Hyperdense Pleural Metastasis from Osteosarcomatous Breast Phyllodes Tumor

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Abstract

Hyperdense pleural metastasis is rare, noting that high-density foci in the pleural space are commonly benign. We present a case of a 76-year-old female with past medical history of multicentric breast malignancy treated 5 years prior, who presented with unexpected weight loss. Chest CT demonstrated high-density foci in the left pleural space as well as a right lung nodule. There was no past medical history to support benign pleural etiologies of talc pleurodesis, asbestosis-related pleural plaques, and fibrothorax. However, the patient’s prior breast malignancy had included malignant phyllodes tumor with osteosarcomatous differentiation, in addition to invasive ductal carcinoma. On bone scan, the left hemithorax demonstrated intense radiotracer uptake, reflecting osteoid tissue, raising suspicion for osteosarcomatous pleural metastasis. This was supported by increasing left pleural lesions, as well as right lung biopsy demonstrating metastatic phyllodes with osteosarcomatous differentiation. Therefore, the hyperdense pleural lesions were determined to represent pleural metastasis from osteosarcomatous breast phyllodes tumor.

Keywords

Malignant phyllodes, Osteosarcomatous differentiation, Hyperdense pleural metastasis

Case Report

A 76-year-old female with past medical history of breast malignancy treated 5 years prior, presented with unexpected weight loss. Initial contrast-enhanced chest CT demonstrated high-density foci in the left pleural space (Figure 1) and a 9 mm right lung nodule (Figure 2). The patient denied history of asbestos exposure, talc pleurodesis, trauma, empyema, and tuberculosis. Technetium-99m methylene diphosphonate (Tc–99m MDP) whole body bone scan (Figure 3), obtained to characterize a possible rib lesion, demonstrated marked radiotracer uptake throughout the left hemithorax, correlating with the high-density material seen in the left pleura on chest CT. There were no other sites of abnormal radiotracer uptake. A follow-up chest CT obtained 4 months later demonstrated increased extent of left pleural high-density regions, now associated with conspicuous pleural soft tissue thickening and left lung parenchymal opacities (Figure 4). The right lung nodule had also increased in size and now had internal hyperdensities.

The breast oncologic history was thoroughly reviewed, noting an estrogen receptor positive and progesterone receptor positive left breast cancer with ipsilateral axillary lymph node metastasis. The patient had undergone left mastectomy, and the surgical specimen showed two separate pathologies, the first of which was...
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moderately differentiated invasive ductal carcinoma. The other pathology was malignant phyllodes tumor with sarcomatous differentiation that included osteosarcomatous, chondrosarcomatous, and focal myxoid liposarcomatous elements. Given the patient’s high-risk breast cancer with nodal metastases, treatment focused on her invasive ductal carcinoma using chemotherapy, radiation, and hormonal therapy, while sarcoma chemotherapy was deferred. After breast cancer treatment, the patient had been followed with yearly mammograms for 5 years, which were benign, leading up to current presentation.

The right lung nodule was biopsied, and pathology demonstrated malignant spindle cell neoplasm with osteosarcomatous and chondrosarcomatous differentiation, compatible with metastatic malignant phyllodes tumor (Figure 5). Subsequent surveillance chest CT at 8 months demonstrated further increase in circumferential left pleural soft tissue thickening, left lung parenchymal opacities extending to the hilum, and metastatic right lung nodule (Figure 6). The left pleural high-density lesions were diagnosed as pleural metastasis from osteosarcomatous breast phyllodes tumor.

Discussion

Phyllodes tumors are rare and account for less than 1% of...
all breast tumors, with approximately 20% of phyllodes tumors being classified as malignant. Imaging alone cannot definitively distinguish between fibroadenoma and phyllodes tumors, which may be benign, borderline, or malignant. Fibroadenomas and phyllodes tumors both generally appear oval, circumscribed, and smoothly margined on mammography, and as an oval heterogenous solid mass on ultrasound. Larger size, irregular shape, noncircumscribed borders and rapid growth should raise suspicion for borderline or malignant phyllodes tumor [1]. However, confirmation requires pathologic diagnosis.

