The Egyptian Journal of Hospital Medicine (October 2022) Vol. 89, Page 4762- 4766

Breast Asymmetry and Value of Contrast-Enhanced Spectral Mammography: Review Article

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ABSTRACT

Background: The major imaging method for early diagnosis of breast cancer is screening mammography. One and half to four years before a malignancy becomes clinically apparent, mammography may identify it. Faster scanning times in the mammography suite are possible with contrast-enhanced spectral mammography. Clinical effectiveness of contrast-enhanced spectral mammography for detecting asymmetry in mammograms was assessed in this study.

Objective: Assessment of possible role of contrast-enhanced spectral mammography for diagnosing breast asymmetry.

Methods: Breast asymmetry, and contrast-enhanced spectral mammography were all looked for in PubMed, Google scholar, and Science direct. References from relevant literature were also evaluated by the authors, but only the most recent or complete study from March 2006 to April 2021 was included. Due to the lack of sources for translation, documents in languages other than English were ruled out. Papers that did not fall under the purview of major scientific investigations, such as unpublished manuscripts, oral presentations, conference abstracts, and dissertations, were omitted.

Conclusion: Especially for women with dense breasts, contrast-enhanced spectral mammography has the potential to be effective in identifying lesions that would otherwise go undetected due to breast asymmetry. This would improve the rate at which breast cancer is detected in its earliest stages.

Keywords: Breast asymmetry, Contrast-enhanced spectral mammography.

INTRODUCTION

When one breast has a greater volume or density of breast tissue than the other, this is referred to as asymmetric breast tissue. While asymmetry is frequently a non-obtrusive observation, it may warrant further investigation in some cases. Tissue loss, underdevelopment, or a more pronounced parenchyma in one side can all contribute to an appearance of asymmetry [(1)].

Focal asymmetry is defined by the Breast Imaging Reporting and Data System as having similar features in more than one quadrant of the breast but lacking convex borders and including interspersed fat. While both asymmetry and focal asymmetry appear on one of the two conventional mammography images, the latter is more common. In contrast, growing asymmetry refers to focal asymmetry that wasn't seen in earlier mammograms but is now more noticeable or demonstrates size increases [(2)].

Contrast-enhanced spectral mammography (CESM) may be helpful for lesion detection in the mammographically dense breast. Further research on the diagnostic potential of contrast-enhanced spectral mammography, an emerging technology derived from spectral mammography, is warranted [(2)].

Breast asymmetry and value of CESM:

If you look at two separate mammogram projections, you can notice a density with concave edges in just one quadrant. This is called focal asymmetry [(3)].

A "focal asymmetry" is an area of increased density that may be seen from two different vantage points as a confined asymmetry of about the same shape. However, it does not qualify as a mass and has no clearly defined boundaries [(4)].

