Breast Stromal Tumors and Carcinoma with Sarcomatous Metaplasia. Radiological-Pathological Correlation

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Learning objectives

The objective of this exhibit is to describe clinical presentation, radiologic findings and histopathologic features of some breast stromal tumours and carcinoma with sarcomatous metaplasia of the breast.

Background

We retrospectively reviewed 17 cases of breast stromal tumours and breast metaplastic carcinomas with sarcomatous differentiation and describe the clinical and radiological spectrum and correlate mammographic, ultrasonographic and MR images to pathologic patterns. We also review some immunohistochemical markers in metaplastic carcinomas.

Imaging findings OR Procedure details

The radiology and pathology databases of our institution were retrospectively reviewed and 13 breast stromal tumours and 4 pathologically proven breast metaplastic carcinoma were selected.

In this exhibit we present 17 cases and the patients were subdivided into two groups:

- **Breast stromal tumours**: 2 lipomas (Fig. 1-3), 1 haemangioma (Fig. 4-6), 1 hamartoma [1] (Fig. 7-9), 3 pseudoangiomatous stromal hyperplasia PASH [2,3] (Fig. 10-13), 1 granular cell tumour [4] (Fig. 14-16), 3 fibromatosis [5] (Fig. 17-22), 1 angiosarcoma [6] (Fig. 23-25) and 1 metastatic leiomyosarcoma [7] (Fig. 26-29).

- **Breast carcinoma with sarcomatous metaplasia**: 4 poorly differentiated adenocarcinoma with areas of matrix-producing differentiation, 3 of them presented mesenchymal chondroid component (Fig. 30-40) and the other one presented osseous metaplasia component (Fig. 41-43) [8-10].

The patients were 18-83 years old (mean: 50 years).
8 postmenopausal women, one of them received hormonal therapy replacement and the other 9 patients were premenopausal women.

**CLINICAL PRESENTATION:**

14 patients presented a palpable nodule/mass and 3 cases were incidental findings: 1 patient diagnosed of infiltrating ductal carcinoma in left breast that underwent breast conservative treatment with mammographic follow-up (Fig.19-20) and 2 women in a screening program (Fig. 23-29). One of them was asymptomatic and the other one underwent bilateral nephrectomy for bilateral renal leiomyosarcoma but she did not refer us to a palpable lump in her left breast.

**IMAGING FINDINGS:**

- **Mammographic findings:** 11 cases showed a dense nodule/mass (12-40 mm.) with variables margins: 5 circumscribed, 2 partially well-defined (one of them presented osteoid matrix), 1 ill-defined and 3 showed spiculated margins.

1 lesion was an encapsulated mass with heterogeneous density.

2 cases of palpable lesions were not mammographically visible.

In 3 women younger than 30 (18, 24 and 27 years) who had palpable masses, mammograms were not performed and US was used as the initial imaging study. Two of them were large and rapidly enlarged tumours and one doubled the size of the young patient’s breast.

- **Ultrasonographic findings:** all the documented tumours in the exhibit were ultrasonographically visibles. 10 cases were a well-circumscribed nodule/mass and 7 cases showed irregular and ill-defined lesions.

15 nodules were hypoechoic or predominantly hypoechoic (6 with accoustic shadowing, 7 with posterior enhancement and 2 had no effect on US transmission), highlighting a lesion with cystic component, a large mass with microcysts and a mass with ossified osteoid matrix.

1 nodule was hyperechoic and 1 nodule showed heterogeneous echogenicity, both without suspect criteria.
In general ultrasonography showed homogeneous lesions except for a mass with cystic component, a mass with microcysts and a mass with ossified osteoid matrix.

- **MR findings:** MR was performed in 8 cases [8].

5 well-defined tumours were found: 2 of them with internal septations one of which contained cystic spaces.

3 circumscribed lesions showed progressive enhancement curves and the other 2 showed suspicious curve type on dynamic measurements.

1 ill-defined nodule showed a progressive enhancement and a partially well-defined nodule, as well as a spiculated mass showed suspicious enhancement curves.

