Radiopathological correlations: Masses, non-masslike enhancements and MRI-guided biopsy

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\textbf{Abstract}  MRI-guided biopsy is a recent interventional breast technique. Validating the procedure poses a new problem because the signal targeted is created by the injection of a paramagnetic contrast agent and is thus transitory. In the first instance, the procedure is validated by the radiologist, who checks that targeting is accurate and inserts a clip at the end of the procedure, and secondly by analysis of the histopathological results, which should be representative of the lesion. The pathologist needs to know the nature of the image, i.e. whether it is of mass or non-masslike enhancement, and its BI-RADS classification. The objective is that the image and the pathological result should concur. If the result is non-specific and benign, a follow-up MRI is required six months later.

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\textbf{Introduction: an overview of MRI-guided biopsy}

\textbf{General points}

Breast MRI can detect cancers, which are occult, both clinically and in mammography examinations. The sensitivity of the technique has been evaluated at between 94 and 100% but its specificity is more variable, at between 37 and 97% [1]. Histopathological evidence needs to be obtained to detect an indeterminate or suspect lesion in MRI [1]. MRI-guided biopsy can confirm its nature, but before deciding on this course of action, it is essential to check the uptake of contrast by ultrasound or mammography. MRI-guided
biopsy is still an uncommon examination because of limited access to machines, the time it takes, the cost of the material and the discomfort for the patient. Three types of MRI enhancing lesions are described by the BI-RADS classification [2]:

- a mass (a process occupying a space), the rationale for radiopathological correlation being comparable with that for a mass detected by ultrasound or mammography;
- non-masslike enhancement (MRI contrast uptake occupying the space of the normal gland but without mass effect), this image essentially being generated by the injection of a paramagnetic contrast agent;
- a focus (an area of contrast uptake measuring less than 5 mm).

The last two types of lesion, which are described only in magnetic resonance imaging, raise a new problem for validating the correlation between the image targeted and the pathological diagnosis obtained. MRI-guided biopsy needs to be fully understood, to grasp the problem.

**Indication for an MRI-guided biopsy**

Types of lesion

MRI mass or non-masslike enhancements (NMLE) classed in the BI-RADS categories 4 or 5 are biopsied, as are those classed 3 by BI-RADS detected in a patient being monitored for high familial risk. The positive predictive value of these lesions is higher in this group of patients.

The indication will be determined after eliminating ‘false’ contrast uptake, related to physiological glandular enhancement in a pre-menopausal patient examined during the 2nd part of her cycle, or of hormonal origin in a patient receiving hormone treatment. In these situations, the MRI will be repeated to confirm the persistent and therefore pathological nature of the abnormal enhancement. MRI-guided biopsy is also indicated after any signs of these enhancements in conventional imaging (mammography and ultrasound) have been eliminated.

Correlation with conventional imaging

When there is positive correlation with a conventional imaging examination, a histopathological diagnosis can be obtained by ultrasound-guided microbiopsy, if the lesion is visible with ultrasound, or by stereotactic macrobiopsy where there is only mammographic detection.

**Second look ultrasonography**

The literature shows that the efficacy of second look ultrasonography is very variable, ranging from 23 to 89% [3]. It is not easy to perform since it depends on detecting subtle or small images not usually revealed in a standard ultrasound examination. The radiologist needs to know the information from the MRI and how to interpret all breast examination techniques: mammography, ultrasound and MRI. MRI is best read on the console so that the type of enhancement, its size and precise location can be evaluated. With second look ultrasound, the lesion can be found and ultrasound-guided biopsies performed in more than 50% of cases. Ultrasound correlation is most often found for mass enhancements, whereas it is less frequent in the case of non-masslike enhancement or a focus [4]. Certain authors, for example LaTrenta et al., have shown that when these lesions can be detected with ultrasound this tends to indicate their malignant nature (43% versus 14%) [5]. Similarly, the risk of a malignant lesion is higher if the latter is in the same quadrant of the breast as a confirmed neoplastic lesion.

