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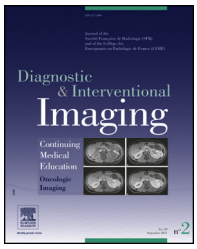

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Masses in mammography: What are the underlying anatomopathological lesions?

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Abstract The semiological description of masses in mammography is based on the BI-RADS system provided by the American College of Radiology. The contour is the most discriminating morphological criterion between benign and malignant masses. Most circumscribed masses are benign. Nevertheless, due to specific histological characteristics, certain malignant lesions or lesions with a risk of malignancy may appear in the mammography in this falsely reassuring form. An indistinct contour in the mammography is suspicious and requires a tissue sample. The positive predictive value of malignancy varies according to the morphology of the contour. It is lower for microlobulated contours, increases for masked, then indistinct contours and reaches 96% for spiculated contours. However, in rare cases, certain benign lesions may appear in the form of spiculated masses. In these specific cases, a correlation between the histological results with the imaging data is essential in order to avoid failing to recognise an underlying malignant lesion that the biopsy may have underestimated.

In mammography, a mass is defined as a space-occupying lesion, visible in two different projections, characteristic by its shape and contour. The asymmetry of the density, as opposed to the mass, corresponds to a localised asymmetric aspect of the mammary gland, without a defined contour. The mass should be measured and located. For this, a profile view, in addition to the external anterior posterior and oblique views is recommended. The mammogram with localised compression allows for a more precise analysis of the shape, contour and density of the mass. It is also useful to distinguish an image obtained by superposition of the mammary gland from a real mass.

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According to the BI-RADS system (Breast Imaging Reporting and Data System) by the American College of Radiology (ACR), a mass is characterised by [1]:

- the shape: round, oval, lobulate or irregular;
- the contour: circumscribed, microlobulated, masked, indistinct, spiculated;
- the density with respect to normal fibroglandular tissue: high, medium or low density or containing fat;
- the association with other anomalies: micro or macrocalcifications, skin retraction, skin thickening, architectural distortion, etc.;
- the evolution over time when past mammograms are available.

The contour is the most discriminating morphological criterion between benign and malignant masses. The positive predictive value (PPV) for malignancy ranges from 2% for circumscribed masses to 96% for spiculated masses [2].

Circumscribed masses

A circumscribed mass in mammography is a mass where the contour is clearly defined along at least 75% of its surface. The remaining 25% may, at most, be masked by the adjacent gland.

Circumscribed masses first indicate benign lesions. In mammography, circumscribed masses of typically benign appearance, placed in category 2 of the BI-RADS system by the ACR, have to be distinguished from ''probably'' benign lesions, placed in category 3, as they require short-term monitoring (in general after 4 months, then 1 year, then 2 years).

Typically benign masses: BI-RADS 2

In the mammogram, the semiology of certain masses is characteristic, thereby allowing them to be classified as benign with certainty. Therefore, knowledge of the semiology is essential so as not to prescribe useless radiological controls for lesions that are certainly benign, and also not to place images in this category where the benign nature is doubtful and will then not be monitored.

The typically benign masses in mammography are:

- circumscribed masses with macrocalcifications (fibroadenomas and calcified cysts);
- masses of fatty or mixed density;
- circumscribed masses corresponding to cysts in the sonography.

Calcified fibroadenomas

A fibroadenoma is a benign fibroepithelial proliferation distinct from the adjacent mammary parenchyma. The distribution of the epithelial structures is homogenous on the surface of the tumour and is balanced with the connective component.

''Juvenile'' (or ''cellular'') fibroadenomas are rare lesions characterised by mixed epithelial and connective hyperplasia with sectors of hypercellularity of the stroma but without an imbalance between the two components. They are generally faster growing and larger. The fibroademona is an oval or lobulate tumour, with well defined contours due to the existence of a peripheral pseudocapsule formed by ''compressed'' connective tissue, accounting for the circumscribed contour in mammography [3] (Fig. 1). Since the growth of the fibroadenoma is hormone sensitive, the natural evolution after menopause is the hyalinisation and appearance of coral-shaped (''pop-corn'') calcifications, pathognomonic in mammography (Fig. 1d).

Calcified cysts

Breast cysts are unilocular formations corresponding, in histology, to a liquid distension of the lobular acini. In mammography, they are masses with a distinct contour and homogenous density. They may contain ''milk of calcium'' that sediments in the profile view and produces the characteristic ''teacup'' appearance of the intracystic microcalifications. In mammography, the macrocalcifications of the cysts are typical, due to their arcuate appearance related to the calcification of the walls of the cyst. When all of the walls are calcified, this creates the classic image of rounded macrocalcification with a light centre.

Masses containing fat

Lymph node

In mammography, the axillary lymph node is characteristic in the form of a round or oval mass, with a circumscribed contour or radiotransparent peripheral indentation, the peripheral density corresponding to the cortex and the radiotransparent zone to the fatty hilium (Fig. 2a).

Oily cyst

The oily cyst is a post-traumatic lesion (whether or not iatrogenic). The initial trauma leads to destruction of adipocytes in the breast that release their lipid content in the interstitium, provoking the liquefaction of the fatty acids and the formation of a fibrous capsule formed by the saponification of the fats. Therefore, in mammography, the oily cyst characteristically appears in the form of a round or oval, well circumscribed mass of oily density, surrounded by a thin peripheral capsule (Fig. 2b). The calcium may precipitate along this capsule and form macrocalcifications that have a typical ''eggshell'' appearance in mammography.

Hamartoma

A hamartoma is a well-circumscribed pseudo-tumoral lesion, formed by a heterogeneous blend of different components of normal breast tissue.

Therefore, variable proportions of fibrous tissue, glandular tissue and fats are found. In the mammography, this composition accounts for the well-circumscribed, round or oval mass, containing fibroglandular tissue and radiotransparent fat, in certain cases associated with a peripheral pseudocapsule, histologically corresponding to the compression of the adjacent normal tissue. This is the classic image of a ''breast within a breast'' (Fig. 2c).

Lipoma

A lipoma is a benign tumour formed from mature adipocyte tissue, surrounded by a pseudocapsule formed by the compression of normal breast tissue. For this reason, in the mammography, the lipoma typically appears as a well-circumscribed, round or oval, totally radiotransparent mass, exerting a mass effect on the adjacent tissue. Necrosis may