Case Report

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Synchronous papillary thyroid carcinoma and breast ductal carcinoma

Heng Kong[1,2], JiXin Chen[2] and Shou-Ching Tang[3]

Abstract

A 48-year-old woman was admitted to our hospital with a lump in her left breast. She was diagnosed with synchronous papillary thyroid carcinoma and breast ductal carcinoma. The patient underwent four cycles of neoadjuvant chemotherapy with epirubicin and cyclophosphamide, and one cycle of docetaxel. She then underwent left breast mastectomy and radical resection of thyroid cancer (total thyroidectomy and bilateral central group [levels VI and VII] lymph node dissection) at the same time. She was administered three cycles of chemotherapy with docetaxel and radiotherapy. The patient had no metastasis in the follow-up period. A literature search was performed to characterize the epidemiology, etiology, management, and prognosis of this condition. We speculate that hormone treatment could be a probable pathogenesis of synchronous breast and thyroid cancers.

Keywords

Breast, thyroid, synchronous cancer, endocrine hormone, chemotherapy, mastectomy

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Introduction

Breast cancer and thyroid cancer are two of the most common malignancies that occur in women. Synchronous carcinoma of the

[1]Department of Thyroid and Breast Surgery, Baoan Central Hospital of Shenzhen (Fifth Affiliated Hospital of Shenzhen University), Shenzhen City, Guangdong Province, China

[2]Department of General Surgery, Shenzhen University General Hospital, Shenzhen University, Shenzhen City, Guangdong Province, China

[3]Cancer Center and Research Institute, Clinical and Translational Research, University of Mississippi Medical Center, Guyton Research Building, 2500 North State Street, Starkville, MS, USA

Corresponding author:
Heng Kong, Department of Thyroid and Breast Surgery, Baoan Central Hospital of Shenzhen (Fifth Affiliated Hospital of Shenzhen University), No. 233 Xixiang section of Guangshen Avenue, Baoan District, Shenzhen City, Guangdong 518102, P.R. China.
Email: generaldoc@126.com

breast and thyroid can occur.[1] The pathogenesis of breast and thyroid cancers is complex, and most of the patients are women. The breast and thyroid are hormone-responsive organs and are subject to hypothalamus–pituitary–glandular axis regulation.[2,3] Therefore, endocrine changes and exogenous hormone drugs can lead to the onset of synchronous breast and thyroid cancers. We report here the clinical data of a case of breast cancer complicated by thyroid cancer. Primary synchronous breast and thyroid cancers might occur with long-term use of endocrine hormone treatment. Endogenous hormone levels could be one of the causes of synchronous breast and thyroid cancers.

Case report

A 48-year-old woman was admitted to our hospital in March 2018 with a lump in her left breast. On a physical examination in the outpatient service, we found a lesion that was approximately 8×7 cm in size in the upper outer quadrant of the left breast with occasional bloody nipple discharge. Some abnormally enlarged lymph nodes were observed in the left axilla (Figure 1).

A biopsy specimen of the left nodule showed invasive ductal carcinoma and scirrhous type cancer of the breast (cT3NxM0). Estrogen and progesterone receptors were positive, but human epidermal growth factor receptor 2 (HER2) was negative in immunohistochemical staining. The Ki-67 labeling index was 60%. At the same time, ultrasound imaging showed a $20 \times 22 \times 27$-mm hypoechoic nodule of Thyroid Imaging Reporting and Data System category 4 in the left thyroid. Fine needle aspiration biopsy of a thyroid nodule showed papillary thyroid carcinoma (cT2NxM0, stage I) (Figure 2).

During routine examinations, transvaginal ultrasound showed a hypoechoic area in the muscle layer of her uterus (Figure 3). She was diagnosed with uterine fibroids. Her history of disease included adenomyosis and dysfunctional uterine bleeding. She had continuous androgen, estrogen, and progesterone treatment for her gynecological diseases for longer than 5 years. She did not have any family history of papillary thyroid or breast cancer. The patient did not receive external beam radiation to the neck region. She did not know whether she had thyroiditis because she had not been

