Contrast-Enhanced Mammography (CEM) Lexicon

Jordana Phillips, MD, Associate Professor of Radiology Boston University School of Medicine, Breast Manager, Department of Radiology, Boston Medical Center,

In the US, Contrast-Enhanced Mammography (CEM) is approved as diagnostic tool so we are primarily using it for the following diagnostic indications : cancer staging, Recall from screening, evaluate NAC response, breast symptoms, and MRI contraindication. However, there is a growing interest in using it as a supplemental screening tool, perhaps as an alternative to Breast MRI and Whole Breast Ultrasound. CEM was actually included recently in the ACR appropriateness criteria to be used for that indication, and there is a lot of interest to use it as a standalone screening tool as an alternative to conventional imaging with 2D Mammography or DBT, especially for women with dense breast.

The Contrast-Enhanced Mammography (CEM) Lexicon was published in April 2022 as A supplement to ACR BI-RADS® Mammography 2013. In this article, Dr Jordana. Phillips reviews the content of this new lexicon, highlights the differences with the existing Breast MRI and Mammography lexicon and explain the choices that the committee has made.

CEM BI-RADS Committee

Carol H Lee MD – Chair
Janice S Sung MD
John M Lewin MD
Mary S Newell MD
Jordana Philips MD

The CEM BI-RADS Committee regroups a variety of different experiences, some having helped develop the technology, others being actively using it, others having been part of developing the guidelines in society.

The effort has been motivated by the increased interest in CEM worldwide. Today, more than 2500 CEM units are installed globally and the number of published CEM articles keeps growing. As the utilization has increased, there has been a need for a formal CEM Lexicon and ACR decided to get together to develop it.

The goal of the Lexicon is to encourage consistency in reporting and encourage downstream research. With all of us using the same terminology, a common language, we can do a strong analysis to understand what is the probability of malignancy associated with these descriptors. How often are these descriptors used to describe benign disease versus being associated with malignant disease. As expected, the CEM lexicon is based on an adaptation of the existing mammography and MRI lexicon

The structure for the CEM report is the same as what is used for other Breast imaging modalities (Picture 1).

Contrast-Enhanced Mammography (CEM) technique:

Although CEM is most commonly performed as a bilateral exam, there are situations where that is not performed, for example if the patient has had a mastectomy, in that case the laterality should be included.

Contrast agent used, route (intravenously), contrast dose, rate of administration and any complication that might develop should be included to document and allow a good communication with the prescriber.

However, including the last menstrual period (LMP) is not required, which is different from what has been done previously with breast MRI. In fact, there is no data to date suggesting that timing with LMP will impact outcomes.

Report Structure
1. Indication for examination
2. CEM technique
3. Comparison to previous examination(s)
4. Succinct description of overall breast composition
5. Clear description of any important findings
6. Assessment
7. Management

Picture 1.

Description of overall breast composition

In line with what is known from MG & MRI, it has been decided to include information about breast tissue density and description of Breast Parenchymal Enhancement (BPE) using classic MRI terms (Picture 2).

From experience, there is a lot of variability in how radiologists apply these BPE categories especially between minimum & mild and moderate & marked. Perhaps because of the newness of the technology or how we teach it, or because it's a planar exam; unlike MRI, we don't have so many details about BPE.

Research will be done to figure out if there is an association between BPE and breast cancer detection rate, BPE and downstream breast cancer risk. We are in very early stage so far.

Description of important findings

Findings are divided in three categories: those seen on low energy (LE) images alone, low-energy findings with associated enhancement on recombined image, and those noted on recombined images only. Both interpretations of the low energy findings and recombined images have to be included in the interpretation of a CEM exam. If suspicious microcalcifications were to be seen on the LE exam, that have no associated enhancement, that is still a positive CEM, and it should be reported. LE findings have to be included in the overall assessment of the modality.

Low energy only

The low energy only findings should be described exactly as they are described on a conventional mammography exam, using the MG BI-RADS Lexicon.

