Breast Cancer Screening

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Disclosures

No conflict of interest to disclose

Objectives

- Screening for Breast Cancer is Important
- Breast Cancer Screening Tools
- How to Screen
- Risk Assessments and High-Risk Groups
- Breast Density Matters
- Future Directions

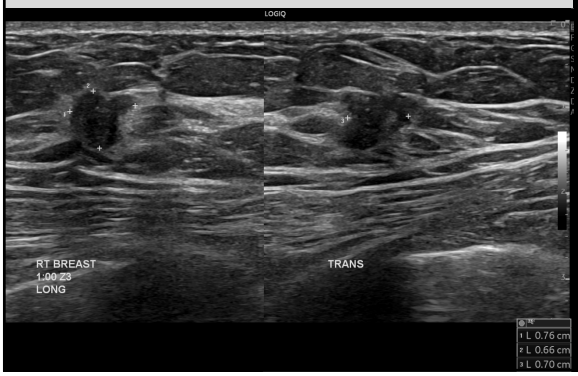
Breast Cancer Screening Matters

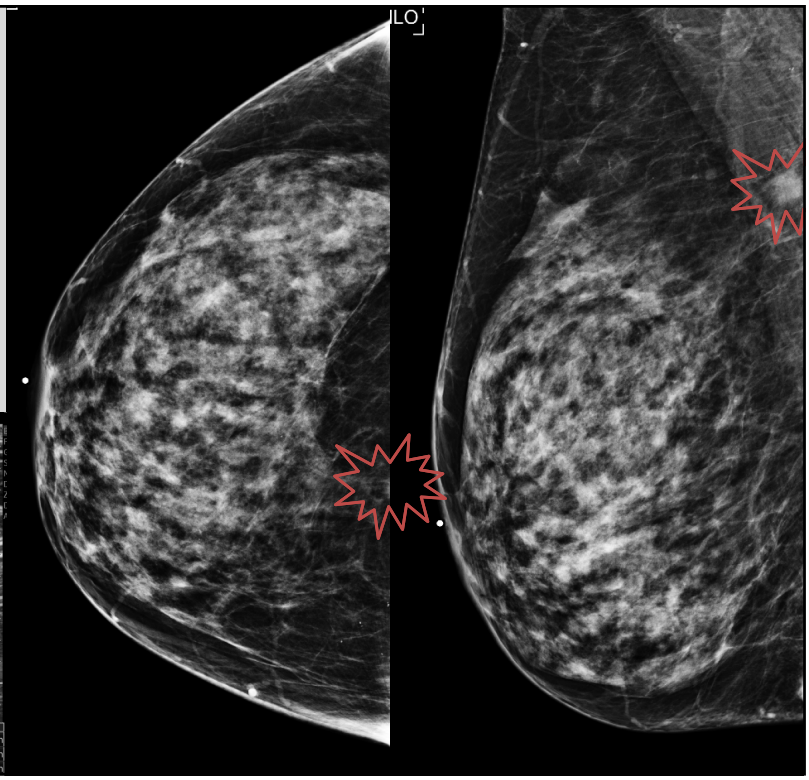
- Breast Cancer is the #1 most common cancer among women worldwide
- Estimated 310,000+ new invasive cases expected in the US with 42,000+ deaths in 2024
- Localized breast cancer has 5 year survival of 99%
- Screening mammography leads to 20-**40% reduction in breast cancer mortality**
- Early Detection → improved outcomes, improved treatment options, improved quality of life

Lifetime Breast Cancer Risk

- **1 in 8 women** in the US will be diagnosed with breast cancer during their lifetime
- Risk of breast cancer risk increases with age
- **Most women diagnosed with breast cancer have no family history or known genetic predisposition**
- Some groups can have higher incidence rates or worse outcomes
  - African American Women – tend to be diagnosed at a younger age with more aggressive subtypes and higher mortality rates

- **58 y/o female screening**
- **No family history**
- **8 mm IDC**





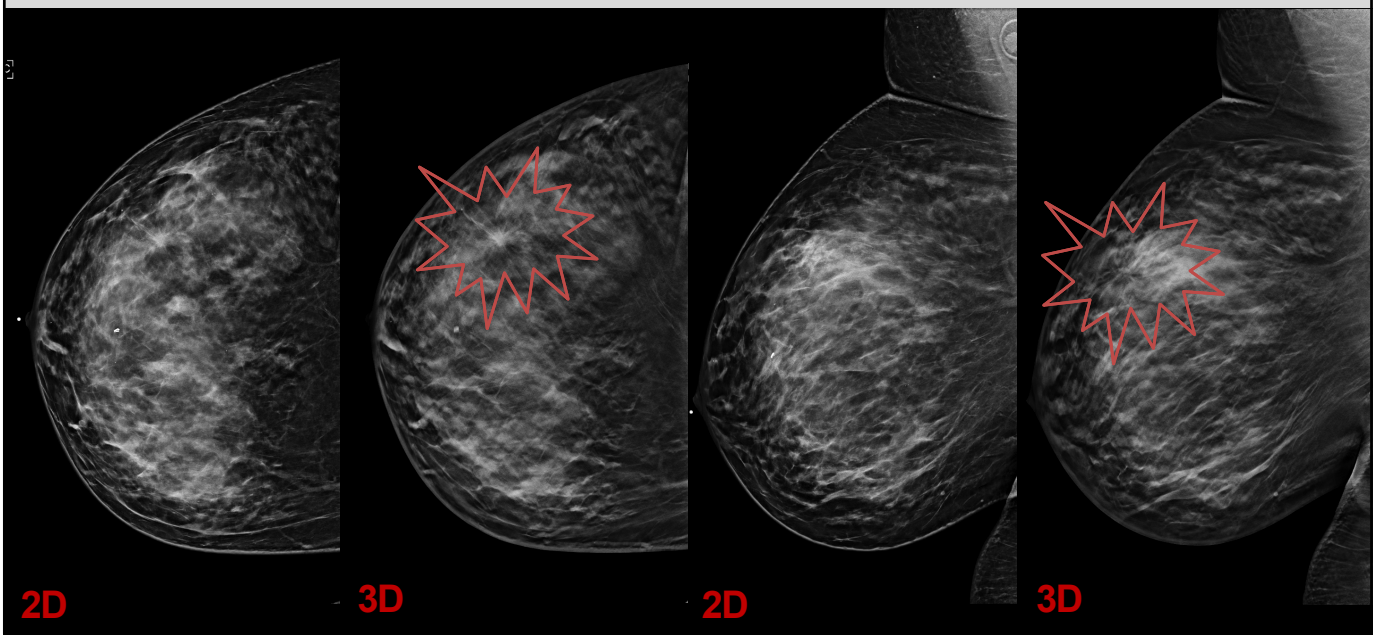
Breast Cancer Screening Tools

- Screening performance depends on appropriate screening methodology
- Quality matters!
- Mammography
  - Gold standard, proven mortality benefit
- Breast Ultrasound
  - Supplements mammography in dense breasts
- Breast MRI
  - Highest sensitivity, for high-risk patients
- Newer Modalities
  - Contrast Enhanced Mammography (CEM)

Screening Mammography

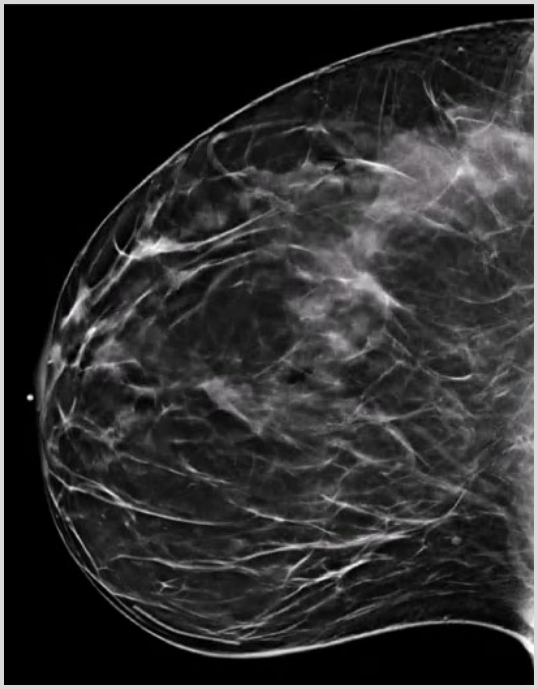
- Gold standard for breast cancer screening
- **Proven to reduce breast cancer mortality**
- 20-40% reduction in mortality
- Widely available and familiar to patients
- **Tomosynthesis / 3D (DBT) mammograms improve cancer detection rate AND reduce recall rate (false positives rate)**
- Limitations: reduced sensitivity in dense breasts

