Metastatic Disease of the Breast - when to think about Non-mammary Malignancies!

Poster No.: C-2237
Congress: ECR 2014
Type: Educational Exhibit
Authors: R. D. T. Mesquita¹, P. M. M. Lopes², A. S. R. Preto³, R. Cardoso⁴;
¹Lisboa/PT, ²Paranhos - Porto/PT, ³Porto/PT, ⁴Santa Maria da Feira/PT
Keywords: Breast, Mammography, Ultrasound, MR, Diagnostic procedure, Metastases, Neoplasia
DOI: 10.1594/ecr2014/C-2237

Any information contained in this pdf file is automatically generated from digital material submitted to EPOS by third parties in the form of scientific presentations. References to any names, marks, products, or services of third parties or hypertext links to third-party sites or information are provided solely as a convenience to you and do not in any way constitute or imply ECR's endorsement, sponsorship or recommendation of the third party, information, product or service. ECR is not responsible for the content of these pages and does not make any representations regarding the content or accuracy of material in this file.
As per copyright regulations, any unauthorised use of the material or parts thereof as well as commercial reproduction or multiple distribution by any traditional or electronically based reproduction/publication method is strictly prohibited.
You agree to defend, indemnify, and hold ECR harmless from and against any and all claims, damages, costs, and expenses, including attorneys’ fees, arising from or related to your use of these pages.
Please note: Links to movies, ppt slideshows and any other multimedia files are not available in the pdf version of presentations.
www.myESR.org
Learning objectives

- To highlight the value of radiological-histopathological correlation in differentiating breast metastases from primary cancer.
- To provide a pictorial review of imaging appearances of breast metastases from various extramammary malignances.
Background

Breast cancer is the most common malignancy in women. Metastatic disease of the breast, however, is relatively rare. Most secondary intramammary tumors occur as a metastatic involvement from a contralateral breast carcinoma.

Metastases from the contralateral breast were specifically excluded from this study, which also intentionally excluded leukaemias and lymphomas.

Intramammary metastases from nonmammary solid malignancies are even rarer. The prevalence of breast metastases varies significantly in several studies, depending on how this prevalence is calculated. Breast metastases range from 0.5 to 6.6% of all malignant neoplasms affecting the breast. This low frequency may be related to the fact that the breast contains large areas of fatty and fibrous tissue with a relatively poor blood supply.

Even though any malignant tumor has the potential to metastasize to the breast, breast metastases arise most frequently from malignant melanomas, lymphomas, ovarian tumors and lung cancer. The following primary malignancies can also be the source of intrammary metastases: rhabdomyosarcomas, gastric cancer, colorectal carcinoma, cervix carcinoma, renal carcinomas, neuroendocrine tumors, sarcomas, hepatocellular carcinomas and prostatic cancer.

The diagnosis of breast metastases is difficult because their clinical, radiological and histological manifestations are unspecific. In addition, a differential diagnosis with primary breast cancer may also be difficult. However, this is essential to determine treatment and prognosis, and radiological studies can help differentiate these two.

Metastases to the breast usually occur in patients with widespread metastatic disease. However, breast metastases may be the initial manifestation of a distant primary tumor. Furthermore, in some patients with primary unknown malignancies, breast involvement can be diagnosed incidentally or during a tumor search on mammography or breast ultrasound.

Clinically, metastases to the breast are usually characterized by the presence of a painless breast mass, and a differential diagnosis from primary breast cancer is generally difficult.

The majority of metastases present as rapidly growing, painless, palpable movable masses. Therefore, breast metastases should be suspected if a patient with a previously known history of metastatic cancer presents with a palpable breast lesion. Typically, breast metastases lie in the subcutaneous tissue, and this is the reason the majority of these lesions are palpable. Primary breast carcinomas usually arise from the glandular parenchyma, so they are deeply located than metastatic lesions.
In addition, usually there are no associated skin changes like peau d'orange and nipple retraction or discharge, because the metastases are usually located outside the ducts. In contrast, when they are close to the skin, because of their fast growth, they may induce skin edema and erythema, and can therefore be misdiagnosed as inflammatory breast cancer.
Findings and procedure details

Breast metastases manifest most frequently as round or oval masses with circumscribed margins on mammography, but can also cause architectural distortion of the surrounding parenchyma without a detectable lesion.

However, other findings, such as lobulated lesions, masses with indistinct margins or asymmetric density of the breast parenchyma are also documented.

According to the literature, unlike metastases arising from other malignancies, breast metastases from gastric cancer predominantly caused diffuse architectural distortion.

Mammographic features

According to the literature, there are no significant differences between features such as form, margin and density in breast metastases from different primary tumors.

The most common mammographic appearances are of one or more well-circumscribed masses, without spiculation, calcifications or other signs of surrounding desmoplastic reaction that characterize the majority of primary carcinomas.

In almost 5% of the cases, breast metastases caused diffuse uni- or bilateral breast opacity.

