SNS COLLEGE OF ALLIED HEALTH SCIENCE

Affiliated to The Tamil Nadu Dr MGR Medical University, Chennai

DEPARTMENT OF RADIOGRAPHY AND IMAGING

TECHNOLOGY

COURSE NAME : MODERN IMAGING TECHNIQUES AND

RECENT TRENDS IN IMAGING

UNIT : MAMMOGRAPHY

TOPIC : CONVENTIONAL & DIGITAL MAMMOGRAPHY

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INTRODUCTION - DEFINE

- Mammography is a specialized medical imaging technique that uses low-dose X-rays to visualize the internal structures of the breast.
- It is a crucial tool for early detection of breast cancer, often identifying abnormalities years before they can be felt during a physical examination.
- Mammography plays a vital role in both screening and diagnostic settings.

CONVENTIONAL VS. DIGITAL MAMMOGRAPHY – OVERVIEW

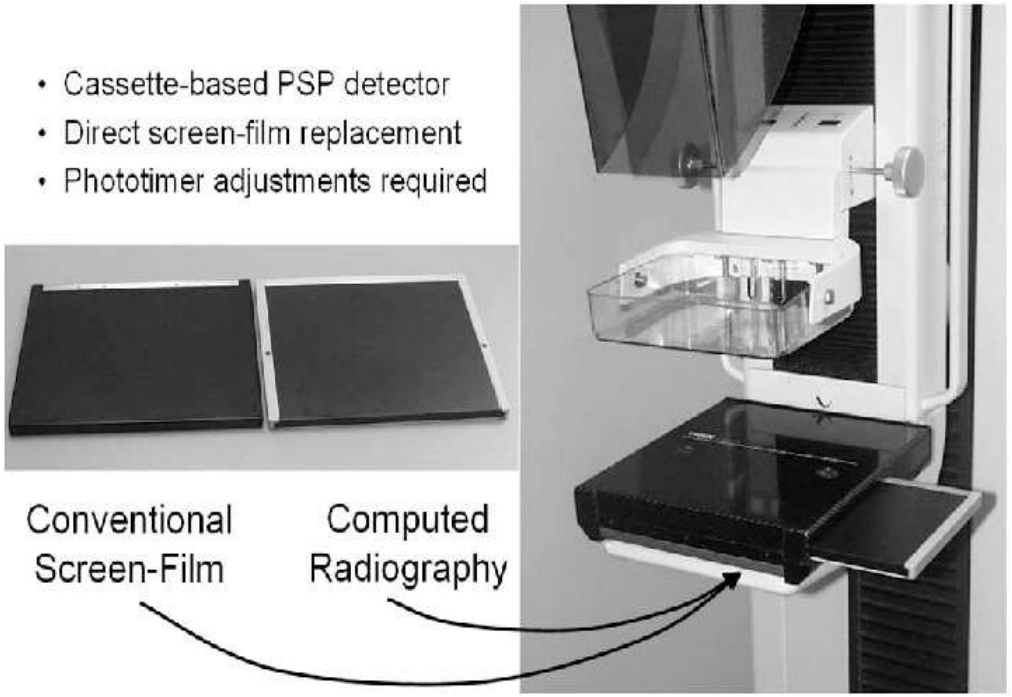
Conventional (Film-Screen) Mammography:

- Uses analog film to capture images; requires chemical processing.
- Image quality: High contrast, but limited dynamic range; prone to over/underexposure.

Digital Mammography:

- Captures images electronically; allows immediate viewing and manipulation.
- Image quality: Superior contrast resolution, wider dynamic range; easier post-processing (zoom, contrast adjustment).

