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FULL PAPER

Can we apply the MRI BI-RADS lexicon morphology descriptors on contrast-enhanced spectral mammography?

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Presented at RSNA 2014 under the title: "The Potential Impact of Applying the Magnetic Resonance Imaging BI-RADS Lexicon Morphology Descriptors to Characterize Enhancing Breast Lesions on Contrast-Enhanced Spectral Mammography" by Prof. Dr Rasha M Kamal.

Objective: To assess the feasibility of using the MRI breast imaging reporting and data system (BI-RADS) lexicon morphology descriptors to characterize enhancing breast lesions identified on contrast-enhanced spectral mammography (CESM).

Methods: The study is a retrospective analysis of the morphology descriptors of 261 enhancing breast lesions identified on CESM in 239 patients. We presented the morphological categorization of the included lesions into focus, mass and non-mass. Further classifications included (1) the multiplicity for "focus" category, (2) the shape, margin and internal enhancement for "mass" category and (3) the distribution and internal enhancement for "non-mass" category. Each morphology descriptor was evaluated individually (irrespective of all other descriptors) by calculating its sensitivity, specificity, positive-predictive value (PPV) and negative-predictive value (NPV) and likelihood ratios (LRs).

Results: The study included 68/261 (26.1%) benign lesions and 193/261 (73.9%) malignant lesions. Intensely enhancing foci, whether single (7/12, 58.3%) or multiple (2/12, 16.7%), were malignant. Descriptors of "irregular"-shape (PPV: 92.4%) and "non-circumscribed" margin (odds ratio: 55.2, LR positive: 4.77; p -value: <0.001) were more compatible with malignancy. Internal mass enhancement

patterns showed a very low specificity (58.0%) and NPV (40.0%). Non-mass enhancement (NME) was detected in 81/261 lesions. Asymmetrical NME in 81% ($n = 52/81$) lesions was malignant lesions and internal enhancement patterns indicative of malignancy were the heterogeneous and clumped ones.

Conclusion: We can apply the MRI morphology descriptors to characterize lesions on CESM, but with few expectations. In many situations, irregular-shaped, non-circumscribed masses and NME with focal, ductal or segmental distribution and heterogeneous or clumped enhancement are the most suggestive descriptors of malignant pathologies.

Advances in knowledge: (1) The MRI BI-RADS lexicon morphology descriptors can be applied in the characterization of enhancing lesions on CESM with a few exceptions. (2) Multiple bilateral intensely enhancing foci should not be included under the normal background parenchymal enhancement unless they are proved to be benign by biopsy. (3) Mass lesion features that indicated malignancy were irregular-shaped, spiculated and irregular margins and heterogeneous internal enhancement patterns. The rim enhancement pattern should not be considered as a descriptor of malignant lesions unless CESM is coupled with an ultrasound examination.

INTRODUCTION

Dynamic contrast-enhanced MRI (DCE-MRI) and contrast-enhanced spectral mammography (CESM) both have features in common. They make use of contrast injection to acquire good-quality images and achieve a proper diagnostic performance, aiming for a precise morphology assessment. Nevertheless, a precise morphology

assessment should be coupled with standard morphology descriptors that enhance the discrimination between benign and malignant breast lesions.

The breast imaging reporting and data system (BI-RADS) initiative was instituted by the American College of Radiology (ACR) to address a lack of standardization and uniformity in

mammography practice reporting. An important component of the BI-RADS initiative is the lexicon of morphology descriptors of specific imaging features.¹ According to the 5th edition of the ACR BI-RADS Atlas,^{2,3} there is a well-defined and standardized lexicon of morphology descriptors to characterize breast lesions on DCE-MRI; yet, there is no similar lexicon for CESM. The need for a standardized lexicon of morphology descriptors has become essential to analyze and report enhancing lesions identified on CESM.

Using a standardized lexicon provides an accurate lesion description and characterization. On the other hand, the standard terminology facilitates communication between radiologists and clinicians, resulting in a positive impact on management decision-making and assessment of outcomes. Previously, BI-RADS mammography lexicon was considered substantial for both feature analysis and management.⁴ Moreover, it was found to be a quality assessment tool in screening and a stratification tool in diagnostic work-up.⁵

Therefore, the aim of this study was to assess the possibility of using the MRI BI-RADS lexicon morphology descriptors in the characterization of enhancing breast lesions identified on CESM.

