Case Report

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대한영상의학회지

Ultrasonographic Features and the Diagnostic Role of Core Needle Biopsy at Metastatic Breast Cancer in the Thyroid gland: A Case Report

갑상선에 생긴 전이성 유방암의 초음파 소견 및 중심부 바늘 생검의 진단적 가치: 증례 보고

Dong Hyun Lee, MD, Ra Gyoung Yoon, MD*, Jin Kyung An, MD, Jeong Joo Woo, MD

Department of Radiology, Eulji Medical Center, University of Eulji College of Medicine, Seoul, Korea

Metastases to the thyroid gland have rarely been reported in clinical settings, and the thyroid gland is an uncommon site for breast carcinoma metastasis. We report a case of a 64-year-old breast cancer patient diagnosed with metastatic breast carcinoma in the thyroid gland after performing ultrasonography (US)-guided core needle biopsy (CNB) and subsequent total thyroidectomy. On US, the thyroid lesion appeared to be mildly enlarged with multiple internal hypoechoic lines and a few microcalcifications without mass formation. Under US-guidance, CNB was performed by targeting the area with microcalcifications and subsequently diagnosed as metastatic breast carcinoma. Total thyroidectomy revealed that the patient had metastatic invasive ductal carcinoma of the breast with lymphatic spread involving both lobes and the isthmus of the thyroid gland. Although the thyroid gland is an uncommon metastatic site, the unusual features of thyroid metastasis can be observed on US; thus, US-guided CNB effectively aids the diagnosis of thyroid metastasis.

Index terms Breast Neoplasms; Metastasis; Thyroid Gland; Ultrasonography; Core Needle Biopsy

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***Corresponding author**
Ra Gyoung Yoon, MD
Department of Radiology,
Eulji Medical Center,
University of Eulji
College of Medicine,
68 Hangeulbiseok-ro, Nowon-gu,
Seoul 01830, Korea.

Tel 82-2-970-8551
Fax 82-2-970-8346
E-mail yoonrg@gmail.com

ORCID iDs
Dong Hyun Lee
https://orcid.org/0000-0002-7265-1334
Ra Gyoung Yoon
https://orcid.org/0000-0003-3203-921X
Jin Kyung An
https://orcid.org/0000-0003-1086-426X
Jeong Joo Woo
https://orcid.org/0000-0002-4669-6176

INTRODUCTION

Although the thyroid gland has an abundant arterial supply, metastases to the thyroid