42 y/o female screening / No Family History / 2 cm IDC

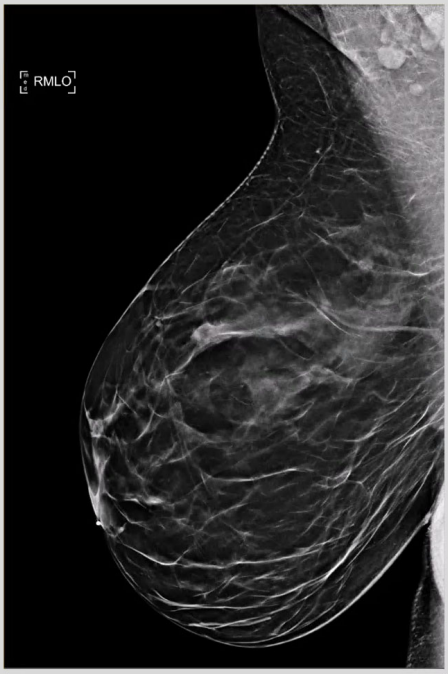


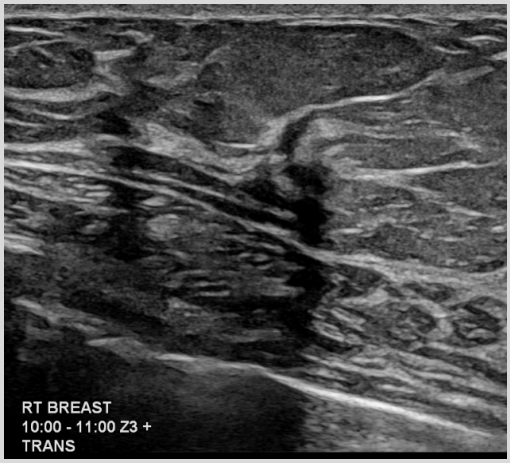
47 y/o female Screening
No Family History
6 mm IDC

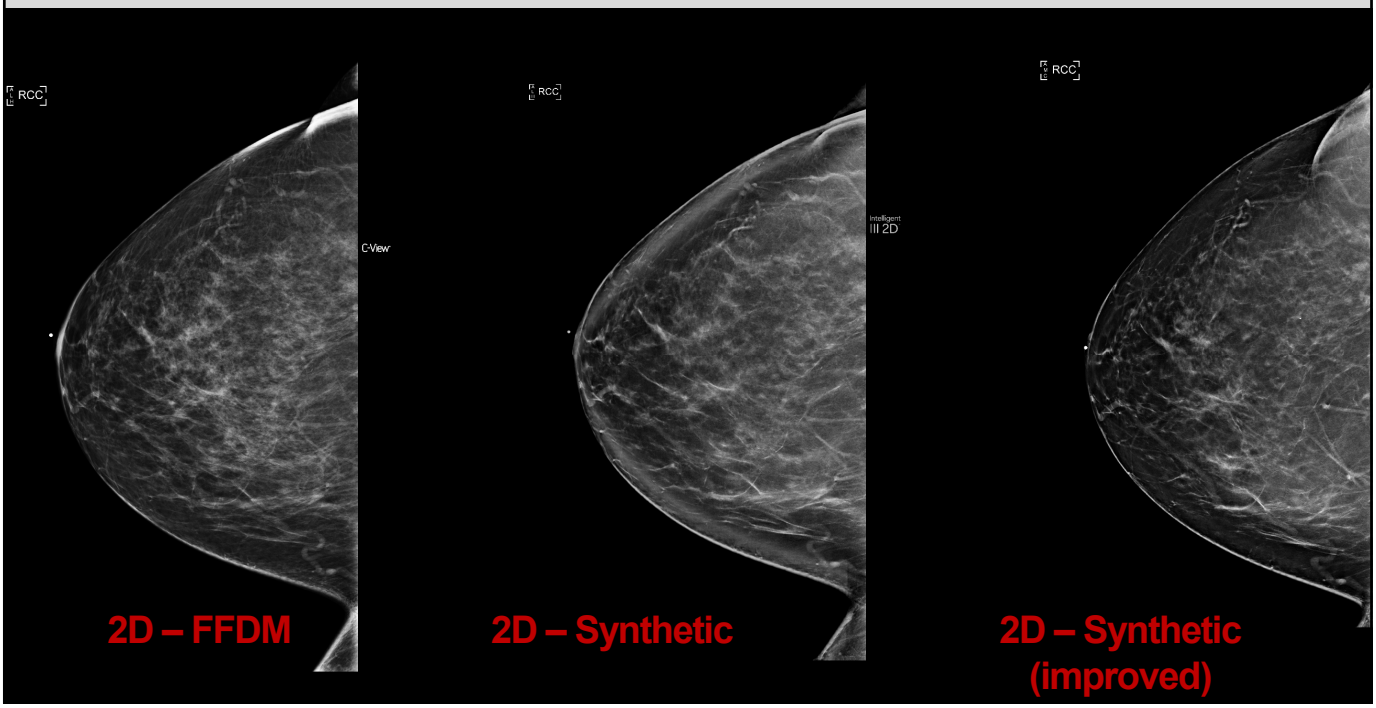
Video – 2D



Video – 3D



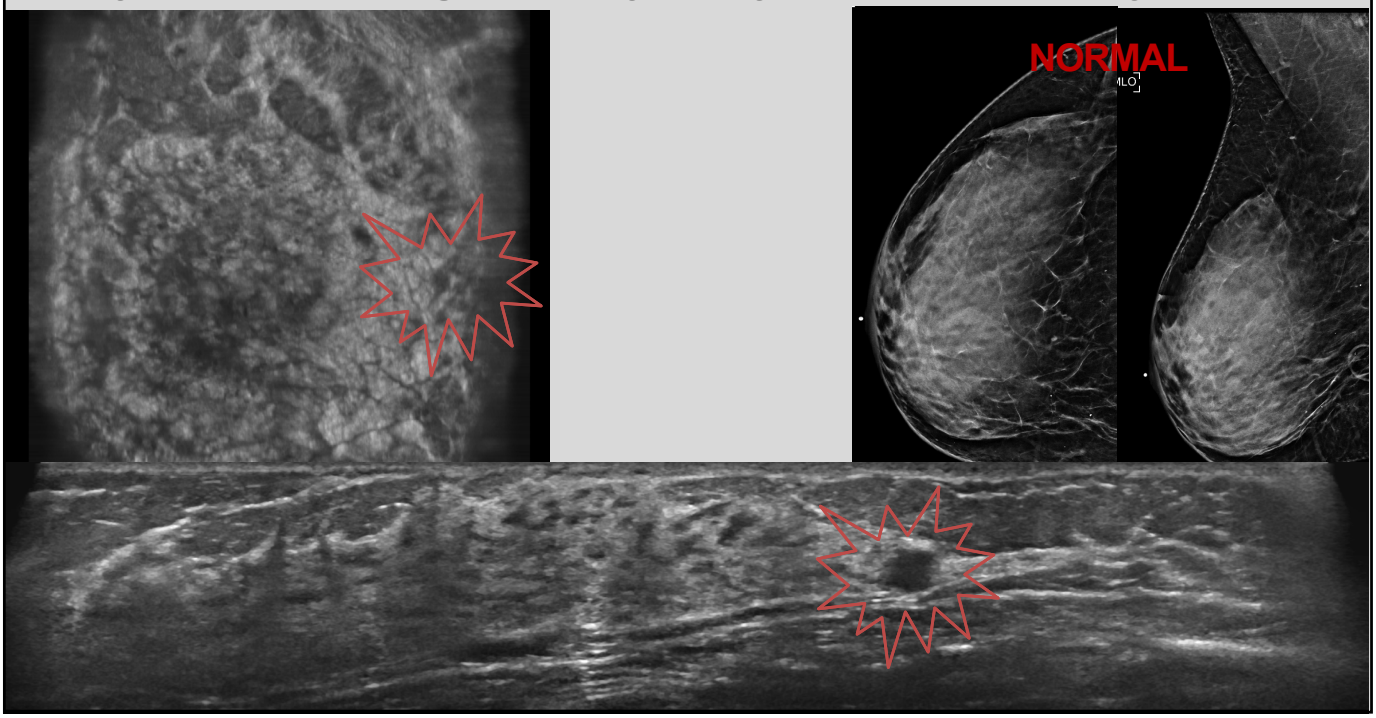

RT BREAST
10:00 - 11:00 Z3 +
TRANS


RCC
C-View
RCC
Intelligent
2D
RCC
2D – FFDM
2D – Synthetic
2D – Synthetic
(improved)

Screening Breast Ultrasound

- Primarily supplemental tool for women with dense breasts
- Ultrasound not impacted by dense breasts
- Well tolerated – no IV or radiation
- Finds cancers missed by mammography in dense breasts
- Limitations: **MRI finds significantly more breast cancers than US**
- Limitations: **False positives**

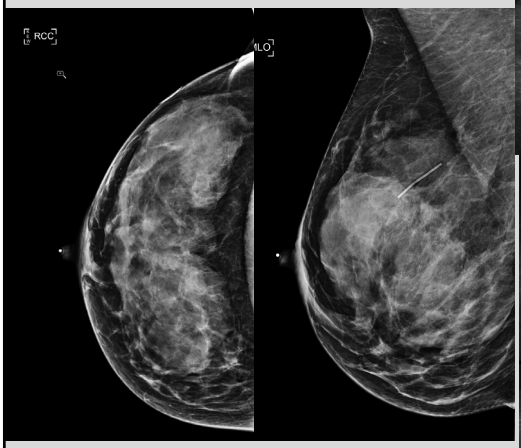
43 y/o female screening / No Family History / 8 mm ILC / Extremely Dense

