

Abstract

Contrast-Enhanced Spectral Mammography (CESM) is an advanced diagnostic technique that combines anatomical and functional breast imaging with the use of iodinated contrast to enhance potential malignant lesion visualization. This capstone presents the fundamental principles of mammography, clinical indications and contraindications, and diagnostic capabilities of CESM compared to traditional mammography. CESM has improved the detection of malignancies, especially in dense breast tissue, as contrast highlights vascular changes associated with tumor angiogenesis. The imaging involves a dual-energy image acquisition, as low-energy is required for structure and high-energy for contrast enhancement. The dual imaging provides a thorough insight into lesion morphology and perfusion. Research shows that CESM offers diagnostic accuracy comparable to Magnetic Resonance Imaging while being faster, more cost-effective, and accessible. However, some contraindications limit patient eligibility, such as, pregnancy, severe allergies, and renal impairment due to contrast-related risks. Overall, the implications of CESM is important and has a growing role in the early detection, staging, and treatment of breast cancer. Furthermore, some future advancements in CESM would be standardizing imaging protocols, potentially expanding CESM to screenings, and increasing the use of CESM in stereotactic biopsies.

Keywords: contrast-enhanced spectral mammography (CESM), contrast-enhanced digital mammography (CEDM), breast cancer, mammography, screening mammogram, diagnostic mammogram, iodinated contrast media, angiogenesis, dense breast tissue, contraindications, indications, invasive ductal carcinoma (IDC), invasive lobular carcinoma (ILC), ductal carcinoma in situ (DCIS), benign findings, cysts, fibroadenomas, enhancement