**PATHOLOGY: general features and immunohistochemistry:**

Breast stromal tumours are rare benign and malignant mesenchymal neoplasms and carcinoma with sarcomatous metaplasia of the breast is an uncommon infiltrating carcinoma (<1%) that includes a heterogeneous group of neoplasms characterised by the coexistence of invasive ductal carcinoma with areas of matrix producing sarcomatous (chondroid, osseous) differentiation [9].

Breast metaplastic carcinoma is characterised by aggressive pathological parameters: large tumour size and high nuclear grade.

Immunohistochemistry has an important role to play in the diagnosis and treatment decision of metaplastic carcinoma that presents a high incidence of triple negative breast cancer [10].

**Images for this section:**
**Fig. 1:** This patient was referred for diagnostic with a palpable mass in the upper outer quadrant of her right breast. Mammography (MLO view) showed an oval circumscribed mass that only contains fat (arrow).
Fig. 2: Sonographic images of lipomas. Solid, homogeneous, oval, smooth and well-defined masses. Many lipomas are isoechoic and can be difficult to identify.
Fig. 3: Micropathology of biopsied lipoma demonstrates mature adipocytes without atypia.
Fig. 4: A 83-year-old woman with a lump in the lower quadrants of the right breast and no prior mammograms. A-B: Mammography (MLO and CC views) showed a solitary round well-circumscribed nodule corresponding to the palpable lesion.
**HEMANGIOMA**

