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Case Report
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Synchronous Dual Metastatic Breast and Thyroid Carcinoma: One Train Can Hide Another

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Abstract

Primary breast and associated synchronous or metachronous thyroid cancer is even rare. Only a few cases have been published in the French and English literature and even fewer cases have been reported in female patients more than 60 years old. Recent studies showed that the incidence of thyroid cancer as a second malignancy following breast cancer has dramatically increased during the past 15 years.

In this study, we report a case of 56 year-old lady, known to have metastatic breast ductal carcinoma, with synchronous poorly differentiated thyroid carcinoma and the appropriate literature is thoroughly reviewed.

Introduction

Although differentiated thyroid and breast cancer are common malignancies among females [1], synchronous (diagnosed at the same time) or metachronous (more than 6 months after the index cancer) neoplasms of the thyroid and breast are even rare [2,3]. The first report on this dual malignancy was written by Billroth in 1889 [4]. A review of the literature and of the guidelines [5,6], revealed that these two malignancies can be synchronous but should not be metachronous.

Herein, we report a case of 56 year-old lady, known to have metastatic breast ductal carcinoma, with synchronous poorly differentiated thyroid carcinoma, with up to date systematical review of the literature.

Case Presentation

A 56-year-old lady female with a history of left breast carcinoma, presented after four cycles of chemotherapy with back pain. The patient was unable to walk. The CT of the brain was performed revealed intraosseous hypervascular destructive lesion left frontal bone with intracranial and intraorbital extension (Figure 1). The visualized part of the thyroid gland and lower neck demonstrates an incidental hypodense lesion at the level of the right thyroid lobe for further evaluation by thyroid ultrasound (Figure 1). The MRI of the brain showed destructive vascular extra cranial left frontal mass with intracranial and intra-orbital component invading the underlying frontal cortical sulci, the dura, the left lacrimal gland and possibly the left superior rectus muscle compressing the left optic nerve and the eye globe (Figure 2). The imaging findings may represent secondary neoplastic deposit related to the primary disease or a second aggressive neoplastic process. There was resection of the large left frontotemporal and orbital tumor. The histological analysis showed deposit from thyroid cancer. So a Fine Needle Aspiration Biopsy of know right thyroid nodule was done, revealing follicular thyroid carcinoma. 18F-Fluorodeoxyglucose (18F-FDG) Emission Tomography/Computed Tomography (PET/CT) was also performed, showing hypermetabolic thyroid mass consistent associated with hypermetabolic residual brain metastasis, metastatic neck lymph nodes most on the right and T4 lesion, as well as bilateral lung metastases (Figure 3). The patient underwent total thyroidectomy and cervical node resection. The predominant lesion is an encapsulated poorly differentiated carcinoma of thyroid (95% of the lesion) present in both lobes almost replacing the entire thyroid gland. This lesion shows extensive capsular and vascular invasion and depicts nested pattern with round nuclei, occasional nucleoli and patchy necrosis. Mitoses are seen but not brisk. Focally nuclear grooves and clearing is noted but this is not a predominant feature in most of the tumor cells. There are 2/45 lymph nodes positive with the poorly differentiated component.

Radioactive Iodine (RAI) ablation therapy with 3700 Mbq of Iodine 131 was performed, as well as palliative radiotherapy for the skull and the spine. The Initial whole body scintigraphy

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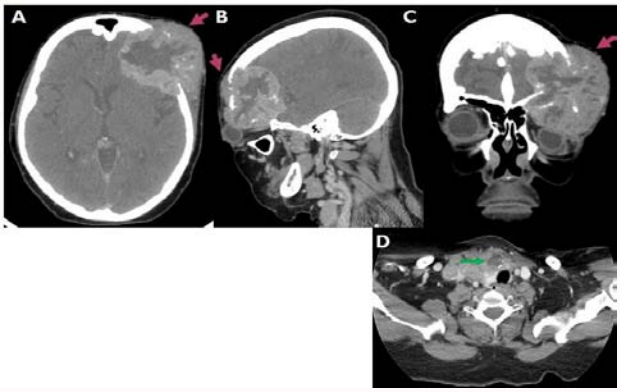

Figure 1: The A) Axial B) Sagittal and C) Coronal images of the CT of the brain revealed intraosseous destructive lesion within the left frontal bone with intracranial and intraorbital extension. D) The visualized part of the thyroid gland and lower neck demonstrates an incidental hypodense lesion at the level of the right thyroid lobe.