Conventional Mammography Machine



Digital Mammography Machine

COMPARISON TABLE

Aspect	Conventional	Digital
Quality	Good spatial resolution; fixed contrast	Excellent contrast/detail; adjustable
Advantages	Lower initial cost; no need for computers	Faster workflow; better for dense breasts; CAD integration

ADVANTAGES OF DIGITAL OVER CONVENTIONAL

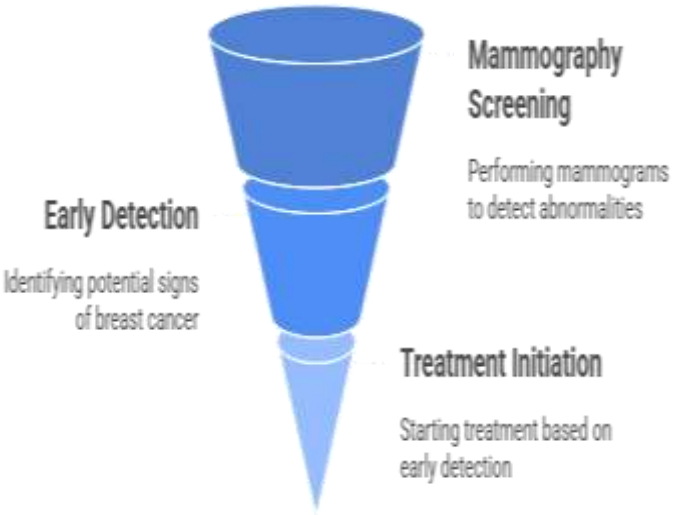
- **Improved Detection:** 10-20% better sensitivity for cancers in dense breasts (per DMIST trial).
- **Patient Comfort & Efficiency:** No film artifacts; quicker exams (reduces retakes by 30-50%).
- **Storage & Sharing:** Digital files easily archived/transmitted; reduces physical storage needs.
- **Cost-Effectiveness Long-Term:** Initial setup higher, but lower per-exam costs due to no film/chemicals.
- **Limitations of Conventional:** Fading over time; environmental waste from processing.

DIAGNOSIS AND SCREENING IN MAMMOGRAPHY

Screening Mammography:

Asymptomatic women; detects early, non-palpable lesions.

- Guidelines: ACR recommends biennial for ages 40-74; annual for high-risk.
- Goal: Reduce mortality by 20-40% via early detection.

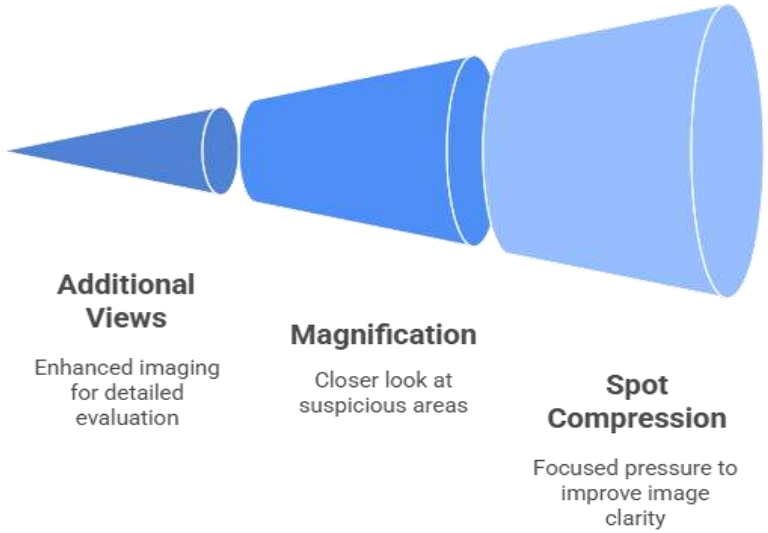


DIAGNOSIS AND SCREENING IN MAMMOGRAPHY

- **Diagnostic Mammography:**

Symptomatic patients (e.g., lump, discharge); includes spot views, magnification.

- Combines with ultrasound/MRI for equivocal findings.