METHODS AND MATERIALS

Patients

The study is a retrospective analysis of the morphology descriptors of 261 enhancing breast lesions identified on CESM in 239 patients. 22 patients had multiple lesions: 15 patients had bilateral lesions while 7 patients presented 2 lesions in the same breast.

The study was approved by the Scientific Research Review Board of the Radiology Department, National Cancer Institute, Cairo University.

The patients were consecutive and their age ranged between 25 and 72 years (mean age 47.9 years). 57 patients were in the menopause state.

CESM was preformed as an adjunct tool for digital mammography.

The density of the breast parenchyma seen in the included patients: [American College of Radiology (ACR) a] category in 84 patients, (ACR b) in 69 patients, (ACR c) in 64 patients and (ACR d) in 22 patients.

Lesions were analyzed in accordance with the ACR MRI BI-RADS lexicon of morphology descriptors³ by two independent readers with at least 10 years' experience in breast imaging and 3 years' experience in CESM.

We assessed the impact of each feature on the final diagnosis rather than on a combination of features to get out of them the most specific in the differentiation between variable breast lesions.

Classification of enhancing lesions

According to the MRI BI-RADS lexicon,³ enhancing breast lesions identified on the CESM subtraction images were classified into:

Focus

A focus is a breast lesion <5 mm. Enhancing focus morphology descriptors include:

- single or multiple
- unilateral or bilateral
- faint or intense enhancement.

Mass

A mass is a three-dimensional space-occupying lesion. Morphology descriptors of enhancing mass lesions include:

- mass shape: round, oval and irregular
- mass margin: circumscribed and non-circumscribed (irregular or spiculated)
- internal enhancement characteristics: homogeneous, heterogeneous, rim enhancement and dark internal septations.

Non-mass

Non-mass enhancement (NME) is non-space occupying lesion. NME morphology descriptors include:

- symmetric or asymmetric when comparing both breasts
- distribution: focal, linear, segmental, regional, multiple regions and diffuse
- internal enhancement pattern: homogeneous, heterogeneous, clumped and clustered ring.

Classification of morphology descriptors

Morphology descriptors were classified into benign and malignant descriptors which match the description of benign and malignant lesions, respectively (Table 1).

Focus morphology descriptors

- Multiple, bilateral and faintly enhancing foci were considered as morphology descriptors of benign breast lesions.
- Single, unilateral or intensely enhancing foci were considered as morphology descriptors of malignant breast lesions.

Mass morphology descriptors

- Rounded or oval-shaped mass lesions, circumscribed margins, homogeneous enhancement and dark internal septations were considered as morphology descriptors of benign lesions.
- Irregular-shaped mass lesions, non-circumscribed margins, heterogeneous and rim enhancement patterns were considered as morphology descriptors of malignant lesions.

Non-mass morphology descriptors

- Symmetric NME taking either multiple regions or diffuse distribution and showing homogeneous internal enhancement characteristics were considered as morphology descriptors of benign lesions.
- Asymmetric NME taking focal, linear, segmental or regional distribution and showing heterogeneous, clumped or clustered ring internal enhancement characteristics were considered as morphology descriptors of malignant lesions.

Statistical analysis

- (1) True-positive and true-negative results were considered when malignant and benign morphology descriptors matched malignant and benign pathologies, respectively.

Table 1. Classification of benign and malignant morphology descriptors

Enhancement type	Benign descriptors	Malignant descriptors
Focus descriptors		
Number Laterality Intensity	Multiple Bilateral Faint	Single Unilateral Intense
Mass descriptors		
Shape Margin Internal enhancement	Rounded or oval Circumscribed Homogeneous and dark septations	Irregular Not circumscribed (irregular and spiculated) Heterogeneous and rim enhancement
Non-mass descriptors		
Symmetry Distribution Internal enhancement	Symmetrical Diffuse and multiple regions Homogeneous	Non symmetrical Focal, linear, segmental, regional Heterogeneous, clumped, clustered ring

- (2) False-positive and false-negative results were considered when malignant and benign morphology descriptors mismatched malignant and benign pathologies, respectively.
- (3) Each morphology descriptor was evaluated individually (irrespective of all other descriptors) by calculating its sensitivity, specificity, positive-predictive value (PPV) and negative-predictive value (NPV) and likelihood ratios.
- (4) Likelihood ratios close to 1 were considered to be of little practical significance.
- (5) The degree of uncertainty of the diagnostic indices was described by calculating the 95% confidence interval (CI).
- (6) The strength of association between the descriptors and corresponding benign and malignant pathologies was measured by calculating the odds ratio (OR).
- (7) The χ^2 test was used to assess group differences. p -values ≤ 0.05 were considered statistically significant.
- (8) The kappa statistic was used to assess the agreement between readers on the individual morphology descriptors in the differentiation between benign and malignant pathologies.

