Unusual malignant breast lesions: imaging-pathological correlations

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ABSTRACT
This pictorial essay presents the common radiological (mammography and/or ultrasonography) and pathological findings observed in unusual malignant breast lesions, which include well-differentiated subtypes of invasive ductal carcinoma not otherwise specified (tubular, mucinous, papillary, and medullary carcinomas), metaplastic carcinoma, and metastases. This study also includes unusual ultrasonographic appearances of a plasmacytoma.

Key words: • breast neoplasms • mammography • ultrasonography

Unusual malignant breast tumors are well-differentiated subtypes of invasive ductal carcinoma (IDC) including tubular, mucinous, papillary, and medullary carcinomas that account for the 10% of invasive tumors (1, 2). Lymphoid and hematopoietic malignancies, mesenchymal stromal neoplasms and metastases are very rare (2). Radiological findings of unusual malignant breast tumors overlap with those of benign breast lesions and ordinary breast cancer (2). We discuss and show imaging (mammography and/or ultrasonography [US]) findings on these tumors and provide radiological-pathological correlation in this pictorial essay.

Tubular carcinoma
Tubular carcinoma accounts for 1%–2% of all breast cancers (2). An excess of 75% tubular elements are required for the diagnosis of tubular carcinoma (3). It is most common in women aged 40 to 60 years (3). Because of their small size, these lesions are often non-palpable and are usually detected incidentally through screening mammography. On mammography, this tumor appears as a small spiculated mass (Fig. 1) (3). This appearance mimics infiltrating ductal carcinoma and radial scars. On US, tubular carcinoma is an irregularly contoured mass with posterior acoustic shadowing (2, 3). Tubular carcinoma must be distinguished pathologically from spiculated lesions, such as sclerosing adenosis or scirrhous carcinoma (2, 3). Histopathologic examination reveals that these tubular carcinomas are composed of small round or oval tubules of ductal epithelium that infiltrate the stroma in a haphazard pattern. The lumina of the tubules is lined by a single type of ductal epithelium cell that abuts directly onto the adjacent stroma with no underlying myoepithelial cells.

Mucinous carcinoma
Mucinous (colloid) carcinoma accounts for 1%–7% of all breast carcinomas (4). This cancer usually occurs in women over 60 years old and is divided into pure or mixed types depending on the mucin rates in the tumor. Pure mucinous carcinoma is associated with a better prognosis and lower incidence of axillary lymph node metastasis (4, 5). The mammographic appearance is a low density, well-defined, or microlubulated mass due to the predominance of mucin. An irregular margin appears with decreased percentages of mucin (Fig. 2) (4). On US, more than one third of the mucinous carcinomas have mixed solid and cystic components. Posterior acoustic enhancement is common (5). Histopathological examination demonstrates a great amount of mucin lakes presenting a pure type of carcinoma. Lower mucin rates in mixed type tumors exhibit more irregular margins due to infiltrative tumor cells at the margins of the tumor (4, 5).
Unusual malignant breast lesions

Figure 1. a–d. A 52-year-old postmenopausal woman who underwent screening mammography. Right mediolateral oblique mammogram (a) shows focal asymmetric density measuring approximately 1 cm in the upper portion of the breast (arrow). Mediolateral oblique spot compression view of right breast (b) shows a small spiculated mass associated with microcalcifications (arrow). US image (c) shows a solid irregular mass. Core needle biopsy revealed invasive tubular carcinoma. Histologic slide (d) shows oval and angular glands in the moderately cellular breast stroma (hematoxylin-eosin stain, original magnification, ×200).

Figure 2. a–c. A 45-year-old woman with a palpable lump in her left breast. Left craniocaudal mammogram (a) shows a 3-cm, ill-defined, round mass indicating palpable abnormality in the inner portion of the breast. Mammography demonstrates another, 1-cm, low density, well-defined mass in the outer portion of the left breast (arrow). US image (b) shows round, homogenously hypoechoic masses in the inner and outer portion of the left breast. Core needle biopsy revealed that large mass was fibroadenoma (not shown) and the small one was mucinous carcinoma. Histologic slide (c) demonstrates that clusters of carcinoma cells are present in the mucin polls (hematoxylin-eosin stain, original magnification, ×100).
Papillary carcinoma

Papillary carcinoma accounts for 1%–2% of breast carcinomas (6). It generally occurs in women over 60 years old. Patients with papillary carcinoma often present a palpable central mass or bloody nipple discharge (6, 7). It is characterized by slow growth and better prognosis compared to ductal carcinomas not otherwise specified. The frequency of axillary nodal metastases is low (6, 7). The mammographic appearance is a solitary round or lobulated, relatively circumscribed mass or clusters of masses (6, 7), which may be associated with microcalcifications. The tumor can mimic a benign ductal papilloma at mammography (3). On US, papillary carcinoma often manifests as a single or multiple circumscribed solid mass or a complex cystic mass (Fig. 3) (3, 7). On histopathologic examination, the tumor can have in situ (intracystic or intraductal) or invasive components. In the in situ component, the neoplastic epithelial cells are usually characteristic of low-grade ductal carcinoma in situ. The absence of a uniform layer of myoepithelial layer distinguishes papillary carcinomas from benign papillary lesions (6).

