Misericordia University
Misericordia Digital Commons

Student Research Poster Presentations 2026 Student Research Poster Presentations

2026

Contrast-Enhanced Spectral Mammography

Alyza Vega
Misericordia University

Follow this and additional works at: https://digitalcommons.misericordia.edu/research_posters2026

Part of the Medicine and Health Sciences Commons

Recommended Citation
Vega, Alyza, "Contrast-Enhanced Spectral Mammography" (2026). *Student Research Poster Presentations 2026*. 15.
https://digitalcommons.misericordia.edu/research_posters2026/15

This Poster is brought to you for free and open access by the Student Research Poster Presentations at Misericordia Digital Commons. It has been accepted for inclusion in Student Research Poster Presentations 2026 by an authorized administrator of Misericordia Digital Commons. For more information, please contact mcech@misericordia.edu.

Contrast-Enhanced Spectral Mammography (CESM)

Student Researcher: Alyza Vega
Faculty Advisor: Michelle Adams, B.S.R.T. (R)(ARRT)

MISERICORDIA UNIVERSITY

Introduction

- Breast cancer remains one of the most common malignancies among women worldwide.
- Early detection is critical for improving patient outcomes and survival rates.
- Traditional mammography may have reduced sensitivity in patients with dense breast tissue.

(Rasheed & Youseffi, 2024)

- Contrast-Enhanced Spectral Mammography (CESM) is an advanced imaging technique designed to improve lesion detection. (Abdi et al., 2026)