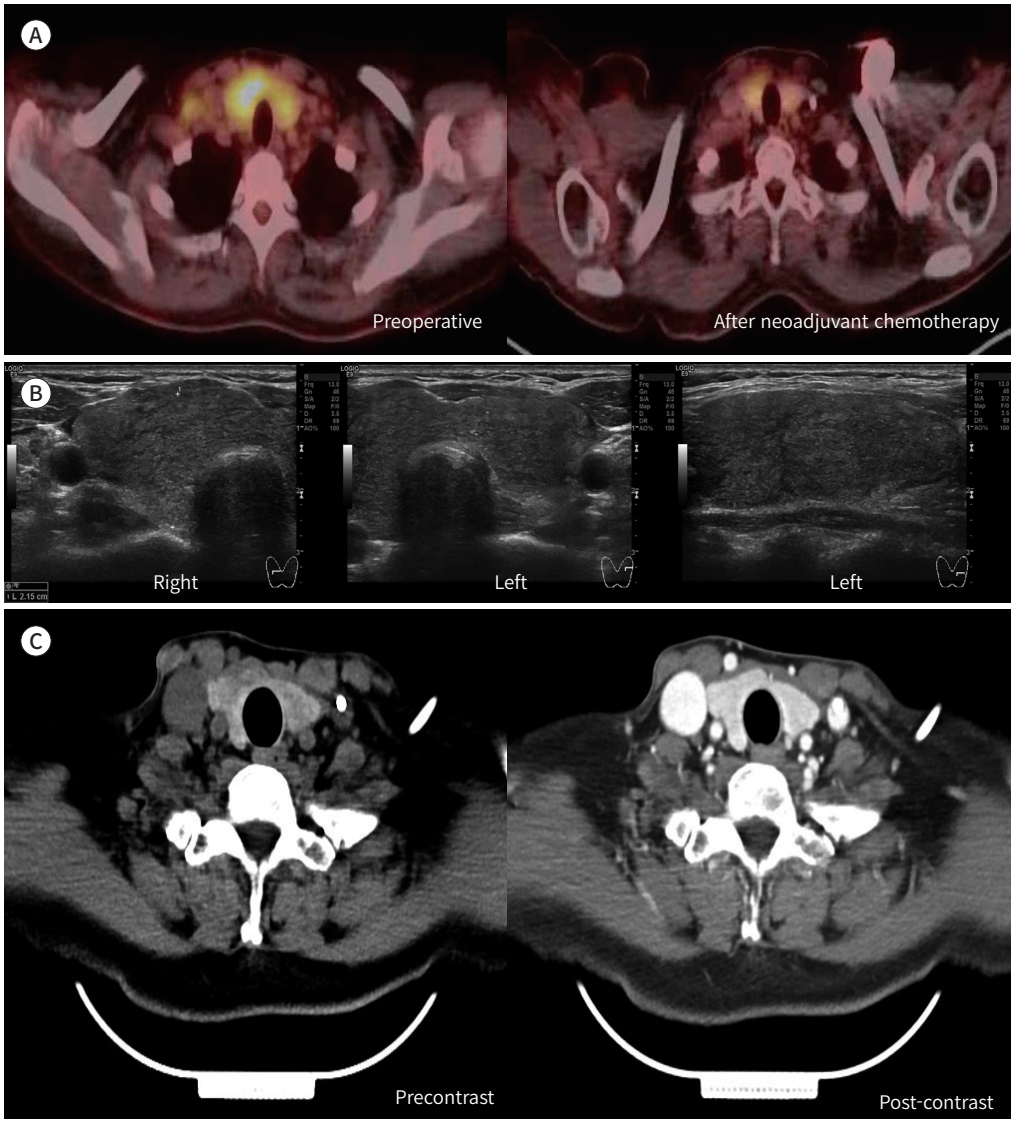
gland have rarely been reported in clinical settings. The low incidence of metastases to the thyroid gland is attributed to rapid arterial flow and high oxygen saturation; furthermore, iodine content in the thyroid gland may inhibit the settlement and growth of metastatic cells. Although postmortem studies suggested that as many as 24% of patients who die of nonthyroidal malignancies have metastases to thyroid gland, the incidence of metastases to thyroid gland has been reported in 1.4–3% of patients who underwent surgery for suspected nonthyroidal malignancies (1).

Ultrasonography (US) is widely used for evaluating metastases to the thyroid gland. Few reports have revealed the detection of metastases to the thyroid gland using US and have classified it into various types. First was a diffuse-type, which showed diffuse enlargement of the thyroid gland with heterogeneous hypo- or isoechogenicity, and second was the nodular type, which showed ill-defined hypoechoic nodular lesions with intranodular vascularization (2). Here, we report a case of a 64-year-old breast cancer patient who was diagnosed with a rare form of thyroid metastases showing diffuse glandular enlargement with multiple internal hypoechoic lines with scattered microcalcification on US, which was confirmed by performing US-guided core needle biopsy (CNB).

