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Review Article

**OVERVIEW OF DETECTING BREAST CANCER IN
MAMMOGRAM**

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¹ Prince Mansour Military Hospital -Taif² Hafer Albatin Central Hospital - Hafer Albatin³ Ayyad Emergency Hospital – Makkah⁴ Taibah University – Madina⁵ University Hospitals Plymouth Nhs Foundation Trust - Plymouth, United Kingdom⁶ Majidya Primary healthcare – Qatif – Saudi Arabia**Abstract:**

Introduction: One most prevalent cancer among women today is breast cancer, which is associated with significant mortality. Screening women with breast cancer involves history, clinical examination, and radiographs. Mammography, among other radiological diagnostic techniques, stands out with evidence of significantly reducing mortality rates among breast cancer patients. This review will discuss mammography in brief and its application in breast cancer screening.

Aim of Work: The aim of this study is to discuss mammography and breast cancer screening.

Materials and methods: This review is a comprehensive search of PUBMED from the year 1985 to 2021.

Conclusion: Due to the high incidence and mortality of breast cancers among women, it becomes imperative to diagnose early if possible if their chances of survival are to improve in such unfortunate events. Mammography has been the gold standard for screening middle-aged to old-age women for breast cancer for over several decades. Although mammography has reduced mortality rates among women, it does come with certain harms, such as overdiagnosis and overtreatment. Digital breast tomosynthesis (DBT) is advanced 3D mammography that does reduce certain drawbacks of conventional mammography.

Keywords: Mammography, breast cancer, cancer screening, Breast Imaging Reporting and Data System, Digital breast tomosynthesis.

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INTRODUCTION:

Breast cancer is one of the commonest cancers and most prevalent cancer worldwide among women. The incidence of breast cancer is highest among high-income countries like North America and Europe, whereas the mortality is highest in Africa and Oceania. The incidence of breast cancer has increased not only in the older population but in other age groups as well. Due to screening programs and access to advanced medical care, mortality rates have decreased in high-income countries. ^[1]

Screening modalities consist of self-examination, clinical breast examination by a trained clinician, risk assessment using risk assessment tools, and various imaging. Radiological modalities include mammography, sonography, magnetic resonance imaging (MRI), contrast-enhanced mammography, and tomosynthesis (three-dimensional mammography). This overview will briefly discuss the screening for breast cancer using mammography. ^[2]

Anatomy & Pathology

The breast is made up of fat and fibro glandular tissue, where the breast parenchyma is formed by a network of secretory lobes embedded in adipose tissue. The mammary gland is an exocrine tubular acinar gland that makes up the secretory lobes. Apart from glands, the breast also contains ducts, stromal connective tissues, vasculature, and nerves. Breast carcinoma either originates from the epithelial lining of ducts or the lobules that supply it. ^[3]

Mammography

It is a procedure that utilizes low-dose x-rays to examine human breasts. A mammogram evaluates the breast based on differential attenuation characteristics of breast tissues. Fatty tissue appears gray as it attenuates fewer x-rays when compared to fibroglandular and stromal tissues. Dense

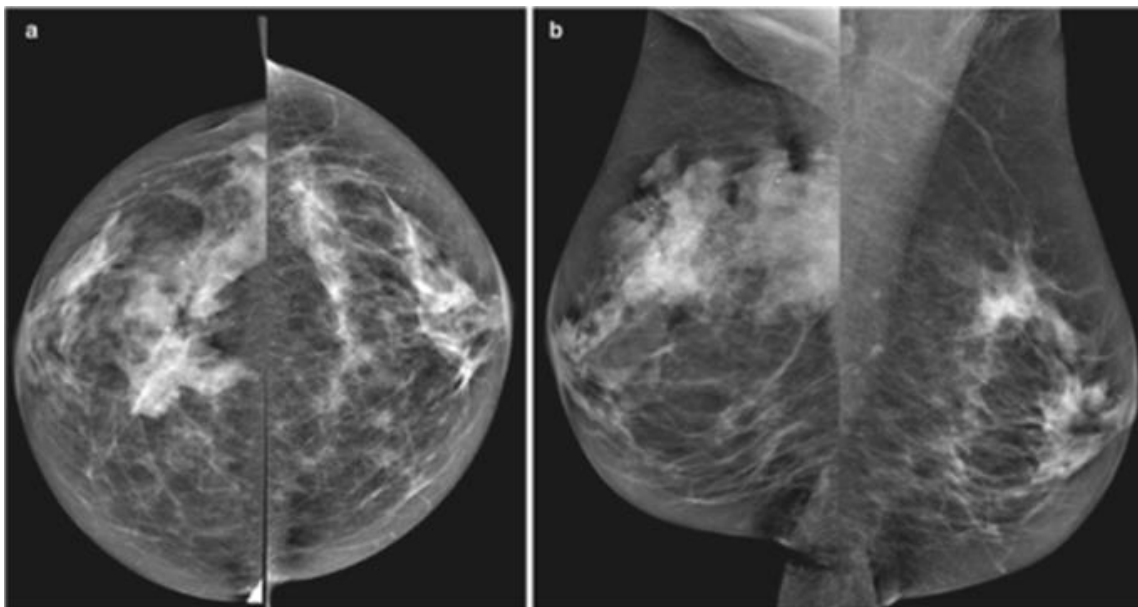
calcification appears bright white on x-rays, whether it be skin calcification or calcification within a cancerous lesion. Excess of fibroglandular tissue can be a challenge as it attenuates more x-rays and can superimpose tissues or masses that it overlies. This is further challenging as patients with dense breast tissue are at a higher risk of developing breast cancer. A typical mammogram can display the skin surface, the nipple, the main breast ducts, fibroglandular tissue, veins, adipose tissue, muscle, and sometimes lymph nodes. ^[4]