**Fig. 5:** On ultrasonographic examination the lesion appeared solid, hyperechoic, homogeneous with well-defined margins (calipers) in superficial lower quadrants of the right breast. US-guided core biopsy showed hemangioma.
**Fig. 6:** Micropathology of a sample obtained by 14G core biopsy of hemangioma shows occupied by erythrocytes dilated vessels lined by endothelial cells without atypia.
Fig. 7: A-B: Mammography (CC view) of the right breast in a 54 year-old woman showed a circumscribed palpable mass (arrows) in the outer quadrants with a thin connective tissue capsule and the halo sign. The lesion was composed of variable amounts of fibroglandular and fatty tissue.
**Fig. 8:** Sonographic evaluation of the palpable mass described in the previous mammography (fig.7) demonstrates a 8 cm. solid oval, smooth, circumscribed and heterogeneous mass displacing adjacent tissue in the upper outer quadrant of the right breast.
**Fig. 9:** Biopsy specimen of this lesion (myoid hamartoma) is composed of adipose tissue and myoepithelial cells.
Fig. 10: A 24-year-old woman was referred for diagnostic imaging of an intramammary palpable mass. The lesion enlarged rapidly and doubled the size of her right breast. Ultrasound showed a large (10.5 cm) and heterogeneous solid tumor, predominantly hypoechoic with well-defined cystlike areas (image not shown). US-guided core biopsy was performed and multiple specimens revealed benign stromal tumor (PASH), confirmed at wide local excision. A-B: coronal GRE 3D T1FS pre and post Gd 2 min. after i.v. administration of contrast medium MR images demonstrating a well-encapsulated large tumoral mass displacing adjacent fibroglandular tissue. The lesion presented cysts containing proteinaceous material or hemorrhage and intratumoral fat with little increase in signal enhancement after contrast infusion. C: This enhancement curve pattern is frequent in benign lesions and was also observed in PASH (an uncommon breast benign lesion).
Fig. 11: A 18-year-old woman with a rapidly growing breast palpable tumor in the inner quadrants of her left breast. A: Ultrasound revealed a circumscribed solid nodule. It was hypoechoic, homogeneous (note the posterior enhancement) and an US-guided 14G core biopsy revealed features of PASH. B: coronal GRE 3D T1FS post Gd MR images showed a well-defined nodule with nonenhancing internal septations.
Fig. 12: A 45-year-old woman taking hormone replacement therapy who had a palpable mass with rapid growth in outer quadrants of the right breast. A-B: MLO and CC mammograms of right breast showed a partially well-circumscribed mass (arrows) corresponding to patient’s area of clinical concern. C: Ultrasound showed a solid, oval and circumscribed mass (calipers). The lesion was predominantly hypoechoic with heterogeneous internal echoes. US-guided core biopsy revealed PASH. Excisional biopsy confirmed the diagnosis.
Fig. 13: Photomicrograph shows typical pseudoangiomatous stromal hyperplasia: mammary stroma contains a network of anastomosing slitlike pseudovascular spaces.
Fig. 14: A 46-year-old woman was referred for diagnostic imaging of a palpable nodule in the lower outer quadrant of her right breast. Standard mammogram (MLO and CC views) performed was negative (not shown). As the palpable lesion was not mammographically visible, an ultrasound was performed demonstrating that the palpable abnormality was correlated with an irregular, solid and hypoechoic shadowing nodule (calipers). Ultrasonographic findings were indistinguishable from carcinoma. Histopathology at US-core(14G)biopsy showed granular cell tumor.
Fig. 15: RM images in this patient (same case as previous fig. 14). A: axial GRE 3D T1FS pre i.v. administration of contrast medium demonstrated an irregular nodule in the lower outer quadrant of the right breast (arrow). B: axial GRE 3D T1FS post Gd (2 min.) revealed an enhancing lesion (arrow) with C: a continuous increase curve. Surgical excision was performed and confirmed granular cell tumor.
Fig. 16: Histology shows granular cells (abundant eosinophilic citoplasm and granular appearance) infiltrating the fatty breast stroma.
Fig. 17: A 61-year-old woman was diagnosed with invasive ductal carcinoma in the left breast in 2000. She underwent left wide local excision and axillary nodal dissection. The patient received chemotherapy as well as radiotherapy to the preserved left breast. She was under postoperative imaging follow-up. Mammograms performed in 2001 (not shown) revealed a spiculated density without calcifications under surgical scar of the left breast that correlated with post-surgical changes. Suspect breast lesions were not found on clinical examination but mammography in 2002 (fig. 17) showed that the density in the left breast seemed to increase in size. A:Mammography in the MLO and CC projections of left breast showing increase in size of the spiculated dense region identified previously under surgical scar.
Fig. 18: A: sonography showed a solid mass with irregular margins correlated with the spiculated dense mass identified at mammograms (fig.17). US-guided 14G biopsy revealed a fibromatosis-like lesion. B: MR images of the left breast showed postoperative scarring with a little nonenhancing central fluid collection (seroma) and pseudonodular enhancement areas (arrows). These findings were compatible with early tumor recurrence after conservative surgery, so surgical wide local excision was performed. Histopathologically of the lesion was mammary fibromatosis and there was no evidence of malignancy.