CASE REPORT

A 64-year-old woman was referred to our department after an initial diagnosis of invasive ductal carcinoma in the right breast. The patient was subjected to 18F-fluoro-2-deoxyglucose (18F-FDG) PET-CT to evaluate distant metastasis, and multiple hypermetabolic lesions (max standardized uptake value; max SUV, 7.4) were eventually detected in the thyroid gland (Fig. 1A). There was no obvious palpable mass in the thyroid gland, and her thyroid function test was normal. US was performed for further evaluation of the patient, which showed mild enlargement of the thyroid gland with multiple internal hypoechoic lines and few microcalcification foci (Fig. 1B). Color Doppler image revealed no evidence of increased vascularity. There was no evidence of a solid nodule or mass-like lesion. Based on US finding, primary diagnosis was non-neoplastic diffuse thyroid diseases such as Hashimoto's thyroiditis. CT revealed mild enlargement of the thyroid gland and a heterogeneous enhancement without the presence of a focal lesion (Fig. 1C). Five-month follow-up examinations were performed after preoperative neoadjuvant chemotherapy. Follow-up US revealed a reduced size of the thyroid gland, less discernible multiple internal hypoechoic lines, and more obvious scattered microcalcifications (Fig. 1D). On performing CT, the size of both the lobes of the thyroid gland was also found to be reduced. The 18F-FDG uptake in the previously detected hypermetabolic thyroid lesions was slightly reduced, but hypermetabolic activity still persisted (max SUV, 4.0) (Fig. 1A). On suspecting diffuse thyroid metastases originating from breast cancer, we performed US-guided CNB using an 18-gauge needle (TSK Ace-cut; Create Medic, Yokohama, Japan) by targeting the microcalcification area in the left lobe of the thyroid gland (Fig. 1E). Metastasis from underlying breast cancer was confirmed based on the results of histologic examination and immunohistochemical analysis of the biopsy specimen, which showed positive results for estrogen receptor (ER), progesterone receptor (PR), and negative result on thyroid transcription factor 1 (TTF-1). She underwent radical mastectomy and total

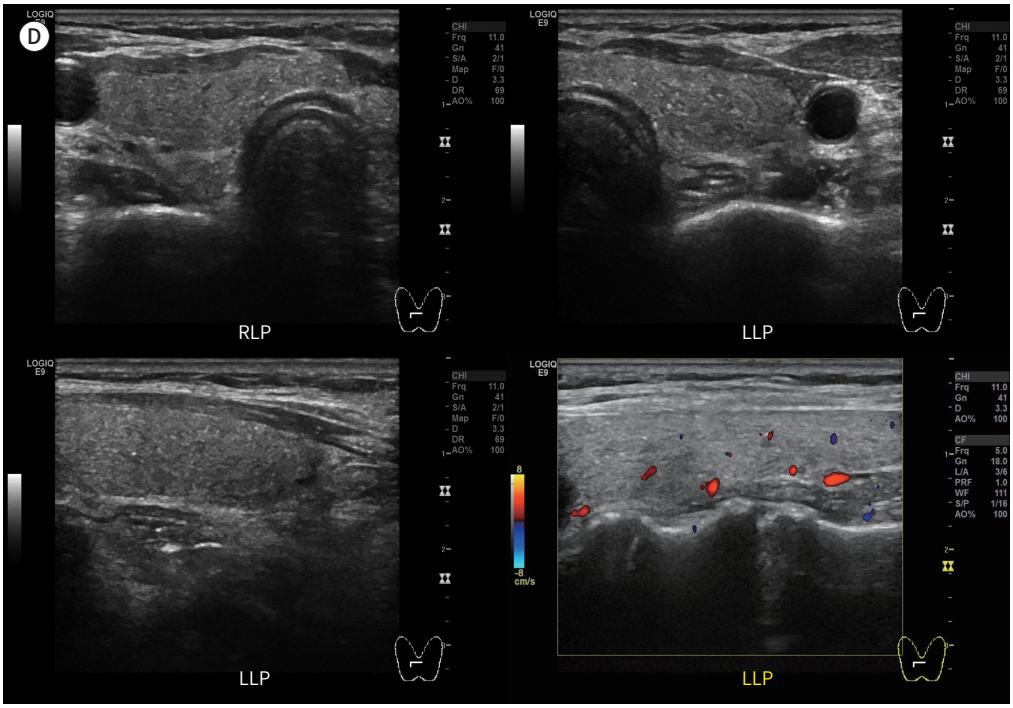
Fig. 1. A 64-year-old woman with synchronous diffuse thyroid metastases from breast cancer diagnosed using US-guided CNB.
A. Preoperative 18F-FDG PET-CT scan shows an increased FDG uptake in both lobes of the thyroid gland (max SUV, 7.4). After neoadjuvant chemotherapy, there is decreased FDG uptake in both lobes of the thyroid gland (max SUV, 4.0).
B. Ultrasonogram of the thyroid gland shows a diffusely enlarged and heterogeneous iso- or hypoechoic thyroid gland with multiple internal hypoechoic lines but without increased vascularity. Moreover, there is no evidence of mass-formation or solid tumor composition.
C. CT scan shows mild enlargement of the thyroid gland and heterogeneous enhancement without focal enhancing lesions.
CNB = core needle biopsy, 18F-FDG = 18F-fluoro-2-deoxyglucose, SUV = standardized uptake value, US = ultrasonography