**Targeted rereading of the mammogram**

Localized and enlarged images should be made centered on the area of the breast where the MRI abnormality has been found. If a group of microcalcifications, distortion or asymmetry is found that is not visible on the standard image, stereotactic biopsy might be performed. Thomassin-Naggara et al. have shown the importance of detecting microcalcifications combined with NMLE in MRI [6]. In this case, the PPV is 90% for enhancement measuring more than 20 mm. This author has also confirmed the high PPV of multiple, regional, diffuse, asymmetric, segmentally distributed NMLEs, or, where these signs are absent, that age of more than 44 years increases the PPV of detected non-masslike enhancements [6].

**Synthesis**

It is essential to confirm concordance with the ultrasound or mammogram image by inserting a clip at the end of the ultrasound-guided microbiopsy or the stereotactic macrobiopsy. If there is any doubt about the accuracy of targeting, a T2*-weighted MRI sequence can be obtained, to confirm it by checking the position of the clip relative to the site of the MRI enhancement and possibly the site of the hematoma. No correlation with conventional imaging

The lack of ultrasound or mammographic correlation is not firm evidence of the benign nature of a lesion. According to various published studies, a cancer is confirmed in 14 to 57% of cases of MRI lesions without ultrasound correlation: in this situation those more frequently encountered are carcinomas in situ and invasive lobular carcinomas [3].

At 6%, the positive predictive value of MRI lesions in the BI-RADS 3 class (probably benign) is higher than for conventional imaging, with less than or equal to 2% in mammography or ultrasound [2, 7]. The action to be taken is as follows for BI-RADS 3 lesions: if there is a concomitant malignant lesion an MRI-guided biopsy is performed without delay. In a high risk context an early follow-up MRI is scheduled after 4 months and a biopsy performed if the image persists or has increased in size. Apart from these particular situations, there should be an MRI follow-up at 6 months and a biopsy performed if the lesion has increased in size. For BI-RADS 4 or 5 lesions, MRI-guided biopsy is essential and must be organized without delay.

**Type of material used: coil and needle**

The surface coil must both allow access to the breast and hold it by a compression system; most systems use an internal or external lateral approach (Fig. 1). The system most often used consists of a compression grid into which a multiply perforated sterile guide block is inserted. This block acts as a support and guide for the coaxial sheath and needle. After dynamic contrast-enhanced sequences have been performed to locate the lesion, its coordinates are calculated and a cannula placed in the sheath (Fig. 2). A
Figure 1. MRI-guided biopsy coil for a lateral approach with compression grid.

Figure 2. Compression grid with guide block system, coaxial sheath in place.

sequence without injection confirms that targeting is correct (Fig. 3a, b). The samples are taken with large gauge needles (11-7 G) attached to an aspiration system (aspiration macrobiopsy) (Figs. 4 and 5). The advantages are that good quality histological samples are rapidly obtained, the equipment is relatively inexpensive and the biopsy does not leave a scar. The recommendations are that at least 18 samples (11G) should be obtained and that a clip should be inserted systematically at the end of the procedure [8].

Figure 3. Sagittal contrast-enhanced MRI breast sequence before MRI-guided biopsy: a: location of the mass to be biopsied; b: sequence without enhancement to check the position of the tip of the cannula before performing the biopsy.

Figure 4. Macrobiopsy needle in place for performing the biopsy through the grid.

Figure 5. Specimens obtained after MRI-guided biopsy.
Histopathological results and radiopathological correlation

Particular issues concerning MRI-guided biopsy

Technical limitations of MRI-guided biopsy

Since the magnets are more often enclosed, the biopsy samples must be obtained outside of the magnet. The patient’s procubitus position can hamper access to the lesion. The approach to prepectoral, retroareolar or superficial lesions is difficult or impossible. Insufficient breast thickness remains a limiting technical factor. The effect of compression by the grid may reduce the intensity and amount of contrast uptake in comparison with the previous MRI that led to the biopsy (Fig. 6a, b), hence the importance of having the previous MRI available on a console during the biopsy to ensure adequate targeting by comparing the position and type of contrast uptake of both examinations (Fig. 7a, b, c). Sometimes no contrast uptake is found during the pre-biopsy scout sequence. Liberman et al. reported that 12% of lesions referred for a biopsy did not enhance in the examination [9]. A follow-up MRI was performed for 93% of these lesions and more than half of the examinations showed no enhancement. Hefler et al. reported a malignancy rate of 10% for lesions which were no longer visible on the day of the biopsy, but which were seen again in the

Figure 6. Contrast-enhanced breast MRI: a: axial slice: examination before the biopsy showing a left lateral spiculated mass (arrow); b: sagittal scout slice during the biopsy: the contrast uptake is less clearly visible and reduced to a punctiform lesion.