Received: 26/05/2022
Accepted: 03/08/2022

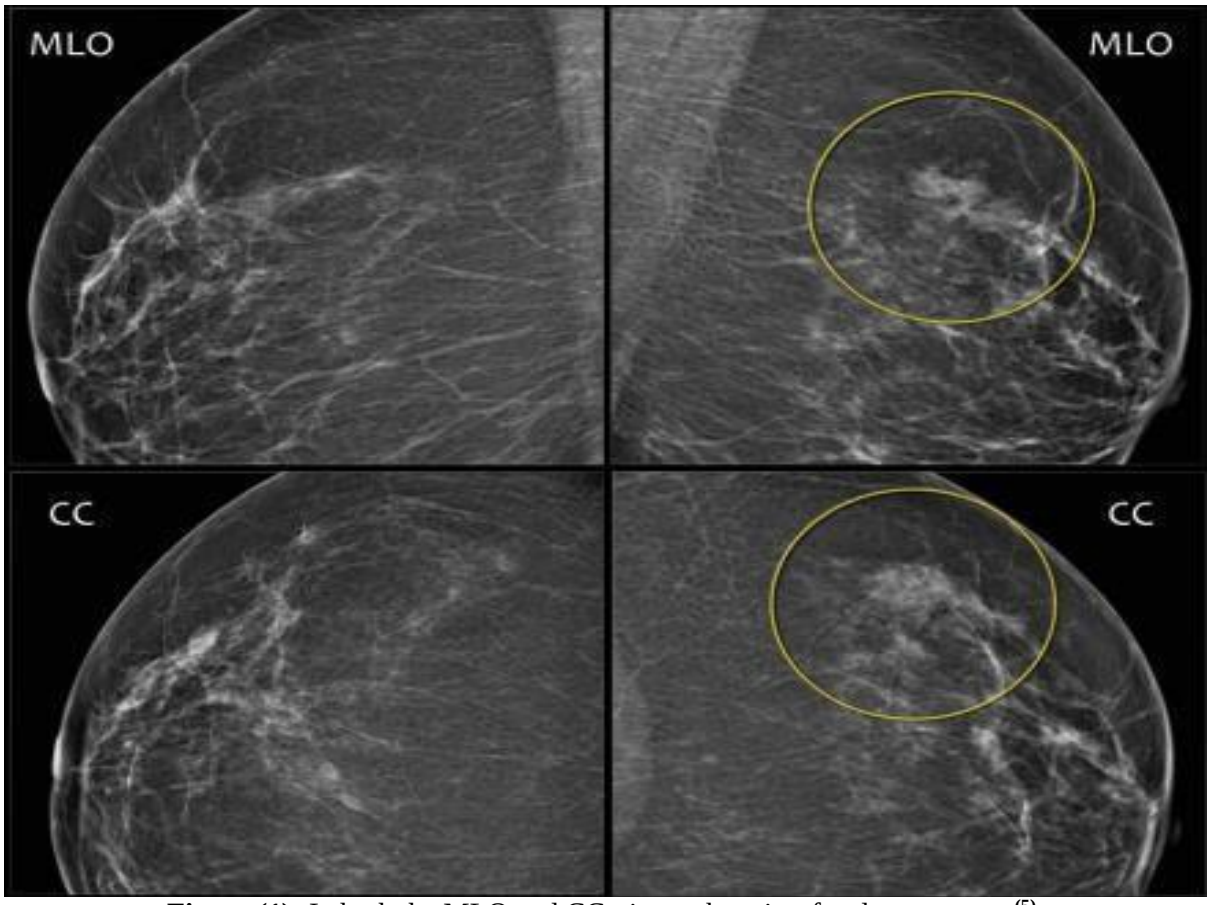

Figure (1): In both the MLO and CC-views, there is a focal asymmetry [5].

Focal asymmetry versus mass:

The focal asymmetry can be seen on both projections, proving that it is not a mere superposition but rather a genuine result. Distinguishing something from a bulk is essential. Unlike genuine masses, which have distinctive border contours, asymmetries are not easily noticeable. The asymmetries look like other areas of distinct fibro glandular tissue, but they only affect one breast and don't have a corresponding area in the other breast [5].

Localized fibroglandular parenchyma is the most common cause of breast asymmetry, and unlike a mass, it typically has concave margins, is mixed with fat, and is not dense in the center [6].

Possibilities of focal asymmetry:

Whenever there is fat interspersed with otherwise normal breast tissue, this is what you'll see most of the time. Concerning signs of malignancy include focal asymmetry accompanied by a palpable discovery, architectural deformity, or microcalcifications [4].

If seen at first during a routine examination, it is typically benign because it is usually intermingled with fat and shows no signs of calcification or morphological deformity. New or enlarging foci of asymmetry are not actual foci of asymmetry but rather growing asymmetries, and they warrant biopsies due to the > 12% cancer risk associated with asymmetries in their early stages as seen during screening [7].

An asymmetry seen on a single standard screening view may be reclassified as a focused asymmetry after being spotted on another projection during follow-up [8]. One of the two conventional mammographic views, traditionally known as a density mammogram, reveals asymmetry of the breast [9].

