Diagn Interv Radiol 2012; 18:270–276

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 metastates 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 microlobulated 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).

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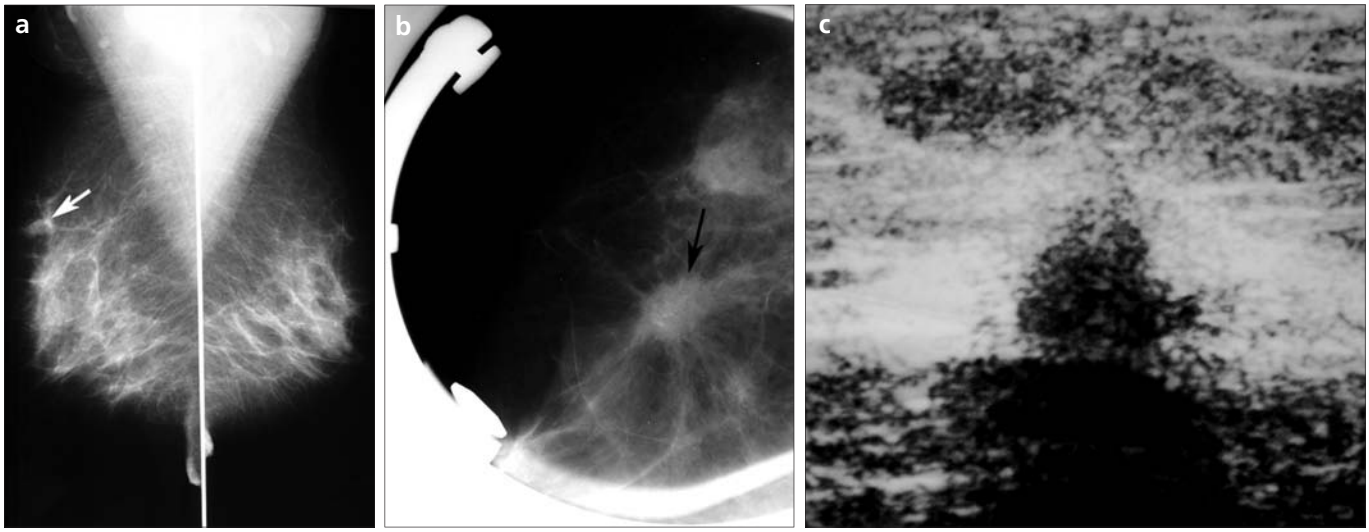
Received 11 April 2011; revision requested 9 May 2011; revision received 6 July 2011; accepted 19 July 2011.

Published online 27 September 2011
DOI 10.4261/1305-3825.DIR.4454-11.2



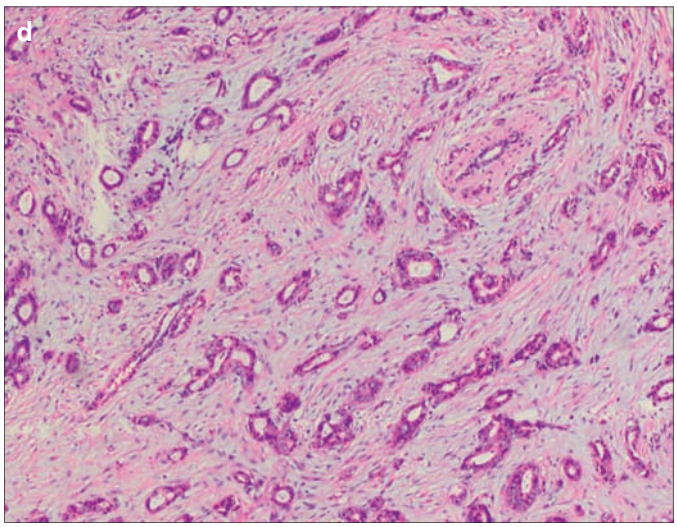


Figure 1. a–d. A 52-year-old postmenopausal woman who underwent screening mammography. Right mediolateral oblique mammogram (**a**) shows focal asymmetric density measuring approximately 1 cm in the upper portion of the breast *(arrow)*. Mediolateral oblique spot compression view of right breast (**b**) 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).