Figure 7. Contrast-enhanced breast MRI: a: axial slice. BI-RADS 4 contrast uptake of the left breast of a patient with a history of a malignant lesion of the contralateral breast; b: sagittal scout slice before the biopsy: ‘false’ contrast uptake not corresponding to the lesion targeted; c: sagittal scout slice before the biopsy: contrast uptake corresponding to the lesion to be biopsied, recognized after comparison with the initial MRI images.
follow-up MRI [10]. A follow-up MRI shortly afterward is suggested therefore when a lesion considered to be potentially suspect is not visible on the day of the biopsy.

Difficulty obtaining the sample
The MRI lesion justifying the biopsy is located because it takes up the contrast agent. The target is not constant over time however, because the enhancement attenuates after the injection, making it difficult to locate. Physiological enhancement of the breast tissue adjacent to the lesion can hinder identification of the target. Compression reduces the intensity and size of the lesion by reducing its vascularization (Fig. 6 a, b) and this can hinder locating it. Radiopathological correlation remains the major problem, rendered difficult by the absence of 'ex vivo' evidence of the MRI enhancement. The sample can only be confirmed as adequate later. In contrast, stereotactic biopsies are validated immediately by the presence of calcifications on the x-ray image of the samples, or, with ultrasound guidance, in real time by viewing the point of the needle in the lesion along two orthogonal axes. The main drawback of MRI-guided biopsy is that it is impossible to confirm that the lesion is actually present in the specimens collected in real time during the biopsy, hence the importance of the radiologist validating the quality of the targeting and the pathologist checking the representative character of the samples [3].

Diagnostic performance
The largest study on the subject, reported by Perlet et al. and published in 2006, was a multicenter study concerning 538 biopsied lesions; 27% were malignant lesions, 3% atypical and 70% benign lesions. The biopsy was performed successfully in 98% of cases. Size does not seem to be a limiting factor since the biopsies were performed successfully in 96 and 97% of cases respectively for lesions smaller than or larger than 10 mm. The mean duration of the procedure was 70 min for one lesion and 90 min for two lesions [11]. There were rare hemorrhagic or infectious complications comparable with those described for macrobiopsies performed with another guidance method. The other studies published on the subject (Table 1) report an equivalent diagnostic performance with 96–100% success of the technique and malignancy rates between 27 and 37% for most series [11–17], and higher in two series [14,17]. The latter results are explained by the differences in the populations studied, including more high risk patients in one [17] and more MRIs performed in staging a malignant condition in the other [14]. Figures reported for atypical lesions were from 7 to 21% depending on the authors (Table 2) [17–19], the percentage of their underestimation of 12–25% in the most recent series corresponding to atypical lesions that proved to be malignant on surgery (Table 2). For some authors, this underestimate also corresponded to the number of carcinomas in situ, which were upgraded to invasive carcinoma after surgery [18]. Nevertheless, the importance is noted of additional surgery following macrobiopsies indicating high-risk lesions, because 30% of these lesions operated in Rauch’s series were cancers [18]. In certain series, higher figures, of 30 to 50%, are reported for underestimating high-risk lesions [9,20,21]. These high-risk lesions include papillary lesions, which are also recommended for surgery where the diagnosis is obtained by MRI-guided biopsy, because the figures reported for underestimating them were 9% in the case of atypia combined with the papillary lesion and 5% in the absence of atypia [22].

Factors influencing the results
According to the type of image: mass or non-masslike enhancement
The malignancy rate is higher when the lesion biopsied using MRI is a mass rather than an NMLE, assessed respectively at 34–60% and 27-41% [17,19,23].

