Second look ultrasound examination for breast lesions: MRI and pathologic correlation

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Aims and objectives

Second-look ultrasound (SLUS) is a targeted ultrasound examination of the breast which is performed after detection of a breast lesion that is not definitively benign on MRI and that may have been overlooked on the initial ultrasound study. Our purpose is to evaluate the clinical utility of SLUS examination in the management of incidental lesions initially identified on MR breast imaging.
Methods and materials

A retrospective study was performed at the Hospital Clínico San Carlos Institution in Madrid. We included a total of 59 women who underwent SLUS after detecting additional suspicious lesions (74 lesions) at MR breast imaging from August 2013 to September 2014. During this interval 869 breast MRI examinations were performed.

The age of the included patients was between 30 and 88 years, with a mean age of 54.5 years, and the indications for breast MRI in our serial were as follows: screening of high risk patients (n=9), disease staging/ preoperative planning (n=44), exploration of a clinical abnormality such as axillary adenopathy (n=2) or a palpable mass (n= 1) with no findings in initial mammography or ultrasound, and inconclusive findings in mammography and sonography (n=3).

Breast MR was performed on a 1.5 T scanner (GE signa excite) using a billateral breast surface coil with the patient in prone position. The MR protocol included the following sequences: an axial T1-weighted non-fat-suppressed and an axial STIR sequences, a sagittal T2-weighted sequence, followed by a dynamic unenhanced and contrast-enhanced sagittal fat-supressed T1-weighted images after iv administration of gadolinium. Postprocessing images was also performed.

The MR images were evaluated by two breast imaging experienced radiologists. The detected lesions were characterized as focus, mass or non-mass-like enhancement according to the BI-RADS lexicon, recommending SLUS if malignancy could not be ruled out.

Ultrasound examination of the breast was performed by two radiologists with expertise on breast imaging using a high frequency linear array transducer, using MR images as a guide. Only lesions detected on sonography showing correlation with regard to its approximate size, and similar shape and location to the MRI findings were recorded as sonographic correlations.

Once the lesion was visualized sonographically, US-guided biopsy was immediately performed in case of concordance between MRI and SLUS if such lesion was suggestive of malignancy, whereas those lesions that had correlated but showed a benign appearance on US (BI-RADS 2) were managed conservatively. Lesions that did not have a definite correlate were considered as not detected and underwent MR guided biopsy or were followed-up with MRI in the short-term.
**Fig. 1:** Histogram showing the different MRI indications included in our study.

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Results

Of 74 lesions identified on MRI, 7 (9.5%) were classified as focus, 48 (64.8%) as masses and 19 (25.7%) as non mass like enhancements.

Sonographic correlation was found in 51 cases (68.9%) Fig. 3 on page 7. Of the 51 correlates, histopathological study was necessary in 41 lesions (78.4%), performing 38 US guided core-needle biopsies and 1 fine needle aspiration resulting the latter a complex cyst Fig. 4 on page 8, Fig. 5 on page 9. In addition, we performed two MR guided biopsies of high suspicious lesion with no US correlation which were both proved to be benign Fig. 6 on page 10. Therefore, we totally performed 40 biopsies proving malignancy in 15 lesions (37.5%), which corresponds to the 20.2% of all the lesions initially detected on MRI Fig. 7 on page 11.

On the other hand, between the 74 lesions 10 (13.5%) were classified as BI-RADS 2 after SLUS examination, corresponding 4 of them to intrammary lymph nodes Fig. 8 on page 12 and 6 to cysts (including fibrocystic mastopathy breast changes). Other 2 lesions (2.7%) were categorized as BI-RADS 3, which are still followed-up without changes until now.

The other 21 noncorrelated lesions are currently followed-up showing no changes thus far, except one of them which has grown but has not been biopsed yet by expressed desire of the patient.

Regarding the lesion type, US correlation was significantly more frequent for masses (40 of 48 [83.3%]) than for non mass-like enhancement (9 of 19 [47.3%]) and for foci (correlation only in 2 of 7 [28.5%]) Fig. 9 on page 13.

Finally, with regard to the different MR indications, between the 15 malignant lesions, 13 (86.6%) were found in the group of disease staging/preoperative planning (6.66%), whereas the other two corresponded to inconclusive findings in other breast imaging techniques and to axillary adenopathy with no findings in mammography or US (6.66%). No malignant findings were reported in the screening group of women Fig. 10 on page 14.
Possible limitations of our study were (1) that we did not always perform whole-breast ultrasound before MRI because the patient came from another institution providing its US report or in case of high risk patients screening, (2) follow-up periods for non-correlated lesions have not been finished already, (3) no standard algorithm was used to determine which MR-detected lesions would be further evaluated by SLUS, thus the decision was left to the judgment of the interpreting radiologist.
**Fig. 2:** Diagram showing the study performance of the incidental lesions and their results.