Fig. 19: An asymptomatic 56-year-old woman in mammographic follow-up. Four years earlier she was diagnosed of high grade DCIS in the upper quadrants of her left breast and she underwent breast conserving treatment (lumpectomy and radiation). A-D: mammographic views A (CC) and C (MLO) showed a distortion and a new central focal density in the lumpectomy site (arrows). Mammography magnification B (CC) and D (MLO) of the non palpable radiologic finding (arrows).
Fig. 20: Ultrasound in this patient showed a hypoechoic nodule with posterior shadowing in the upper quadrants of the left breast and established concordance with highly suspicious mammographic finding (fig. 19). US-guided biopsy showed mammary fibromatosis.
Fig. 21: A 27-year-old woman who was referred for diagnosis of a palpable mass with progressive growth in the upper quadrants of left breast. Ultrasound revealed a solid and mixed hypoechoic and hyperechoic oval mass corresponding to the palpable lesion. The mass presented ill-defined margins, measuring 4 cm. US-guided (14G) core biopsy demonstrated features suggestive of fibromatosis-like. Excisional biopsy revealed mammary fibromatosis.
**Fig. 22:** Micropathology of fibromatosis shows digitiform fascicles of spindle cells without atypia with abundant collagen compressing a mammary lobule (right).
**Fig. 23:** This asymptomatic 59-year-old woman underwent screening mammography. A-B: MLO and CC routine projections of right breast revealed, in the inner quadrants of her right breast, a nonpalpable nodule poorly defined (arrows), new compared to prior mammograms. C: Ultrasound demonstrated a hypoechoic solid nodule (12 mm.) with irregular margins (arrow) corresponding to the mammographic finding. US-guided core biopsy revealed angiosarcoma.
Fig. 24: A: axial TSE T2 MR images showed a 12 mm. diameter well-defined hyperintense nodule (arrow) in the inner central right breast corresponding to the mammographic and ultrasonographic findings (fig. 23). B-C: coronal GRE 3D T1FS postGd MR showed a weak peripheral ring enhancement nodule with a slow and progressive signal curve. This enhancement curve pattern has also been described in low grade angiosarcoma, in this case corresponding to the US-guided biopsied lesion (fig. 23) and confirmed at surgical excision.
Fig. 25: Photomicrograph shows breast angiosarcoma: anastomosing vascular channels lined with atypical endothelial cells dissecting mammary stroma.
Fig. 26: A 67-year-old woman presented a palpable lump in the lower inner quadrant of the left breast. She underwent bilateral nephrectomy for bilateral renal leiomyosarcoma few years earlier. A-B: Mammographic views (MLO and CC) showed a well-defined and lobulated nodule corresponding to the palpable lump in the lower inner quadrant (arrows).
Fig. 27: Ultrasound of the lump in the left breast showed a solid circumscribed and gently lobulated nodule measuring 2 cm. It was hypoechoic and homogeneous with posterior enhancement. US-guided 14G core biopsy revealed a mesenchimal tumor (leiomyosarcoma) indicative of spread diffuse metastatic disease.
Fig. 28: A: coronal GRE 3D T1FS postGd MR image showed in the lower inner quadrant (subcutaneous) of the left breast a bilobulated lesion or 2 nearby nodules. The inner area measuring 2 cm. in greatest dimension, presented strong enhancement (B: with initial signal increase). Laterally to this lesion, another nodule showed no significant increase in signal enhancement with peripheral slight enhancement.
Fig. 29: Histopathologic findings of metastatic leiomyosarcoma reveal atypical spindle cells fascicles of smooth muscle lineage.
Fig. 30: A 36-year-old woman presented a rapidly enlarging palpable mass in the upper outer quadrant of her right breast. A-B: MLO and CC mammography showed a dense round mass with indistinct margins corresponding to the large palpable lesion.
**Fig. 31:** Ultrasound of preceding case (fig. 30) directed to palpable mass showed a 4 cm. solid and defined lesion with lobulated margins. It was hypoechoic and homogeneous with posterior enhancement. US-guided core biopsy specimens revealed metaplastic carcinoma. At surgical excision histopathologically the tumor showed a poorly differentiated adenocarcinoma with areas of chondroid matrix.
Fig. 32: A: MR sagital TSE T2 showed a 4 cm. round nodule in the upper outer right breast corresponding to the palpable lesion shown in previous images (Fig. 30 and 31) and multiple axillary lymph nodes of varying size highly suspicious for metastatic nodes. B: axial GRE 3D T1FS post Gd (2 min.) subtraction MR showed a very heterogeneous ring enhancement mass and C: curve type obtained in dynamic measurements revealed a rapid initial signal increase and a plateau postinitial signal behavior.
Fig. 33: A 58-year-old woman presented a palpable rapidly enlarging mass in the right breast. A-B: mammograms (MLO and CC views) showed a dense partially well-defined nodule in the lower outer quadrant corresponding to the palpable tumor.
**METAPLASTIC CARCINOMA WITH CHONDROID DIFFERENTIATION**