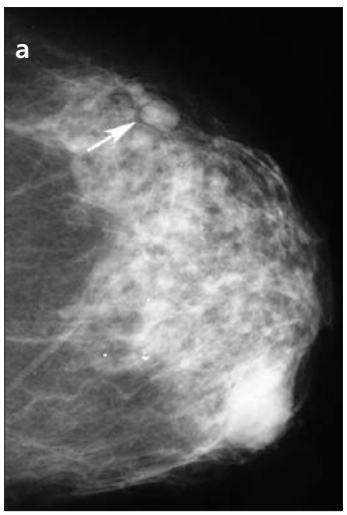
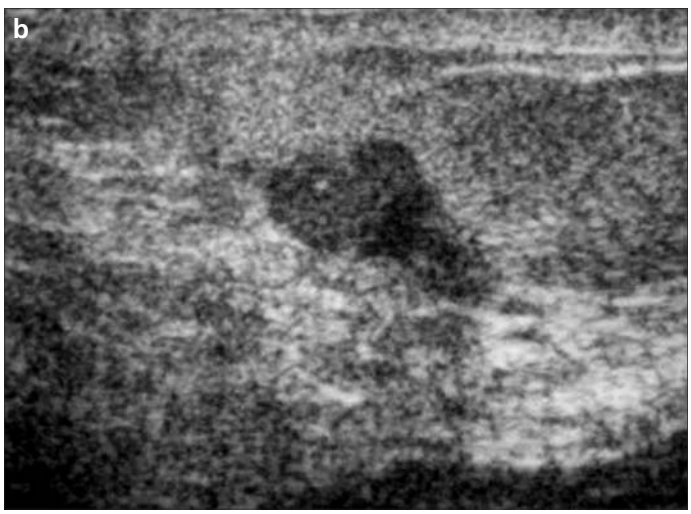
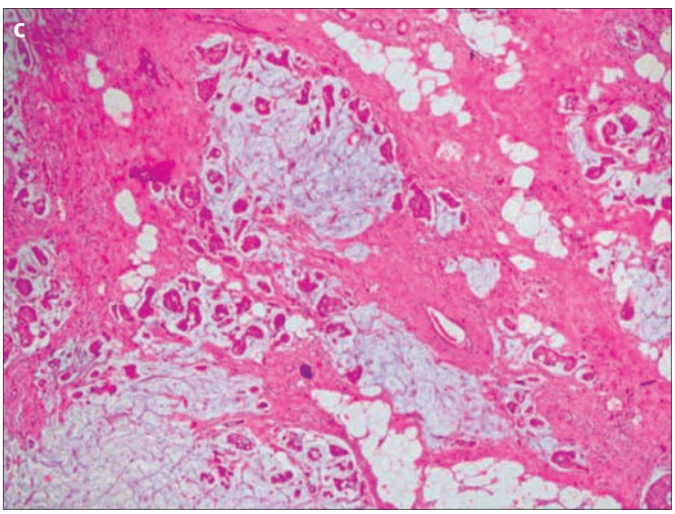
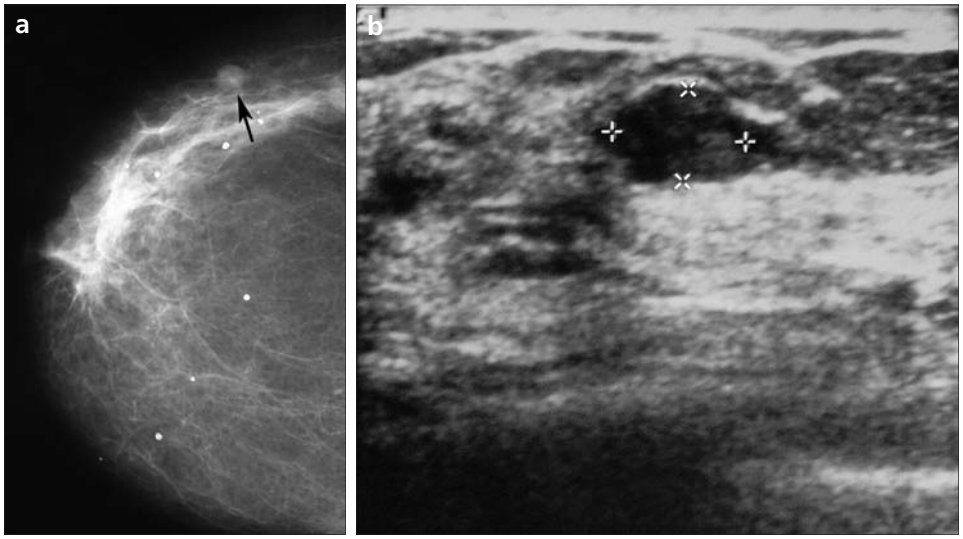


Figure 2. a–c. A 45-year-old woman with a palpable lump in her left breast. Left craniocaudal mammogram (**a**) shows a 3-cm, ill-defined, round mass indicating palpable abnormality in the inner portion of the breast. Mammography demonstrates another, 1-cm, low density, well-defined mass in the outer 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).