Because of this ambiguity, the term "density" should be reserved for describing the difference in x-ray attenuation between a mass and an equivalent volume of fibroglandular tissue [5].

In the case of global asymmetry, at least one quadrant of one breast is significantly larger than the other. This discovery is benign when unaccompanied by other symptoms, and a small fraction (3%) may be linked to breast cancer when other symptoms are present [4].

Diagnostic mammography or ultrasound may reveal a tumour where just a localised asymmetry was suspected at screening. Most focal asymmetries can be thought of as solitary regions of healthy tissue. Focal asymmetries on a baseline mammography are likely benign findings (BI-RADS 3), with less than 2% probability of cancer, provided there are no concomitant clinical, mammographic, or sonographic abnormalities. After a diagnostic evaluation, a brief follow-up period is appropriate [10].

To rule out the possibility of a mass, US is the best diagnostic tool for a persistent focal asymmetry. It was found that US had a negative predictive value of

89.4% (7/9) for breast cancer in one series. Both the palpable asymmetry and the non-asymmetry had infiltrating ductal carcinomas on US.

If a biopsy is warranted because to a palpable focal asymmetry, a negative US should not rule out the possibility. Localized hyperechoic tissue that coincides with a region of focal asymmetry, on the other hand, is indicative of a benign process [(11)].

Value of CESM in assessment of asymmetry:

It has been shown that focal and global asymmetries, when combined with other suspicious mammographic findings, are statistically significant for malignancy, and that CESM plays a crucial role in defining tumour size and extension. In the absence of any concerning imaging findings, any asymmetrical density that is not enhancing is likely to represent a benign disease [(12)].

Developing asymmetry:

According to the BI-RADS 5th edition, a developing asymmetry on mammography is defined as a focal asymmetry that is either new or has increased in size or conspicuity compared with images from earlier examinations [(8)].

Compared to a previous mammography, a developing asymmetry is a focal asymmetry that is either new, growing larger, or denser. Hormone-induced developing asymmetry, on the other hand, is bilateral and universal, as opposed to developing focal asymmetry. A clinical history can rule out infection, trauma, and surgery as possible reasons of a new asymmetry [(13)].

The term "developing asymmetry" is specific to mammography and is not used to characterize abnormalities found with ultrasound or magnetic resonance imaging [(8)].

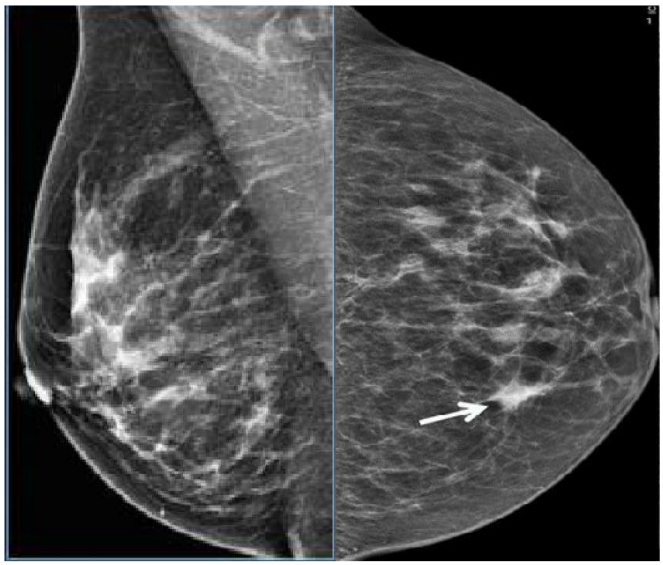

Figure (2): To the left global asymmetry. To the right focal asymmetry without calcifications or architectural distortion [(7)].

Recognizing a developing asymmetry can be difficult, but it worth it because of the link to breast cancer. When a developing asymmetry is detected with screening mammography, the risk of underlying cancer is 12.8%, and when detected using diagnostic mammography, the likelihood is 26.7% [(14)].