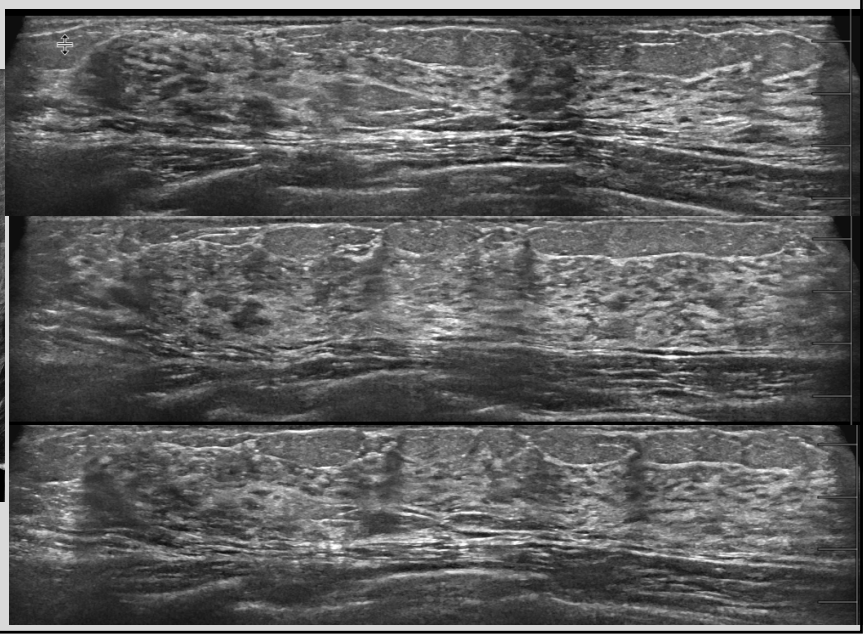


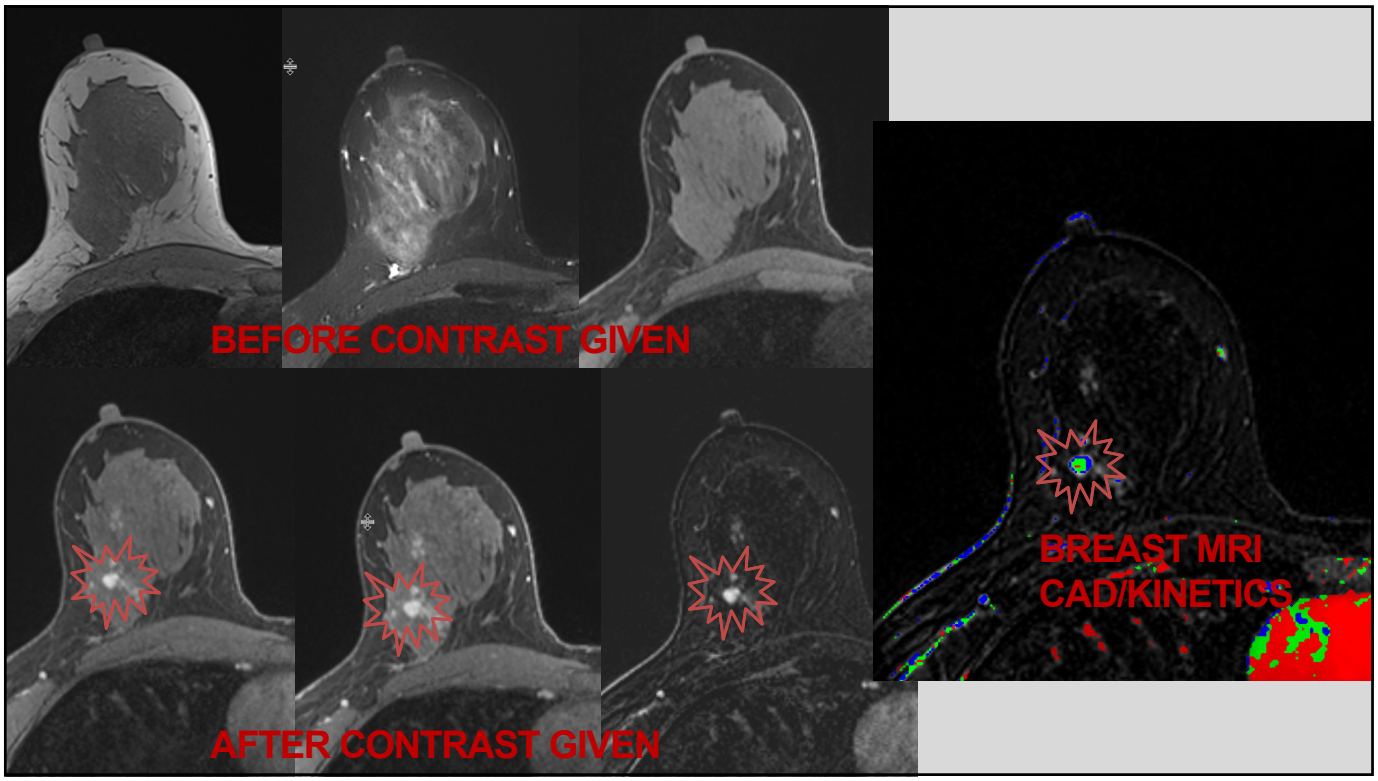
Screening Breast MRI

- Supplemental tool for women at high risk
- **Highest sensitivity for breast cancer detection**
- Identifies an additional 10-15 cancers per 1000
- Used in conjunction with screening mammography
- Do not need screening US and screening MRI
  - MRI will find the cancers that would be seen under US
- Limitations: cost, contrast, claustrophobia