thyroidectomy along with central compartment lymph node dissection. The final diagnoses associated with the breast and thyroid gland were invasive ductal carcinoma and metastatic invasive ductal carcinoma, which originated from the breast, accompanied with lymphatic spread involving both lobes and the isthmus of the thyroid gland. The dimensions of the metastases excised from the right to isthmus and left lobe of the thyroid gland were 3.5 cm × 2.5 cm ×

1.3 cm, and another 0.5 cm × 0.3 cm × 0.3 cm metastatic lesion was detected at left upper pole. There was no metastatic lymph node in both central neck. Histologically, pleomorphic tumor cells from the invasive ductal carcinoma metastasis were intermingled with thyroid follicles, and the normal thyroid components were surrounded by metastatic breast carcinoma cells (Fig. 1F). Tumor cells in the metastatic foci positively stained for ER and PR but were

Fig. 1. A 64-year-old woman with synchronous diffuse thyroid metastases from breast cancer diagnosed using US-guided CNB.
D. Follow-up US examination after neoadjuvant chemotherapy reveals improved reduction in the size of the thyroid gland and improves state of heterogeneous echogenicity and previous multiple internal hypoechoic lines without increase in vascularity. However, more discrete scattered microcalcification foci are observed on follow-up US.
E. US-guided CNB was performed using an 18-gauge needle by targeting the area of microcalcification in the left lobe of the thyroid gland.
CNB = core needle biopsy, LLP = left lower pole, RLP = right lower pole, US = ultrasonography



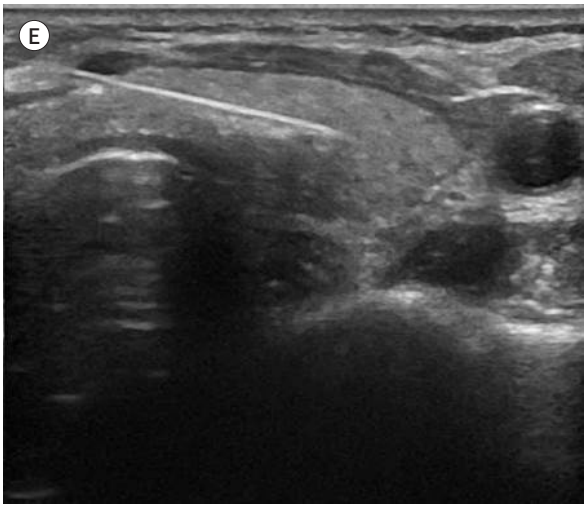
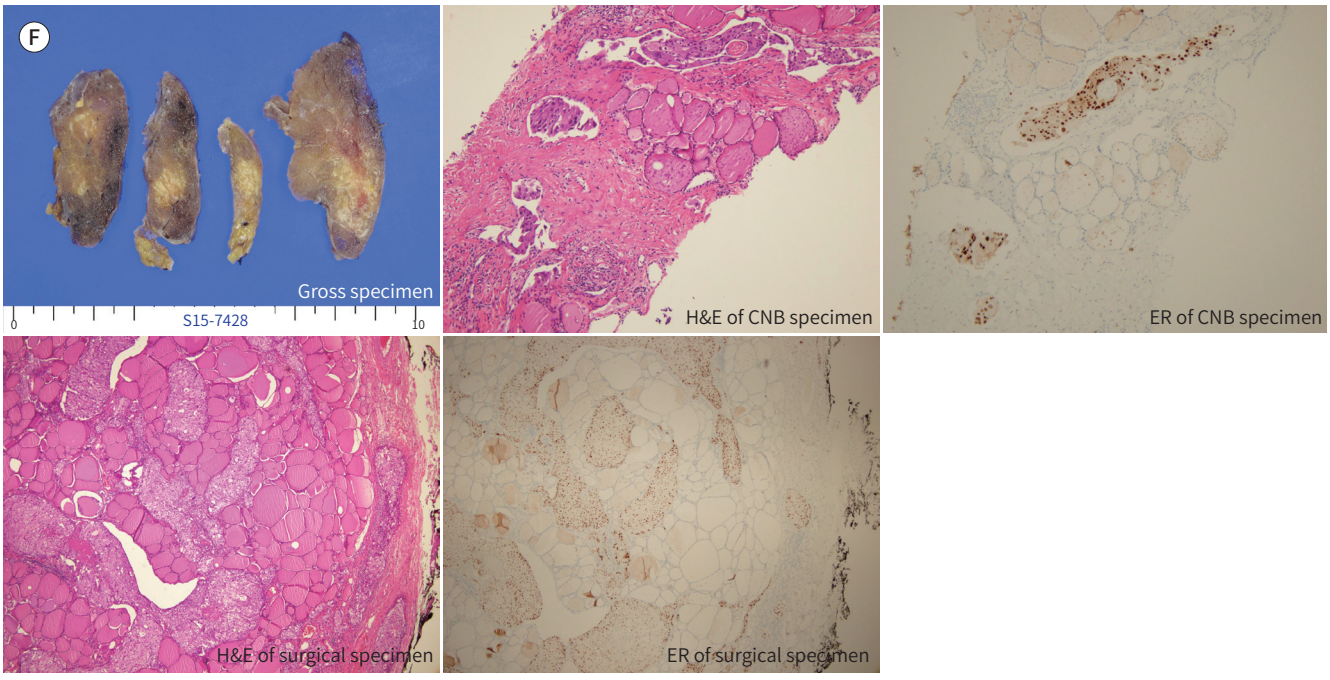