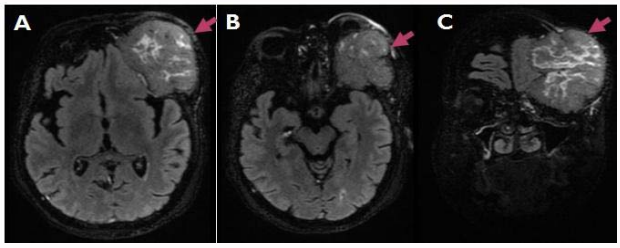

Figure 2: The MRI of the brain: A and B) Axial Flair C) Coronal Flair images showed destructive vascular extra cranial left frontal mass with intracranial and intra-orbital component invading the underlying frontal cortical sulci, the dura, the left lacrimal gland and possibly the left superior rectus muscle compressing the left optic nerve and the eye globe.

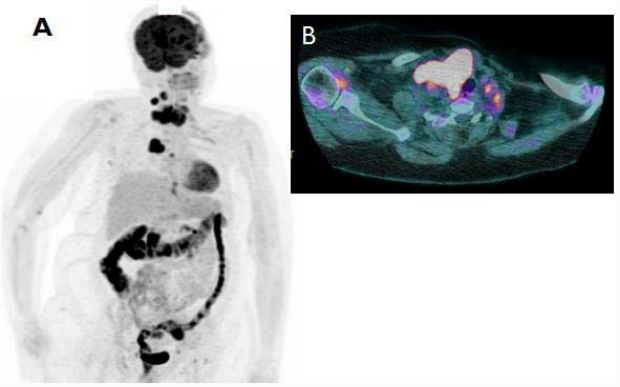

Figure 3: 18F-Fluorodeoxyglucose (18F-FDG) Emission Tomography/ Computed Tomography (PET/CT): A) Maximum intensity projection showing hyper-metabolic residual brain metastasis, metastatic neck lymph nodes most on the right and bones metastases, bilateral lung metastases as well as thyroid uptake. B) The axial fused images hypermetabolic thyroid mass consistent, SUV max 15.

showed multiple foci of increased uptake involving the thyroid bed, the residual tumor within the skull and the orbit, the spine (T4), the left iliac bone and the bilateral lung, (Figure 4). There was also large suspect increased uptake within the right kidney and smaller faint uptake within the right adrenal gland, suspicious for metastases (Figure 4). A second RAI ablation six months after showed persistent stable metastatic disease.

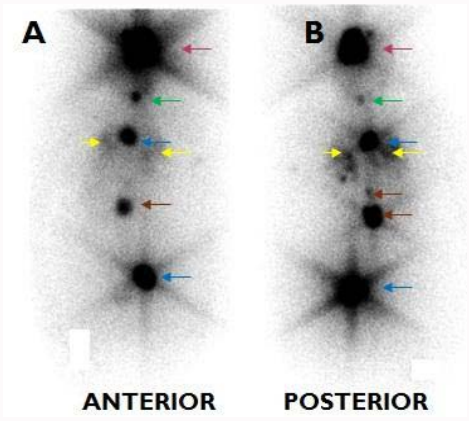

Figure 4: The post therapy whole body scintigraphy showed multiple foci of increased uptake involving the thyroid bed (green arrow), the residual tumor within the skull and the orbit (red arrow), the bone: spine (T4) and left iliac bone (blue arrow), the bilateral lung (yellow arrow), as well as suspicious uptake within the right kidney and the right adrenal (brown arrow).