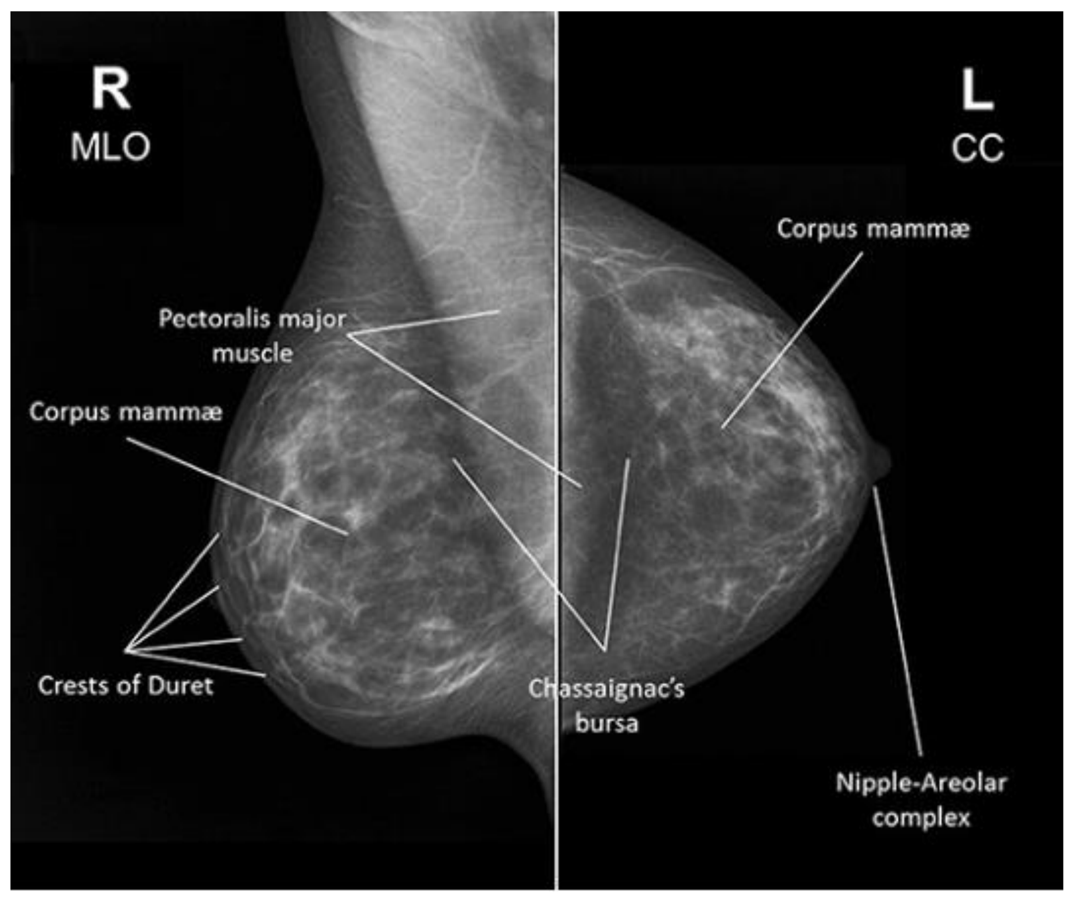

Figure 5.2. Labeled normal mammograms.
(Rasheed & Youseffi, 2024. p. 59)

What is CESM?

- CESM is a dual-energy imaging technique that combines digital mammography with intravenous iodinated contrast.
- It utilizes a dual-energy imaging system to capture two sets of images:
    - Low-energy images similar to standard mammograms
    - High-energy images that detect contrast uptake
- The contrast agent highlights areas of increased vascularity, which is commonly associate with malignant tumors.
- CESM produces recombined images, where background breast tissue is suppressed, and areas of enhancement are emphasized.
- This technique allows for improved visualization of lesions that may be obscured in dense breast tissue.
- CESM provides both anatomical and functional imaging information in a single exam.
- The technology is designed to improve diagnostic accuracy, lesion characterization, and clinical decision-making.
- CESM is a faster and more accessible alternative to breast MRI. (Wong et al., 2024)

How CESM Works

- CESM begins with the intravenous administration of an iodinated contrast agent that is injected into an arm vein prior to imaging.
- The contrast circulates though the bloodstream and accumulates in areas of increased tumor vascularity.
- After contrast administration, the breast is positioned similarly to a standard mammogram and dual-energy imaging acquisition is performed.
- Two types of x-ray exposures are obtained during each compression such as low-energy images and high-energy images.
- This recombination technique improves lesion conspicuity, making abnormalities more visible compared to conventional mammography.
- The entire procedure is relatively quick, typically within a few minutes, and is well tolerated by patients.
- CESM provides both morphologic (structural) and functional (contrast-enhanced) information in a single examination.
- The technique follows a similar approach to contrast-enhanced breast MRI, but is more accessible, faster, and cost-effective. (Wong et al., 2024)

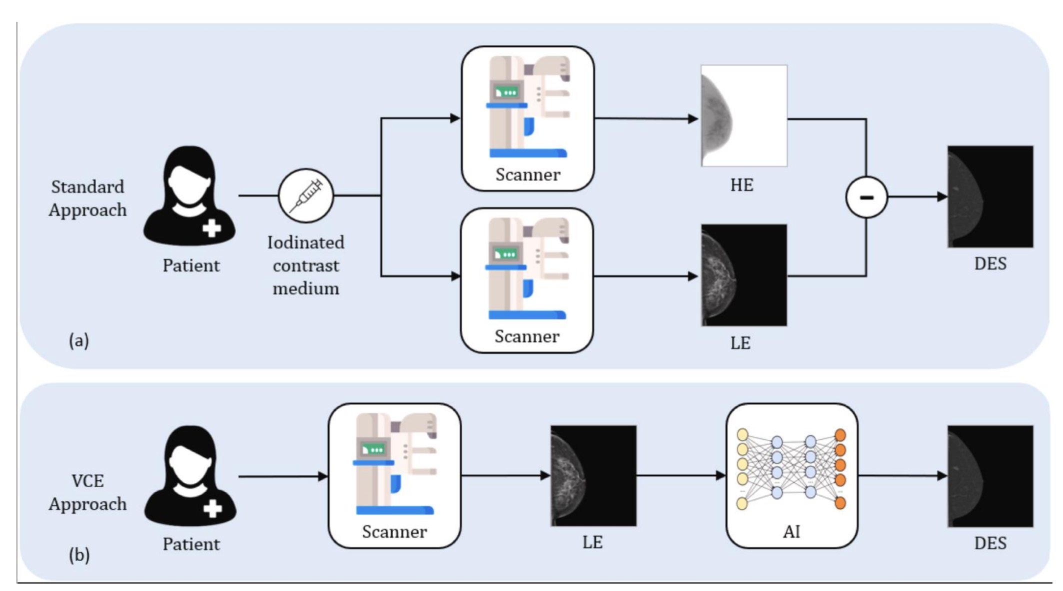

Fig. 1. Illustration of dual-energy subtracted (DES) images generation.
(Rofena et al., 2024. p. 2)

