Original Article

Interpretation of patterns of enhancement on contrast-enhanced spectral mammography: An approach to a standardized scheme

Yasmin Mounir Tohamey[a,*], Sherihan Wahid Youssry[b], Asmaa Ibrahim Abd El Aziz[c]

[a] Diagnostic and Interventional Radiology Department, Faculty of Medicine, Cairo University, Egypt
[b] Diagnostic and Interventional Radiology Department, National Cancer Institute, Cairo University, Egypt
[c] Pathology Department, National Cancer Institute, Cairo University, Egypt

ABSTRACT

Objective: Applying the morphological descriptors described in the MRI breast imaging and reporting data system (BIRADS) in characterizing enhancing breast lesions seen on CESM.

Methods: 178 breast lesions in patients with mean age 46 years in a prospective study were included. Morphological categorization of the included lesions was presented into focus, mass and non-mass forms. Furthermore classifications included (1) the margin, enhancement intensity for "**focus**" (2), the shape, margin and internal enhancement for "**mass**" and (3) the distribution and internal enhancement for "**non-mass**". Each morphology descriptor was evaluated separately (irrespective of the other descriptors) by calculating its sensitivity, specificity, (PPV) and (NPV).

Results: This study included 104 malignant lesions versus 74 benign. Diagnostic accuracy parameters for CESM were sensitivity 98% (102/104) and specificity 76% (56/74). Irregular margin intense enhancement focus (1/8) was diagnosed malignant, (7/8) while regular margin faint enhancing foci were benign.

Irregular shape, spiculated margin and heterogeneous internal enhancement descriptors of mass lesion descriptors conformed to malignancy (PPV 92.5% of the former and 88.7% of the latter, p value ≤ 0.001).

Asymmetry with segmental distribution, (17/27) (70.8%) heterogeneous and clumped internal enhancement patterns were indicative for malignancy in non mass enhancement (PPV < 0.001).

Conclusion: MRI lexicon morphology descriptors can be applied (yet with few exceptions) in the characterization of enhancing breast lesions on CESM.

The most sensitive descriptors for malignant lesions regarding masses are irregular, margins yet for NME the focal, ductal and segmental distribution with heterogeneous or clumped enhancing patterns. Still foci are controversial.

1. Introduction

Mammography still is the reliable breast screening examination proved to reduce breast cancer mortality in general screening population [1]. Mammography is not expensive and available widely, but with limited sensitivity 70–85% overall that drops to 30–50% in high-risk women with dense breasts [2].

The ultimate sensitivity of MR imaging is attributed to combining anatomical and physiological imaging. The MR physiologic component

imaging lies in its ability to detect enhancing tumor vascularity after contrast administration [3].

Contrast-enhanced spectral mammography (CESM) is the advanced technology stemming from the digital platform having common background as MR imaging in attaining contrast enhanced good quality images with sensitivities reported up to 98% [4].