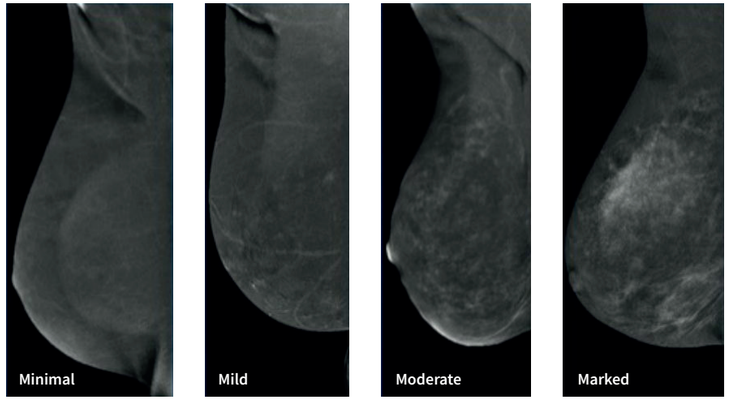
Low energy findings with associated enhancement

Standard conventional mammography descriptors are still used to describe the morphology on images.

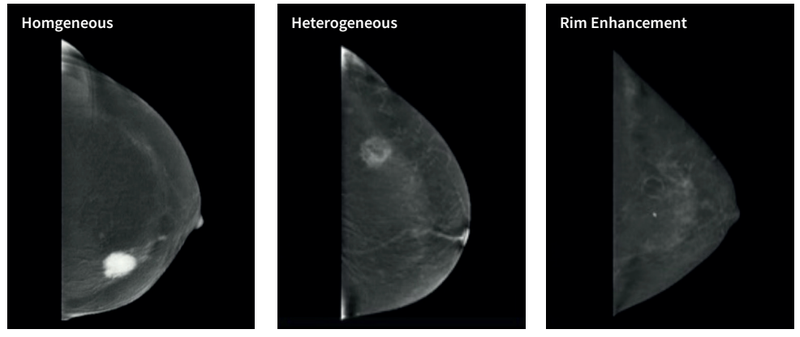
Then, information should be added on:

- **Enhancement pattern** (internal enhancement – homogeneous / heterogeneous / RIM enhancement) (Picture 3)
- One major difference between the CEM Lexicon and the Breast MRI Lexicon is the removal of descriptor for Dark Internal Septation. The reason for this is that we felt we can't appreciate that level of details on CEM images.
- **Extent of Enhancement** on Recombined images relative to LE findings.
  It should be first mention if LE and recombined images findings are:
  - equivalent OR
  - lesion on LE partially enhance OR
  - lesion on LE completely enhance OR
  - the enhancement extend goes beyond the lesion seen on LE images OR
  - there is no enhancement of the lesion seen on LE but enhancement in adjacent tissue (picture 4)
- **Lesion Conspicuity:** Lesion conspicuity should be described as low / moderate or high.
  A fairly highly debated conversation happened about that topic. We first thought that we would describe lesion as their degree of enhancement. Do they markedly enhance? Do they minimally enhance? Do they have weak or strong enhancement ? Because this is how people have been reporting on it in the literature. But we realized that it was not an objective measure of lesion enhancement. And we felt that this subjective assessment was impacted by the BPE. If a lesion is strongly enhancing, you would see it very well with minimal BPE. But that same lesion, if it was small, with a marked BPE, you might not be able to appreciate it as much and you might not call it as strongly enhancing. So instead, we chose to include this more subjective category of how well we see the lesion relative to BPE? low / moderate / high conspicuity (picture 5)

BPE



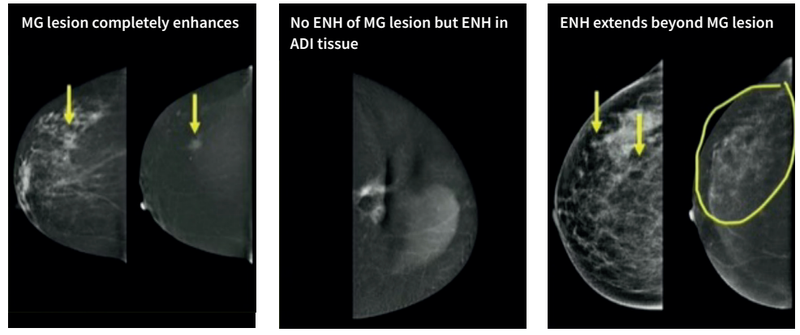
Picture 2. Classification of Breast Parenchymal Enhancement