Medullary carcinoma

Medullary carcinomas account for fewer than 2% of breast carcinomas (3). It occurs more frequently in women aged 35 years or younger (8, 9). It is a rapidly growing tumor and manifests as a palpable mass. The mammographic appearance is usually an uncalcified mass with ill-defined or circumscribed borders (8). Mammography cannot help distinguish true from atypical medullary carcinomas of the breast. On US, medullary carcinoma may have complex echogenicity with solid and cystic components and may be microlobulated (10).

Metastatic lesions

Breast metastases account for 0.5%–2% of breast carcinomas (12). The lesions tend to be superficially located in the upper outer quadrant. They are much more likely to be multiple or bilateral compared to primary cancers. The mammographic appearance is usually a round mass with circumscribed
Figure 4. a–d. A 48-year-old woman with a palpable right breast mass. Right mediolateral oblique (a) and craniocaudal (b) mammograms show a 1.5-cm, noncalcified, round mass with circumscribed margins in the inferior outer portion of the breast (arrows). US image (c) shows a circumscribed, lobulated, homogeneously hypoechoic mass. US-guided core needle biopsy revealed medullary carcinoma. Histologic slide (d) demonstrates syncytial sheets of carcinoma cells (arrows) surrounded by a diffuse lymphocytic reaction (hematoxylin-eosin stain, original magnification, ×200).

Figure 5. a, b. A 56-year-old woman with a rapidly growing palpable right breast mass. Left mediolateral oblique mammogram (a) shows a 3.5-cm high density, circumscribed mass with irregular margins at 12 o’clock. US image (b) shows a mass with irregular margins and heterogeneous echogenicity. Mass has both solid and cystic components. Core needle biopsy revealed metaplastic carcinoma.
or ill-defined margins. Axillary adenopathy is usually present (2, 12). On US, circumscribed, hypoechoic lesions are the usual feature (12). The most common extramammary cancers that metastasize to the breast are lymphoma, melanoma, soft tissue sarcoma, and lung, ovarian, and renal cell carcinomas (2, 12).

Non-Hodgkin lymphoma

Breast lymphoma is a rare disease representing only 0.1%-0.5% of all breast cancers (12, 13). Secondary involvement is more common and is almost always of non-Hodgkin’s type (2, 12). The most common mammographic manifestation of non-Hodgkin’s lymphoma, whether primary or secondary, is one or more uncalcified masses with circumscribed or relatively circumscribed margins (Fig. 6) (13).

Diffuse increased parenchymal density in combination with skin thickening can be seen (13). Bilateral axillary adenopathy is usually present (2, 12, 13). The US appearance is a hypoechoic mass with circumscribed margins. At histopathologic examination, the most common type is a diffuse large cell (histiocytic) lymphoma. Lymph node architecture is needed for a definitive diagnosis (2).

Plasmacytoma

Breast plasmacytoma is very rare. It may present as a solitary finding or in association with disseminated multiple myeloma (14, 15). More than half of the lesions are unilateral, with the majority of the cases occurring in the setting of multiple myeloma (14, 15). The mean age at presentation of breast plasmacytomas is 53 years. Tumors range in size from 1 to 7.5 cm (15). The mammographic appearance is single or multiple well-defined masses without spiculations and microcalcifications. On US, the masses may be either well-defined or ill-defined. They are round and hypoechoic with posterior shadowing or enhancement (14, 15). One patient with bilateral plasmacytoma is reported in this study. Mammographic examination demonstrated some masses with partial, lucent, halo signs (Fig. 7). The mammography findings were similar to the non-specific findings documented in previous studies (15). However, we observed well-defined hypoechoic masses containing central and peripheral hyperechoic rims on US (Fig. 7). The ultrasonographic appearance of breast plasmacytoma in this study has not been previously reported. Histopathologic analysis of breast

Figure 6. a–c. A 63-year-old woman with a history of non-Hodgkin’s lymphoma presented with a palpable mass in the left breast. Craniocaudal mammogram (a) shows a large, high density, round mass with circumscribed margins in subareolar region. US image (b) shows an oval, solid, hypoechoic mass with microlobulated margins. US-guided core needle biopsy revealed large cell lymphoma infiltration. Photomicrograph (c) demonstrates large cell non-Hodgkin’s lymphoma of the breast (arrows point to the breast parenchyma) (hematoxylin-eosin stain, original magnification, ×200). Inset (c) shows that the lesion is characterized by sheets of cells with large, convoluted nuclei atypical for lymphocytes (hematoxylin-eosin stain, original magnification, ×200).
plasmacytoma demonstrates myeloma infiltration.

Conclusion

There is a number of unusual malignant lesions with variable appearances on mammography and/or US. Tubular, mucinous, papillary, and medullary carcinomas have better prognosis compared to IDC not otherwise specified. Except for medullary carcinoma, they are slow growing tumors, and except for tubular carcinoma, tumors appear as relatively well-defined masses on mammograms. Metastatic lesions of the breast tend to be superficially located in the upper outer quadrant. Axillary adenopathy is often present. Plasmacytoma usually occurs in the setting of multiple myeloma. The lesions may have a partial halo on mammograms, and peripheral and central hyperechoic rims on US. In conclusion, radiologists may be in a better position regarding sound and accurate diagnoses of malignant breast lesions when familiarized with their radiologic findings and specific clinical and imaging clues.

Conflict of interest disclosure

The authors declared no conflicts of interest.

References