RESULTS

261 enhancing lesions [68/261 (26.1%) benign and 193/261 (73.9%) malignant] detected on CESM were retrospectively analyzed by two independent readers (kappa: 0.940, CI: 0.893–0.988). The final diagnosis of the lesions was by either revision of core biopsy or using the operative pathology specimens of 234/261 (89.6%) lesions. Follow-up was applied to 27/261 (10.4%) lesions that were previously categorized as BI-RADS 2 and showed a stationary course over a period of 1 year in a way to confirm their benign nature. The true-positive, true-negative, false-positive and false-negative results were calculated according to the match or mismatch of benign and malignant morphology descriptors (Table 1) and the final diagnosis. Values provided by the independent readers were further evaluated by a third reader, who is a pioneer in contrast-enhanced mammography, to give a cut-off value for debates.

The level of association between the different morphology descriptors and the final diagnosis of the 261 enhancing lesions is shown in Table 2. The diagnostic indices of the independent descriptors were calculated and are represented in Table 3.

Table 2. Association between the morphology descriptors and the final diagnosis of the 261 enhancing lesions

Enhancement type	True positive		False positive		True negative		False negative		OR	p -value
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%		
Focus enhancement (12 lesions)	7	58.3	0	0	3	25	2	16.7	21	0.06
Mass enhancement (168 lesions)										
Shape	110	65.5	9	5.3	22	13.1	27	16.1	9.95	<0.0001
Margin	129	76.8	7	4.2	24	14.2	8	4.8	55.2	<0.0001
Internal enhancement	110	65.5	13	7.7	18	10.7	27	16.1	5.6	<0.0001
NME (81 lesions)										
Symmetry	52	64.2	15	18.5	14	17.3	–	–	98.2	0.0018
Distribution	46	56.8	16	19.8	16	19.7	3	3.7	15.3	0.0001
Internal enhancement	43	53.1	10	12.3	22	27.2	6	7.4	15.7	<0.0001

NME, non-mass enhancement; OR, odds ratio.

Table 3. Diagnostic indices of each morphology descriptor independently, irrespective of all other descriptors

Descriptor	Sensitivity		Specificity		PPV		NPV		LR positive		LR negative	
	%	CI	%	CI	%	CI	%	CI	Value	CI	Value	CI
Focus descriptors	77.7	39.9–97.1	100	29.2–100	100	59.0–100	60	14.6–94.7	–	–	0.22	0.07–0.75
Mass descriptors												
Shape	80.2	72.6–86.5	70.9	51.9–85.7	92.4	86.1–96.4	44.9	30.6–59.7	2.77	1.59–4.83	0.28	0.19–0.42
Margin	94.1	88.8–97.4	77.4	58.9–90.4	94.8	89.6–97.9	75.0	56.6–88.5	4.17	2.1–8.0	0.08	0.04–0.15
Internal enhancement	80.2	72.6–86.5	58.0	39.0–75.4	89.4	82.6–94.2	40.0	25.7–55.6	1.9	1.25–2.92	0.34	0.22–0.53
Non-mass descriptors												
Symmetry	100	93.1–100	48.2	29.4–67.4	77.6	65.7–86.9	100	76.8–100	1.93	1.36–2.75	–	–
Distribution	93.8	83.1–98.7	50.0	31.8–68.1	74.1	61.5–84.4	84.2	60.4–96.6	1.82	1.32–2.67	0.12	0.04–0.39
Internal enhancement	87.7	75.2–95.3	68.7	49.9–83.8	60.4	49.0–71.1	81.1	68.0–90.5	2.81	1.6–4.7	0.18	0.08–0.39

CI, confidence interval; LR, likelihood ratio; NPV, negative-predictive value; PPV, positive-predictive value.

