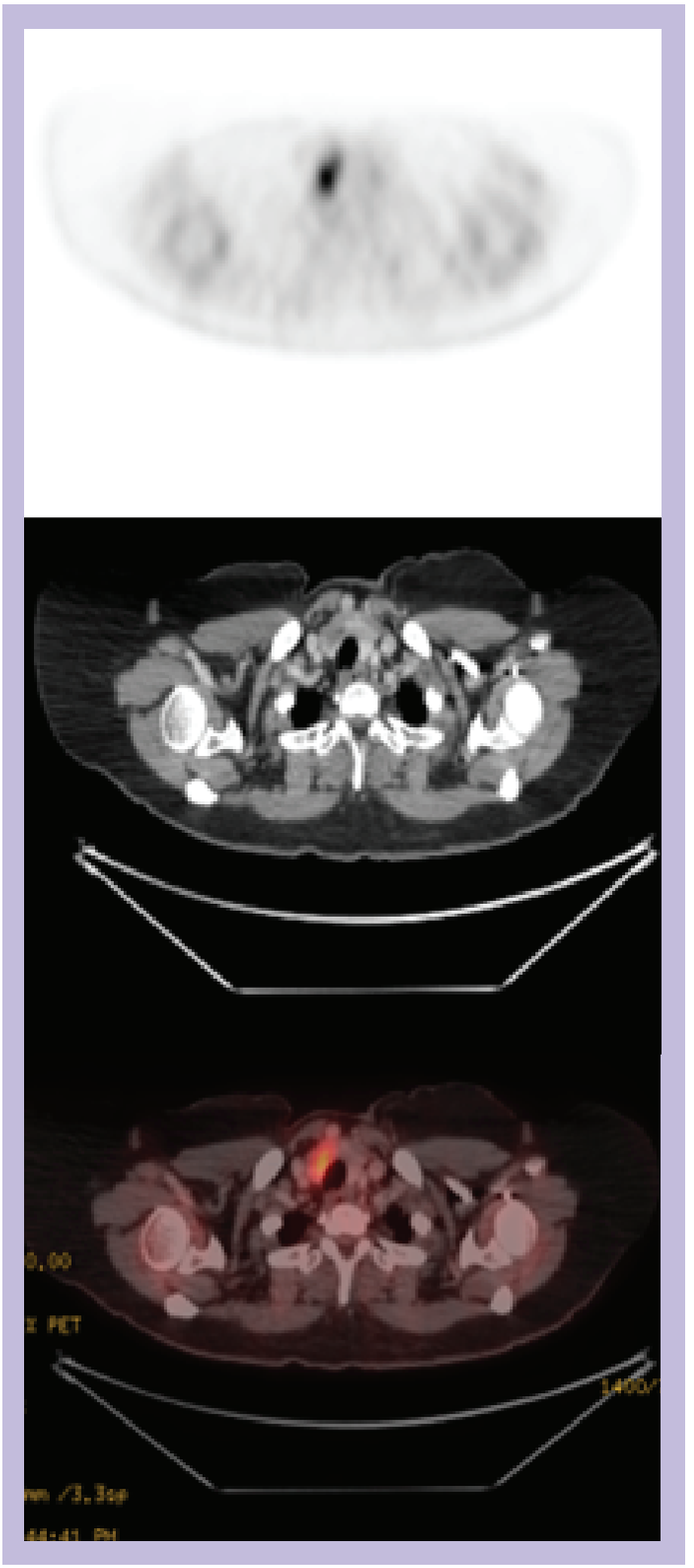

Figure 1: axial slices PET, CT and fused PET/CT images (top to bottom) showing the focal FDG avid hypodense nodule in right thyroid lobe (SUVmax – 5.9).

DISCUSSION

Metastasis to the thyroid gland from extrathyroidal origin is rare despite the organs rich vasculature nature. Willis[6] put two hypotheses in 1931 about the infrequent occurrence of metastasis to thyroid. First, the rapid blood flow hampers cancer cells

from adhering to the gland's tissue and subsequently prevents them from forming new tumours (metastases) within the gland. Second, the high arterial oxygen content and high iodine concentration within the thyroid may suppress tumor cell proliferation; however, this relationship remains complex and not fully understood[5-10]. More recent research also suggests that the rich blood supply itself can inhibit the deposition of tumor thrombus[5]. If the thyroid develops lesions, a reduced or disrupted blood supply can create favorable conditions for tumor cell deposition[11].

Contemporary studies reveal that thyroid metastasis accounts for 1.5–3% (approximately 2%) of all malignancies, with their autopsy-confirmed incidence rate ranging from 1.25 to 24.2%. These lesions may result from hematogenous spread from distant primaries or direct invasion from adjacent neoplasms[7]. This discrepancy between clinical and autopsy findings suggests that metastatic involvement of the thyroid is likely underdiagnosed in clinical practice.