A growing asymmetry indication on screening or diagnostic mammography indicates a high enough risk of cancer to warrant recall and biopsy. In the event of asymmetrical growth, even normal sonographic findings do not rule out the possibility of cancer [(15)].

A BI-RADS 4 with a biopsy referral should be given for a newly developed asymmetry that does not resolve following a diagnostic workup, unless the asymmetry is caused by a benign discovery, such as a cyst, as determined by ultrasonography. However, even in the case of a normal ultrasound, a biopsy may be advised. Six percent of non-palpable tumors in a study of 300 showed signs of asymmetric development [(4)].

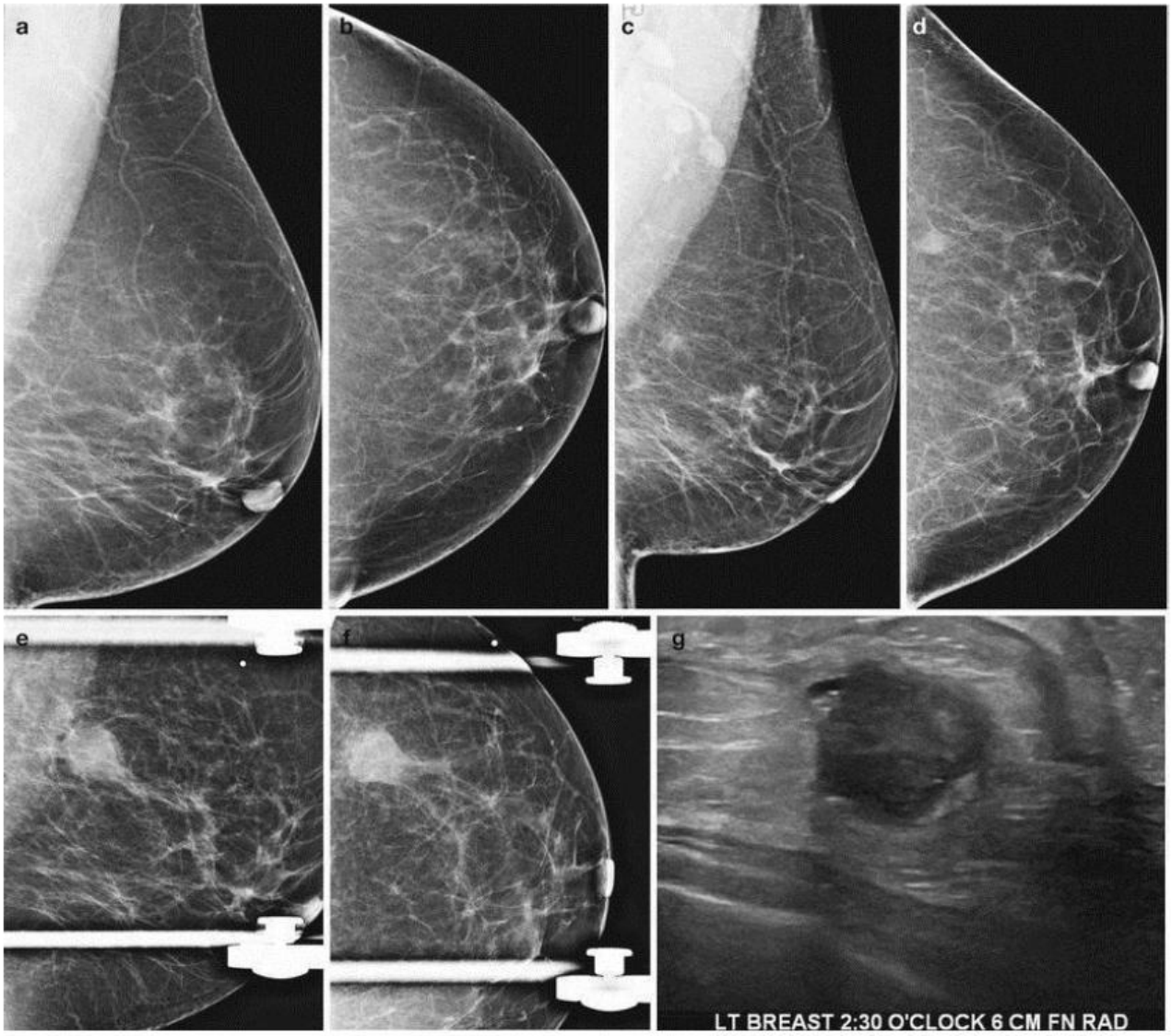

Figure (3): Asymmetries that were just discovered and identified as IDC **(4).**

(a) In the MLO image of the left breast taken in August 2011, the parenchyma has been replaced by fat, and there are no aberrant findings. (b) There are no abnormalities visible on a CC scan of the left breast performed in August 2011. (c) An MLO image of the left breast taken in August 2012 reveals a growing asymmetry in the outer posterior region of the breast. (d) The CC image of the left breast from August 2012 shows an emerging asymmetry in the outer posterior breast. (e) Regional contraction. The MLO image from February 2013 shows an irregular mass with significant density in the central outer region of the breast. In August 2012, the patient was supposed to return for a diagnostic mammography but she never did. (f) A high-density irregular mass may be seen in the posterior outer central breast on a spot-compression CC image from February 2013. (g) According to the results of the ultrasound, the lump is solid and displays signs of cancer.

CESM is a novel technique in breast imaging that, like magnetic resonance imaging (MRI), employs recombined images with contrast enhancement to assess neovascularity. Currently, CESM is only offered by a small fraction of breast imaging centers. Practitioners' lack of experience with the technology and the difficulties of incorporating CESM into standard breast imaging workflows may contribute to the poor acceptance of CESM **(16).**