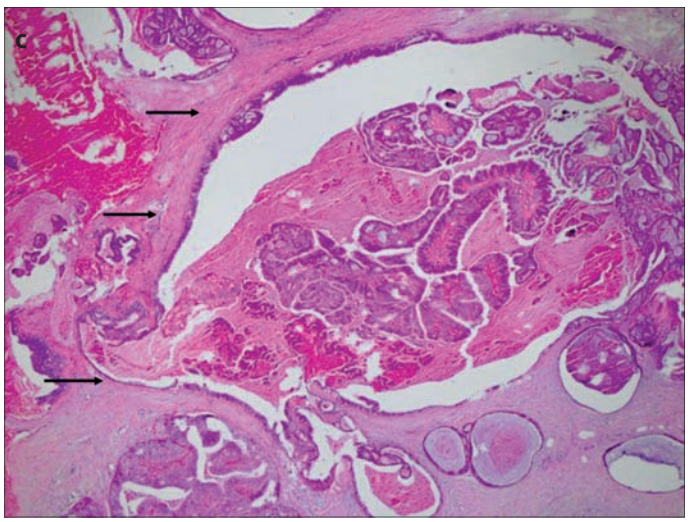


Figure 3. a–c. A 61-year-old woman with right-sided bloody nipple discharge. Right craniocaudal mammogram (**a**) shows a 1-cm, round, circumscribed mass in the outer portion of the breast *(arrow)*. US image (**b**) shows a complex cystic mass *(calipers)*. US-guided core needle biopsy revealed intraductal papillary carcinomas. Histologic slide (**c**) demonstrates tall columnar cells that form papillary fronds *(arrows)* (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

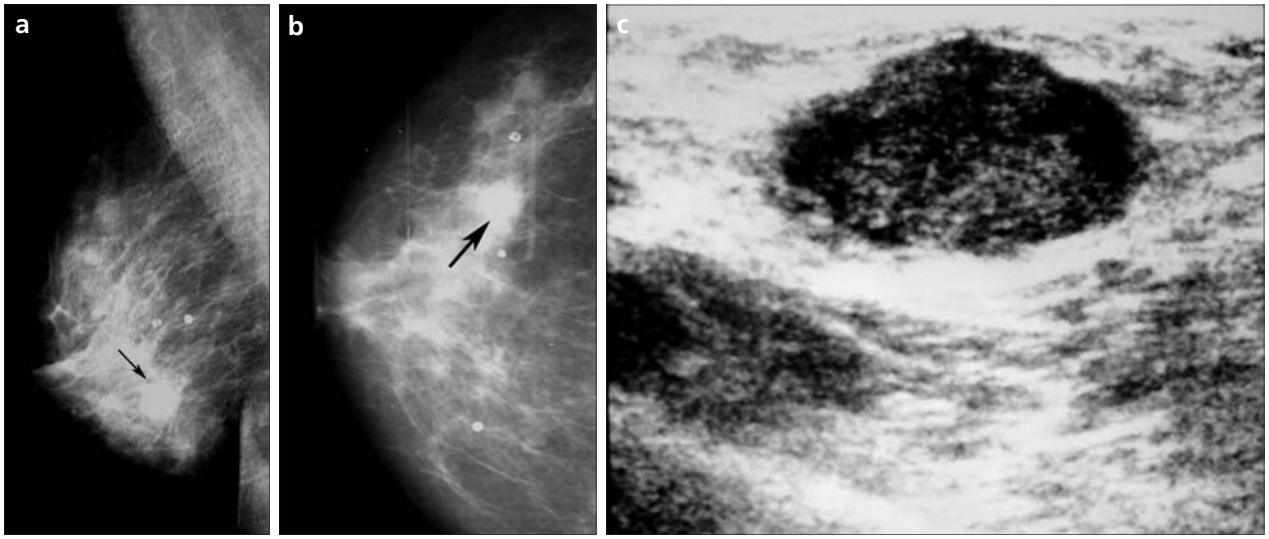
Medullary carcinomas account for fewer than 2% of breast carcinomas (3). It occurs more frequently in women aged 35 years or younger (8, 9). It is a rapidly growing tumor and manifests as a palpable mass. The mammographic appearance is usually an uncalcified mass with ill-defined or circumscribed borders (8). Mammography cannot help distinguish true from atypical medullary carcinomas of the breast. On US, the tumor manifests as a homogeneous or inhomogeneous hypoechoic mass with a well-defined margin (Fig. 4) (3, 9). Histopathologic examination reveals a well-circumscribed carcinoma composed of poorly differentiated cells with scant stroma and prominent lymphoid infiltration (8). The histological appearance of medullary carcinoma mimics atypical medullary carcinoma and IDC not otherwise specified (3, 8). However, the prognosis for this type of carcinoma is good.