50 y/o female screening / Family History Risk > 20% / Het Dense Breasts

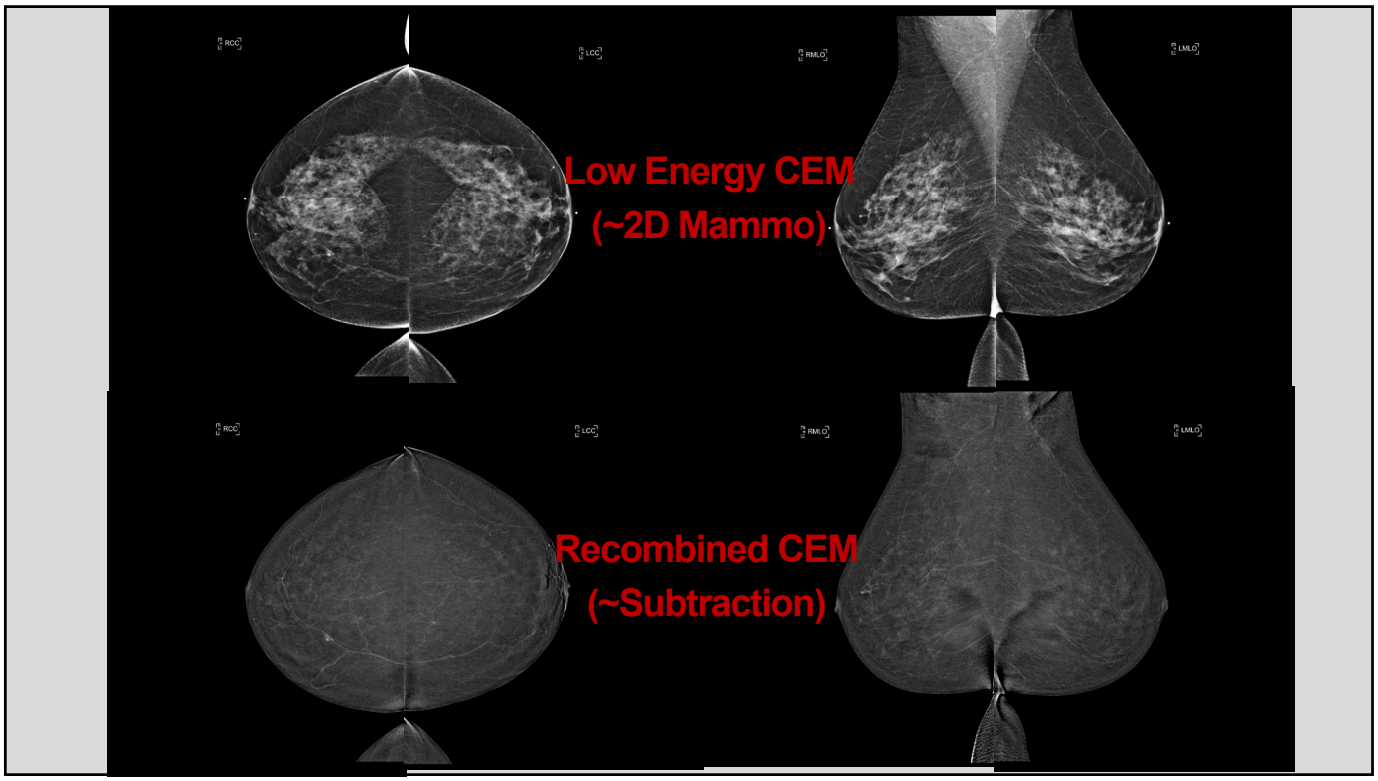


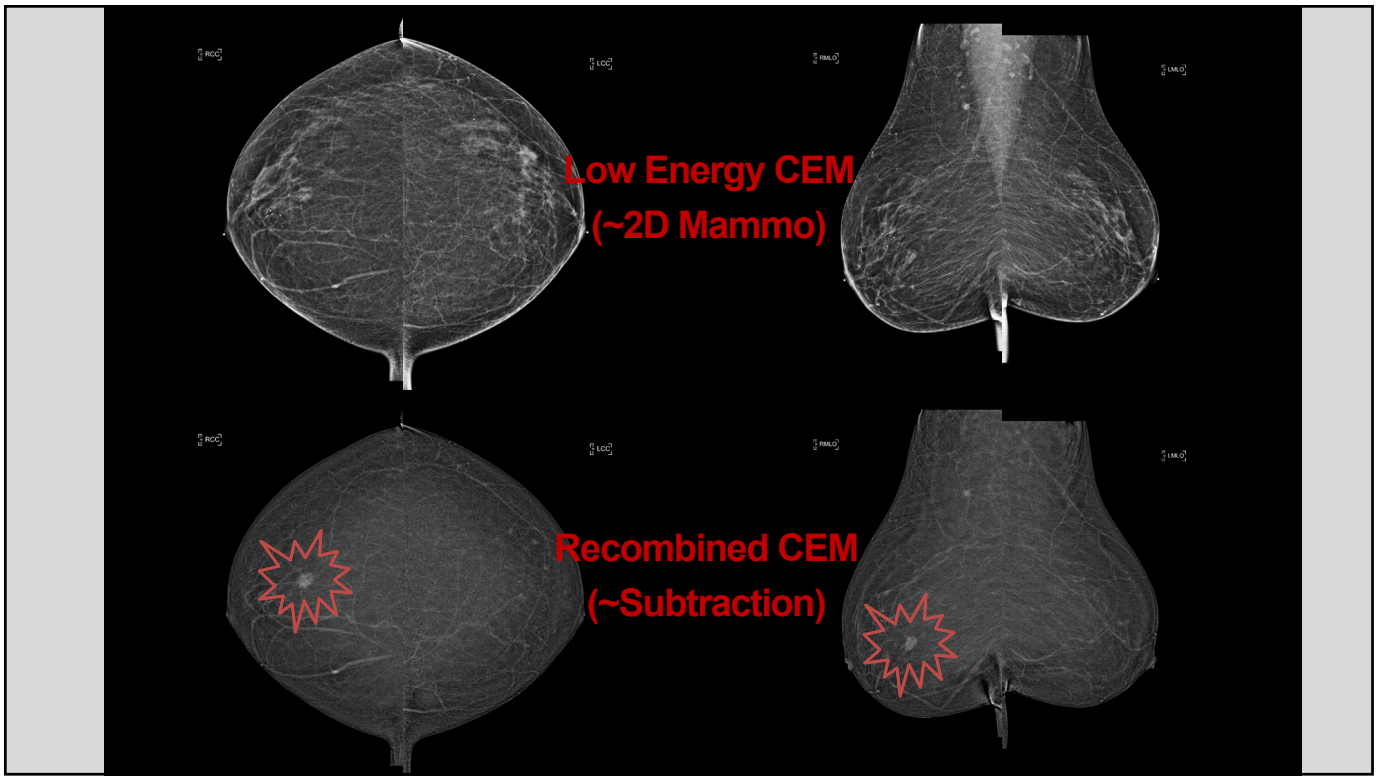




CEM – Contrast Enhanced Mammo

- New(er) tool for breast imaging
- Uses Mammography modality but with ability to acquire high and low energy images
- Administer IV iodinated contrast (like CT)
- Functional exam – generates recombined images – like subtraction images
- Evolving use in breast imaging
  - Diagnostic, trouble shooting, extent of disease, etc
  - Contraindication to MRI for high risk – maybe more frequent use


Low Energy CEM
(~2D Mammo)
Recombined CEM
(~Subtraction)


Low Energy CEM
(~2D Mammo)
Recombined CEM
(~Subtraction)

Breast Cancer Screening Guideline

- American College of Radiology (ACR) and Society of Breast Imaging (SBI):
- **Risk assessment by age 25**
- **Annual Mammography start at age 40**
- Annual Mammography continues past age 74
  - **No upper age limit** unless comorbidities limit life expectancy
- Patients should be allowed to weigh benefits and risks when deciding to screen

Breast Cancer Screening Confusion

- ACR/SBI and USPSTF and American Cancer Society **all agree most lives saved with annual screening**
- Certain groups of women such as black women, Ashkenazi Jewish women and some other minorities develop breast cancer before age 50 at a higher rate than non-Hispanic white women
- Essential to determine who is high risk before screening needed (assess risk by age 25)
- Annual screening at age 40 – saves most lives

Breast Cancer Higher Risk Populations

- **Genetic Mutation Carriers**
- **Calculated lifetime risk > 20%**
- **Personal history of chest radiation while young**

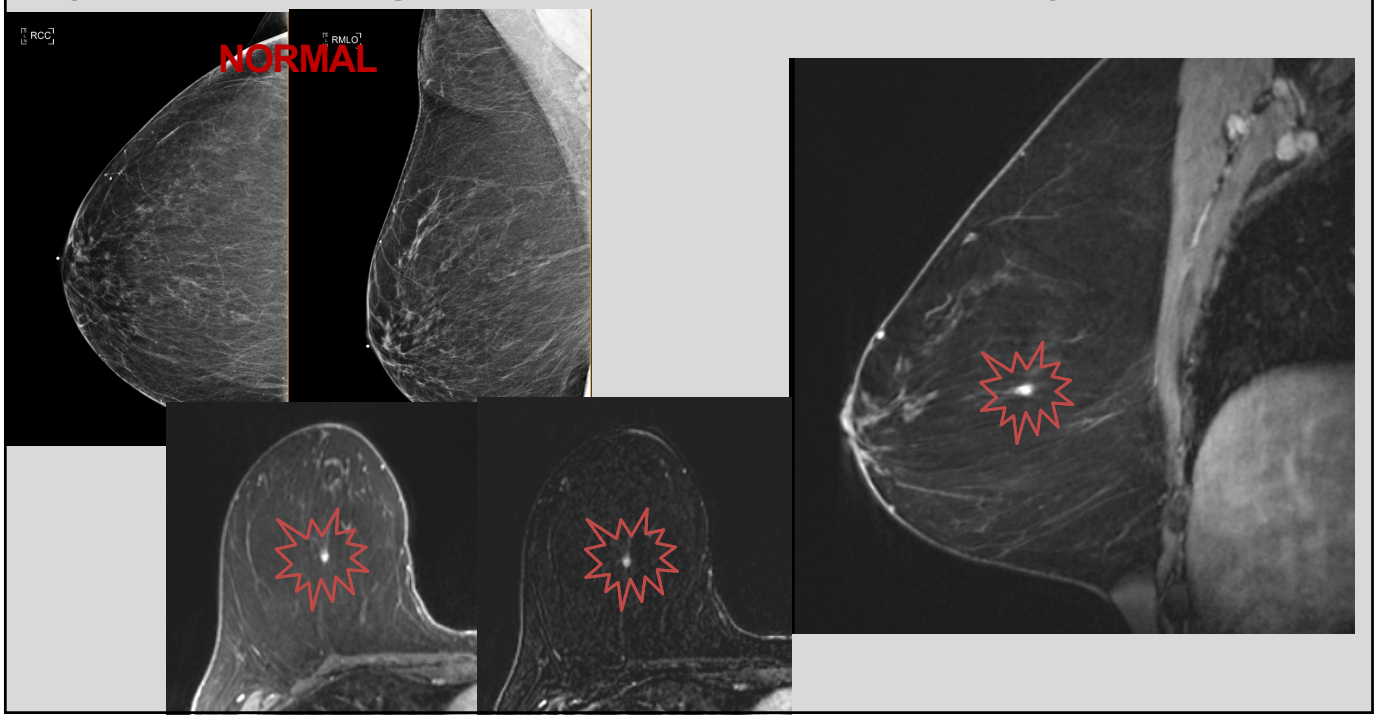
- Personal history of breast cancer
- History of atypia/LCIS

- Dense breast tissue

Breast Cancer High Risk Populations

- Genetic Mutation Carriers (untested 1st relatives)
- ATM, **BRCA1/BRCA2**, BARD1, CDH1, CHEK2, NF1, PALB2, PTEN, RAD51C/D, STK11, TP53
- **Annual Mammography at age 30**
- **Annual MRI at age 25**

61 y/o female screening / BRCA 1 / 4 mm IDC / Scattered Density



Breast Cancer High Risk Populations

- Calculated lifetime risk > 20%
- Tyrer-Cuzick (v8)
  - Likely most accurate
  - Includes breast density
- BRCAPRO, BOADICIEA, BCSC, Gail
- **Annual Mammography at age 30**
- **Annual MRI at age 30**