Despite the most common presentations, breast metastases can present a varied range of imaging appearances, and four mammographic patterns can be used to describe it: well-circumscribed lesions, ill-circumscribed lesions, inflammatory changes and asymmetric density.

The most frequent pattern is a well circumscribed lesion and these lesions can be indistinguishable from benign breast masses, such as cysts or fibroadenomas, or from primary neoplastic lesions like medullary breast carcinomas. If a patient with a previous history of malignancy presents with multiple and bilateral well-circumscribed masses, breast metastases should be suspected.

An irregular, ill-circumscribed mass is highly suspicious for malignancy, mimicking breast carcinoma.

The radiological appearance of inflammatory infiltration (diffuse dense infiltrate, skin thickening and increased stromal density) is described as a consequence of metastatic infiltration of the lymphatic ducts.

The appearance of breast metastases as an asymmetric density with no other associated signs is very uncommon.
Although microcalcifications are not usually associated with breast metastases, they can be present in up to 18% of the cases. Typically, they occur in mucinous ovarian carcinoma. However, metastases of renal cell carcinoma, malignant melanoma, hepatocellular carcinoma, gastric cancer and medullary thyroid carcinoma can also develop calcifications.

**Ultrasound characteristics**

Most of the intramammary metastases are hypoechoic masses, oval or round in shape, with circumscribed or microlobulated margins and posterior acoustic enhancement or without any posterior acoustic phenomenon. This finding is unspecific and could equally represent a cyst, fibroadenoma, or breast carcinoma. Therefore, further investigations are needed to determine these lesions.

Interestingly, many metastases can be anechoic and demonstrate posterior acoustic enhancement. This pattern is typical of breast cysts, and these lesions can be misdiagnosed. Isoechoic or hyperechoic lesions may be easily misdiagnosed as normal fibroadipose tissue. Therefore, further investigations are always needed.

One study has shown that an echogenic halo can be seen in 29% of cases; this is in contrast with previous reports suggesting that the lack of echogenic halo helped differentiate metastases from primary breast cancer.

A recent study showed that breast metastases from lung cancer presented like inhomogenously hypoechoic lesions with circumscribed margins and posterior shadowing in almost 50% of the cases. In contrast to lung cancer metastases, metastases from ovarian carcinoma had typically microlobulated margins and posterior enhancement. Most metastases from thyroid cancer presented as homogenous masses with indistinct margins. None of these primary tumors are illustrated in our cases of breast metastases.

**CASE 1**

**Imaging findings in a 53-year old woman with known history of a metastasizing adenocarcinoma of the colon.**

**Mammography and ultrasound were classified as BI-RADS 5.**
**Fig. 1:** Craniocaudal (a) and medio-lateral oblique (b) mammograms show a 1.9-cm oval circumscribed dense nodular mass with irregular margins in the upper outer quadrant of the left breast.

**References:** Department of Radiology, Hospital de São João/ Porto 2013
**Fig. 2:** On ultrasound (c) the mass is hypoechoic with irregular margins and no posterior acoustic enhancement.

**References:** Department of Radiology, Hospital de São João/ Porto 2013

**Fig. 3:** Histological examination (d) after ultrasound guided biopsy demonstrated mammary parenchyma infiltrated by tumor with a tubular pattern and a strong positive expression of CK 20, confirming the diagnosis of metastases of known colon adenocarcinoma.

**References:** Department of Anatomic Pathology, Hospital de São João/ Porto 2013
CASE 2

Imaging findings in a 63-year old woman with a known history of hepatocellular carcinoma.

Mammography and ultrasound were classified as BI-RADS 4c.

Fig. 4: Craniocaudal (a) and medio-lateral oblique (b) mammograms show a round well-defined dense nodular opacity in the upper outer quadrant of the right breast. The other small opacity in the same quadrant proved to be a benign lesion (conglomerate of cysts).

References: Department of Radiology, Hospital de São João/ Porto 2013
**Fig. 5:** On ultrasound (c) the nodule, is located in the subcutaneous tissue, is hypoechoic with circumscribed margins and posterior acoustic enhancement.

**References:** Department of Radiology, Hospital de São João/ Porto 2013

**Fig. 6:** Histologic analysis (d) revealed a metastatic involvement of the breast, with immunostaining confirming its hepatocellular origin.

**References:** Department of Anatomic Pathology, Hospital de São João/ Porto 2013

CASE 3
Imaging findings in a 65-year old woman with a known history of renal cell carcinoma.

**Fig. 7:** Ultrasound (a) shows a 26-mm well-circumscribed oval hypoechoic mass, with posterior acoustic enhancement, located in the subcutaneous tissue. The lesion had a smooth contour and an echogenic halo.

*References:* Department of Radiology, Hospital de São João/ Porto 2013

**Fig. 8:** Histological examination (b) of sections of the breast mass core needle biopsy specimen showed positive immunohistochemical staining features to specific markers, confirming the diagnosis of metastases of renal cell carcinoma.