Evaluation of focus morphology descriptors

Enhancing foci comprised 12/261 (4.6%) lesions; 3/12 (25%) benign lesions and 9/12 (75%) malignant lesions. Intensely enhancing foci, whether single (7/12, 58.3%) or multiple (2/12, 16.7%), were malignant while faintly enhancing foci, whether single (1/12, 8.3%) or multiple (2/12, 16.7%), were benign (Figure 1).

Evaluation of mass morphology descriptors

There were 168/261 (64.4%) enhancing masses, out of which 31/168 (18.5%) masses were benign and 137/168 (81.5%) masses were malignant. The mass shape showing the highest prediction for malignancy was the “irregular” shape (PPV: 92.4%). On the other hand, we could not exclude malignancy on the basis of the “round” or “oval” shape *per se* (NPV: 44.9%, LR negative: 0.28) (Figure 2). Mass margins that recorded the best diagnostic performance were the “non-circumscribed” margins, both spiculated and irregular (OR: 55.2, LR positive: 4.77; *p*-value: <0.001) (Figure 3). On the other hand, the internal enhancement pattern of the mass lesions showed a very low specificity (58.0%), NPV (40.0%) and positive and negative likelihood ratios (1.9 and 0.34, respectively) owing to the relative large number of false-positive and false-negative results. 13 (7.7%) benign inflammatory lesions showed rim enhancement (false positive) (Figure 4) and 27/168 (16.1%) malignant lesions showed homogeneous enhancement (false negative). Dark internal septations indicative of benign pathology were identified in 3/168 (1.8%) lesions; all of them were fibroadenomas on pathology (Figure 5).

Evaluation of non-mass morphology descriptors

NME was detected in 81/261 (31%) lesions, 32/81 (39.5%) lesions of which were benign and 49/81 (60.5%) lesions were malignant. Asymmetrical NME was noted in 67 cases and indicated an underlying pathology in all cases: 52/81 (81%) lesions were malignant lesions (true positive) and 15/81 (18.5%) lesions were inflammatory lesions (false positive).

Symmetrical NME was noted in 14/81 (17.3%) lesions and there was no underlying pathology identified in all of them.

The focal, linear, segmental and regional non-mass distributions showed an average association with malignancy (PPV: 74.1%, OR: 15.3) (Figure 6). The internal enhancement patterns indicative of malignancy were the heterogeneous and clumped ones. The clustered enhancing ring pattern was encountered in three cases, all of which proved to be granulomatous mastitis (false positive) (Figure 7).

DISCUSSION

The need for a standardized lexicon to describe enhancing lesions on CESM has become essential. Most malignant and some benign lesions may show enhancement. Therefore, enhancement alone is not enough to diagnose malignancy. According to the ACR BI-RADS lexicon, the need for a standardized lexicon for the analysis of findings is twofold: to concisely describe the findings and to allow analysis of outcomes across institutions to validate management recommendations.³

Substantial research has been performed to describe the most significant features which may be useful for

Figure 1. Different cases demonstrating examples of enhancing foci on contrast-enhanced spectral mammography: (a) a single benign focus (arrow), (b) multiple diffuse and bilateral foci of adenosis, (c) a single malignant focus which proved to be invasive ductal carcinoma (IDC) (arrow) and (d) multiple enhancing foci of mixed IDC and invasive lobular carcinoma (ILC).

differentiating benign from malignant breast lesions on MRI. The ACR breast MRI-specific BI-RADS lexicon of morphology descriptors that illustrates many of the morphological findings seen on MRI has facilitated the interpretation of lesions on DCE-MRI. The BI-RADS MRI lexicon also aids in the uniformity of reporting of breast MRI findings.^{2,6,7}

In the present study, we tried to apply the MRI BI-RADS lexicon of morphology descriptors in the characterization of 261 enhancing lesions identified on the subtraction high-energy CESM images and assess the impact of these descriptors on reaching the

correct diagnosis. Analysis of lesion descriptors was performed by two independent readers (kappa: 0.940, CI: 0.893–0.988).

We classified these 261 enhancing lesions into three subgroups: focus, mass and NME. We also categorized the morphology descriptors into two groups: those characterizing benign lesions and those characterizing malignant lesions. Accordingly, we assessed each descriptor individually in an attempt to rank their degree of competency in the accurate characterization of benign and malignant pathologies. By understanding which of these morphology descriptors is most suggestive of malignancy, the diagnostic accuracy of CESM imaging can be improved.