### Table 2 Rates of underestimation of atypical lesions in MRI-guided biopsies.

<table>
<thead>
<tr>
<th>Studies</th>
<th>Atypia</th>
<th>Underestimation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Han, 2008 (19)</td>
<td>14 (150)</td>
<td>25</td>
</tr>
<tr>
<td>Malhaire, 2010 (17)</td>
<td>14 (72)</td>
<td>13</td>
</tr>
<tr>
<td>Rauch, 2012 (18)</td>
<td>17 (37)</td>
<td>12</td>
</tr>
</tbody>
</table>

a Year of publication (reference).

b Atypia rate as % (number of biopsies, absolute value).

c Underestimation rate as %.

### Table 1 Rates of success of MRI-guided biopsies and percentage of malignancy.

<table>
<thead>
<tr>
<th>Studies</th>
<th>Technical success rate</th>
<th>Malignancy rate</th>
<th>False negatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malhaire, 2010 (17)</td>
<td>72/74 (97)</td>
<td>33/72 (46)</td>
<td>2</td>
</tr>
<tr>
<td>Fischer, 2009 (16)</td>
<td>365/389 (96)</td>
<td>106/365 (27)</td>
<td>2 (immediate)</td>
</tr>
<tr>
<td>Perlet, 2006 (11)</td>
<td>517/538 (96)</td>
<td>138/517 (27)</td>
<td>0</td>
</tr>
<tr>
<td>Gebauer, 2006 (515)</td>
<td>42/42 (100)</td>
<td>11/42 (26)</td>
<td>1 (immediate)</td>
</tr>
<tr>
<td>Orel, 2006 (514)</td>
<td>85/85 (100)</td>
<td>52/85 (61)</td>
<td>2 (immediate)</td>
</tr>
<tr>
<td>Liberman, 2005 (13)</td>
<td>95/98 (97)</td>
<td>24/98 (25)</td>
<td>7 (incl. 3 atypia)</td>
</tr>
<tr>
<td>Lehman, 2005 (12)</td>
<td>38/38 (100)</td>
<td>14/38 (37)</td>
<td>1 (atypia)</td>
</tr>
</tbody>
</table>

a Year of publication (reference).

b Number of successful procedures/number of procedures (success rate %).

c Number of cancers/total biopsies (malignancy rate %).

d False negatives as absolute value.
Of the descriptive points characterizing NMLEs, their ductal or segmental distribution has the highest PPV, reported respectively as 26—37% and 30—50%, depending on the series [17—19]. The high PPV for focal NMLEs, reported as 50% in their series by Malhaire et al., was not found in the other series [17].

As for masses, their having irregular or spicular contours have a PPV of between 27 and 43% [18,19]. According to Han et al., no morphological or dynamic characteristic has any statistically significant value; nevertheless, the risk of malignancy would seem to be higher when the mass has irregular contours and a type 2 or 3 dynamic curve, or when the mass has regular contours combined with a type 3 curve [19].

The size of the image
In the recent series reported, the mean size of the lesions biopsied could be compared with a mean of 12 mm (4—70 mm) in Malhaire et al.’s series and 15 mm in Han’s (4—70 mm) [17,19]. It appeared that the mean size of lesions biopsied is greater for non-masslike enhancements than for masses, 16 mm versus 10 mm [17]. The incidence of cancer increases with the size of the lesion detected using MRI; it seems to be 3% for lesions of less than 5 mm as against 31% for lesions of 20 mm and more [24]. However, more recent series confirm the need for MRI-guided biopsy exploration of any suspect contrast uptake, even if it is less than or equal to 5 mm in size, because in certain series their PPV is 20—31% [25,26]. This is particularly so for the group of patients for whom MRI was indicated for staging a malignant lesion; if the contrast uptake was in the same breast, the PPV was 27.8%, in the same quadrant 44.4% and in the contralateral breast 16.7% [25,26].

Coexistence of other lesions
Association with a malignant lesion concomitant to the contrast uptake detected raises its PPV, which reached 43% in the series by Han et al. when the cancer was homolateral, and 30% when the cancer was in the contralateral breast [19]. Similar figures have been reported by other authors [18,27].

The indication for MRI
The probability of malignancy varies depending on the indication for MRI. It was 36 and 28%, respectively, in Han’s and Rauch’s series, in the group of women who underwent MRI for staging a malignant lesion or for evaluating a clinical problem. The PPV is lower, at 14 and 10% respectively for these two authors, when MRI is performed for screening [18,19].

