

# Mammography: Insights into Early Detection and Prevention of Breast Cancer

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**Received date:** May 20, 2024, Manuscript No. IPMCR-24-19283; **Editor assigned date:** May 22, 2024, PreQC No. IPMCR-24-19283 (PQ); **Reviewed date:** June 05, 2024, QC No. IPMCR-24-19283; **Revised date:** June 12, 2024, Manuscript No. IPMCR-24-19283 (R); **Published date:** June 19, 2024, DOI: 10.36648/2471-299X.10.3.47

**Citation:** Li H (2024) Mammography: Insights into Early Detection and Prevention of Breast Cancer. Med Clin Rev Vol.10 No.3: 47.

## Description

Mammography plays a critical role in the early detection and diagnosis of breast cancer, making it an indispensable tool in the fight against this prevalent disease. This imaging technique utilizes low-dose X-rays to create detailed images of the breast tissue, allowing radiologists to identify abnormalities such as tumors, cysts, or calcifications that may indicate the presence of cancer. The primary goal of mammography is to detect breast cancer at an early stage when it is most treatable. Early detection not only improves the chances of successful treatment but also enables less aggressive treatment options and better outcomes for patients. Mammography screening is recommended for women starting at the age of 40 and is typically performed annually or biennially, depending on individual risk factors and guidelines from medical organizations.

### Digital mammography

There are two main types of mammography: Screening mammography and diagnostic mammography. Screening mammography is performed in asymptomatic women with no signs or symptoms of breast cancer. It involves taking X-ray images of both breasts to detect any abnormalities that may not be palpable during a physical examination. Diagnostic mammography, on the other hand, is used to evaluate breast abnormalities found during screening mammography or in women with symptoms such as breast pain, lumps, or nipple discharge. Diagnostic mammography may include additional views or specialized imaging techniques to further evaluate suspicious findings. Digital mammography has largely replaced traditional film mammography due to its numerous advantages, including faster image acquisition, easier storage and retrieval of images, and the ability to enhance and manipulate images for better visualization of breast tissue. Digital mammography also offers the option of Computer-Aided

Detection (CAD), which uses algorithms to assist radiologists in identifying areas of concern on mammograms. In addition to standard two-dimensional (2D) mammography, newer technologies such as Digital Breast Tomosynthesis (DBT) or 3D mammography have emerged as valuable adjuncts to conventional mammography. DBT produces multiple thin-slice images of the breast, allowing radiologists to visualize breast tissue in greater detail and reduce the overlap of breast structures that can obscure abnormalities on conventional mammograms. Studies have shown that DBT improves cancer detection rates and reduces the number of false-positive results compared to 2D mammography alone.

### Breast cancer

Mammography is not without limitations and potential risks. False-positive results, where abnormalities are detected on mammograms that turn out not to be cancerous, can lead to unnecessary anxiety and follow-up procedures such as additional imaging or biopsy. False-negative results, where cancer is present but not detected on mammograms, can delay diagnosis and treatment. Furthermore, mammography exposes the breasts to ionizing radiation, albeit at low doses, which carries a small risk of radiation-induced cancer over time. However, the benefits of mammography in detecting breast cancer early generally outweigh the risks associated with radiation exposure. Mammography remains the cornerstone of breast cancer screening and early detection efforts. By providing high-quality images of the breast tissue, mammography enables the timely detection and diagnosis of breast cancer, leading to improved outcomes for patients. In addition to technological advancements, ongoing research is focused on understanding the biological mechanisms of breast cancer development and progression. This knowledge may lead to the discovery of new biomarkers or imaging techniques that could revolutionize early detection and treatment strategies.