Figure 2. Contrast-enhanced spectral mammography images in three different cases showing shape patterns of enhancing masses: (a) rounded and (b) oval shape patterns both consistent with fibroadenoma; and (c) an irregular mass shape for invasive ductal carcinomas (IDCs).

Figure 3. Mass margin assessment on contrast-enhanced spectral mammography images in three different cases: (a) fibroadenoma with a circumscribed margin; (b, c) non-circumscribed margin in an irregular (b) or spiculated (c) form in two cases of invasive ductal carcinoma (IDC).

As previously mentioned in literature, the management of a focus should depend on other findings such as the symmetry, corresponding findings from mammography or ultrasound and risk status of the patient.⁸ Others declared that correlation with ultrasound or mammography findings generally do not provide any support for foci and that the strategy must be chosen based on the patient risk factors.⁹ In a retrospective study that included 666 cases, Liberman *et al*¹⁰ also concluded that biopsy is rarely necessary for focus lesions because of their low (3%) likelihood of cancer.

Assessment of the enhancing foci in this study is considered somewhat unreliable owing to the limited number of cases and the small size of the enhancing foci, which makes morphology assessment difficult. We mainly assessed foci according to their (i) number, (ii) laterality and (iii) intensity of contrast uptake. In the latter item, although assessment was subjective, it was a good discriminating sign between benign and malignant lesions even in cases of multiple and bilateral foci. This contradicts what was stated in the MRI BI-RADS lexicon:^{2,7} bilateral enhancing foci

Figure 4. Five different examples of rim enhancement pattern on contrast-enhanced spectral mammography, four of which were benign. (a) A thin uniform mural enhancement can be noted in an infected cyst (arrows); (b, c) thick rim enhancement of the uniform outline in granulomatous mastitis and post-operative infected seroma (arrows). (d, e) A dilemma presented with the non-uniform irregular thick rim enhancement noted in the “malignant” invasive ductal carcinoma (IDC) (d) and the “benign” abscess cavity (e) (arrows).

Figure 5. Example patterns of internal enhancement of masses on contrast-enhanced spectral mammography. (a) A craniocaudal view showing fibroadenoma with homogeneous enhancement; (b) an enhancing circumscribed mass with dark non-enhancing internal septations (arrow) characteristic of fibroadenomas; and (c) a mediolateral oblique view showing an invasive ductal carcinoma (IDC) with heterogeneous internal enhancement pattern (arrows).

are not considered actual lesions and they should be described under the background parenchymal enhancement. In our work, the histopathology diagnosis in 2/12 (16.7%) cases that showed multiple bilateral intensely enhancing foci was multicentric

mixed invasive duct and invasive lobular carcinomas. In addition to the intense enhancement of these foci, the differential appearance of their sizes and distribution in both breasts was another clue to their malignant nature.

Figure 6. Non-mass enhancement (NME) patterns in contrast-enhanced spectral mammography images. (a-c) Three cases of invasive ductal carcinomas (IDCs) that demonstrate examples of homogeneous (a), heterogenous (b) and clumped (c) patterns of NME (arrows). (d) The clustered ring NME pattern in most of the situations describing the inflammatory process as in granulomatous (granulom.) mastitis (arrows).

Figure 7. Mediolateral oblique views of six different cases showing variable distributions of non-mass enhancement (NME) patterns on contrast-enhanced spectral mammography images. (a-e) Invasive ductal carcinomas (IDCs) presenting focal (a), linear (b), segmental (c), regional (d) and multiple region (e) patterns (arrows). (f) A diffuse NME pattern with adenosis (arrows).

The study included 168 enhancing mass lesions that were analyzed according to their shape, margin and internal enhancement pattern.

As reported by Agrawal et al,⁷ amongst the various types of mass shapes, the highest interobserver agreement was the irregular shape, which suggests cancer. This was also confirmed in this study, as 110/168 (65.5%) lesions were malignant and showed irregular shapes whereas only 27/168 (16.1%) lesions showed a round or oval shape.

Margin assessment of mass lesions is considered as one of the most important features with a high PPV in the characterization of a breast mass on MRI.¹¹ Masses with smooth margins strongly suggested benign pathology in the present study, while those with spiculated and irregular margins were most suggestive of malignancy (p -value <0.0001).