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Fig. 3: Graphic showing the proportion of SLUS correlated an noncorrelated lesions, including the radiologic evaluation (with or without histopathological study) of the correlated ones.

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**Fig. 4:** 59-year-old woman with known cancer in the right breast who underwent breast MR imaging for staging (a,b). (a) Axial T1 weighted 3D contrast-enhanced MRI fat-saturated image shows two lesions in the right breast: the malignant one which has been already biopsed (right arrow) in the upper inner quadrant, and an oval circumscribed mass localized anteriorly in the upper outer quadrant (yellow arrow). (b) Contrast-enhanced T1-weighted fat-saturated subtraction image confirms the location and the suspicious enhancement of the incidental lesion. (c) US correlation was found and US guided biopsy was performed. The lesion resulted to be benign (fibroadenoma).

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**Fig. 5:** Breast MRI of an 82-year-old woman with known breast cancer in the left breast (a-b). (a) Axial T1 weighted 3D contrast-enhanced MRI fat-saturated image manifests a BIRADS 6 lesion in the upper outer quadrant of the left breast (red arrow) and a mass in the upper inner quadrant of the contralateral breast (yellow arrow). (b) Contrast-enhanced T1-weighted fat-saturated subtraction image shows the incidental lesion of the right breast. (c) SLUS image: correlation was found and consequently US guided biopsy was performed. Histopathological study proved to be benign (adenosis without atypia).

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Fig. 6: MRI of a 44-year-old woman with known breast cancer in the upper outer quadrant of the right breast. (a) T1 weighted 3D contrast-enhanced MRI fat-saturated and (b) sagittal contrast-enhanced T1-weighted fat-saturated subtraction images show the previously described malignant mass in the right breast (red arrow) and an incidental one in the inner inter quadrant of the same breast (yellow arrow). No correlation was found in SLUS. (c,d) Consequently, MRI guided core-needle biopsy was performed. Histopathological study did not prove malignancy.

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Fig. 7: 71-year-old woman with a known cancer in the right breast. (a,b) MR Sagittal contrast-enhanced T1-weighted fat-saturated subtraction images shows in (a) a big round mass with heterogeneous enhancement in the lower inner quadrant of the right breast positive for malignancy (red arrow) and an oval, circumscribed lesion (b) in the lower inter quadrant of the left breast (yellow arrow), which had not been detected previously. (c) SLUS detected such lesion, performing US guided biopsy. Histopathological study revealed invasive carcinoma.

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Fig. 8: 52-year-old high risk woman with a strong family history of breast cancer who underwent screening breast MR imaging (a-b). (a) Axial T1 weighted 3D contrast-enhanced MRI fat-saturated image and (b) sagittal contrast-enhanced T1-weighted fat-saturated subtraction image show a mass in the upper outer quadrant of the right breast (yellow arrows) (c) SLUS demonstrated an intramammary lymph node and no biopsy was needed.

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<table>
<thead>
<tr>
<th>Lesion type</th>
<th>Number of lesions</th>
<th>Correlated lesions (US correlation rate %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus</td>
<td>7</td>
<td>2 (28.5%)</td>
</tr>
<tr>
<td>Mass</td>
<td>48</td>
<td>40 (83.3%)</td>
</tr>
<tr>
<td>Non mass</td>
<td>19</td>
<td>9 (47.3%)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>74</td>
<td>51 (68.9%)</td>
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</table>

**Fig. 9:** Table illustrating the total correlation rate between MRI and SLUS as well as the correlation rates regarding the various lesion types.

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Fig. 10: Histogram showing the total incidental MRI lesions with regard to the different groups of patients and the number of malignant lesions diagnosed in each group.

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Conclusion

Results of our analysis confirm that SLUS examination is significantly useful to evaluate MR incidental lesions not initially detected on the other breast imaging techniques, obtaining a high rate correlation between MRI and SLUS (68.9%) in our case. Similar rates have been reported in the literature.

The success rate was much higher for masses compared to non-mass lesions and foci, and the probability of cancer detection at SLUS was up to 20.2%.

Furthermore, SLUS allows to perform US guide biopsy if needed avoiding in several cases expensive and time-consuming MRI guided biopsies.
References


