BIRADS™ classification in mammography

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Abstract

The Breast Imaging Report and Data System (BIRADS) of the American College of Radiology (ACR) is today largely used in most of the countries where breast cancer screening is implemented. It is a tool defined to reduce variability between radiologists when creating the reports in mammography, ultrasonography or MRI. Some changes in the last version of the BIRADSTM have been included to reduce the inaccuracy of some categories, especially for category 4. The BIRADSTM includes a lexicon and descriptive diagrams of the anomalies, recommendations for the mammographic report as well as councils and examples of mammographic cases. This review describes the mammographic items of the BIRADS classification with its more recent developments, while detailing the advantages and limits of this classification.

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1. Introduction

BIRADS (Breast Imaging Reporting and Dated System) is today the communication tool in mammography reports in most of the countries which set up a breast cancer screening program. Initially, BIRADS was a system of quality assurance intended to homogenize the data collect and quality of mammographic reports, implemented in the United States, since 1995 [1]. This system, diffused by the ACR (American College of Radiology) is based on a national database regularly enriched by new cases subjected by the physicians registered to the program [2]. At the beginning, BIRADS was only devoted to mammography, but the fourth version of the American edition version, published in 2003, is completed by ultrasonography and MRI lexicons. BIRADS is integrated in standard DICOM and will be soon implemented directly on the stations of digital mammography and in computer assisted diagnosis (CAD).

The last version of the BIRADS™ includes innovations about the description and the classification of mammographic anomalies and will be presented in this review.

2. Which mammographic features are described in the BIRADS?

Each mammographic feature is described in the BIRADS lexicon and their definition is completed with a radiological image and a description scheme. The lexicon includes the following mammographic images:

- Densities and masses.
- Micro/macrocalcifications.
- Architectural distortions.
- Special cases including: ductal ectasia, intramammary lymph node, or focal asymmetric density.
- Associated findings: skin or nipple retraction, skin thickening, cutaneous lesions, axillary lymph nodes.

2.1. Masses

A mass is defined as a lesion occupying a volume, and seen in two different views. If the lesion is seen only in a single projection, it is a density. Masses are described according their shape, margin and density.

2.1.1. Shape

The shape of a mass can be round, oval, lobular or irregular.
2.1.2. Margin

The margin of a mass can be described as circumscribed, microlobulated, obscured (by density of adjacent tissues), indistinct (ill-defined), speculated.

2.1.3. Density

The density of a mass can be lower, isodense or higher than the surrounding glandular tissue. The mass can also be fatty.

2.2. Microcalcifications

BIRADS lexicon distinguishes different types of microcalcifications: typically benign, intermediate calcifications and calcifications with a high probability of malignancy. To classify the microcalcifications, it is necessary to analyze the shape, density, but also their distribution within the breast, especially the location from the nipple area.

Some examples are detailed in the lexicon:

- Typically benign: skin calcifications, milky calcifications, etc.
- Intermediate: amorphous calcifications.

2.3. Architectural distortion

Architectural distortion is the most difficult mammographic image to detect. The definition is a rupture of the normal architecture with no visible mass.

2.4. Associated findings

The findings can be described alone or associated with masses or microcalcifications.

The following features can be classified as associated findings: skin retraction, axillary lymph node, nipple retraction, etc.

2.5. Location of a lesion

At the end of the analysis, it is important to locate the lesion and to detail the side, the location within the breast according to a clock, the location from the nipple area (subareolar, central or axillary), and finally the depth (anterior, middle or posterior).

3. Reporting

The first item should precise the composition of the breast according to the breast density. Four categories are described:

- Type 1: fatty breast (less than 10% of dense tissue).
- Type 2: fibroglandular (10–49% of dense tissue).
- Type 3: heterogeneously dense (49–90% of dense tissue).
- Type 4: dense and homogeneous (>90% of dense tissue).

Accuracy of mammogram to detect suspicious lesions decreases for types 3 and 4 [3]. An additional ultrasoundography is often useful to complete the screening. Thus, ultrasound accuracy for breast cancer screening when the mammogram is normal is not yet known. The answer could be provided with the results of the ACRIN study, which are awaited at the end of 2006 [4,5].

Then, the report should include the description of all mammographic benign, suspicious or malignant images, according to the BIRADS lexicon.

It is recommended to describe each breast separately.

A conclusion should be written at the end of the report, including the following BIRADS categories:

| BIRADS 0 | Incomplete, need for an additional imaging evaluation |
| BIRADS 1 | Normal. Normal interval follow-up |
| BIRADS 2 | Typically benign. Normal interval follow-up |
| BIRADS 3 | Probably benign. A short interval follow-up is recommended: 4 months follow-up for masses and 6 months follow-up for microcalcifications |
| BIRADS 4 | Suspicious abnormality: a biopsy should be considered |
| BIRADS 5 | Highly suggestive of malignancy. Biopsy or surgery should be performed |
| BIRADS 6 | Histologically proven malignancy. Imaging is performed for cancer staging or evaluation after chemotherapy |

4. Additional items in the fourth version of the BIRADS

Probability of malignancy in the BIRADS 4 category is very large, from 5 to 95%, in the literature [6,7]. The authors and BIRADS committee decided to subdivide the BIRADS 4 category in three subclasses: BIRADS 4a, 4b and 4c.

BIRADS 4a category is used if the lesion is sampled, but with a very low probability for malignancy. We do not attend a malignant result and a 6 months follow-up after a benign biopsy should be performed. The following examples can be integrated in BIRADS 4a: palpable solid mass partially circumscribed with sonographic features suggestive of a fibroadenoma, a palpable complicated cyst or a breast abscess.

BIRADS 4b includes lesions with an intermediate probability of malignancy. Fine Needle Aspiration (FNA) or biopsy is recommended and radio-pathological correlations should be precise. Follow-up in case of a benign result depends of the concordance between imaging and pathological features: a partially circumscribed mass with ill-defined margins with a fibroadenoma result is acceptable, but in case of a diagnosis of papillary lesion, surgery should be proposed.

BIRADS 4c includes lesions with an intermediate but non-typical risk of malignancy. Such following lesions could be categorized as BIRADS 4c: solid, irregular masses with ill-defined margins or recent cluster of microcalcifications with pleomorphic, thin calcifications... [8]. The awaited result is malignant.

5. Advantages and limits of the BIRADSTM classification

5.1. Advantages

The first advantage is that BIRADS exists... Even, it is not perfect, it makes it possible to define an interpretation guide of the mammographic images, less related to the subjectivity of the
radiologist. It also allows a homogenization of the radiological language, between the radiologists themselves, but also between radiologists and clinicians. There are thus fewer misinterpretations of the reports [9]. Lastly, the existence of a definite guide facilitates reproducibility and comparison, which are critical in mammography. It facilitates also the analysis and the evaluation of the results of the breast cancer screening programs [10].

5.2. Limits

It is not perfect like every classification. Some radiologists used to write their own terms were reticent to use a strict lexicon, which was moreover imposed. Nevertheless, this classification remains a radiological classification and thus does not take into account some clinical or prognostic factors, which could make change categories for some images [11]. Finally, this classification has a great inter and intra observer variability for the images which are more difficult to classify, especially in the BIRADS 3 and 4 categories [12–15].

6. Conclusion

BIRADS in mammography is a useful tool for the radiologists and the clinicians for the analysis and the characterization of mammographic images. The fourth American version, published in 2003, was largely applied and commented in the majority of the countries where the breast cancer screening programs exist. Apart from its imperfections, it allows a standardization of the mammographic reports and appears as an interesting tool for the training of the young radiologists [16].

References