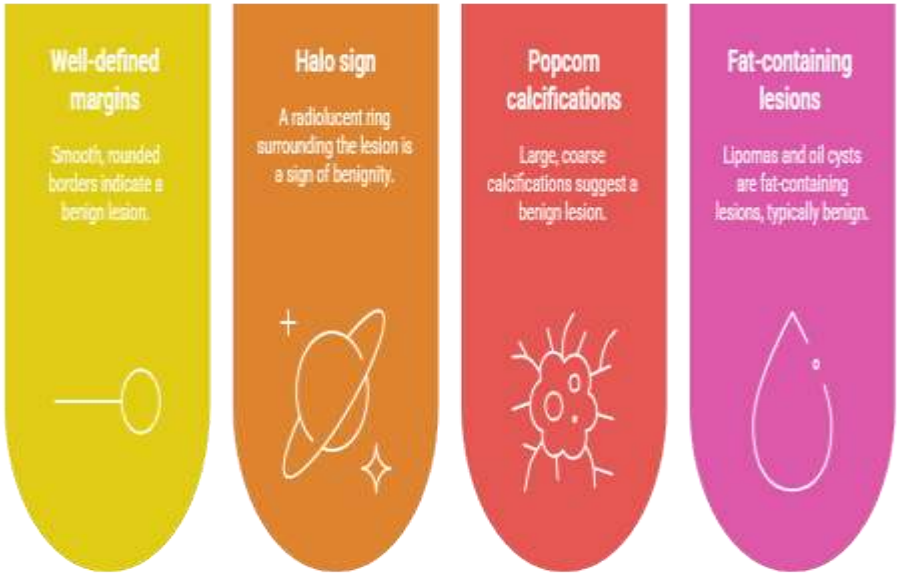


CHARACTERISTICS OF BENIGN LESIONS

Definition: Non-cancerous; often incidental or hormone-related.

Common Types:

- Fibroadenomas: Well-circumscribed, mobile masses; oval, uniform density.
- Cysts: Fluid-filled; round, sharp margins; may change with cycle.
- Calcifications: Benign (e.g., vascular, skin); coarse, popcorn-like.



CHARACTERISTICS OF BENIGN LESIONS

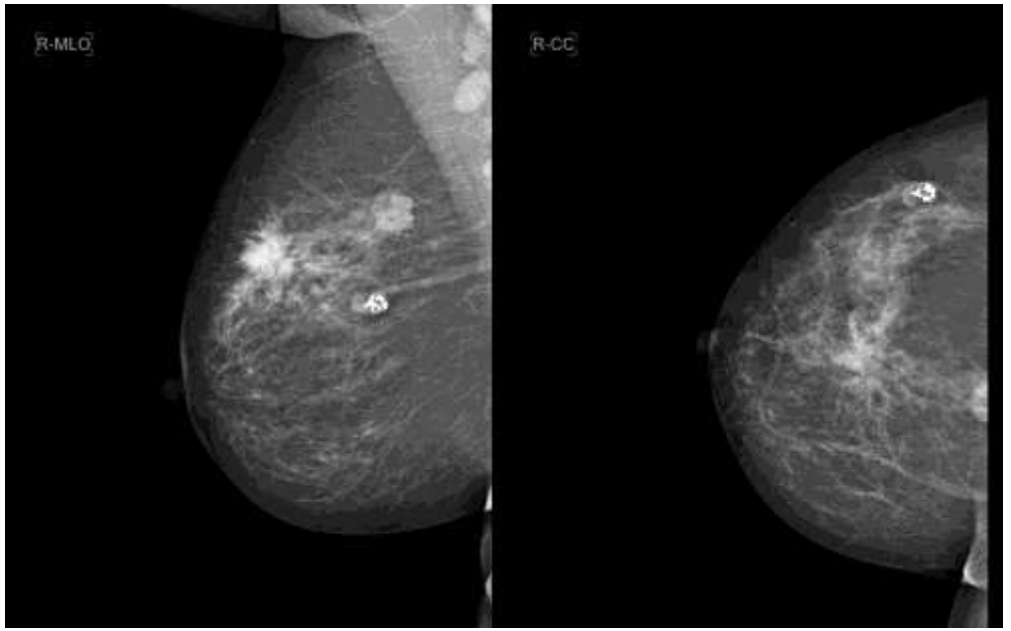
Mammographic Features:

•Smooth, lobulated borders; no spiculation.