In contrast to the MRI BI-RADS lexicon, the internal enhancement pattern of mass lesions scored the least diagnostic indices in terms of specificity (58.0%), NPV (40.0%) and likelihood ratios (1.82 and 0.12). The main reason for this was the high number of false-positive and false-negative cases. The rim enhancement pattern was an unreliable sign in predicting malignancy in the present study. Out of the 24 lesions showing rim enhancement, 13/24 (54.2%) lesions were benign inflammatory lesions (false positive) and only 11/24 (45.8%) lesions were malignant (true positive). On MRI, we have the advantage of referring back to the T_2 weighted images in lesions showing rim enhancement, where we can easily elicit the high T_2 signal denoting infected cysts and abscess cavities. This is not feasible on CESM unless the examination is coupled with an additional complementary technique, such as an ultrasound examination. A second reason is that although a homogeneous internal enhancement pattern has a high predictive

value for benign lesions such as a fibroadenoma, the pattern can also be a presentation of invasive cancer as reported in previous studies.¹² This was the case in the 27/168 malignant lesions (false negative) showing homogeneous contrast uptake in this study. Dark internal septations, described by Nunes et al¹³ as a characteristic of fibroadenomas, was a diagnostic feature in three masses which proved to be fibroadenomas in our work.

After evaluating the morphology descriptors of enhancing mass lesions, we concluded that “irregular” shape, “non-circumscribed” margins (irregular and speculated) and “heterogeneous” internal enhancement showed the highest prediction of malignancy. At the same time, we cannot exclude malignancy based on either a rounded or oval shape or a homogeneous pattern of enhancement. The rim enhancement pattern was a non-specific morphology descriptor on CESM.

The evaluation of non-mass-enhancing lesions on MRI is more subjective than that of enhancing masses and its value in the differentiation between malignant and benign lesions has not been documented. In addition, morphology descriptors for non-mass-enhancing lesions have more false results than those for enhancing masses.¹⁴ In their study, El Khoury et al¹⁵ found a better agreement in the prediction of malignancy for mass than NME.

Morphology descriptors of 81 non-mass lesions were analyzed in terms of symmetry, distribution and internal enhancement characteristics. Similar to what was previously reported by Gity et al,¹⁶ bilateral symmetrical NME was not encountered in any malignant lesions and it usually indicated a normally enhancing parenchyma in 14/14 (100%) of cases. According to Kuhl,¹⁷ bilateral symmetrical NME in any distribution is highly suggestive of benign changes. On the other hand, asymmetrical enhancement

always indicated an ongoing underlying pathology, whether benign or malignant.

The distribution and internal enhancement characteristics showed more or less equal competency in the differentiation of benign from malignant enhancing lesions. In accordance with Mahoney et al,¹⁸ segmental, ductal and regional clumped or heterogeneous enhancement were significantly associated with malignant lesions ($p < 0.0001$). On the other hand, the clustered ring pattern encountered in 3/81 cases was seen in only 3 inflammatory lesions with multiple abscess formation. We recommend adding another diagnostic tool in the characterization of NME.

CONCLUSION

In conclusion, we can confidently apply the MRI morphology descriptors to characterize lesions on CESM, but with few exceptions:

- Not all multiple bilateral enhancing foci should be included under the normal background parenchymal enhancement, but only faintly enhancing ones should be.
- Rim enhancement and clustered ring NME should not be considered as descriptors of malignant lesions unless

CESM is coupled with another diagnostic modality such as ultrasound.

- Irregular-shaped mass lesions with spiculated and irregular margins and heterogeneous enhancement patterns and NME taking a focal, ductal or segmental distribution with heterogeneous or clumped internal enhancement characteristics are the most suggestive descriptors of malignant pathologies.

The present work is faced by a few limitations such as: (1) inclusion of few cases of foci; (2) subjective assessment of part of the criteria, like the intensity of enhancement; and (3) inclusion of complex masses that showed rim enhancement and overlap with invasive malignancy, which may have altered the final results.

Although the present study is not a perfect one, we consider it as a first step towards using a common standardized language in reporting CESM to ensure adequate communication between radiologists and clinicians. A multicentre collaborative work with a larger number of patients has to be performed to confirm our preliminary results.

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