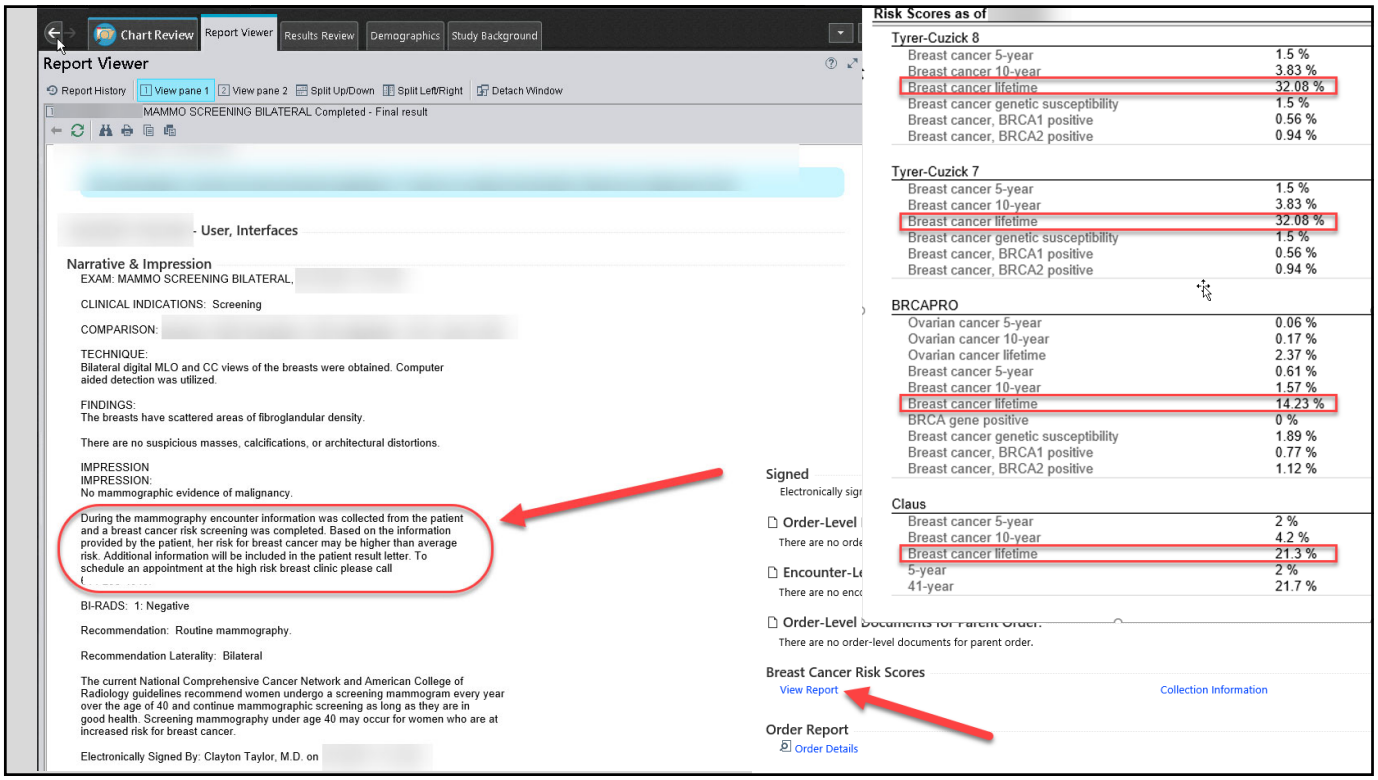


Chart Review
Report Viewer
Results Review
Demographics
Study Background
Report Viewer
Report History
View pane 1
View pane 2
Split Up/Down
Split Left/Right
Detach Window
MAMMO SCREENING BILATERAL Completed - Final result
- User, Interfaces
Narrative & Impression
EXAM: MAMMO SCREENING BILATERAL,
CLINICAL INDICATIONS: Screening
COMPARISON:
TECHNIQUE:
Bilateral digital MLO and CC views of the breasts were obtained. Computer aided detection was utilized.
FINDINGS:
The breasts have scattered areas of fibroglandular density.
There are no suspicious masses, calcifications, or architectural distortions.
IMPRESSION
IMPRESSION:
No mammographic evidence of malignancy.
During the mammography encounter information was collected from the patient and a breast cancer risk screening was completed. Based on the information provided by the patient, her risk for breast cancer may be higher than average risk. Additional information will be included in the patient result letter. To schedule an appointment at the high risk breast clinic please call
BI-RADS: 1: Negative
Recommendation: Routine mammography.
Recommendation Laterality: Bilateral
The current National Comprehensive Cancer Network and American College of Radiology guidelines recommend women undergo a screening mammogram every year over the age of 40 and continue mammographic screening as long as they are in good health. Screening mammography under age 40 may occur for women who are at increased risk for breast cancer.
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Order-Level
There are no orde
Encounter-L
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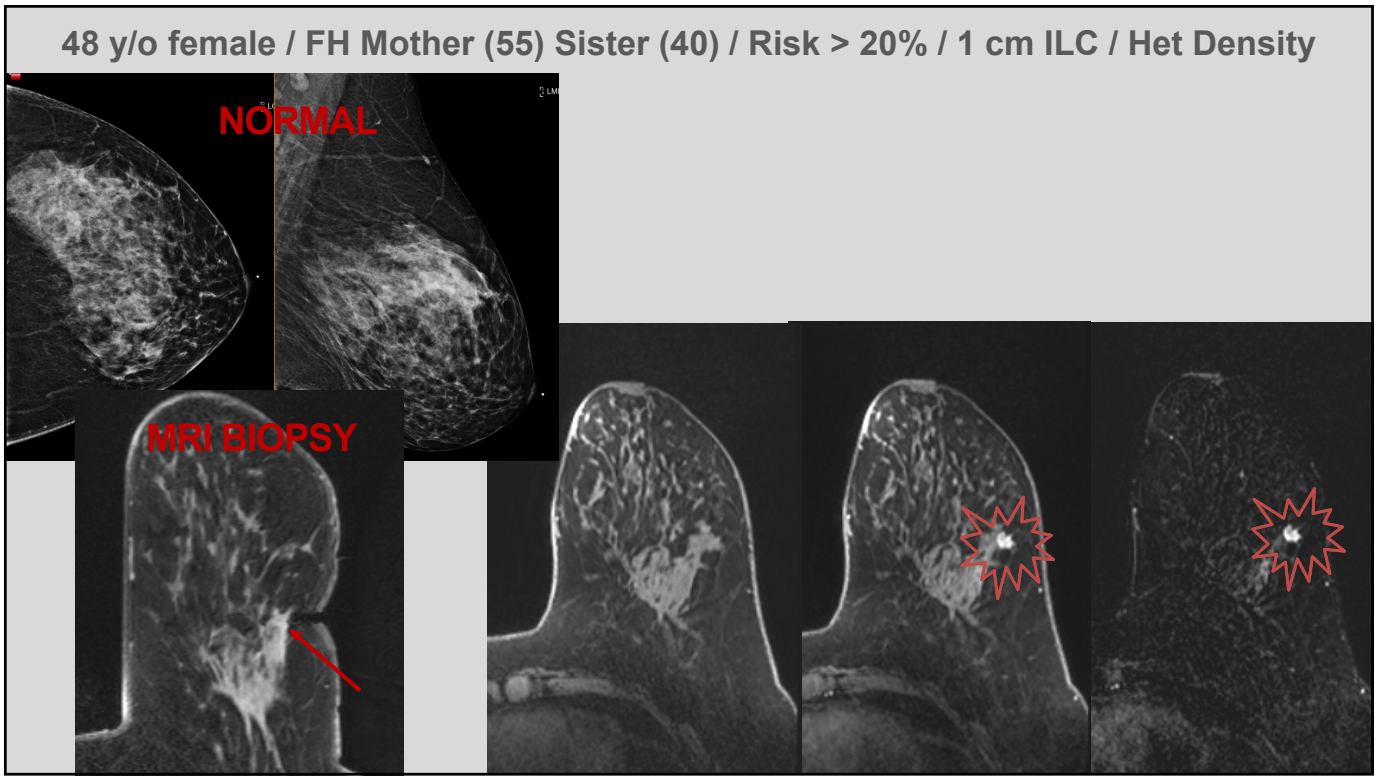
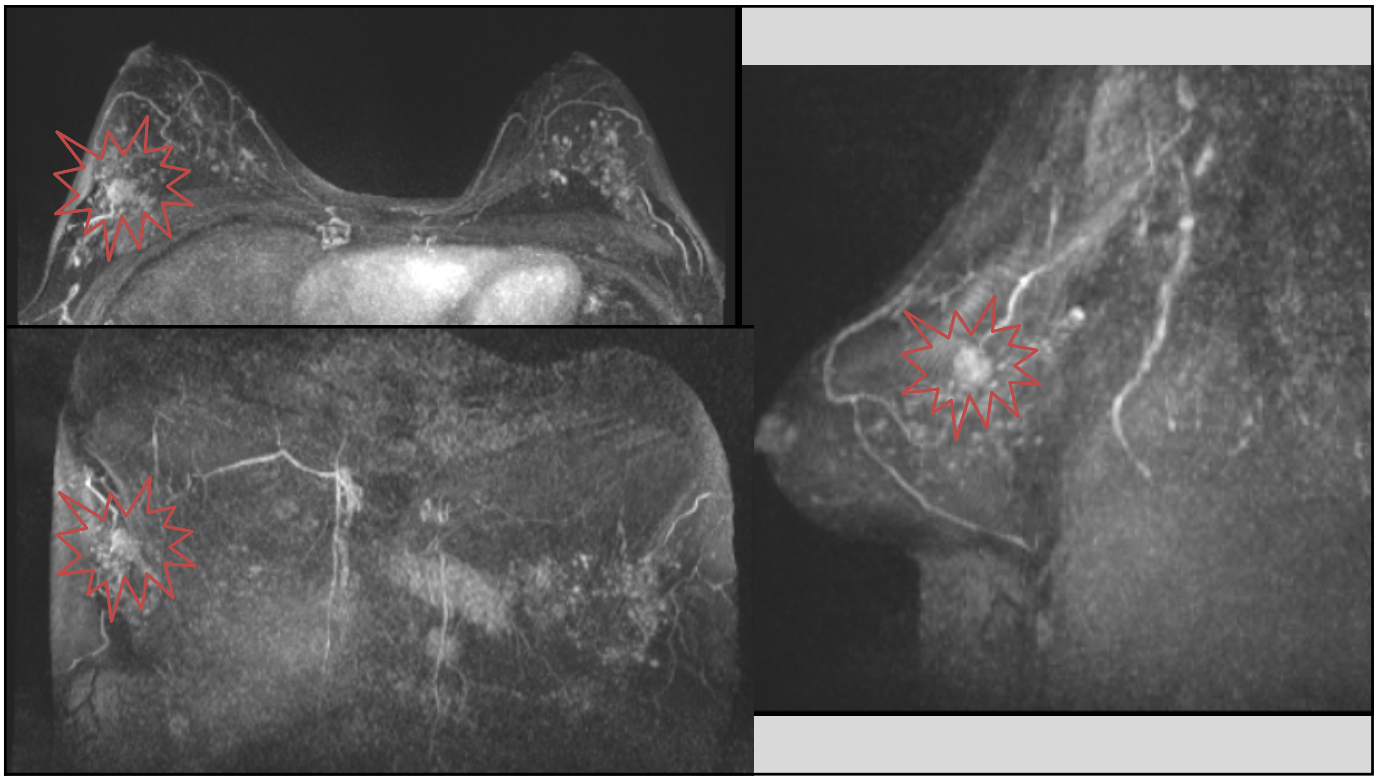
Order-Level
There are no order-level documents for parent order.
Breast Cancer Risk Scores
View Report
Collection Information
Order Report
Order Details
Risk Scores as of
Tyrer-Cuzick 8
Breast cancer 5-year 1.5 %
Breast cancer 10-year 3.83 %
Breast cancer lifetime 32.08 %
Breast cancer genetic susceptibility 1.5 %
Breast cancer, BRCA1 positive 0.56 %
Breast cancer, BRCA2 positive 0.94 %
Tyrer-Cuzick 7
Breast cancer 5-year 1.5 %
Breast cancer 10-year 3.83 %
Breast cancer lifetime 32.08 %
Breast cancer genetic susceptibility 1.5 %
Breast cancer, BRCA1 positive 0.56 %
Breast cancer, BRCA2 positive 0.94 %
BRCAPRO
Ovarian cancer 5-year 0.06 %
Ovarian cancer 10-year 0.17 %
Ovarian cancer lifetime 2.37 %
Breast cancer 5-year 0.61 %
Breast cancer 10-year 1.57 %
Breast cancer lifetime 14.23 %
BRCA gene positive 0 %
Breast cancer genetic susceptibility 1.89 %
Breast cancer, BRCA1 positive 0.77 %
Breast cancer, BRCA2 positive 1.12 %
Claus
Breast cancer 5-year 2 %
Breast cancer 10-year 4.2 %
Breast cancer lifetime 21.3 %
5-year 2 %
41-year 21.7 %


