


CEM: Contrast Enhanced Mammography

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What Is CEM?

It is a mammogram requiring an intravenous injection of an iodine contrast agent. The image displayed is the standard view showing tissue density and a contrast-enhanced image in the exact same position with the background signal subtracted out.

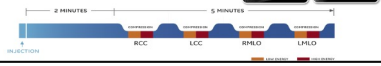
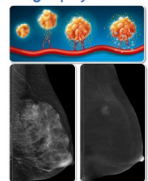


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Contrast-Enhanced Spectral Mammography

- Detection of unusually high blood flow can be used to increase suspicion
- Iodine injection – Contrast agent can be used to highlight areas of unusual blood flow
- CESH uses multiple x-ray exposures to reduce background signal, effectively highlighting contrast enhanced areas.
- Two images per view are provided. The first uses standard mammographic techniques and represents tissue density (left). The second is a contrast-enhanced image in exactly the same position (right).
- A complete 4-view bilateral exam can be performed with a single injection.

Slide Courtesy of GE

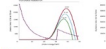
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How Does CEM Work?

When an exposure is made, two images are created per view using a high energy beam and a low energy beam (Spectral Imaging).


CEM – Technology Fundamentals

Energy and Iodine Absorption




- Iodine absorption drops at edge of 100keV k-edge
- High energy spectrum (low iodine absorption)
- Low energy spectrum (high iodine absorption)

Spectral Shaping of X-rays



- Generation (tube capable of 150kV)
- 100kVp (high energy) and 100kVp (low energy)
- 100kVp (high energy) and 100kVp (low energy)
- High energy spectrum with 100kVp (low energy) and 100kVp (high energy)

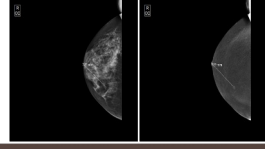



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Why Is CEM Performed?

It is performed as an adjunct to an inclusive mammogram or ultrasound exam. Using an iodine contrast agent, CEM highlights the suspicious area that exhibits increased vascularity.





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Why Is CEM Performed?

Only as an adjunct test to an abnormal mammogram or ultrasound.




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How to Incorporate CEM Into Your Breast Center

Step 1

- Contact your IT department
- Contact your billing/scheduling department




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How to Incorporate CEM Into Your Breast Center

- Contact your RIS (MagView, MRS, Penrad, EPIC) vendor
- Build and review your transcription template




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How to Incorporate CEM Into Your Breast Center

- Build and review your charges
- Decide if you are going to use your lab or perform the creatinine test yourself (point of care device)



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How to Incorporate CEM Into Your Breast Center

Step 2

- Assess your room



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How to Incorporate CEM Into Your Breast Center

- Mayo stand
- Rolling stool
- Personnel performing exam and the patient



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How to Incorporate CEM Into Your Breast Center

Room must be large enough for:

- IV chair
- Injector
- Mammo Equipment



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How to Incorporate CEM Into Your Breast Center

Step 3

- Train your Staff:
 - Arrange for applications of CEM and injector on same day
 - Designate which day exam will be performed



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How to Incorporate CEM Into Your Breast Center

- Appointment length
- Who schedules/interviews the patient
- Who will start IV? Tech, Nurse, Rad



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How to Incorporate CEM Into Your Breast Center

STEP 4

- Exam Day
 - Appointment time should be 1 hour
 - This allows enough time review of lab results or performance of the lab work and for insertion of IV
 - Imaging time is usually around 7 minutes



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Our Protocol

- Patient is scheduled for one hour appointment
- Nurse interviews and screens patient prior to appointment
- Patient arrives 15 minutes early for check-in
- Patient is brought back and gowned in dressing area



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Our Protocol

- Nurse collects patient and brings patient to CEM room
- Nurse inserts IV
 - We allow 45 minutes for IV insertion and a minimum of 4 attempts
- Technologist loads injector
- Technologist retrieves Radiologist once IV has been inserted



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Our Protocol

- Technologist and nurse coordinate injection time
- Patient waits two minutes and begin imaging
- Imaging starts with affected side CC first, then the unaffected side CC
- The ML or MLO is determined by the Radiologist (start with affected side)



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Our Protocol

- Exam is completed
- IV is removed
- Radiologist reviews exam
- Patient is given results before leaving