CESM is an innovative breast imaging technique that brings together FFDM's benefits and intravenous contrast's. Since FFDM is a two-dimensional modality, the summing of overlapping tissues compensates for false-negative and false-positive findings in heterogeneously dense or extremely thick breast tissue, leading to increased recall rates and reduced sensitivity of the examination **(17).**

Neo-angiogenesis is a hallmark of cancerous growths. By using contrast chemicals to emphasize areas of blood vessel proliferation in tumors relative to surrounding normal breast tissue, CESM takes advantage of the idea of angiogenesis in malignancies (18). Moreover, it's crucial in determining tumor extent and size **(12).**

CEDM may be preferable to mammography for screening purposes in women with thick breasts or a greater than usual lifetime risk of breast cancer.

Current ACR guidelines recommend annual surveillance breast MRI for women with thick breasts who have a personal history of breast cancer or who are diagnosed before the age of 50, and yearly supplemental MRI screening for high-risk women of any breast density. However, MRI is economically viable as a supplementary screening approach only for women with a > 20 percent lifetime probability of having breast cancer, such as women with BRCA1 or BRCA2 mutations [(19)]. Studies have revealed that CEDM is more effective than 2D mammography and on par with MRI in terms of sensitivity and negative predictive value [(19-20)]. When MRI is unavailable or cannot be performed, CEDM may be a cost-effective option for women with thick breasts or those at an increased risk of developing breast cancer.

CONCLUSION

Contrast-enhanced spectral mammography has the potential to be successful in finding lesions that would otherwise go undetected due to breast asymmetry, especially for women with dense breasts. Breast cancer would be discovered earlier if this were done.

Conflict of interest: The authors declared no conflict of interest.
Sources of funding: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.
Author contribution: Authors contributed equally in the study.