48 y/o female / FH Mother (55) Sister (40) / Risk > 20% / 1 cm ILC / Het Density
NORMAL
MRI BIOPSY

Breast Cancer High Risk Populations

- Personal history of chest radiation while young
- Radiation that includes chest/breast prior to age 30
- Most breast cancers are seen in the upper outer breast as well as the lower inner breast within the mantle field
- **Annual Mammography and MRI**
- **Start age 25 or 8 years after radiation therapy**



Breast Cancer High Risk Populations

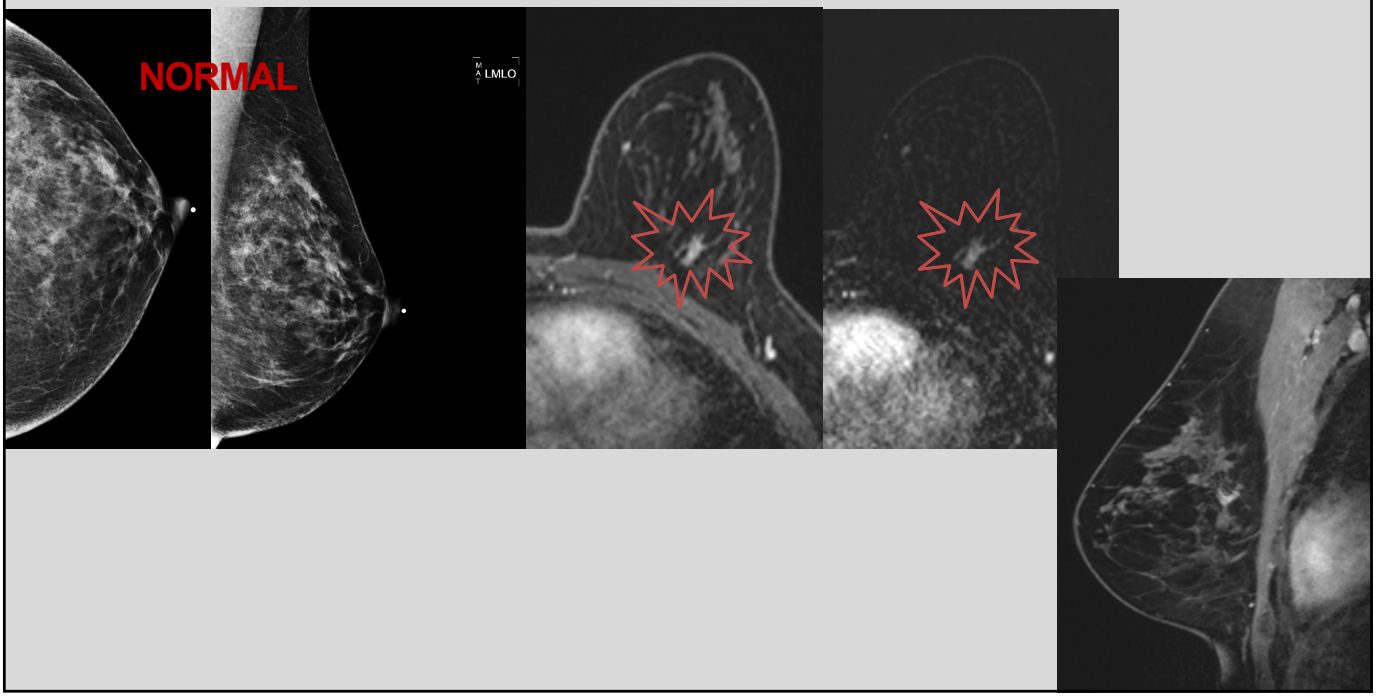
- **Personal history of breast cancer and dense breast tissue**

  OR

- **Personal history of breast cancer diagnosed before age 50**

- Heterogeneous group – age of diagnosis, subtypes, treatment, hormone therapy – will impact risk.
- **Annual Mammogram and Annual Breast MRI**