Metaplastic carcinoma

Metaplastic carcinoma is a heterogeneous carcinoma with mixed epithelial and mesenchymal differentiation. Metaplastic changes include squamous cell, spindle cell, and heterologous mesenchymal growth (10, 11). It accounts for fewer than 5% of breast carcinomas (10, 11). Clinically, the tumor manifests as a rapidly growing, palpable mass in women who are more than 50 years old (11). Axillary lymph node metastasis is infrequent (10). The mammographic appearance is a round, lobular, oval lesion with a predominantly circumscribed, high density mass (Fig. 5) (10, 11). On US, metaplastic 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



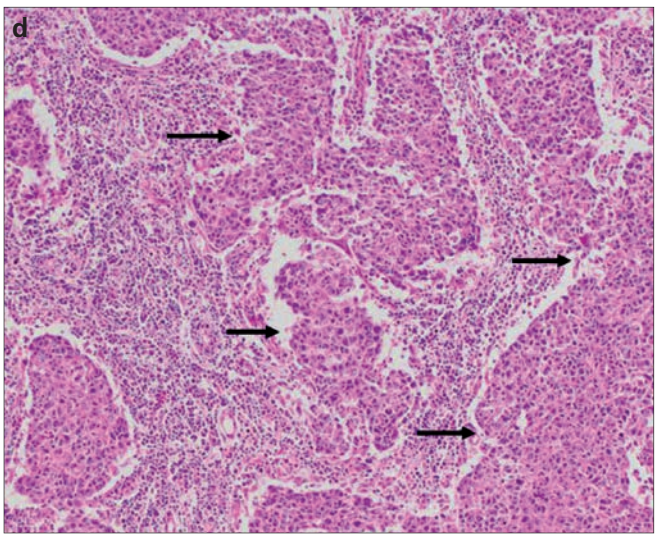


Figure 4. a–d. A 48-year-old woman with a palpable right breast mass. Right mediolateral oblique (**a**) and craniocaudal (**b**) mammograms show a 1.5-cm, noncalcified, round mass with circumscribed margins in the inferior outer portion of the breast *(arrows)*. US image (**c**) shows a circumscribed, 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).