REFERENCES

1. **Jochelson M, Lobbes M (2021):** Contrast-enhanced Mammography: State of the Art. Radiology, 299 (1): 36-48.
2. **Mann R, Kuhl C, Kinkel K *et al.* (2008):** Breast MRI: guidelines from the European Society of Breast Imaging. Eur Radiol., 18: 1307–1318.
3. **D'Orsi C, Sickles E, Mendelson E *et al.* (2013):** ACR BI-RADS Atlas: Breast Imaging Re-porting and Data System. American College of Radiology, Reston, VA, USA, Pp: 150–153. https://www.scirp.org/(S(czeh2tfqyw2orz553k1w0r45))/reference/ReferencesPapers.aspx?ReferenceID=2274695
4. **Shetty K (2014):** Springer Breast Cancer Screening and Diagnosis: A Synopsis E. book, Pp: 104-107. https://link.springer.com/book/10.1007/978-1-4939-1267-4
5. **Cheung Y, Juan Y, Lin Y *et al.* (2016):** Dual-Energy Contrast-Enhanced Spectral Mammography: Enhancement Analysis on BI-RADS 4 Non-Mass Microcalcifications in Screened Women. PLoS One, 11 (9): e0162740. https://doi.org/10.1371/journal.pone.0162740
6. **Barazi H, Gunduru M (2021)**: Mammography BI RADS Grading.Treasure Island (FL): StatPearls. https://www.ncbi.nlm.nih.gov/books/NBK539816/
7. **Lee K, Talati N, Oudsema R *et al.* (2018):** BI-RADS 3: Current and Future Use of Probably Benign. Current Radiology Reports, 6 (2): 5. doi:10.1007/s40134-018-0266-8.
8. **Price E, Joe B, Sickles E (2015):** The developing asymmetry: revisiting a perceptual and diagnostic challenge. Radiology, 274 (3): 642–651.
9. **Prummel M, Muradali D, Shumak R *et al.* (2016):** Digital Compared with Screen-Film Mammography: Measures of Diagnostic Accuracy among Women Screened in the Ontario Breast Screening Program. Radiology, 278 (2): 365–373.
10. **Burnside E, Sickles E, Bassett L *et al.* (2009):** The ACR BI-RADS experience: learning from history. J Am Coll Radiol., 6 (12): 851-60.
11. **Eberl M, Fox C, Edge S *et al.* (2006):** BI-RADS classification for management of abnormal mammograms. J Am Board Fam Med., 19 (2): 161-4.
12. **Wessam R, Gomaa M, Fouad M *et al.* (2019):** Added value of contrast-enhanced mammography in assessment of breast asymmetries. Br J Radiol., 92 (1098): 20180245. doi: 10.1259/bjr.20180245
13. **D'Orsi C, Hall F (2006):** BI-RADS lexicon reemphasized. AJR Am J Roentgenol., 187 (5): 557-59.
14. **Venkatesan A, Chu P, Kerlikowske K *et al.* (2009):** Positive predictive value of specific mammographic findings according to reader and patient variables. Radiology, 250 (3): 648–65.
15. **Leung W, Sickles E (2007):** Developing Asymmetry Identified on Mammography: Correlation with Imaging Outcome and Pathologic Findings' American Journal of Roentgenology, 188 (3): 667-675.
16. **Covington M, Pizzitola V, Lorans R *et al.* (2018):** The Future of Contrast-Enhanced Mammography. American Journal of Roentgenology, 210 (2): 292-300.
17. **Bhimani C, Matta D, Roth R *et al.* (2017):** Contrast-enhanced Spectral Mammography: Technique, Indications, and Clinical Applications. Acad Radiol., 24 (1):84-88.
18. **Daniaux M, Zordo T, Zantner W *et al.* (2015):** Dual-energy contrast- enhanced spectral mammography (CESM). Arch Gynecol Obstet., 292 (4): 739–747.
19. **Patel B, Lobbes M, Lewin J (2018):** Contrast Enhanced Spectral Mammography: A Review. Semin Ultrasound CT MR., 39 (1): 70–79.
20. **Lee-Felker S, Tekchandani L, Thomas M *et al.* (2017):** Newly diagnosed breast cancer: Comparison of contrast-enhanced spectral mammography and breast MR imaging in the evaluation of extent of disease. Radiology, 285 (2): 389–400.