Technique for validating the procedures
This poses two major questions concerning targeting and radiopathological correlation. For the first, the question is whether the biopsy has been taken at the right place. For the second, it is whether the samples are sufficient to allow the pathologist to correlate the MRI image with what is represented on his slides of the pathology.

Immediate validation of targeting
For some authors, disappearance of the abnormal contrast uptake after the biopsy can be validated with an MRI sequence after reinjecting contrast agent at the end of the procedure [11]. However, in current practice, suffusion of the contrast agent due to vascular breakdown together with hemorrhagic changes does not confirm with any certainty a reduction in size of the contrast uptake targeted (Fig. 8a, b). Other authors suggest a follow-up MRI after 24 h, demonstrating that in nearly 14% of cases the lesion would not have been correctly targeted [28]. A non contrast-reenhanced MRI sequence with 3-dimensional reformatting performed at the end of the procedure currently confirms that the biopsy cavity and the clip are perfectly centered in the targeted area (Fig. 9). If there is any doubt about the quality of targeting, a follow-up MRI performed 8—15 days later can provide verification.

Radiopathological correlation
The procedure is validated when the pathological diagnosis is obtained; it answers the two questions concerning the quality of the targeting and the material provided to the pathologist. Radiopathological correlation confirms that the diagnosis obtained is consistent with the image targeted.

Figure 8. Contrast-enhanced breast MRI: a: contrast-enhanced control sagittal slice after the biopsy: post biopsy changes with suffusion of the contrast agent mixed with the hematoma; b: sagittal slice after MRI-guided biopsy: gas filled cavity with hematoma with a hyperintense signal mixing with residual contrast uptake.
and its level of diagnostic assumption [29]. For masses, the suspicious MRI signs are spiculated or irregular margins, rim enhancement and a type 3 enhancement curve, even if suspicious morphological criteria are absent, while for NMLEs, they are their segmental or ductal distribution, their multinodular or multiple rim character [17–19] (Figs. 10 and 11a, b).

Various categories of radiopathological concordance described for imaging-guided biopsies can be applied to MRI-guided biopsies [30]:

- category 1: concordance concerning malignancy: suspect images, malignant histology (Figs. 12 and 13);
category 2: discordance concerning malignancy, with benign images and malignant histology. In this situation, the pathologist must be asked to confirm the result and if necessary the imaging should be reviewed to avoid underestimating the severity of the lesion (Fig. 14);

- category 3: concordance concerning the benign nature; benign images and benign histology for BI-RADS 2 to BI-RADS 4a lesions. The histopathological results obtained may not be very specific: fibrocystic mastopathy, for which it is best to have the pathologist specify the basic lesions and the proliferative (presence of regular ductal hyperplasia and its severity) or non-proliferative characteristics (apocrine metaplasia, sclerosing adenosis, focal fibrosis) (Fig. 15a, b). In all these cases, comparison with the adjacent breast tissue and specifying the lesion’s focalized character, or otherwise, is useful for validating correlation with imaging. Sometimes, the lesion appears more specific because it is localized, such as a fibroadenoma, a lymph node or fat necrosis (Fig. 16a, b). Finally, the signals may also be due to localized enhancement of normal parenchyma. In all these situations MRI follow-up at 6 months is recommended (Fig. 17a, b);

- category 4: discordance, with suspect images (BI-RADS 4 or 5) and benign histology. In imaging, certain benign lesions can simulate a cancer due to their localized character, and/or their cellularity and/or their association with fibrosis or inflammation and/or their vascularization, and/or because they disrupt the normal architecture of breast tissue, as in sclerosing adenosis, complex sclerosing lesions, fat necrosis, granular cell tumors, surgical

Figure 13. a: contrast-enhanced breast MRI: axial slice. Contrast uptake of a mass combined with distortion in a situation (arrow) posterior to a malignant lesion already proved to be ductal carcinoma in situ; MRI-guided biopsy decided; b: HES x 2.5 histological section corresponding to the MRI-guided biopsy of the mass in the right breast. Mixed ductal/lobular adenocarcinoma. Concordant result: suspect images and malignant result; surgery is necessary.