*References:* Department of Anatomic Pathology, Hospital de São João/ Porto 2013

**CASE 4**

Imaging findings in a 44-year old woman with known history of a neuroendocrine mediastinal tumor/atypical carcinoid.
Mammography and ultrasound were classified as BI-RADS 4c.

Fig. 9: Craniocaudal (a) and medio-lateral oblique (b) mammograms show an ill-defined focal density area of asymmetrical density in the inner quadrants of the left breast.

References: Department of Radiology, Hospital de São João/ Porto 2013
Fig. 10: On ultrasound (c) there is a hypoechoic area of altered echostructure, with irregular margins, and no posterior acoustic enhancement.  
References: Department of Radiology, Hospital de São João/ Porto 2013

Fig. 11: Histological examination (d) after ultrasound guided biopsy demonstrated mammary parenchyma infiltrated by tumor with a solid pattern. The tumor had a strong positive immunoreaction to Chromogranin A and Synaptophysin, in contrast with the rest of the mammary parenchyma.  
References: Department of Anatomic Pathology, Hospital de São João/ Porto 2013

d)  

The correlation between the histological findings of breast metastases and the histology of the primary tumor is essential in order to confirm the diagnosis. Sometimes, it may be necessary to carry out exhaustive anatomopathological tests using specific immunohistochemical stains to make the correct diagnosis.

Some reports have suggested that fine-needle biopsy can definitively confirm the diagnosis of breast metastases. However, several metastatic malignancies, such
as endometrial or prostatic cancers, and some variants of malignant melanomas have cytologic features resembling mammary carcinoma.
Fig. 1: Craniocaudal (a) and medio-lateral oblique (b) mammograms show a 1.9-cm oval circumscribed dense nodular mass with irregular margins in the upper outer quadrant of the left breast.

© Department of Radiology, Hospital de São João/ Porto 2013
Fig. 2: On ultrasound (c) the mass is hypoechoic with irregular margins and no posterior acoustic enhancement.

© Department of Radiology, Hospital de São João/ Porto 2013

Fig. 3: Histological examination (d) after ultrasound guided biopsy demonstrated mammary parenchyma infiltrated by tumor with a tubular pattern and a strong positive expression of CK 20, confirming the diagnosis of metastases of known colon adenocarcinoma.
Fig. 4: Craniocaudal (a) and medio-lateral oblique (b) mammograms show a round well-defined dense nodular opacity in the upper outer quadrant of the right breast. The other small opacity in the same quadrant proved to be a benign lesion (conglomerate of cysts).

© Department of Radiology, Hospital de São João/ Porto 2013
Fig. 5: On ultrasound (c) the nodule, is located in the subcutaneous tissue, is hypoechoic with circumscribed margins and posterior acoustic enhancement.

© Department of Radiology, Hospital de São João/ Porto 2013

Fig. 6: Histologic analysis (d) revealed a metastatic involvement of the breast, with immunostaining confirming its hepatocellular origin.

© Department of Anatomic Pathology, Hospital de São João/ Porto 2013
**Fig. 7:** Ultrasound (a) shows a 26-mm well-circumscribed oval hypoechoic mass, with posterior acoustic enhancement, located in the subcutaneous tissue. The lesion had a smooth contour and an echogenic halo.

© Department of Radiology, Hospital de São João/ Porto 2013

**Fig. 8:** Histological examination (b) of sections of the breast mass core needle biopsy specimen showed positive immunohistochemical staining features to specific markers, confirming the diagnosis of metastases of renal cell carcinoma.

© Department of Anatomic Pathology, Hospital de São João/ Porto 2013
**Fig. 9:** Craniocaudal (a) and medio-lateral oblique (b) mammograms show an ill-defined focal denser area of asymmetrical density in the inner quadrants of the left breast.

© Department of Radiology, Hospital de São João/ Porto 2013
Fig. 10: On ultrasound (c) there is a hypoechoic area of altered echostructure, with irregular margins, and no posterior acoustic enhancement.

© Department of Radiology, Hospital de São João/ Porto 2013

Fig. 11: Histological examination (d) after ultrasound guided biopsy demonstrated mammary parenchyma infiltrated by tumor with a solid pattern. The tumor had a strong positive immunoreaction to Chromogranin A and Synaptophysin, in contrast with the rest of the mammary parenchyma.

© Department of Anatomic Pathology, Hospital de São João/ Porto 2013
Conclusion

In the appropriate clinical scenario, metastatic disease must be considered in differential diagnosis of breast lesions. Detailed clinical history and appropriate radiologic and histopathologic evaluations are essential for diagnosis, making it possible to avoid unnecessary mastectomy and ensure that appropriate treatment is implemented.
Personal information

Romeu Mesquita
romeu.mesquita@gmail.com