![Ultrasound Image]

**Fig. 34:** Ultrasound of the mass showed it to be solid, hypoechoic with microlobulated well-defined margins and posterior enhancement. US-guided 14G biopsy revealed high-grade sarcoma, but finally high grade metaplastic carcinoma with chondroid differentiation and high grade invasive ductal carcinoma was confirmed at right mastectomy.
METAPLASTIC CARCINOMA WITH CHONDROID DIFFERENTIATION

Fig. 35: A: axial TSE T2 MR image showed a well-circumscribed nodule measuring 2.6 cm. in lower outer right breast (same lesion as fig. 33 and 34). B: coronal GRE 3D T1FS postGd (2 min.) subtraction MR showed a ring enhancing nodule and C: curve type obtained in dynamic measurements revealed a rapid initial signal increase and a persistent postinitial signal behavior.
**Fig. 36:** A 63-year-old woman presented a rapidly enlarging palpable tumor in her left breast. A-B: Mammography (CC and MLO views) of left breast showed an irregularly shaped spiculated high density mass in the upper outer quadrant corresponding to patient’s palpable lesion.
Fig. 37: Ultrasound of this palpable outer mass (fig. 36) revealed a heterogeneous solid lesion, with lobulated and partially well-defined margins and a thick-walled cystic component with thick internal septations and internal debris within the mass. US-guided aspiration of the cystic component showed tumoral cells. US-guided core biopsy and excision confirmed metaplastic carcinoma with chondroid differentiation.
Fig. 38: A: sagital T2 MR image showed in the upper outer quadrant of left breast a 3,7 cm. lobulated nodule with heterogeneous signal intensity. B: axial STIR image revealed hyperintense component within the tumor corresponding to necrosis or cystic area described in ultrasonographic study (Fig. 37).
**METAPLASTIC CARCINOMA WITH CHONDROID DIFFERENTIATION**

**Fig. 39:** A: axial GRE 3D T1FS postGd MR image showed a ring enhancing lobulated lesion corresponding to proven metaplastic carcinoma with chondroid differentiation. B: curve type obtained in dynamic measurements revealed a rapid initial signal increase and a plateau postinitial signal behavior.
Fig. 40: Histopathology picture of metaplastic carcinoma with chondroid differentiation shows: areas of chondroid matrix with atypical cells and poorly differentiated adenocarcinoma (bottom right). Immunohistochemical tests were performed in order to obtain data on estrogen and progesterone receptors (ER and PR) and HER/2. ER, PR and HER/2 were negative (triple negative).
Fig. 41: A 80-year-old woman was referred for diagnostic imaging of a palpable mass in upper outer quadrant of left breast. A-B: mammography (CC and MLO views) showed a dense and partially circumscribed tumor with extensive dense calcifications. C-D: detail in CC and MLO views of the lesion showed multiple large, coarse and heterogeneous calcifications in a dense mass.
Fig. 42: Ultrasound of the lesion (fig.41) revealed a solid and heterogeneous mass, predominantly hypoechoic with large shadowing calcifications within the lesion. US-guided (14G) core biopsy specimens showed breast osteosarcoma and mastectomy revealed metaplastic carcinoma with osseous differentiation.
**METAPLASTIC CARCINOMA WITH OSSEOUS DIFFERENTIATION**

**Fig. 43:** Histopathology of metaplastic carcinoma with osseous differentiation revealed that calcifications were ossification and shows: areas of osteoid matrix interspersed with infiltrating ductal carcinoma. Immunohistochemical tests were performed in order to obtain data on estrogen and progesterone receptors (ER and PR) and HER/2. ER, PR and HER/2 were negative (triple negative).
Conclusion

Imaging findings of breast stromal tumours and carcinoma with sarcomatous metaplasia of the breast are nonspecific so it is very important that radiologist become familiar with the various mammographic and sonographic appearances and MR findings to better advise management.

The most common clinical presentation is a palpable nodule/mass, the most frequent imaging finding is a well-circumscribed or partially well-defined nodule/mass and the best imaging tool is contrast-enhancement MR, but the diagnosis of these lesions is pathological. Most "sarcomas" of the breast are actually metaplastic carcinomas and primary breast sarcomas are really rare nonepithelial breast tumours.

The management of these rare neoplasms that have a significant clinical and morphologic overlap necessitates careful, studied consultation among the radiologist who performs the biopsy, the pathologist, and the clinician.

References


Personal Information