Metastases to the breast are relatively rare, which constitute 0.4-6.6% of all breast malignancies [1, 2]. This wide range depends on inclusion or exclusion of leukemia and lymphoma as primary tumors [2]. Patients with extramammary malignancies and metastases to the breast were often presented with palpable breast lumps, or breast nodules detected at mammography or sonography [1-5]. In about 40% of patients with breast metastases from extramammary carcinomas, the breast lesions were even the first manifestations of diseases [3]. Herein we report a case of breast metastases from adenocarcinoma of lung, in which breast nodules were incidentally disclosed with computed tomography (CT) of chest for the known lung cancer.

CASE REPORT

A 53-year-old female patient presented to our institution with known adenocarcinoma of lung confirmed at an outside hospital. Initial assessment of disease disclosed a 2-cm tumor in left lung with bilateral multiple lung to lung metastases, and extensive metastases to pleura, mediastinum, brain, and liver. The laboratory test showed a high serum carcinoembryonic antigen (CEA) of 31.13-ng/ml (normal upper limit, 5-ng/ml). She underwent chemotherapy thereafter, and serial follow-up imaging studies showed partial remission of disease in the brain and stable disease in the remaining sites during the following 9-month period.

Contrast-enhanced CT scan of chest performed 9 months after initial presentation showed stable disease with respect to lung, pleura and mediastinum; but multiple small nodules in the left breast were incidentally disclosed (Fig. 1a), which were not found in initial CT scan. A few left axillary lymph nodes were also noted. The routine contrast-enhanced CT of chest was performed with intravenous administration of 100 mL iopromide (Ultravist 300; Schering, Berlin, Germany) by using a mechanical power injector at a rate of 2.5-mL/sec. The scanning was performed 50 seconds after initiation of the contrast medium injection.

The breast nodules were non-palpable. Metastatic adenocarcinoma of pulmonary origin was subsequently confirmed at sonographically guided biopsy.

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0.6-cm to 0.9-cm at maximal diameter. Multiple left axillary lymph nodes with maximal diameter of 1.7-cm were noted. Sonographically guided core-needle biopsy of the breast nodule was performed with a 14-gauge automated biopsy gun, which revealed metastatic poorly differentiated adenocarcinoma of pulmonary origin (Fig. 1c). The histopathologic appearance was unusual for a primary mammary tumor, and immunohistochemical stains revealed negative for ER and PR, and positive for thyroid transcription factor-1 (TTF-1, an immunohistochemical marker of lung cancer).

Progressive disease was considered, and protocol of chemotherapy was adjusted with gefitinib (Iressa, AstraZeneca, London, United Kingdom). Follow-up breast sonography 3 months later showed regression of the breast metastases.

**DISCUSSION**

Breast metastases were rare; and commonly associated primary extra-mammary malignancies included malignant melanoma, lymphoma, leukemia, and lung cancer [6-9]. Wood et al reviewed 32 cases with breast metastases, and reported a wide range of primary extra-mammary malignancies including cutaneous melanoma (n=10), lung cancer (n=8), non-Hodgkin’s lymphoma (n=5), soft-tissue tumors (n=4), and colon cancer (n=2) [8]. Lee et al reported that five

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**Figure 1.** A 53-year-old female patient with lung cancer metastasizing to breast. **a.** Contrast-enhanced CT scan of chest shows multiple small well-defined nodules with homogeneous enhancement in the left breast (arrows). **b.** Sonography of breast shows multiple small lobulated hypoechoic nodules (arrows) in left breast. **c.** Photomicrograph of the specimen obtained at sonographically guided biopsy confirms the metastatic poorly differentiated adenocarcinoma of pulmonary origin (original magnification, x400; hematoxylin-eosin [H-E] stain).
(28%) of 18 patients with breast metastases had lung cancer as primary extra-mammary malignancies [9]. However, lung cancer with breast metastasis was an uncommonly encountered entity in radiological practice, and only a few cases were reported in recent literatures [2, 7, 10, 11]. Lung cancer usually metastasized to the bone, liver, brain, and adrenal glands; the breast remained a rare location of metastasis [7].