Fig. 1. A 64-year-old woman with synchronous diffuse thyroid metastases from breast cancer diagnosed using US-guided CNB.
F. The gross specimen measures 3.5 cm × 2.5 cm × 1.3 cm and has a well-defined yellowish white fibrotic lesion located in the left lobe of the thyroid gland. The CNB specimen reveals a follicular proliferative lesion with focal nuclear atypia, including nuclear enlargement, irregularity, and positive staining for the ER (H&E stain, × 200). After total thyroidectomy, the tumor cells shows diffuse infiltration into the thyroid gland, with lymphatic spread (H&E stain, × 40) and positive staining for the ER.
CNB = core needle biopsy, ER = estrogen receptor, H&E = hematoxylin and eosin, US = ultrasonography



negative for TTF-1, similar to the staining pattern for the primary breast cancer lesion.

DISCUSSION

Metastasis to the thyroid gland is uncommon for thyroid malignancy after surgery (3), and the most frequently reported primary sites were the kidney, breast, and lung (4). The incidence of newly diagnosed metastatic thyroid tumor has gradually been increasing owing to the advancement of radiological techniques, such as high-resolution US, CT, and 18F-FDG PET-CT along with the use of fine-needle aspiration cytology (FNAC) in suspected lesions (2, 4). Therefore, an appropriate diagnostic approach for metastases to the thyroid gland is important for patient management.

Saito et al. (2) classified US findings of metastasis to the thyroid gland into two categories, nodular and diffuse type. The diffuse type is a rare condition, which demonstrates diffuse hypoechogenicity involving an enlarged thyroid gland with internal hypoechoic lines but without increased vascularity (4). According to the previous studies, frequent primary malignancy has been reported for lung cancer, esophageal cancer, cholangiocarcinoma, penile cancer, and cancer of unknown primary site when US findings showed diffuse type metastases to the thyroid gland (4, 5). Additionally, there are other reports about metachronous nodular-type metastasis to the thyroid gland from breast cancer (5). On the other hand, Lee et al. (6) divided thyroid metastases into diffuse non-mass-forming lesion (type I), solitary suspicious malig-

nant nodule (type II), multiple nodules suspected to be malignant (type III), and metastatic thyroid nodule(s) with no suspicion of malignancy (type IV). Our case could be classified as diffuse type or type I according to the categorization of Satio et al. (2) and Lee et al. (6) Because a diffuse sclerosing variant of papillary thyroid carcinoma (PTC) may also be seen as diffusely scattered microcalcification on US, which is similar to our finding, a diffuse sclerosing variant of PTC can be included in differential diagnosis.