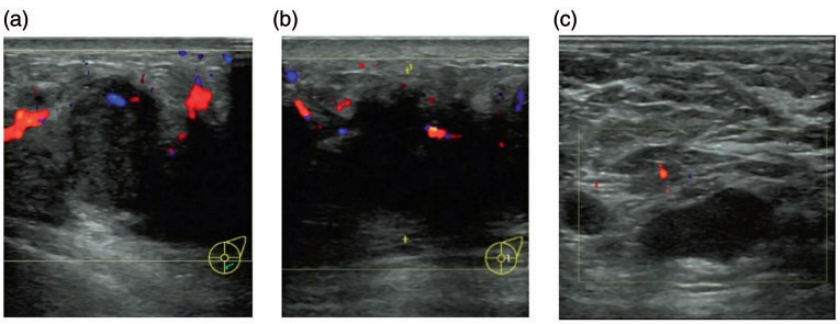

Figure 1. Ultrasound showing a left breast nodule and abnormally enlarged axillary lymph nodes. (a, b) A hypoechoic nodule with a size of $80 \times 70 \times 30$ mm was observed on ultrasound. The shape of the nodule is irregular and the boundary is unclear. Color Doppler flow imaging shows blood flow signals inside of the hypoechoic zone. (c) A number of abnormally enlarged lymph nodes can be seen in the left axilla. The boundary of the lymph nodes is clear. These lymph nodes are hypoechoic with no lymphatic structure. A small amount of blood flow signal can be seen.

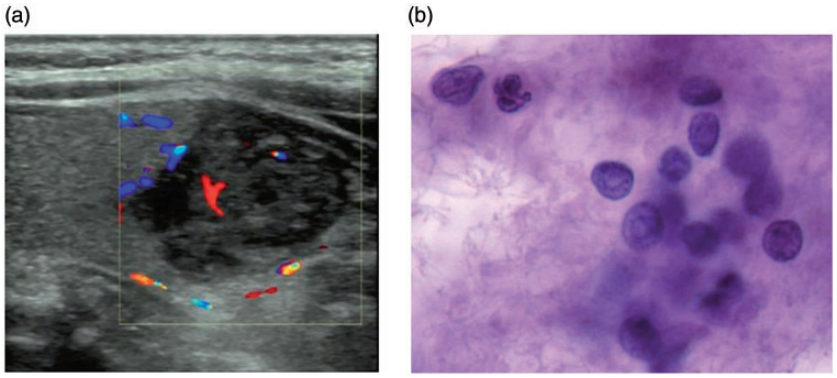

Figure 2. (a) An ultrasound image shows a 20 × 22×27-mm hypoechoic nodule in the left thyroid. (b) Fine needle aspiration biopsy shows papillary thyroid carcinoma.

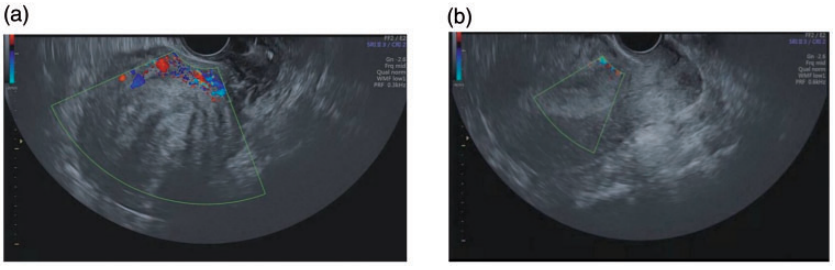

Figure 3. Transvaginal ultrasound shows a hypoechoic area in the muscle layer of the patient's uterus. (a) The shape of the uterus is full and the shape is irregular. A hypoechoic area can be seen in the muscle layer of the right side. The size of the area is 76 × 71×57 mm. (b) The boundary is clear and the inner echo is uneven. The uterine intimal thickness is approximately 15 mm.

examined before admission. She was not diagnosed with thyroiditis during preoperative laboratory tests in this hospitalization. She underwent endometrial scraping surgery 30 years previously because of uterine functional bleeding and adenomyosis.

The patient was diagnosed with breast cancer and thyroid cancer. Her breast cancer was in the advanced stage and luminal B type. She was treated with neoadjuvant chemotherapy of epirubicin 100 mg/m^2 and cyclophosphamide 600 mg/m^2, followed by docetaxel 100 mg/m^2 every 21 days. She had four cycles of chemotherapy with epirubicin and cyclophosphamide and then one treatment with docetaxel. Clinical responses in the breast and lymph nodes were assessed by ultrasound after five cycles of neoadjuvant chemotherapy. Ultrasound results were classified as stable disease by RECIST1.1.[4] Clinicians decided to undergo surgical treatment combined with the patient's wishes. In March 2019, she underwent modified radical mastectomy and radical resection of thyroid cancer (total thyroidectomy and bilateral central group [levels VI and VII] lymph node dissection). A histopathological examination showed that the lesion was invasive ductal carcinoma (Figure 4a) with lymph node metastasis (12/21) (pT3N3aM0, stage IIIc). Immunostaining results were positive