The most common primary tumors metastasizing to the thyroid are renal cell carcinoma, lung cancer, and colorectal cancer, although breast cancer has also been reported as a source[5]. It has been suggested that, possibly due to some common risk factors, such as genetic, lifestyle, diet habits, hormonal, menstrual, and reproductive factors, individuals with breast cancer are more likely to develop primary thyroid cancer[12]. Therefore, an individual presenting with both thyroid and breast malignancy is more likely to have primary cancer of thyroid and breast, rather than breast metastases to the thyroid. The follow-up and treatment approaches to thyroid metastasis and primary thyroid cancer differ from each other; therefore, proper diagnosis is critically important in prognosis. Most cases of breast cancer with metastasis in the thyroid gland are diffuse metastatic disease[13]. After primary breast cancer surgery, thyroid metastasis may occur as late as 12 years[11,14]. In our case, the patient with primary breast cancer was found to have thyroid lesion on PET/CT scan after almost 4 years of initial diagnosis, and eventually it was confirmed as metastatic carcinoma. While FNAC or core biopsy is usually used in the differential diagnosis of thyroid nodules, it may not always be easy to distinguish primary thyroid tumours from metastatic lesions[15]. Immunohistopathological analysis should be performed to confirm the diagnosis of metastatic breast cancer[16].

CONCLUSION

Metastasis to thyroid is often an incidental finding of investigations undertaken during the follow-up care of cancer patients. The case presented herein is a rare instance of thyroid metastasis, originating from breast cancer, occurring nearly four years after the initial diagnosis. It is critically important to distinguish metastatic lesions from primary thyroid cancer as treatment strategies and prognoses differ significantly between the two. Awareness of the possibility of thyroid metastasis is crucial, especially if the thyroid or neck are the only sites of metastatic disease, as such lesions may be misinterpreted on imaging as primary thyroid cancers.

REFERENCES

1. Shamsi T. Burden of breast cancer in Bangladesh – current and future and financing treatment with link to willingness to pay. Int J Community Med Public Health. 2021;8(11):5525-8.
2. Siegel RL, Miller KD, Jemal A. Cancer statistics, 2020. CA Cancer J Clin. 2020;70:7-30.
3. Yousefi M, Nosrati R, Salmaninejad A, Dehghani S, Shaharyari A, Saberi A. Organ-specific metastasis of breast cancer: molecular and cellular mechanisms underlying lung metastasis. Cell Oncol. 2018;41:123-40.
4. Chen H, Nicol TL, Udelsman R. Clinically significant, isolated metastatic disease to the thyroid gland. World J Surg. 1999;23:177-80.
5. Tang Q, Wang Z. Metastases to the thyroid gland: what can we do? Cancers (Basel). 2022;14:3017. doi:10.3390/-cancers14123017.
6. Willis RA. Metastatic tumours in the thyroid gland. Am J Pathol. 1931;7:187-208.
7. Konturek A, Barczynski M. Management of metastases to the thyroid gland. Ann Thyroid. 2020;5:19. doi:10.21037/aot-20-46.
8. Nixon IJ, Coca-Pelaz A, Kaleva AI, Triantafyllou A, Angelos P, Owen RP, et al. Metastasis to the thyroid gland: a critical review. Ann Surg Oncol. 2017;24:1533-9.
9. Guan S, Ye Q, Li P, Ding L. Thyroid metastasis from hepatocellular carcinoma: a rare case report and literature review. Front Oncol. 2025;15:1581927. doi:10.3389/-

fonc.2025.1581927.
10. Lv C, Gao Y, Yao J, Li Y, Lou Q, Zhang M, et al. High iodine induces the proliferation of papillary and anaplastic thyroid cancer cells via AKT/Wee1/CDK1 axis. Front Oncol. 2021;11:622085. doi:10.3389/fonc.2021.622085.
11. Zhou L, Chen L, Xu D, Shao Q, Guo Z, Ge M. Breast cancer metastasis to thyroid: a retrospective analysis. Afr Health Sci. 2017;17(4):1035-43.
12. Fei X, Christakos G, Lou Z, Ren Y, Liu Q, Wu J. Spatio-temporal co-existence of female thyroid and breast cancers in Hangzhou, China. Sci Rep. 2016;6:23432. doi:10.1038/srep23432.
13. Pensabene M, Stanzione B, Cerillo I, Ciancia G, Cozzolino I, Ruocco R, et al. It is no longer the time to disregard thyroid metastases from breast cancer: a case report and review of the literature. BMC Cancer. 2018;18:146. doi:10.1186/s12885-018-4054-x.
14. Plonczak AM, DiMarco AN, Dina R, Gujral DM, Palazzo FF. Breast cancer metastases to the thyroid gland – an uncommon sentinel for diffuse metastatic disease: a case report and review of the literature. J Med Case Rep. 2017;11:269. doi:10.1186/s13256-017-1441-x.
15. Magers MJ, Dueber JC, Lew M, Pang JC, Davenport RD. Metastatic ductal carcinoma of the breast to the thyroid gland diagnosed with fine needle aspiration: a case report with emphasis on morphologic and immunophenotypic features. Diagn Cytopathol. 2016;44:530-4.
16. Celik E, Ozturk T, Samanci NS, Demirci NS, Akovali B, Demirelli FH. Breast cancer to thyroid gland: an unconventional metastatic site. J Cancer Res Ther. 2022;18:788-91.