The American College of Radiology (ACR) [5–7] issued new guidelines for the interpretation and relation of morphological enhancement and kinetics features in an attempt to standardize the
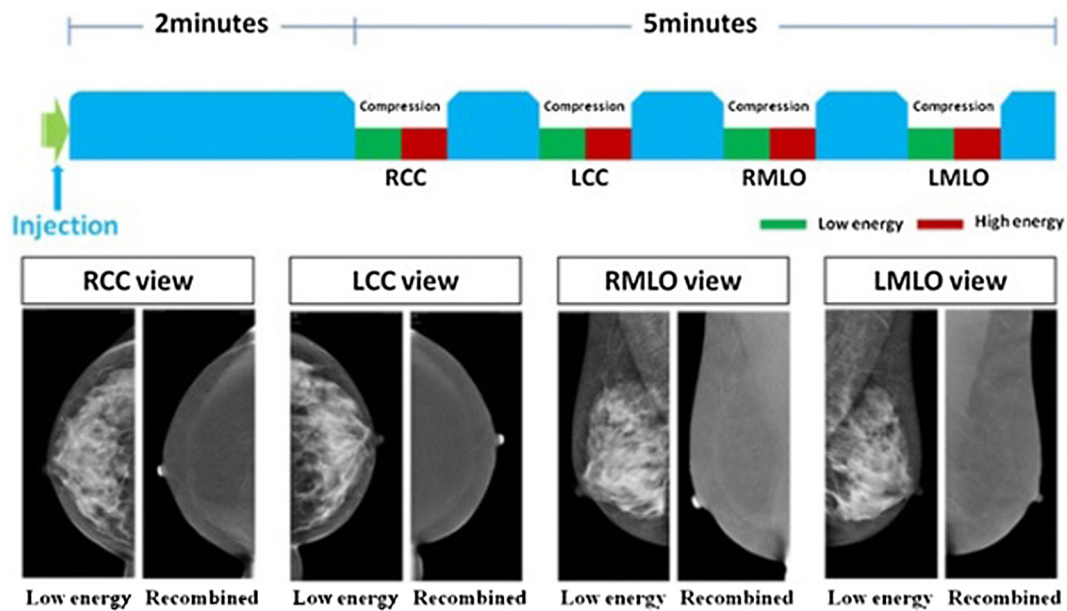
Fig. 1. Contrast enhanced spectral mammography examination scheme (courtesy of GE Healthcare) [8].

Table 1
Number of cases of the different benign and malignant lesions represented in the study.

Benign lesions	Number of lesions	Malignant lesions	Number of lesions
Fibroadenoma	27	IDC	64
Inflammatory conditions	15	ILC	17
Fibrocystic changes	10	Mixed IDC&ILC	10
Phyllodes	4	DCIS	6
Papilloma	4	Tubuloductal	2
Post-operative scar	3	Paget's	2
Adenosis	3	Papillary	2
Atypia	3	Mucinous	1
Intramammary lymph node	2		
Fat Necrosis	2		
Adenomyoepithelioma	1		
Total	74		104

communication language, a similar one is not issued for CESM and is now becoming crucial for better management (see Fig. 1).

The aim of this work is to establish whether or not the patterns of enhancement encountered on CESM can be analysed according to the MRI BIRADS Lexicon. This entails categorizing the lesions according to their enhancement alongside their pathological correlation into benign and malignant entities. The ability to set forth specific terminologies as seen with other breast imaging modalities will result in a standardized scheme when it comes to reading the CESM report and thus enable better communication between the radiologist and clinicians.

2. Patients and methods

2.1. Patients

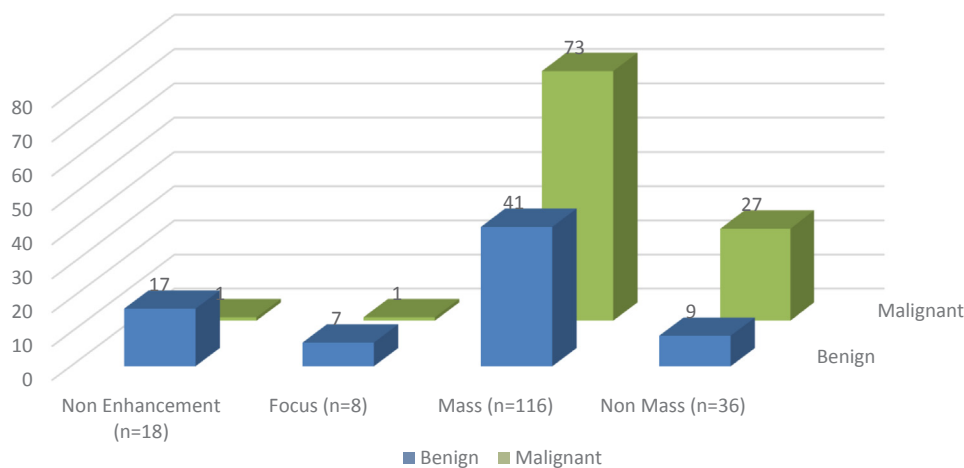The study was approved by the hospital ethical committee and an

Fig. 2. Patterns of contrast uptake in the 178 lesions with their pathological correlation.