Clinical Applications

- Detection of breast cancer in dense breast tissue
- Evaluation of suspicious lesions
- Preoperative staging of known breast cancer
- Monitoring response to chemotherapy
- Problem-solving tool when conventional imaging is inconclusive (Wong et al., 2024)

Advantages of CESM

- Higher sensitivity compared to conventional mammography
- Improved lesion visualization in dense breasts
- Faster and more cost-effective than MRI
- Widely accessible in many imaging departments
- Better patient tolerance compared to MRI

(Abdi et al., 2026)

Limitations and Risks

- Requires iodinated contrast (risk of allergic reaction)
- Increased radiation dose compared to standard mammography because CESM requires a double energy exposure for each exposure
- Limited availability compared to conventional mammography
- Contrast medium can cause a decline in renal function within three days of iodine-based contrast medium administration
- CESM is not suitable for patients with known renal impairment (Rofena et al., 2024)

Emerging Technology and Research

- Recent advancements in artificial intelligence (AI) and deep learning are significantly improving the diagnostic capabilities of CESM.
- Machine learning models are being developed to assist radiologists in:
    - Automated lesion detection
    - Classification of benign vs malignant findings
    - Reduction of interpretation variability
- The Full Automated Pipeline System (FAPS) is an example of deep learning framework designed to analyze CESM images and improve diagnostic accuracy.
- Attention-based neutral networks are being utilized to identify subtle imaging features that may not be visible to the human eye.
- Studies show that AI-assisted CESM can increase diagnostic accuracy and efficiency, supporting clinical decision-making. (Bouzarjomehri et al., 2024)

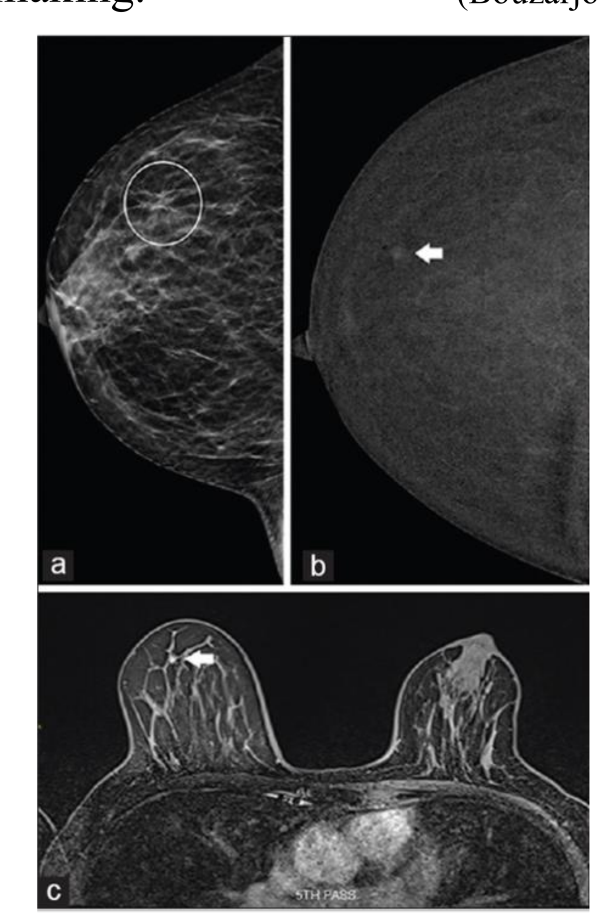

Figure 5: Case 5: A 59-year-old woman. (a) Full-field digital mammography shows an asymmetry in the outer right breast (circled), visible only on craniocaudal view. (b) Contrast-enhanced spectral mammography (CESM) shows that the lesion was localized to the right upper outer quadrant (arrow). (c) Subsequent MR image shows type I enhancement kinetics, suggestive of a benign lesion (arrow), which confirmed the CESM finding.
(Wong et al., 2024 , p. 198)