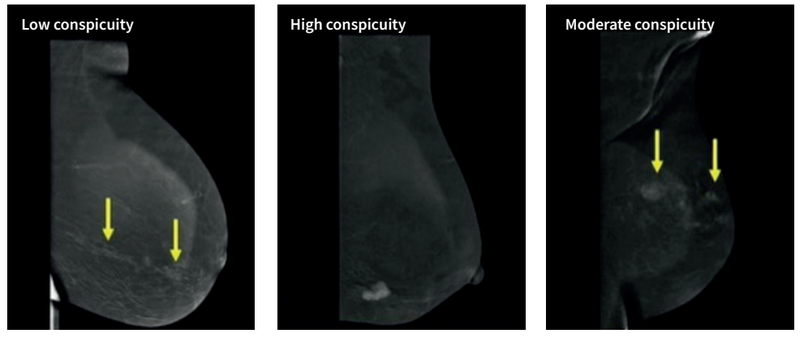
Picture 3. Enhancement pattern

On the right image : On the mammography image, there is a density involving a large portion of outer right breast which was there for decades. But the two discrete groups of calcifications round but grouped are new. A CEM has been performed. Recombined image shows an entire area of enhancement on the right breast, extending all the way to the nipple.

Result: Polymorphic LCIS and invasive Lobular cancer. The extent was far larger than anticipated on mammography, it transformed her care.



Picture 4. Exemple of extent of enhancement



Picture 5. Lesion conspicuity

Findings seen on Recombined images only

The description of the morphology is similar to MRI Lexicon with a few important differences.

- **Mass enhancement**
  - Shape : Oval, Round, Irregular
  - Margins : Circumscribed, Not Circumscribed
  - Internal Enhancement Characteristics: Homogeneous, Heterogeneous, Rim Enhancement.

Dark Internal Septations descriptor has been removed as well as the term “focus”. A small area of enhancement without a LE correlate should therefore be described as a mass, Non-Mass Enhancement or with the new descriptor “enhancing asymmetry” if seen on only one view. The idea of removing focus is because we do not have the same amount of details in CEM as in MRI. And the reason why we call a focus on MRI is because we get down to such small areas that we are not able to characterize them, so we say focus. In fact, there is a goal of removing that term, even from the MRI lexicon. Although the move on MRI lexicon may or may not happen, the thought is to be consistent with it. And we don’t have enough detail to characterize the abnormality as mass or non-mass enhancement.

- **Non Mass enhancement**
  - Distribution : Diffuse, Multiple Regions, Regional, Focal, Linear, Segmental
  - Internal Enhancement pattern : Homogeneous, Heterogeneous, Clumped,

Clustered ring enhancement is not included as we felt we could not see that level of detail on CEM images

- **Enhancing Asymmetry:** This term is a new addition to the CEM lexicon and should be used when you see an enhancement on only one view. It can be used whether the finding is seen on recombined images only or with an asymmetry on LE views.

This was another dilemma. We thought that if we give it a name, we will be able to track it, do research on it, and understand how often we need to be concerned about it. The decision to include this new entity is also because it parallels what people are already doing for conventional mammography which is the foundational basis.

- Internal Enhancement Pattern : Homogeneous, Heterogeneous,
  - Lesion Conspicuity should be described as well.

Assessment and Management

Assessment and management are exactly the same as for rest of Breast Imaging.
The well-established Birads categories 0-6 are also used for the CEM lexicon.

In general, when using CEM for screening:

BIRADS 0 is the preferred BIRAD category if you need additional imaging to better characterize an abnormality
BIRADS 3/4/5 are not recommended but may be appropriate if all imaging is available on the CEM. This is similar to guidelines for conventional mammography

In a Diagnostic setting, the reverse is true
BIRADS 0 is not recommended unless there is a true need for extra imaging to classify the abnormality as benign, probably benign or suspicious. A common scenario is if the patient needs to return for ultrasound or MRI exam
BIRADS 3/4/5 is preferred if the abnormality is probably benign or suspicious, and the additional views are simply being performed to identify a target for follow-up imaging or biopsy.

LEXICON

The Lexicon is an exciting development for contrast Mammo, it really legitimizes the use of this modality. But this is a 1st edition of CEM BI-RADS lexicon, changes are anticipated.

Feedback is welcome and will be critical to make sure the lexicon reflects all of our practices and allow to provide meaningful reports.

> *“I am constantly impressed by the potential of Contrast-Enhanced Mammography and it’s simplicity. Any practice anywhere can use it to find clinically significant cancers.*
>
> *It’s a game changer for practices like my own, where we have a lot of patients that don’t have access to advanced Imaging technique, it’s a game changer to reduce healthcare disparities.”*