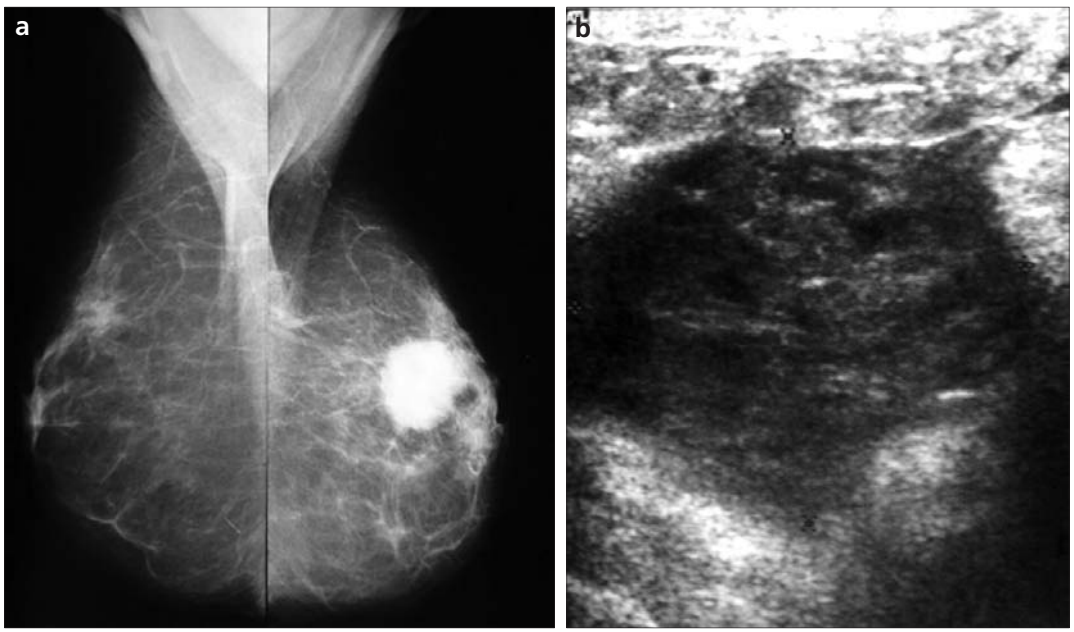


Figure 5. a, b. A 56-year-old woman with a rapidly growing palpable right breast mass. Left mediolateral oblique mammogram (**a**) shows a 3.5-cm high density, circumscribed mass with irregular margins at 12 o'clock. US image (**b**) shows a mass with irregular margins and heterogeneous echogenicity. Mass has both solid and cystic components. Core needle biopsy revealed metaplastic carcinoma.