Statistics

- "The overall malignant breast lesion diagnosis for CESM yielded a sensitivity of 95.4 % and a specificity of 94.0 %. Conventional mammography demonstrated a sensitivity of 85.0 % and a specificity of 93.5 %, which were both slightly lower than those achieved with CESM." (Abdi et al., 2026, p. 1)
- "CESM retains its sensitivity, while conventional mammography shows a decrease. Integrating CESM into clinics could enhance reporting systems and facilitate clinical decision-making, especially for patients with dense breast tissue." (Abdi et al., 2026, p. 1)
- CESM has been shown to have diagnostic performance comparable to breast MRI and patients prefer CESM due to shorter exam times with better comfort and lower noise levels. (Wong et al., 2024)
- The use of both digital mammography (DM) and CESM in a multimodal approach combined will provide the best clinical outcomes.

(Bouzarjomehri et al., 2024. p. 1)

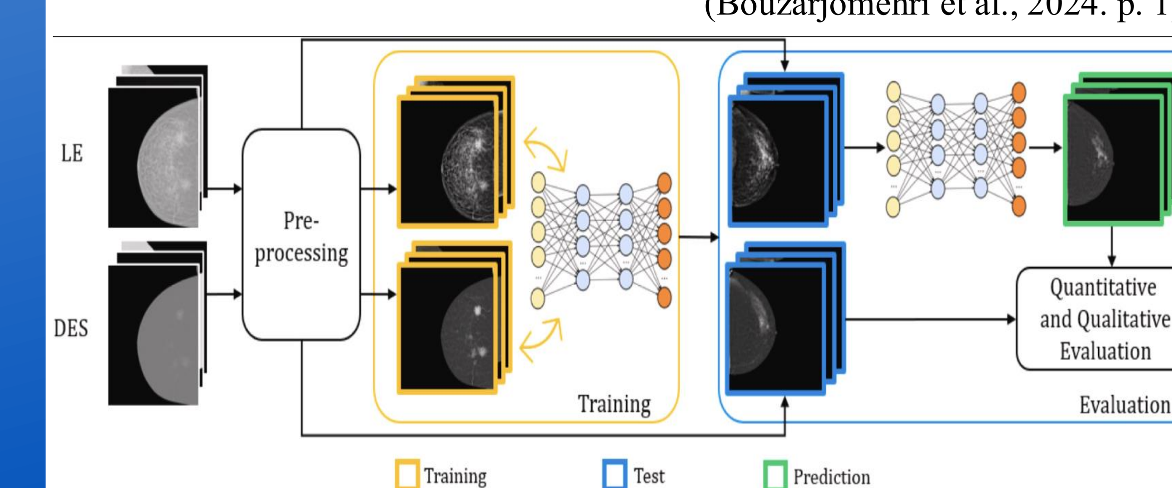

Fig. 3. Schematic representation of the methodology
(Rofena et al., 2024, p. 5)

Conclusion

- CESM is an innovative and valuable advancement in breast imaging, improving the detection and characterization of breast lesions.
- By combining anatomical and functional imaging, CESM enhances visualization of malignancies, particularly in patients with dense breast tissue, where conventional mammography may be limited. (Abdi et al., 2026)
- CESM demonstrates high diagnostic performance with sensitivity comparable to breast MRI, while offering a more accessible, cost-effective, and time-efficient alternative. (Wong et al., 2024)
- The technique plays an important role in clinical decision-making, including detection, staging, and monitoring of breast cancer.
- Despite its advantages, considerations such as contrast use, radiation dose, and patient selection remain important in clinical practice.
- Ongoing advancements in artificial intelligence, deep learning, and virtual contrast imaging are expected to further enhance the accuracy and efficiency of CESM.
- As research and technology continue to evolve, CESM is likely to become an increasingly important tool in breast cancer diagnosis and management.

Misericordia University Printing Services