Although rare, osteosarcomatous transformation of malignant phyllodes tumor has been reported [2]. Approximately 22% of patients with malignant phyllodes have been shown to have metastases, which spread hematogenously. The most common sites for distant metastases are the lung, pleura, liver, and bone [3]. Phyllodes tumors with osteosarcomatous differentiation, such as in this patient, are often aggressive tumors, with distant metastases in about a third of patients [2].

Following her breast cancer treatment which included mastectomy, the patient had 5 years of negative surveillance breast imaging with mammography. After that she presented with unexpected weight loss. Subsequent imaging work-up demonstrated high-density left pleural abnormalities. On initial chest CT, the pleural finding was attributed to talc pleurodesis, noting that the imaging appearance alone could have plausibly reflected a robust manifestation. However, upon further investigation, there was no documented history of talc pleurodesis. The imaging findings were difficult to interpret because pleural calcifications are commonly benign [4].

The differential diagnosis for pleural calcifications includes asbestos-related pleural disease, talc pleurodesis, and fibrothorax (from prior empyema, tuberculosis, or hemothorax). Malignant etiologies include osteosarcomatous/chondrosarcomatous pleural metastasis, sarcomatoid mesothelioma [5], and primary sarcoma of pleura/chest wall [6].

In this case, the main differential diagnosis for the initial chest CT is pleural metastasis, talc pleurodesis, fibrothorax, and asbestos-related pleural plaques. The differential diagnosis for the subsequent chest CT is pleural metastasis, sarcomatoid mesothelioma, and primary sarcoma of pleura / chest wall. The past medical history did not support asbestos-related pleural disease, noting no history of asbestos exposure. On chest CT, the unilateral contiguous pleural lesions appeared different from the typically bilateral multifocal discrete plaques seen with asbestos-related pleural plaques. Past medical history did not support fibrothorax, noting no history of prior trau-
ma, empyema, or tuberculosis. Moreover, the pleural lesions involved the mediastinal pleura, which are not seen with fibrothorax.

The Tc-99m MDP whole body scan demonstrated marked radiotracer uptake in the region of the left hemithorax, correlating with the high-density left pleural material seen on CT. The bone scan was challenging to interpret as it was obtained to evaluate for a possible rib lesion in the setting of breast cancer, so the pleural finding was minimized initially as an incidentaloma and attributed to talc pleurodesis as considered on initial chest CT. However, no abnormal uptake at sites of talc pleurodesis has been documented to occur on Tc-99m MDP bone scan, to our knowledge. It is on 18F-fluorodeoxyglucose (FDG)-PET, that talc pleurodesis stimulates an inflammatory response resulting in pleural thickening and FDG uptake, which can last for many years [7]. Tc-99m MDP is typically incorporated into bone via chemisorption in which it is used as a phosphate analog at sites of osteoblastic bone remodeling in osteoblastic metastatic disease as well as a variety of benign processes [8]. Tc-99m MDP uptake in the lungs has been reported in cases of calcified pulmonary adenocarcinoma [9], granulomatosis with polyangiitis, myelodysplastic syndromes, and pulmonary manifestations of multiple myeloma, with various proposed mechanisms for the abnormal radiotracer uptake in these processes. In pleural metastasis from osteosarcoma, Tc-99m MDP is likely incorporated by metastatic tumor cells into the osteoid deposits in the same way that the radiotracer is incorporated by osteoblasts in skeletal bone [10].

In this case, after subsequent CT demonstrated increase in pleural disease, the left pleural radiotracer uptake was attributed to pleural metastasis. Although benign etiologies of pleural hyperdensities on CT are more common, the increasing imaging findings over time support a malignant etiology. Also, the past medical history did not support any of the benign entities. On follow-up chest CTs, there was increasing extensive circumferential left pleural thickening with high-density foci. Moreover, other concurrent findings of disease progression were shown on subsequent chest CTs, including right lung metastasis, and left lung parenchymal opacities extending to the hilum. These imaging findings were highly suspicious for malignant etiology. Here, metastasis was more likely than a separate primary malignancy of the pleura, such as sarcomatoid mesothelioma or primary sarcoma, because the patient already had a known history of malignant sarcomatous phyllodes.

### Conclusion

The hyperdense pleural lesions were determined to represent pleural metastasis from osteosarcomatous breast phyllodes tumor. Arriving at this diagnosis required correlating multimodality imaging findings with careful review of past medical history and with close attention to pathology.

### References