Metastases to the thyroid gland is usually associated with cancer dissemination through blood from a distant focus or with a direct or lymphatic spread to the thyroid gland by a neoplastic process situated in the adjacent organs (7). A previous case report has been published in which chylous was aspirated from the hypoechoic line of an enlarged thyroid gland that was diffusely infiltrated by malignant cells. Therefore, lymphatic dissemination is implicated in diffuse thyroid metastasis (8). In our case, US showed multiple internal hypoechoic lines and few microcalcification foci. Because the primary malignancy was breast cancer in our patient, the microcalcification might reflect intrathyroidal lymphatic spread of tumor cells. Few previous reports also described that the US features of intrathyroidal breast cancer metastases may manifest as diffuse calcifications within heterogeneous thyroid parenchyma. Therefore, these US finding would be explainable by this lymphatic spread mechanism in breast cancer.

Diagnosis of a metastatic lesion in the thyroid gland using US-guided FNAC has some limitations such as a high false-negative rates (range, 4.5–82.3%) and challenging differentiation of primary thyroid malignancies including anaplastic or clear cell carcinoma from metastatic high-grade malignancy based on cytological features (1). Choi et al. (9) reported that US-guided CNB had better diagnostic performance and needed lesser repetitions of diagnostic examinations or surgery than FNAC owing to larger tissue sampling and procurement of additional histological information. Current guideline also recommended that CNB can be effective for diagnosing repeatedly inadequate FNA, suspicious anaplastic carcinoma, or lymphoma and even for an initial diagnosis based on malignant US findings (10). Our case could also be accurately diagnosed as metastases because the specimen obtained by US-guided CNB allowed immunohistochemical analysis.

In summary, we reported a case of synchronous diffuse thyroid metastases from breast cancer diagnosed by US-guided CNB. Based on this case, if diffuse thyroid enlargement with multiple internal hypoechoic lines and scattered microcalcifications are seen on an ultrasonogram, diffuse metastatic infiltration of the thyroid gland may be considered for differential diagnosis, especially for breast cancer. Also, US-guided CNB could allow accurate diagnosis of metastases to thyroid gland owing to larger tissue sampling and feasibility of immunohistochemical analysis.

Author Contributions

Conceptualization, Y.R.G.; data curation, Y.R.G., L.D.H.; formal analysis, Y.R.G., L.D.H.; funding acquisition, W.J.J.; investigation, L.D.H.; methodology, Y.R.G., L.D.H.; project administration, Y.R.G.; supervision, Y.R.G.; validation, Y.R.G.; visualization, L.D.H.; writing—original draft, L.D.H.; and writing—review & editing, A.J.K., W.J.J.

Conflicts of Interest

The authors have no potential conflicts of interest to disclose.

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갑상선에 생긴 전이성 유방암의 초음파 소견 및 중심부 바늘 생검의 진단적 가치: 증례 보고

이동현 · 윤라경* · 안진경 · 우정주

갑상선으로의 전이는 매우 드물며, 유방암의 갑상선으로의 전이 또한 드문 것으로 알려져 있다. 우리는 64세 유방암 환자에서 발생한 갑상선으로의 전이성 암 병변에 대한 초음파 소견과 중심부 바늘 생검의 진단적 역할에 중점을 두어 증례 보고를 하고자 한다. 초음파에서는 뚜렷한 종괴 형성은 보이지 않으면서 갑상선의 크기가 증가하였고, 저에코의 선 형태와 미세석회화가 관찰되었다. 이러한 미세석회화 부분을 조직검사의 표적으로 하여 중심부 바늘 생검을 시행하였고, 생검 결과 전이성 유방암으로 확인되었다. 최종적으로 갑상선 전절제술을 시행하여 림프선을 따라 전이한 침윤성 유관암으로 진단되었다. 저자들은 이러한 초음파 소견을 보일 경우 미세침흡인생검으로는 표적을 정하기 어려울 수 있으나, 중심부 바늘 생검을 이용하면 조직 자체를 얻어 수술 전 정확한 진단에 도움이 될 수 있다는 것을 경험하였기에 보고하고자 한다.

을지대학교 의과대학 을지병원 영상의학과