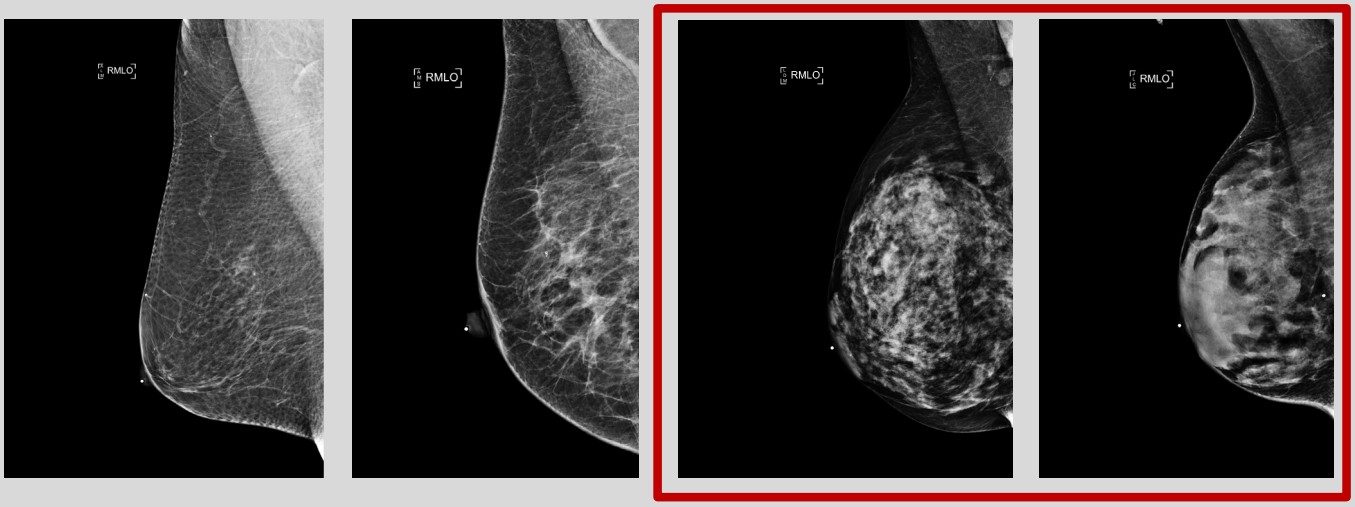
61 y/o female screening / Personal History BC / 1 cm IDC + DCIS / Het Dense



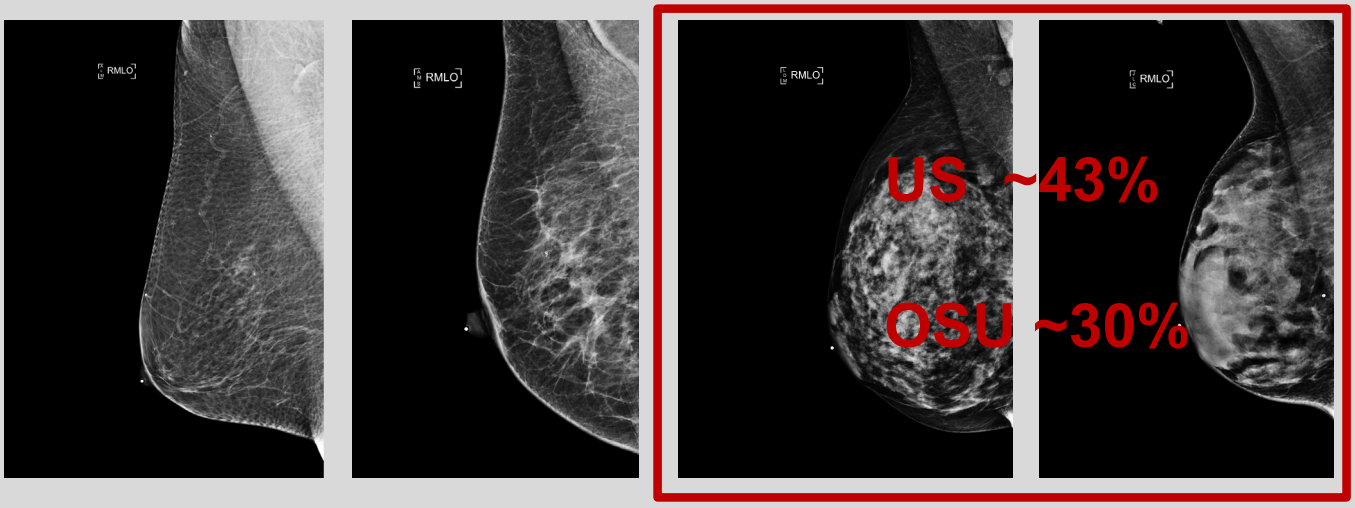
Breast Density

- **Breast density determined by mammography**
- BI-RADS Lexicon Breast Density Categories
  - The breasts are almost entirely fatty
  - There are scattered areas of fibroglandular density
  - **The breasts are heterogeneously dense, which may obscure small masses**
  - **The breasts are extremely dense, which lowers the sensitivity of mammography**

Breast Density



Breast Density



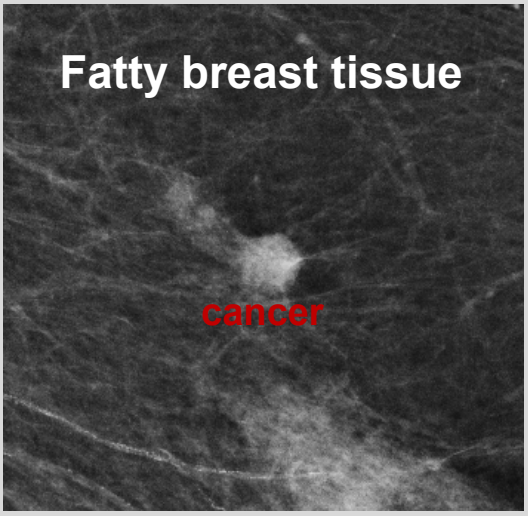
Breast Density - Masking

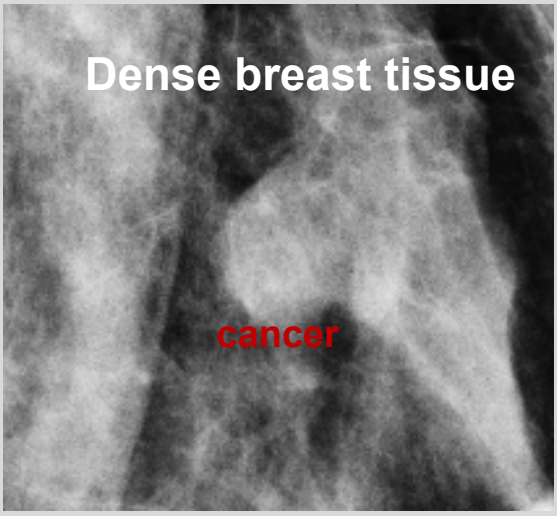
- As breast density increases mammographic sensitivity decreases
- Dense breast tissue and breast cancer are similar density on mammography, overlap causes **masking**
- Challenging and sometimes impossible to find breast cancers in dense breasts
- **Like trying to find a snowball in a snowstorm…**