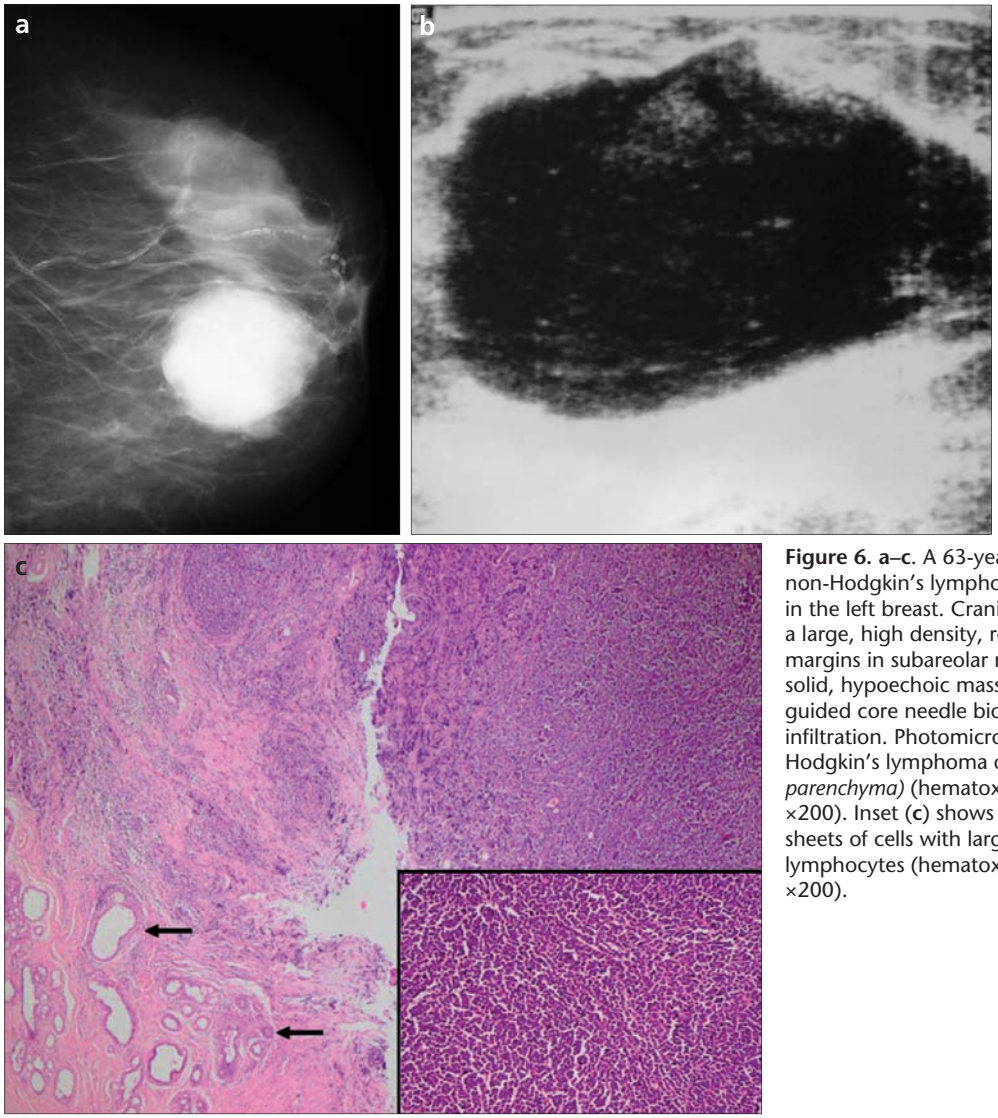


Figure 6. a–c. A 63-year-old woman with a history of non-Hodgkin's lymphoma presented with a palpable mass in the left breast. Craniocaudal mammogram (**a**) shows a large, high density, round mass with circumscribed margins in subareolar region. US image (**b**) shows an oval, solid, hypoechoic mass 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).

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 involment 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 apperance 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