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SCHEIDT/POWERS/REAGAN CLINIC

EXAM: Contrast Enhanced Spectral Mammography

CEM HISTORY FORM

Name: _____ Date: _____
Weight: _____ Age: _____

1. Are you allergic to contrast dye? ____ NO ____ YES
2. Have you ever been diagnosed with asthma? ____ NO ____ YES
3. Have you ever had heart surgery? ____ NO ____ YES DATE: _____
4. Have you ever had breast cancer? ____ NO ____ YES DATE: _____
5. Have you ever had any type of cancer? ____ NO ____ YES
When did you have it? _____
6. Have you ever had radiation or chemotherapy? ____ NO ____ YES
When did you have it? _____
7. Have you ever had any vascular surgery or stroke? ____ NO ____ YES
When did you have it? _____
8. Are you diabetic? ____ NO ____ YES If yes, how long? _____
9. Do you have any implants? ____ NO ____ YES
What type are they? _____
10. Do you have any Orthopedic Implants? ____ NO ____ YES
Please list all given Orthopedic Implants (Date of Surgery): _____
11. Do you have any other conditions you are aware of? ____ NO ____ YES
12. Do you have any tattoos? ____ NO ____ YES

Patient Signature: _____ Date: _____

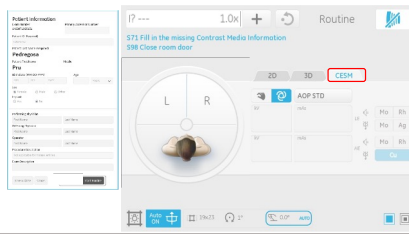
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The Set-Up



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Our Protocol: Criteria for CEM

- If patient has an abnormal screening mammogram...
- The patient is called back and scheduled for U/S first
 - If U/S is abnormal, we perform CEM on same day
 - Do additional views after the CEM



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Case Review



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Asymmetry



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65-year-old Female
RT Breast Asymmetry

Right Breast

12 o'clock 10 cm fn 7mm mass. Asym RUOQ. US performed, multiple complex masses

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Right Breast

Right breast US vacuum assisted core biopsy
Pathology-Fibrous tissue with necrosis
and chronic inflammation and foamy histiocytes

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Left Breast

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Left Breast

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88-year-old Female
Asymmetry

Left Breast

Focal asymmetry UOQ (9mm 7cm fn)

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Left Breast

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Left Breast

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Right Breast Mastectomy Site

Stereotactic vacuum assisted core biopsy
Pathology - Left Breast Invasive Ductal Carcinoma

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Mass

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60-year-old Female,
Hx of left breast cancer, mass in right breast

16 mm focal area of asymmetry 9cm In

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Right Breast

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Right Breast

Right Breast US guided, vacuum-assisted core biopsy
Pathology = FCB, fibrosis

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Left Breast

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Left Breast

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Left Breast

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64-year-old Female
Right breast thickening at 9 o'clock with yellow nipple discharge

Right Breast

Nothing seen radiographically, breast tissue extremely dense.
US showed fibrotic-type echotexture pattern, based on pt symptoms and palp area. CEEM done

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Right Breast

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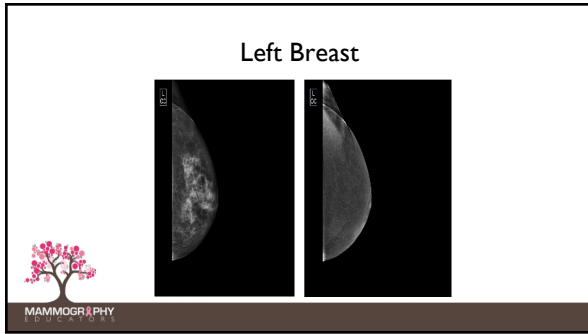
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Right Breast

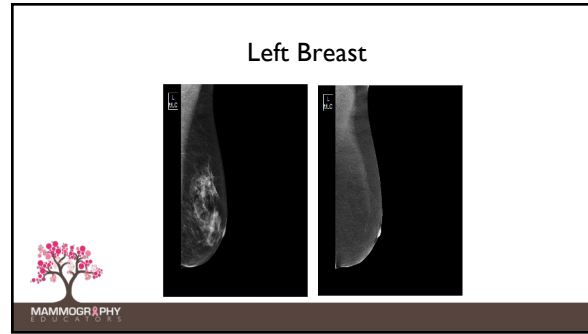
Right breast, stereotactic, vacuum-assisted core bx
Pathology = DCIS right breast