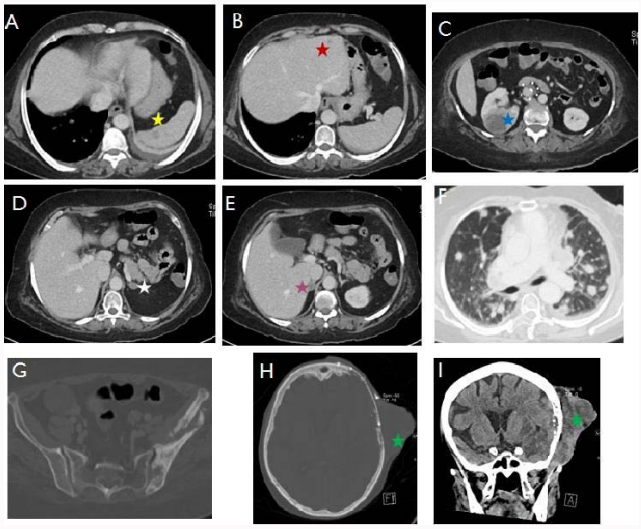

Figure 5: The follow-up CT of the brain, chest abdomen and pelvis: A, B, C, D and E) Axial images of the abdomen showed new focal hypodense splenic lesion measuring 0.9 cm × 1 cm (yellow star), new small focal small hypodense lesions at segment II measuring 0.7 cm (red star), the right kidney interpolar cortex mass measuring 3.5 cm × 3.1 cm (blue star), bilateral hypodense adrenal lesions, within the left adrenal measures about 1.3 cm × 1.1 cm (while star), the largest on the right side measures 1.5 cm × 1.3 cm (purple star). F) The axial images of the lung showed significant interval worsening of bilateral lung metastasis with hilar lymphadenopathy and minimal bilateral pleural effusions, left more than right.
G) The axial images of the pelvis, bone window, showed interval progression complicated with fracture in the left iliac lytic lesion. H and I) the axial and the coronal images of the CT of brain showed interval significant progression of the previously seen left temporal extracranial lobulated soft tissue.

Six months later, the patient referred for medical imaging evaluation including MRI of the brain, as well as CT of the brain, chest, abdomen and pelvis. The result was interval progression, with interval increase in size of the previously known metastases within the right kidney, right adrenal, bilateral lung metastases, mediastinal lymph nodes, bone lesions as well as the left temporal extracranial residual mass and the left intraorbital mass (Figure 5). There were also new metastatic lesions involving the left adrenal, the liver and the spleen (Figure 5). The patient died one week after.

Discussion

Although breast and thyroid carcinoma are considered by far as the two most common female malignancies, synchronous or metachronous primary tumors of both entities are rare in clinical practice [1-3]. The first case of these concomitant dual malignancies was reported by Billroth in 1889 [4]. Recent studies showed that the incidence of thyroid cancer as a second malignancy following breast cancer has dramatically increased during the past 15 years [1]. Others previous analyses concluded that the incidence of thyroid cancer is higher in patients with a pre-existing malignancy than in patients without a preexisting malignancy and that the incidence of other malignancies is higher in patients with thyroid cancer than in patients without thyroid cancer [7,8]. Until nowadays the mechanism underlying the development of breast and thyroid cancer in the same patient is not well known, although breast and thyroid are both endocrine organs [8]. Liu et al. [9] performed a deep literature review to explain the possible mechanism of the development of both breast and thyroid cancer in the same patient and he concentrated on thyroid hormones and proposed mechanisms underlying the activation of associated oncogenes, such as a sodium iodide symporter that acts as a potential co-passageway and facilitates thyroid and breast cancer development [10,11]. Others authors focused on the amplification levels of nuclear protein [12], retinoid-inducible nuclear factor [13] and nuclear receptor coactivator [14] within the breast gland, acted as promise oncogenic coactivators of and biomarkers for development of thyroid and breast malignancies.

The big challenge is to make the difference between the diagnosis of synchronous or metachronous breast and thyroid cancer and the interval occurrence of either as a result of metastasis from a primary tumor involving the other, that is, thyroid cancer arising from breast cancer metastasis or breast cancer arising from thyroid cancer metastasis [1,2]. In conclusion, although synchronous primary tumors of the thyroid and breast are very rare, our case presentation and review have reminded us of the possibility that breast and thyroid cancer can occur synchronously. However, more studies in this field are needed to confirm our results. Medical imaging exams have a powerful role in the detection of additional primary malignancy [15]. PET with 18F-FDG is being used with increasing frequency in the evaluation and clinical management of an ever greater number of neoplasms [15-17].

Regarding our case, the initial CT and MRI of the brain founded that the bone and the orbital lesion were suspected of other synchronous tumor, due to morphological features of the lesions, with incidental findings of the suspected right thyroid nodule, which was highly tracer avid on FDG-PET. The final diagnostic was proven histologically. Moreover, However, our case was little complex and it is similar to the one described by Zhong et al. [8] it is not evident to be sure on whether the thyroid or breast cancer developed first based on depth of invasion or tumor size. However, we can conjecture that the thyroid carcinoma could be the first cancer to develop and that the breast cancer was the second cancer to develop based on the fact that the thyroid cancer exhibited poorer TNM staging than the breast cancer and left neck lymph node metastasis.

Conclusion

Despite the fact that synchronous primary malignancies of the thyroid and breast are even rare, our case study and the systematical review of the literature have reminded us of the possibility that breast and thyroid cancer can occur synchronously.

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