Metaplastic breast carcinoma: Radiologic findings with pathologic correlation

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Learning objectives

The learning objectives of this exhibit are to review mammographic, ultrasonographic and magnetic resonance findings of metaplastic carcinoma of the breast and correlate the radiological features with clinical and histopathologic findings.

Background

Metaplastic carcinoma of the breast accounts for less than 5% of breast carcinomas. It presents as a rapidly growing, palpable mass, and it is a breast carcinoma that exhibits varied patterns of metaplasia and differentiation along multiple cell lines.

This mixed cell differentiation is seen both morphologically and immunophenotypically, as evidenced by immunohistochemical expression of markers of mesenchymal cells (vimentin), epithelial cells (pancytokeratin), and myoepithelial cells (S-100, smooth-muscle actin, and p63).

It is a histologically diverse type of malignancy in which a ductal carcinoma is found to co-exist with an admixture of spindle cell, squamous, chondroid or bone-forming neoplastic cells. Less commonly it may exhibit fibrosarcoma, glioma, melanoma, rhabdomyosarcoma, angiosarcoma or liposarcoma.

Historical names are matrix-producing carcinoma, squamous cell carcinoma, spindle cell carcinoma, carcinosarcoma, and adenosquamous carcinoma.

The differential diagnosis between invasive ductal carcinoma and metaplastic carcinoma is important for treatment planning and prognosis.

We reviewed 26 metaplastic carcinomas diagnosed to 25 women between 1996 and 2008. One patient had bilateral synchronous metaplastic carcinoma.

Patient's age ranged from 31 to 93 years (mean 53'2).

All patients presented with a single palpable firm mass without skin changes or nipple retraction.

Mammography was performed to all 26, ultrasound to 23 and magnetic resonance to 6 cases. Radiological findings were classified according to the American College of Radiology of Breast Imaging Reporting and Data System (BI-RADS) classification.
Pathologically, size, tumor type and presence of necrosis and osteoclast-like cells were assessed, and immunostains for oestrogen and progesterone receptors, HER2, and markers of mesenchymal, epithelial and myoepithelial cells were performed.

Breast-conserving surgery was performed in fifteen patients. Eleven patients were treated with radical mastectomy.

Axillary node dissection was performed in twenty-three patients, and axillary metastasis were detected in eleven patients.

Three patients developed metastatic dissemination in brain, forearm skin and bronchus.

**Imaging findings OR Procedure details**

**Mammography** was performed to all patients.

Sixty nine per cent of the tumours were round or lobular, 76'9 % had circumscribed or indistinct margins. (Figures 1, 2)

Mean size of the tumours was 44’31 mm (120 - 5 mm).

All masses were highly dense. Twelve masses were round, six lobular, seven irregular and one oval. Margins were circumscribed in seven masses, microlobulated in four and indistinct in thirteen. Two masses had spiculated borders. Five tumours had calcifications. (Figures 3, 4, 5, 6, 7, 8, 9 )

**Sonography** was performed to 23 patients.Ten masses had circumscribed margins, ten microlobulated, one spiculated and two indistinct. Thirteen tumours had both solid and cystic areas inside. Posterior acoustic enhancement was seen in 56'5% of the cases. (Figures10, 11, 12, 13, 14, 15, 16, 17)

**Magnetic Resonance Imaging** was performed to 6 patients.

All tumors had type 2 or 3 enhancement and four had cystic areas, shown as a hypersignal area on T2-weighted images. This sign is useful to differentiate metaplastic carcinoma from other ductal carcinoma not otherwise specified.

The uptake morphology was ring-like in 4 cases, secondary to the extensive central necrosis shown in these tumours. (Figures 18, 19)

At pathology, metaplastic carcinoma must have a neoplastic component that is either squamous or non-epithelial, that can involve a small focus or an extensive proportion of the tumour.

Metaplastic carcinomas can be:
• pure epithelial metaplastic carcinomas, with spindle and/or squamous differentiation
• mixed epithelial/mesenchymal metaplastic carcinomas, with no squamous or sarcomatous differentiation.

Histologic subtype in our series were: (Figure 20)

Metaplastic Squamous components: 19

Pure squamous: 1

Mixed epithelial-mesenchymal: 3, two in the same patient with chondroid differentiation, and one with chondroid and osteoclast-like giant cells differentiation.

Spindle cells: 2

Spindle cells and osteoclast-like giant cells: 1

Osteoclastic giant cells can occur in invasive ductal, lobular, papillary or squamous types of breast carcinoma. (Figure 21)

Mixed epithelial-mesenchymal tumours showed transition to a cartilaginous stromal matrix cells.

In spindle cell carcinoma the fusocellular component predominates, resembling a low-grade sarcoma or a reactive process. (Figure 22)

Immunohistochemical staining with p63 is valuable in the differential diagnosis with other sarcomas and mixed tumours of the breast.

In the pure squamous carcinoma there were no features of glandular differentiation (Figure 23)

Calcifications can be associated to osseous metaplasia or keratin calcified nodules, in one of our cases was associated to keratin calcified nodule (Figure 8). In another case it was associated to ductal carcinoma in situ with comedo necrosis.

Cystic components seen at ultrasound examinations corresponded to cystic degeneration of the squamous component in 3 cases (Figures 24, 25) and to necrosis in 10 cases. (Figures 24, 26)

This cystic component results in a cystic radiological appearance that may be misdiagnosed with papillary tumor or abscesses.

All patients had Grade 3 tumours with negative estrogen receptor and progesterone receptor status. The c-erbB-2 oncogene was negative in all cases except one that was positive in the areas of ductal carcinoma.
Markers of mesenchymal, epithelial and myoepithelial cells were performed. Immunohistochemical studies revealed triple negative tumours with basal phenotype in all tumours.

**Images for this section:**

![Fig. 1](image-url)
Fig. 2
Mammography findings: irregular shape, indistinct margins

Fig. 3
Mammography findings: round shape, circumscribed margins

Fig. 4
Mammography findings: irregular shape, spiculated margins

Fig. 5
Mammography findings: lobular shape, ill-defined margins

Fig. 6
Mammography findings: irregular shape, microlobulated margins

Fig. 7
Mammography findings: calcifications

Fig. 8
Mammography findings: cystic areas

Fig. 9
Fig. 10
Fig. 11
US findings: lobular shape, microlobulated margins

Fig. 12
US findings: irregular shape, microlobulated margins

Fig. 13
US findings: irregular shape, angular margins

Fig. 14
US findings: oval shape, circumscribed margins

Fig. 15
US findings: Posterior acoustic enhancement

Fig. 16
US findings: cystic areas

Fig. 17
**MR findings: ring enhancement**

Fig. 18
MR findings: hyperintensity T2 and SPIR. US cystic areas.

Fig. 19
Fig. 20
Osteoclast-like giant cells (→)
Expression of CD68 by giant cells.

Fig. 21
Transition between invasive ductal carcinoma and spindle cell metaplasia.

Fig. 22
Pure Squamous Metaplastic carcinoma

Fig. 23
Pathologic findings:
Cystic area with keratin cyst

Fig. 25
Pathologic findings: Cystic area of necrosis

Fig. 26
Conclusion

Radiologists must be aware of these imaging findings, because metaplastic carcinoma tends to show benign imaging features, such as round or lobular shape with circumscribed margins, but biologically it is an aggressive tumor with poor prognosis.

Although seen rarely and possibly not a characteristic finding, metaplastic carcinoma should be included in the differential diagnosis of predominantly circumscribed, noncalcified masses seen on mammography, and tumours with both solid and cystic appearances on ultrasonography.

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