Figure 14. Contrast-enhanced breast MRI: axial slice. Contrast uptake of focal non-masslike enhancement, classed as BI-RADS 4a, in a patient treated for ovarian cancer; MRI-guided biopsy: invasive lobular carcinoma and lobular carcinoma in situ. Benign images but malignant result; surgery necessary.

Figure 15. a: contrast-enhanced breast MRI: sagittal slice. Contrast uptake of heterogeneous regional NMLE, classed as BI-RADS 4a; b: HES x 10 histological section corresponding to the MRI-guided biopsy of the regional NMLE; florid ductal hyperplasia without atypia in a context of scleroscystic mastitis. Concordant benign but not very specific result requiring a follow-up MRI after 6 months.
Figure 16. a: contrast-enhanced breast MRI: axial slice. Contrast uptake of mass with a benign appearance in the right breast in an axillary ACUP; b: HES × 2.5 histological section corresponding to the MRI-guided biopsy of the mass in the right breast, fibroadenoma with intraductal architecture. Benign concordant result. No follow-up.

Figure 17. a: contrast-enhanced breast MRI: axial slice. Contrast uptake of an oval mass with rim enhancement contralateral to a multifocal carcinoma of the left breast. Classed as BI-RADS 4B; b: HES × 2.5 histological section corresponding to the MRI-guided biopsy of the mass in the left breast: focus of adenosis in apocrine metaplasia. Benign result but suspicious imaging, requiring MRI follow-up after 6 months.

Figure 18. a: contrast-enhanced breast MRI: axial slice. Contrast uptake of segmental NMLE contralateral to a multifocal carcinoma classed as BI-RADS 4C (arrow); b: HES × 10 histological section corresponding to the MRI-guided biopsy of the NMLE: rather non-specific fibrosis, punctuated by siderophages, compatible with a scar lesion (no known breast history). Discordant result with suspect images and benign histological results; another biopsy or surgery suggested.

Scars, mastitis, diabetic mastopathy, or sarcoidosis. However, because of the risk of missing a malignant lesion, it is important to propose another biopsy or surgery (Fig. 18a, b);

- category 5: high-risk lesions (atypical ductal hyperplasia, lobular neoplasia, papillary lesion, phyllodes tumor), for which additional surgery is recommended because of the known risk of underestimation with other percutaneous breast biopsy techniques (ultrasound-guided or stereotactic microbiopsies and macrobiopsies) (Fig. 19a, b).

Radiopathological correlation for MRI-guided biopsies is difficult to establish, in particular when evaluating NMLEs. Unlike stereotactic macrobiopsies on microcalcifications,
where the presence of the calcium in the radiological signal and histologically in the samples can validate the procedure, or even in the biopsy of a mass where the nodular character of the lesion can be recognized by the pathologist, during analysis of macrobiopsies relating to an NMLE there are currently no specific aspects that allow the pathologist to confirm that the samples have been perfectly targeted.

For the radiologist, validating an MRI-guided biopsy therefore consists of ensuring that the biopsy samples have been collected from the correct target by producing documents imaging the procedure, providing the pathologist with the level of diagnostic assumption concerning the image using the BI-RADS classification of the lesion, in addition to detailing certain signs, in particular those with the highest PPV, and familiarizing the pathologist with the classification of this new set of radiological signs with which he is as yet unfamiliar. All this information will help the pathologist to recognize a predominant lesion representative of the condition when examining the tissue provided, and to distinguish it from the normal tissue. As for all biopsies, lesion fragmentation may hinder the pathologist. It is important for the pathologist to define the normal breast histology depending on the age of the patient, her menopausal status (richness in lobules and their size) and any hormone treatment, and also perhaps to know the anatomical area from which the samples have been taken: in the middle of glandular parenchyma or at the fat/gland interface.