Patients with lung cancer and breast metastases were usually presented to clinicians with palpable breast lumps, which required sonography, mammography or, in rare case, magnetic resonance (MR) imaging for characterization of breast nodules [2, 7, 10, 11]. The imaging studies showed multiple well-defined breast masses or solitary breast mass (Table 1); and for each case, a histopathologic examination was required for definitive diagnosis of breast metastasis. In our case, the breast nodules were not palpable in advance, probably due to their small sizes. The breast metastases were disclosed incidentally with a routine contrast-enhanced CT scan of chest, although the routine chest CT was usually performed for indications other than breast disease, and the technology was not optimized for breast imaging.

Multidetector CT (MDCT) of breast with dynamic contrast-enhanced technique had been used to investigate features of breast tumors [12, 13]. Although several recent reports have described the feasibility of dynamic contrast-enhanced breast CT for visualizing lesions in dense breast tissue and located adjacent to the chest wall, or for identifying the extent of a breast carcinoma [12-14], CT is still not the primary imaging modality for evaluation of breast lesions. However, CT scan of chest, upper abdomen or heart may in occasion offer the first images of the breast, because the breast is almost always within the field of view. While the breasts are not the primary focus of these scans, the incidental breast lesions are not uncommon [13]. The chest CT in our case was not performed with dynamic breast CT technique. However, the multiple incidental breast lesions with well-defined margins on routine contrast-enhanced chest CT, together with known history of extra-mammary malignancy should suggest the possibility of breast metastases [2, 14].

With the increased use of chest CT either for diagnostic or screening purposes, the incidental breast lesions are increasingly being encountered. However, incidental breast lesions at CT were frequently overlooked or inaccurately assessed [13]. It was essential, in our case, to detect breast metastases at routine follow-up chest CT scan and to adjust the treatment for progressive disease. Therefore, careful evaluation of the breast should be included in the checklist of a routine chest CT in daily practice.

### Table 1. Clinical and imaging features of breast metastases from lung cancer in recent literatures

<table>
<thead>
<tr>
<th>Authors</th>
<th>Age/ Sex</th>
<th>Type of lung cancer</th>
<th>Location of breast metastasis</th>
<th>Palpable</th>
<th>Size (cm)</th>
<th>Imaging features of breast metastases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jakovljević et al [2]</td>
<td>44/F</td>
<td>Small-cell lung cancer</td>
<td>Bilateral</td>
<td>Yes</td>
<td>0.5-2.5</td>
<td>Multiple hypoechoic, well-circumscribed solid masses, Multiple oval, well-defined masses, Not performed, Multiple lesions with early, strong peripheral rim enhancement, and centripetal enhancement in late phases§</td>
</tr>
<tr>
<td>Ucar et al [7]</td>
<td>63/M</td>
<td>Adenocarcinoma, left lung</td>
<td>Left</td>
<td>Yes</td>
<td>4 × 2</td>
<td>Solitary, irregular mass, Not performed, Heterogeneity in left breast tissue and thickening of thoracic wall¶</td>
</tr>
<tr>
<td>Masmoudi et al [10]</td>
<td>54/F</td>
<td>Adenocarcinoma, right lung</td>
<td>Left</td>
<td>Yes</td>
<td>8</td>
<td>Not performed, Solitary, ill-defined mass, Not performed</td>
</tr>
<tr>
<td>Hsu et al [11]</td>
<td>48/F</td>
<td>Squamous cell carcinoma, right lung</td>
<td>Left</td>
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F, female; M, male; NA, not available.

§ MRI was performed on a 0.5-T MR unit using a dedicated double breast coil.
¶ CT was performed using standard chest CT protocol for follow-up of lung cancer.
In summary, metastases to the breast may be incidentally found at routine chest CT. It is important for radiologists to search for the incidental breast lesions, and to refer patients to dedicated breast imaging study and appropriate management.

REFERENCES