•Fat-containing (e.g., hamartomas).

•Stability over time (no growth).

Management: Short-interval follow-up; biopsy if atypical.



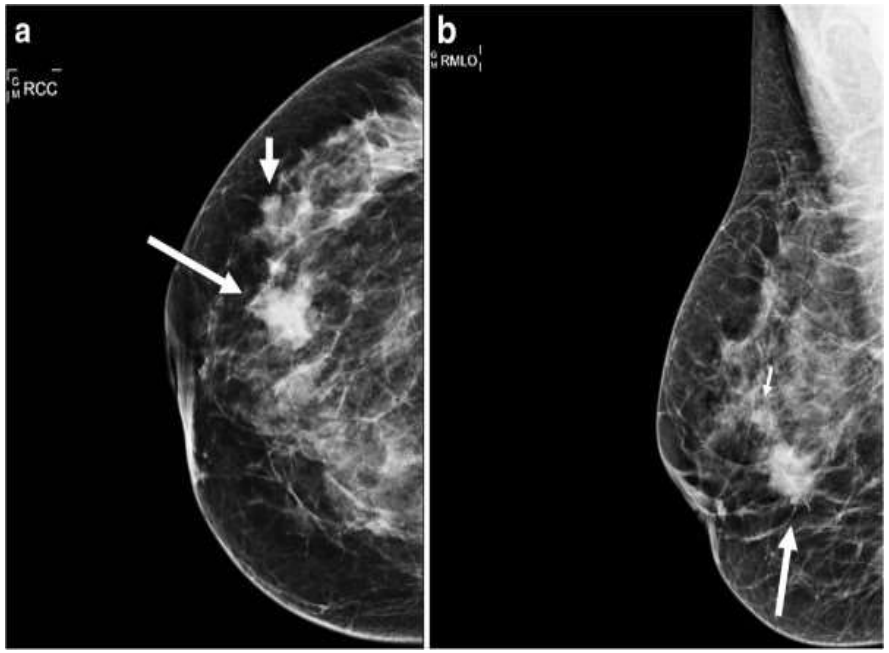
A mammogram showing a fibroadenoma with well-defined margins.

CHARACTERISTICS OF MALIGNANT LESIONS

Definition: Cancerous; invasive or in-situ.

Common Types:

- Ductal Carcinoma In-Situ (DCIS): Microcalcifications predominant.
- Invasive Ductal Carcinoma: Most common (70-80%); irregular mass