For MRI-guided biopsies, this correlation is still difficult and at present there are no data in the literature of specific study of this aspect. Consequently a follow-up MRI some time later seems essential in particular where there are benign, non-specific histological results and benign images (category 3). Of the results considered to be benign and concordant, Sung et al. found 8–12% of the lesions had been inadequately biopsied, with a rate of malignancy assessed at between 14–18%, i.e. an estimated rate of false negatives of 2.5% [29]. A follow-up MRI at 6 months is offered in the event of benign and, at first sight, concordant results [29]. If at the time of this follow-up the lesion appears to be stable in size, it is recommended to continue monitoring for 2 years, although in the series by Li et al., two lesions stable at 2 years were later found to be malignant [31]. If the size of the lesion has increased at follow-up a new MRI-guided biopsy or surgery must be proposed. If the lesion has decreased in size or disappeared, monitoring may be discontinued.

**Conclusion**

MRI-guided biopsy is a technique that is becoming more widespread. The technical difficulties of the procedure have currently been overcome through improvement in the equipment. The difficulty remaining concerns the reliability of the radiopathological correlation, because the biopsy signal is unusual, being revealed by enhancement following the injection of a paramagnetic contrast agent; in addition this image is only transitory. The reliability of a benign result more often than not revealing a non-specific condition should always be discussed fully in a multidisciplinary consultative meeting. Improvement in the reliability of this concordance is desirable and requires further studies. Currently, only later monitoring of the biopsied lesion can provide certainty by showing its stability or decrease in size. For malignant results or those showing a high-risk lesion, surgery is currently recommended.

**TAKE-HOME MESSAGES**

**General concepts**
- MRI-guided biopsy is a new interventional breast imaging technique, which is still not common.
- Lesions classed as BI-RADS 4 or 5 in MRI, or even BI-RADS 3 in a context of high risk, undergo MRI-guided biopsy once the presence of an ultrasound or mammographic equivalent of the enhancement has been eliminated in a second look examination.
- The problem of the radiopathological correlation of MRI-guided biopsies is due to the transitory nature of the MRI signal, generated by the injection of a paramagnetic contrast agent, which does not allow ex vivo validation of the reliability of the biopsy samples.
Clinical case

A screening mammogram was performed on a 55-year-old, post-menopausal woman, with no personal or familial risk factors. There was a doubt in this examination about an asymmetric focal density in the left breast, on a mediolateral oblique projection that justified an additional examination with a lateral projection and localized images, where the image was negative.

An ultrasound examination centered on the mammographic abnormality was negative.

Additional tomosynthesis was performed, which detected an image of left lateral distortion (Fig. 20).

Questions

- What do you do?
- What is the MRI BI-RADS classification of this lesion and how do you react?

![Tomosynthesis image: axial slice of the left breast showing an image of lateral distortion (circle).](image1)

![Contrast-enhanced breast MRI and subtraction: axial slice. Contrast uptake of left lateral mass with spiculated margins (arrow).](image2)

Answers

1. Faced with this image of distortion discovered on tomosynthesis examination, a breast MRI is recommended. This type of image requires additional percutaneous biopsy or surgical exploration without fail, and currently there is limited access to tomosynthesis-guided biopsy. Percutaneous biopsy should be performed whenever possible preoperatively. Breast MRI is an additional imaging technique, which can be used where there is any difficulty with conventional imaging. In post-menopausal women, its negative predictive value is excellent. The patient’s breast MRI (Fig. 21), interpretation of which was hindered by symmetrical, bilateral, micropunctate, masking glandular enhancement, detected a mass in the area corresponding to the abnormality detected by tomosynthesis (concordance on the site of the lesions).

2. The BI-RADS classification is 5 because the mass is of irregular shape and has spiculated margins. The PPV of masses with spiculated margins is high and justifies this classification. MRI-guided biopsy is therefore proposed. The biopsy is performed with a clip inserted at the end of the procedure and the biopsy cavity checked in the three planes. Targeting was considered correct. The histopathological result was a grade II micropapillary adenocarcinoma (Fig. 22).

3. This result is concordant, with suspect imaging and malignant histology. Surgery (lumpectomy and sentinel lymph node technique) should be carried out after preoperative location of the clip with a hookwire. This was performed stereotactically. Surgical histopathology did not reveal any residual carcinomatous lesion but the biopsy scar was found, evidence that the surgery occurred in the area previously biopsied. It is essential to verify this, particularly if there is no residual tumor. The two sentinel lymph nodes were negative.
Disclosure of interest
The authors declare that they have no conflicts of interest concerning this article.

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