Breast Density

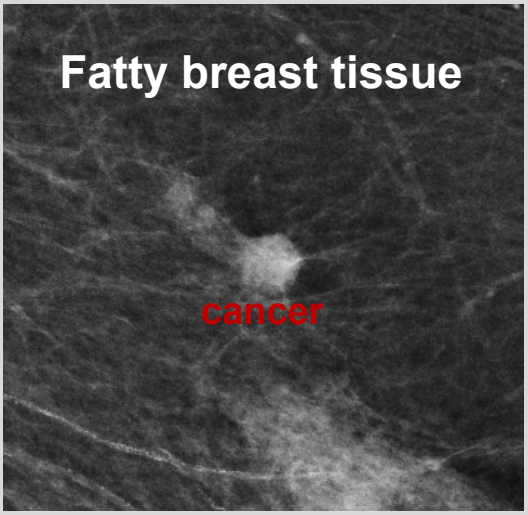
Breast Density

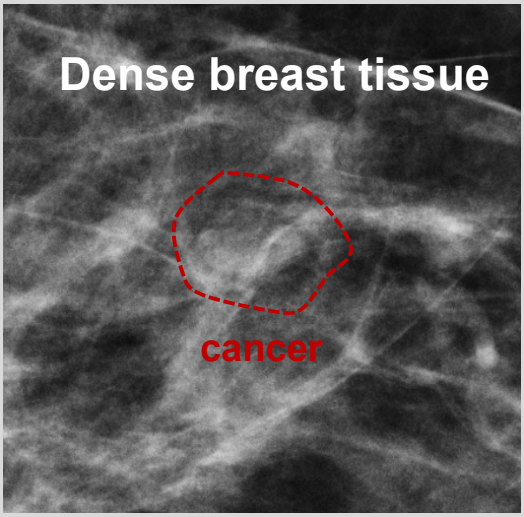
Breast Density



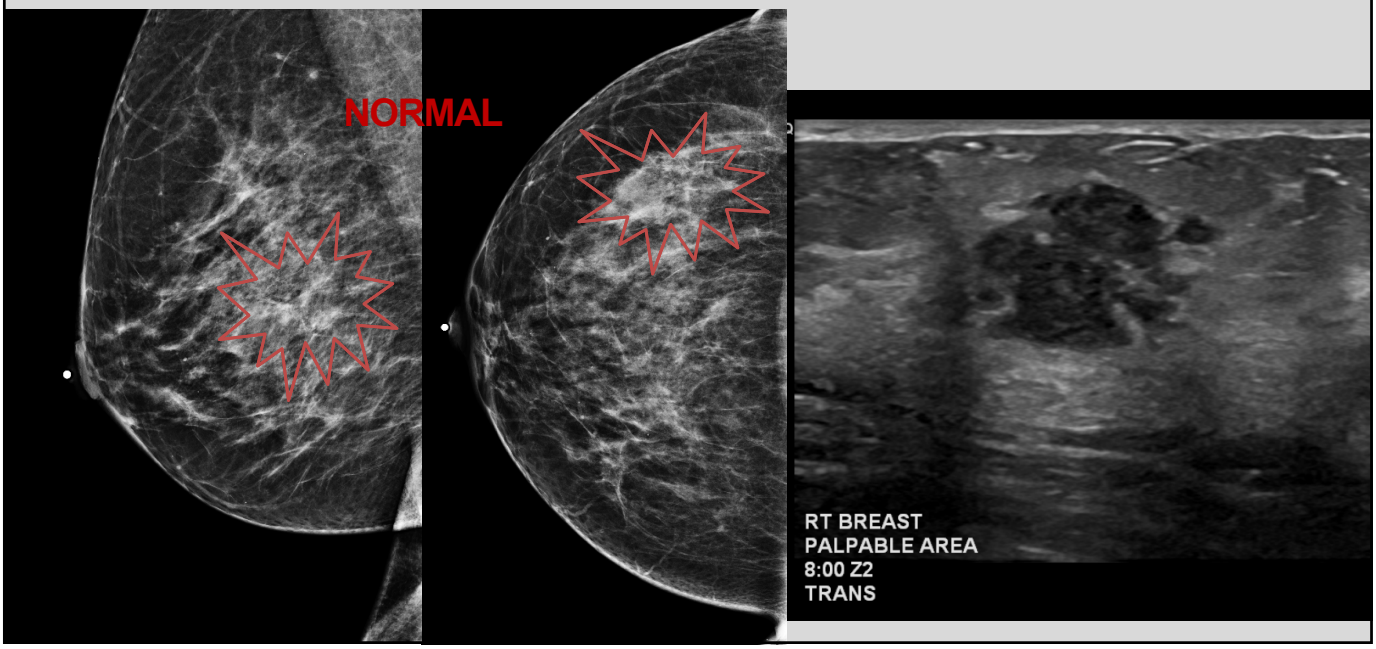


Breast Density





52 y/o female screening / No Fam History / 2 cm IDC / Het Dense

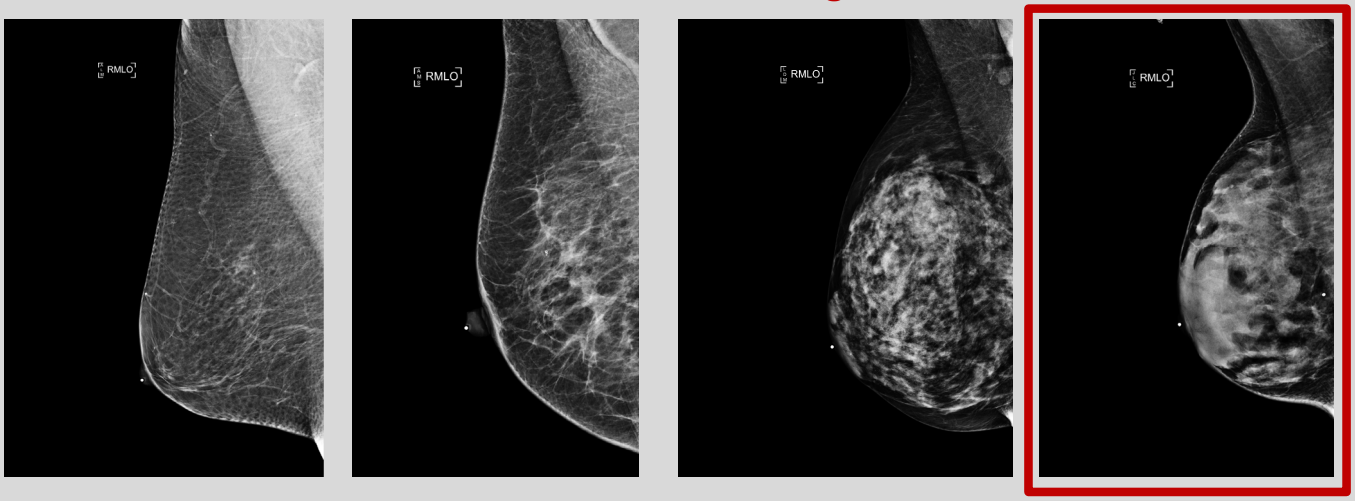


Breast Density - Risk

- **Women with dense breasts are at elevated risk for breast cancer**
- Risk for breast cancer increases as density increases
- Studied heavily with relative risk typically found to be around four-fold increase between extremes in density
- Differences in risk comparing extreme densities are large
- Differences in risk comparing similar densities are smaller

Breast Density

Extremely Dense Breasts:
Much lower sensitivity
Much higher risk of breast cancer
Much higher risk of interval cancer



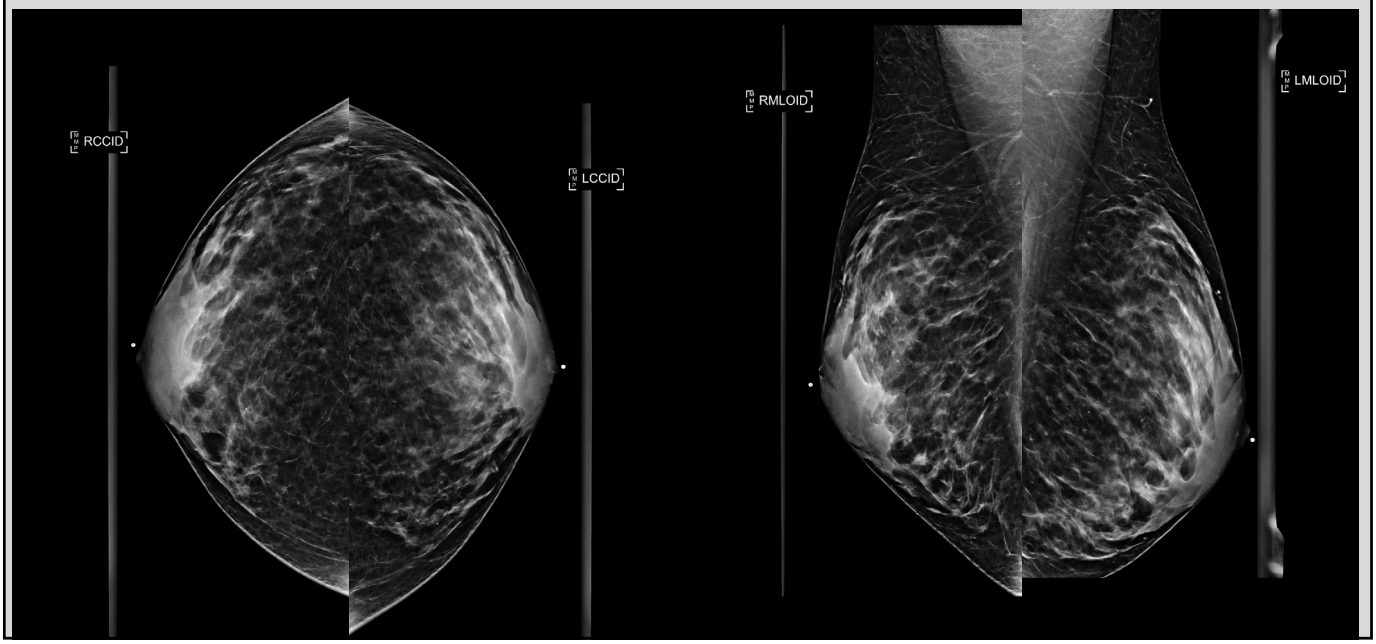
Dense Breast Screening

- Dense breasts **increase risk of breast cancer** and **increase chance of missing breast cancer** on mammography
- Can supplement annual mammography (3D) with:
- Screening US (Handheld or Automated (ABUS))
  - Well tolerated, no IV / Finds fewer cancer, false +
- Screening Breast MRI with contrast
  - Finds the most cancers / More expensive, requires IV

Transgender Breast Cancer Screening

- Transfeminine (male to female) patients
  - 40+ y/o and 5 years hormone use
    - Annual Mammography
- Transmasculine (female to male) patients
  - Bilateral Mastectomies (top surgery)
    - No imaging
  - 40+ y/o and reduction mammoplasty/no surgery
    - Annual Mammography
    - If high risk can add Annual MRI

56 y/o transgender female (male to female) / 7 years hormone use / Het Dense



Breast Cancer Screening Stats

- What should you expect?
- Data from NMD 2008-2021
- Screening Mammography
- Recall Rate 10%
- CDR 4.2 per 1000
- PPV of callback 4.2%
- PPV of biopsy 25.8%

Screening Workup

1. Screening Mammogram
2. Recall from Screening
   Additional Mammogram
   Breast Ultrasound
3. Breast Biopsy
   US or Stereotactic Biopsy

Future of Breast Cancer Screening

- AI, AI, AI
  - Cancer Detection
  - Decision Support / Triage
  - Image Acquisition / Image Augmentation
  - Risk Assessment
- Further Personalized Screening
  - CEM (Contrast Enhanced Mammography)
  - Abbreviated Breast MRI

Breast Cancer Screening Strategy

- Patient high risk? Evaluate risk by age 25
  - **HIGH RISK SCREENING (Annual Mammo + MRI)**
- Patient over 40 and not high risk?
  - **ANNUAL MAMMOGRAPHY (3D)**
- Patient with Dense Breasts?
  - Consider supplemental screening

Selected References/Resources

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