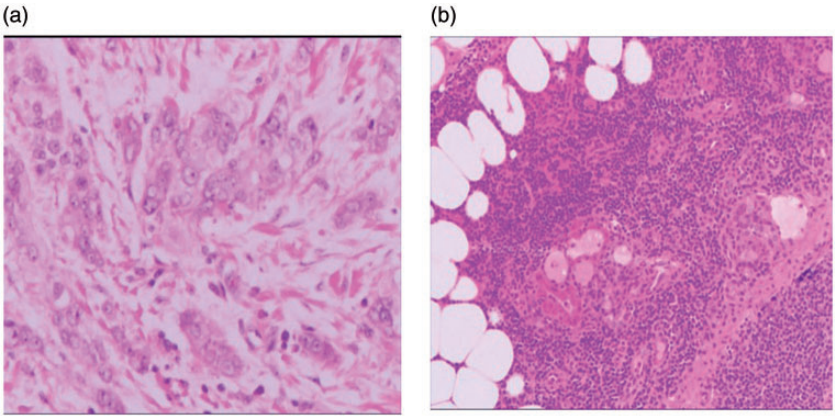

Figure 4. Postoperative pathological results. (a) Left breast infiltrative ductal carcinoma. (b) Left papillary thyroid carcinoma.

for estrogen and progesterone receptors, but negative for HER2. The Ki-67 labeling index was 10%. The thyroid specimen showed a papillary thyroid carcinoma, with a classical subtype (Figure 4b), right central regional lymph node metastasis (1/9), and no left central regional lymph node metastasis (0/3) (pT2N1M0, stage I).

After surgery, the patient accepted the remaining three cycles of chemotherapy, endocrine therapy, and radiation. She has already finished chemotherapy and radiation. Currently, she is still on endocrine therapy. She had no metastasis and no postoperative complications in the 2-year follow-up period.

Discussion

The breast and thyroid are hormone-dependent organs. Once endocrine changes occur in the body, glandular diseases increase.[5] The mammary gland is a target organ for many hormones. Estrogen and progestin are closely related to the incidence of breast cancer.[6] The ratio of estrogen receptor-positive breast cancer is approximately 75% in all subtypes of breast cancer.[7] Estrogen and progestin can activate transformation of breast cells and proliferation and invasion of estrogen receptor-positive breast cancer cells.[8] An increasing amount data have shown that thyroid tissue also contains estrogen and progestin receptors.[9] Estrogen and progestin can promote proliferation of thyroid cells and carcinogenesis of differentiated thyroid carcinoma.[10] Estrogen receptor can be further divided into two subtypes as estrogen receptor α and β.[11] The expression rate of estrogen receptor α and progestin receptor is significantly higher in papillary thyroid carcinoma than in other types of thyroid tumors.[12]

Breast tissue also has receptors of thyroid-stimulating hormone, which alone or in combination with estrogen can promote the onset of breast cancer.[13,14] Levels of thyroid-stimulating hormone are associated with the onset of primary thyroid cancer.[15,16] Thyrotropin, thyroxin, and thyroid antibodies also promote the occurrence and development of primary thyroid cancer and breast cancer.[17,18] This could be one mechanism of synchronous thyroid and breast carcinoma occurring.

In our case, the patient was diagnosed with synchronous thyroid and breast carcinoma. She had continuous intramuscular injection of androgen, estrogen, and

progesterone for dysfunctional uterine bleeding and adenomyosis for longer than 5 years. Unfortunately, no doctor reminded her to be screened for breast and thyroid cancer. She visited a doctor when her nipples showed a neoplasm in France 1 month before admission to our hospital. Therefore, her breast illness was terminal as soon as it was discovered. A histopathological examination confirmed that her breast cancer was pT3N3aM0, stage IIIc. In view of positive estrogen and progesterone receptors in breast cancer tissue and long-term use of hormone drugs, we speculate that the synchronous thyroid and breast carcinoma in our case was due to long-term use of hormone drugs. More research on this subject is required to confirm this association.

The findings in our case suggest that clinicians should be careful when endocrine hormone treatment is used for a long time in any patient. Discussion should be carried out on whether endocrine hormones should be used in a large dose and for a long time, so that we can reduce or avoid the risk of patients suffering from breast and thyroid cancers.

In summary, long-term use of exogenous estrogen may increase the occurrence of thyroid and breast cancers. For patients who have to use exogenous estrogen to treat other systemic diseases, such as conditions of the uterus, regular screening of the breast and thyroid should be emphasized. Physicians should pay attention to the occurrence of thyroid cancer and breast cancer in this type of patient.

Declaration of conflicting interest

The authors declare that there is no conflict of interest.

Ethics statement

This study was approved by the Human and Animal Ethics Review Board of Baoan Central Hospital of Shenzhen (Shenzhen, China) (reference number: A20200019). We obtained verbal consent for publication of this case report from the patient.

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ORCID iD

Heng Kong https://orcid.org/0000-0003-2028-2028

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