Equipment

A mammogram is a two-dimensional x-ray image of the human breast. The basic mammography equipment includes an x-ray generator, an image detector, and a breast compression paddle. The x-ray generator and image detector are oriented at right angles to each other and are set at a fixed distance, where the entire unit can be rotated as desired by a particular view. Each breast is entirely placed. Each breast is placed on a plate, and 2D radiographic images are taken using penetrating low-energy (20–32 kVp) X-rays through the tissues. Additionally, protective gears for the operator and patient are provided, which include a lead barrier and remote controller. ^[5]

Techniques

Standard screening mammography uses two common imaging techniques known as craniocaudal (CC) and medio-lateral-oblique (MLO) views. Taking images from two different perpendicular views helps to overcome the challenge of tissue overlap. In the CC view, the patient's breast is positioned between the x-ray generator and image detector in the superior-inferior direction, which produces a top-down or bottom-up view. In MLO view, the machine is angled 40-60 degrees laterally, which produces lateral breast images. It is essential to include as much breast tissue as possible in the image. ^[6]



Mammogram of ductal carcinoma in a 72-year-old woman. **a** CC view. **b** MLO view ^[7]

Rationale

Several clinical trials have shown the benefits of screening with mammography. In a Swedish trial of women of 40–74 years, 77080 women were invited to be screened with mammography, whereas 55985 were not. A 30% decrease in mortality was seen in a group of women who were invited to be screened. ^[8] Meta-analysis of randomized controlled trials testing the efficacy of screening with a 20-35 % reduction in mortality among women aged 50–69 years, although a lesser reduction was seen in women aged 40-49 years. The high incidence and mortality associated with breast cancer do provide a rationale for screening with mammography if it significantly reduces mortality rates. ^[9]

Harm

The biggest harm in screening otherwise healthy women with mammography is overdiagnosis and overtreatment. Overdiagnosis may result in panic, more imaging, and unnecessary invasive biopsies or treatment of cancer that may otherwise not have caused any harm to the patient. The results from randomized controlled trials of mammographic screening show that 1 in 5 women diagnosed with breast cancer over approximately ten years may get overdiagnosed. ^[10]

Recommendation

According to U.S. Preventive Services Task Force, the decision to start screening with mammography for women below 50 years is an individual one. Ladies who choose to weigh the benefits of mammography

over harm can get it once every two years. For 50 to 74-year-old women, it is recommended to have mammography screening every two years. For women with age 75 years and above, there is insufficient evidence in favor of continued screening with mammography. Women who have BRCA1 or BRCA2 mutation or someone in their family who does have BRCA1 or BRCA2 mutation, or someone who was previously irradiated are at a higher risk of developing breast cancer. ^[11]

Interpretation

Mammographic reporting has been standardized using BIRADS [Breast Imaging Reporting and Data System]. A description of breast composition with fibroglandular densities:

- breast composition is almost entirely fat (<25% glandular)
- It has scattered fibroglandular densities (25 to 50% glandular)
- breast tissue is heterogeneously dense (51–75% glandular)
- breast tissue is extremely dense (> 75% glandular)

The amount of fibroglandular tissue gives the idea of attenuation in the x-rays and hence relative sensitivity. Then, the next step is to describe any mass (size, morphology), calcifications (morphology and distribution), distortion in architecture, and special cases (dilated ducts, lymph nodes, asymmetries) ^[12]

BIRADS [Breast Imaging Reporting and Data System] [12]

Birads final assessment	Recommendation
Category 0	Incomplete Assessment. Need additional imaging evaluation and or prior mammograms for comparison
Category 1: Negative	Routine Screening Mammography
Category 2: Benign	
Category 3: Probably benign Finding	Initial short interval follow suggested
Category 4: Suspicious Abnormality	Biopsy should be considered
Category 5: Highly suggestive of malignancy	Appropriate action should be taken
Category 6- Known Biopsy-Proven Malignancy	

Digital breast tomosynthesis (DBT)

It is a more advanced subset of mammography, where an x-ray tube rotates around the compressed breast, producing 3D information. Studies have shown that DBT increases the dose by 20%, but also cancer detection also increases by 15-30%. DBT also decreases false-positive findings by 15% and also reduces recall rates as well. [13]

CONCLUSION:

Due to the high incidence and mortality of breast cancers among women, it becomes imperative to diagnose early if possible if their chances of survival are to improve in such unfortunate events. Mammography has been the gold standard for screening middle-aged to old-age women for breast cancer for over several decades. Although mammography has reduced mortality rates among women, it does come with certain harms, such as overdiagnosis and overtreatment. Digital breast tomosynthesis (DBT) is advanced 3D mammography that does reduce certain drawbacks of conventional mammography.

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