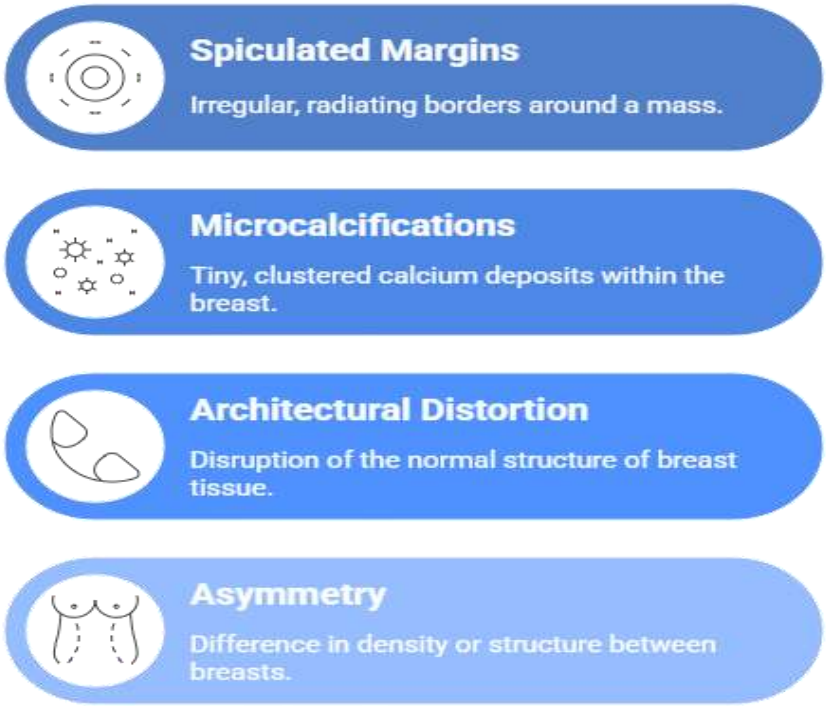


A mammogram showing a malignant mass with spiculated margins.

CHARACTERISTICS OF MALIGNANT LESIONS

Mammographic Features:

- Spiculated margins; architectural distortion.
- Pleomorphic, linear calcifications; high density.
- Asymmetry or skin thickening.



PATIENT CARE IN MAMMOGRAPHY

Pre-Exam Preparation: Avoid deodorants/lotions (interfere with imaging); wear two-piece clothing.

- Inform about implants, prior surgeries, or pregnancy.

During Exam: Compression technique: Minimize discomfort (explain purpose: reduces motion blur, lowers dose).

- Positioning: CC and MLO views; ensure full breast inclusion.

Post-Exam: Results discussion: Immediate if diagnostic; follow-up scheduling.

- Emotional support: Address anxiety; provide resources (e.g., ACS helplines).

PATIENT CARE IN MAMMOGRAPHY

Explain Procedure

Clearly describe the process to the patient.

Ensure Proper Positioning

Position the patient for optimal images.

Explain Compression

Discuss the importance of compression and address concerns.

Provide Comfort

Create a supportive and comfortable environment.

Communicate Results

Clearly convey results to the patient and physician.

FEMALE ATTENDANT IN INTERVENTIONAL PROCEDURES

Role & Importance:

- Chaperone for privacy/comfort during biopsies, wire localizations.
- Assists in positioning, monitoring vital signs, emotional reassurance.
- Ensures consent, infection control, and documentation.

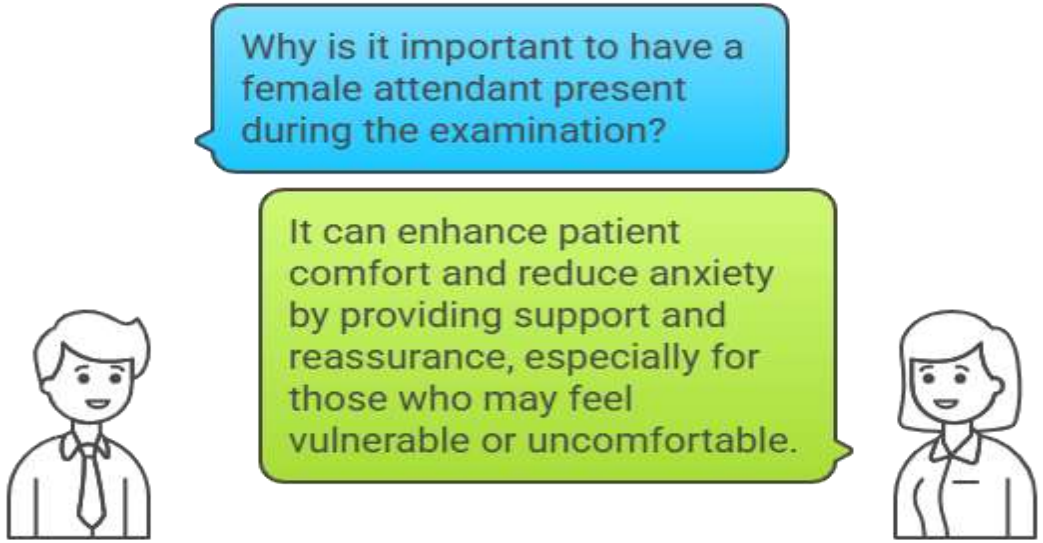
Procedures Involved:

- Stereotactic/Ultrasound-Guided Biopsy: Needle insertion under imaging.
- Ductography: Contrast for nipple discharge evaluation.
- Pre-Op Wire Localization: Guides surgical excision.