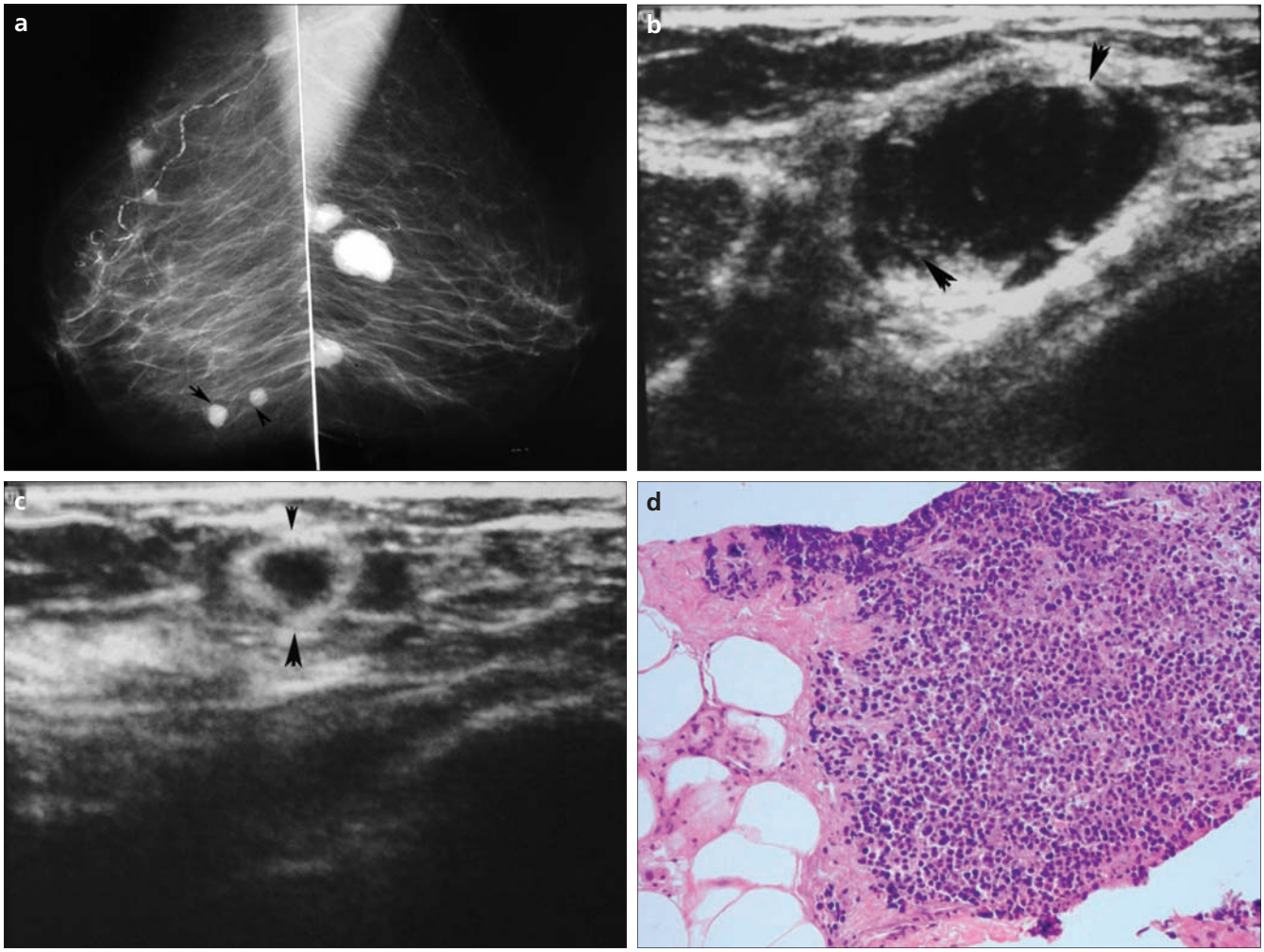


Figure 7. a–d. A 54-year-old woman with multiple myeloma presented with a lump in her left breast. Bilateral mediolateral oblique mammogram (**a**) demonstrates multiple, well-defined, oval or round masses bilaterally *(arrows).* Some masses have partial lucent halo sign. US image (**b**) shows a well-defined, hypoechoic left breast mass containing central hyperechoic rim *(arrowheads).* US image (**c**) shows a well-defined, hypoechoic right breast lesion with a hyperechoic rim *(arrowheads).* US-guided core needle biopsy revealed bilateral plasmacytomas with plasma cells similar to those seen in the bone marrow. Histologic slide (**d**) demonstrates atypical plasma cells in the breast parencyma (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

1. Li CI, Uribe DJ, Daling JR. Clinical characteristics of different histologic types of breast cancer. Br J Cancer 2005; 93:1046–1052.
2. Harvey JA. Unusual breast cancers. Useful clues to expanding the differential diagnosis. Radiology 2007; 242:683–694.
3. Bilgen IG, Oktay A. Tubular carcinoma of the breast: mammographic, sonographic, clinical and pathologic findings. Eur J Radiol 2007; 61:158–162.
4. Memis A, Ozdemir N, Parildar M, Ustun EE, Erhan Y. Mucinous (colloid) breast cancer: mammographic and US features with histologic correlation. Eur J Radiol 2000; 35:39–43.
5. Lam WWM, Chu WCW, Tse GM, Ma TK. Sonographic appearance of mucinous carcinoma of the breast. AJR Am J Roentgenol 2004; 182:1069–1074.
6. Soo MS, Williford ME, Bentley RC, Kornguth PJ. Papillary carcinoma of the breast: imaging findings. AJR Am J Roentgenol 1995; 164:321–326.
7. Muttarak M, Lerttumnongtum P, Chaiwun B, Peh WCG. Spectrum of papillary lesions of the breast: clinical, imaging, and pathologic correlation. AJR Am J Roentgenol 2008; 191:700–707.

8. Liberman L, LaTrenta LR, Samli B, Morris EA, Abramson AF, Dershaw DD. Overdiagnosis of medullary carcinoma: a mammographic-pathologic correlative study. Radiology 1996; 201:443–446.
9. Meyer JE, Amin E, Linfors KK, Lipman JC, Stomper PC, Genest D. Medullary carcinoma of the breast: mammographic and US appearance. Radiology 1989; 170:79–82.
10. Bilgen IG, Memis A, Ustun EE, Zekioglu O, Ozdemir N. Metaplastic carcinoma of the breast: clinical, mammographic, and sonographic findings with histopathologic correlation. AJR Am J Roentgenol 2002; 178:1421–1425.
11. Patterson SK, Tworek JA, Roubidoux MA, Helvie MA, Oberman HA. Metaplastic carcinoma of the breast: mammographic appearance with pathologic correlation. AJR Am J Roentgenol 1997; 169:709–712.
12. Feder JM, Shaw de Paredes E, Hogge JP, Wilken JJ. Unusual breast lesions: radiologic-pathologic correlation. Radiographics 1999; 19:11–26.
13. Pameijer FA, Beijerinck D, Hoogenboom HHVM, Deurenberg JJMD, Nortier JWR. Non-Hodking's lymphoma of the breast causing miliary densities on mammmography. AJR Am J Roentgenol 1995; 164:609–610.
14. Brem RF, Revelon G, Willey SC, Gatewood OMB, Zeiger MA. Bilateral plasmacytoma of the breast: a case report. Breast J 2002; 8:393–395.
15. Kocaoglu M, Somuncu I, Bulakbasi N, et al. Multiple myeloma of the breast: mammographic, ultrasonographic, and magnetic resonance imaging features. Eur J Radiol Extra 2003; 47:112–116.