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What is a Mammograph?

A mammogram is specialized medical imaging that uses a low-dose of x-ray to examine the breast for the early detection of cancer and other breast diseases. It is used as both a diagnostic and screening tool.

History And Advances

- Mid 1950s Jacob Gershon Cohen uses mammography to screen healthy women for breast cancer. Late 1950s
 – Robert Egan developed a new method of screening mammography. He published his results in a paper in 1959 and in a book in 1964. 1960s – Mammography became a widely used diagnostic tool.
- Three recent advances in mammography include digital mammography, computer-aided detection and breast tomosynthesis

Digital Mammography

- also called full-field digital mammography (FFDM)
- in which the x-ray film is replaced by electronics that convert x-rays into mammographic pictures of the breast.
- These detectors convert the x-rays that pass through them into electronic signals that are sent to a computer.
- The computer then converts these electronic signals into images that can be displayed on a monitor and also stored for later use.

DIGITAL MAMMOGRAPHY MACHINE





What are the types of mammograms?

- ▶ □ Mammograms are used as :
- I-as a Screening Mammography to detect early breast cancer in women experiencing no symptoms.
- 2- as Diagnostic Mammography breast disease in women experiencing symptoms such as a lump, pain, skin dimpling or nipple discharge

Screening mammography		Diagnostic mammography	
For asymptomatic 'well' women to detect unsuspected lesions	Scope	For diagnosing breast changes or a bnormalities that may have been detected through breast self exam (BSE) and/or clinical examination	
Emphasis is on mass population screening to reduce overall mortality and morbidity	Emphasis	Emphasis is on individual benefit	
According to guideline followed	Target	For women or men of any age who have symptoms or signs	
Free service mostly as part of Govt. funded screening programme	Cost	Medicare rebate may be available but out-of-pocket costs may be incurred	
No referral required. Recommendations from health professionals are strongly encouraged	Referral	Referral required from medical practitioner	
Staff specialise in screening for and assessing impalpable lesions. Mammograms are read independently by two specially trained radiologists	Staff	Staff experienced in a range of diagnostic procedures. Experience in breast cancer mainly with women presenting with palpable lesions/changes	
Results letter notifying the woman screened and her primary health care provider Where screening results are abnormal, notification is sent to the woman screened and her nominated general practitioner immediately	Notification	Full report is sent to general practitioner or surgeon usually within a few days	

How are screening and diagnostic mammograms different?

- The same machines are used for both types of mammograms.
- However, diagnostic mammography takes longer to perform than screening mammography and the total dose of radiation is higher because more x-ray images are needed to obtain views of the breast from several angles.
- The technologist may magnify a suspicious area to produce a detailed picture that can help the doctor make an accurate diagnosis.

How should patients prepare for mammography?

- Schedule the mammogram when patient's breasts are not tender or swollen to help reduce discomfort and get good pictures.
- Do not wear deodorant, talcum powder or lotion under the arms or on breasts on the day of the exam. These can appear on the mammogram as calcium spots.
- Obtain the prior mammograms and make them available to the radiologist if they were done at a different location. This is needed for comparison with the current exam.

How does the procedure work?

- During a mammogram, a patient's breast is placed on a flat support plate and compressed with a parallel plate called a paddle.
- An x-ray machine produces a small burst of x-rays that pass through the breast to a detector located on the opposite side.
- The detector can be either a photographic film plate, which captures the x-ray image on film, or a solid-state detector, which transmits electronic signals to a computer to form a digital image.
- The images produced are called mammograms.

- On a film mammogram, low density tissues, such as fat, appear translucent (i.e. darker shades of gray approaching the black background)., whereas areas of dense tissue, such as connective and glandular tissue or tumors, appear whiter on a gray background. In a standard mammogram, both a top and a side view are taken of each breast, although extra views may be taken if the physician is concerned about a suspicious area of the breast. An adult's approximate effective radiation dose in women is (0.4 -0.7)mSv
- The effective doses are typical values for an average-sized adult. The actual dose can vary substantially, depending on a person's size as well as on differences in imaging practice.

Mammographic views

Standard views.

- Cranio caudal view (CC view)
- 45* Medio lateral Oblique (MLO view) / Lundgren's view







Fig. 2 — Mammourams obtained 2 years prior showing normal craniceaudal

Why does the breast need to be compressed?

- Compression holds the breast in place to minimize blurring of the x-ray image that can be caused by patient motion.
- Also, compression evens out the shape of the breast so that the x-rays can travel through a shorter path to reach the detector. This reduces the radiation dose and improves the quality of the x-ray image.
- Finally, compression allows all the tissues to be visualized in a single plane so that small abnormalities are less likely to be obscured by overlying breast tissue.

Without compression your X-ray would appear

With compression your X-ray will be much

blurred

clearer

What will the results look like?

- A radiologist will carefully examine a mammogram to search for high density regions or areas of unusual configuration that look different from normal tissue like cancerous tumors, non-cancerous masses called benign tumors, complex cysts.
- Radiologists look at the size, shape, and contrast of an abnormal region, all of which can indicate the possibility of malignancy (i.e. cancer).
- They also look for tiny bits of calcium, called microcalcifications. While usually benign, sites of microcalcifications may occasionally signal the presence of a specific type of cancer.
- If a mammogram shows one or more suspicious regions that are not definitive for cancer, the radiologist may order additional mammogram views, with or without additional magnification or compression, or they may order a biopsy.
- Another alternative may be referral for another type of non-invasive imaging study

I. Normal breast anatomy

Mammography







- 1. Intercostal muscle
- 2. Pectoralis
- 3. Glandular tissue
- 4. Nipple
- 5. Areola
- 6. Lactiferous ducts
- 7. Subcutaneous fat
- 8. Skin
- 9. Retromammary fat

NORMAL BREAST DENSITIES

			D
Category A	Category B	Category C	Category D
Almost Entirely Fatty	Scattered areas of fibroglandular density	Heterogeneously dense	Extremely dense
10 % of women	40 % of women	40 % of women	10 % of women



'arious well-known shapes and margin (a) mass shapes (b) mass margins



Typically Benign



Limitations of Mammograms

- A false-negative mammogram looks normal even though breast cancer is present.
- A false-positive mammogram looks abnormal even though there's no cancer in the breast.
- Overall, screening mammograms do not find about 1 in 5 breast cancers.
- Women with dense breasts have more false-negative Limitations of Mammograms

False-positive results

A false-positive mammogram looks abnormal even though no cancer is actually present. Abnormal mammograms require extra testing (diagnostic mammograms, ultrasound, and sometimes MRI or even a breast biopsy) to find out if the change is cancer.

False-positive results are more common in women who are younger, have dense breasts, have had breast biopsies, have breast cancer in the family, or are taking estrogen.

About half of the women getting annual mammograms over a 10-year period will have a false-positive finding. The odds of a false-positive finding are highest for the first mammogram. Women who have past mammograms available for comparison reduce their odds of a false-positive finding by about 50%.

How often should one get mammography?

You should do a breast self exam (BSE) every month if you are over the age of 20 and it's a good idea to have a complete breast exam every 3 years as well. If you are over 40 years old then you should get a mammogram every year.