FEMALE ATTENDANT IN INTERVENTIONAL PROCEDURES

Benefits:

- Reduces patient stress (studies show 25% lower anxiety with female attendant); complies with ethical standards.



RADIATION DOSE IN MAMMOGRAPHY

Typical Exposure:

•Digital: 3-7 mGy per view (lower than conventional's 5-10 mGy).

•Full exam (4 views): ~14 mGy total; equivalent to 7 weeks background radiation

Dose Reduction Strategies:

•High-kV techniques; iterative reconstruction in digital.

•AEC (Automatic Exposure Control): Optimizes per breast density.

Risk Assessment:

•Lifetime risk: <1% increase in breast cancer from screening (benefits outweigh).

•ALARA Principle: As Low As Reasonably Achievable.

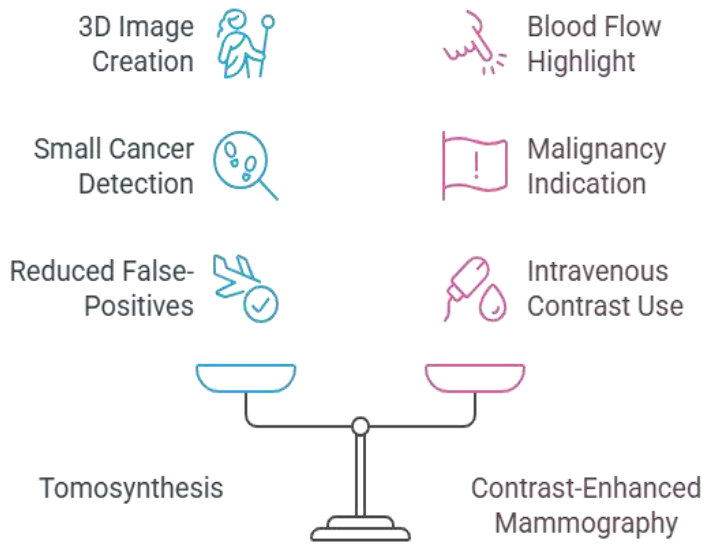
RECENT ADVANCES IN MAMMOGRAPHY TECHNIQUES

Contrast-Enhanced Mammography (CEM):

- Iodinated contrast highlights vascularity; 90% sensitivity for cancers.

Digital Breast Tomosynthesis (DBT/3D):

- Reduces false positives by 15-40%; better for overlaps in dense tissue.



SUMMARY


Diagnosis and Screening
Early Cancer Detection
Early Cancer Detection
Quality and Advantage
Improved Detection
Reduced Recall Rates)
Characteristics of Lesions
Benim (e.9, Cysts, Fibaroadoomas)
Maligrant (e.9) Irrsrular Mass, Microcalaffications)
Patient Care
Comfort & Support
Mammography: Conventional & Digital Studies
Patient Care
Biopsy (Core Needle, Stereeataxtic)
Female Attendant
Wire Localization
Radiation Dose
ALARA
ALARA Principle
Recent Advances
Contrat Enhanced (Tomoytlnemis)
Techniques
Digital (Full Field Digital, Tomogthemis)
3D Mammogrphy (Tomoighlhemis)
Interventional Procedures
ALARA Principle
Dose Reduction Techniques (e.9, 3D Mammography)

References:

- **Mammography Quality Standards Act (MQSA) Regulations.**
- **Bushberg, J. T., et al. (2020). *The Essential Physics of Medical Imaging*.**
- **https://www.ncbi.nlm.nih.gov/books/NBK546557/**
- **https://pmc.ncbi.nlm.nih.gov/articles/PMC7187399/**