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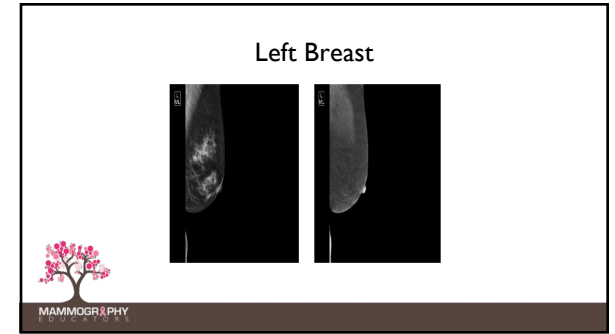
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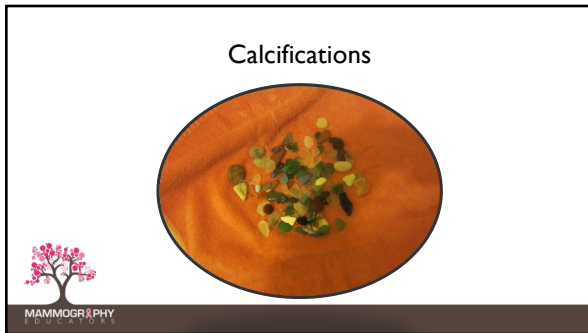
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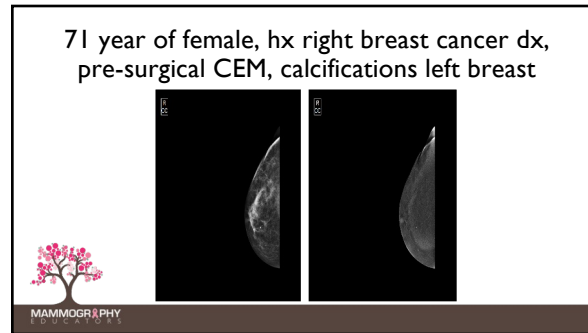
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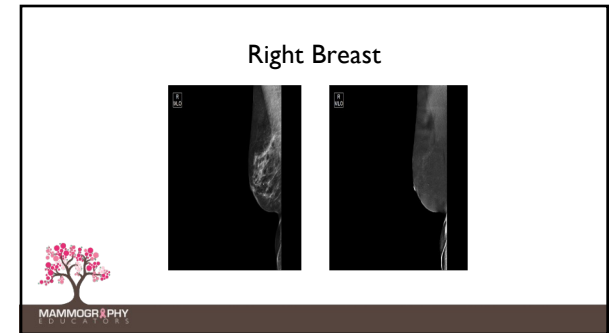
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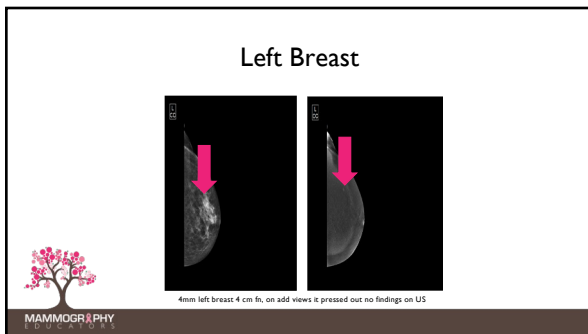
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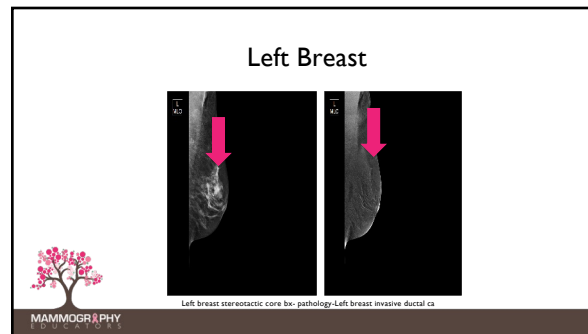
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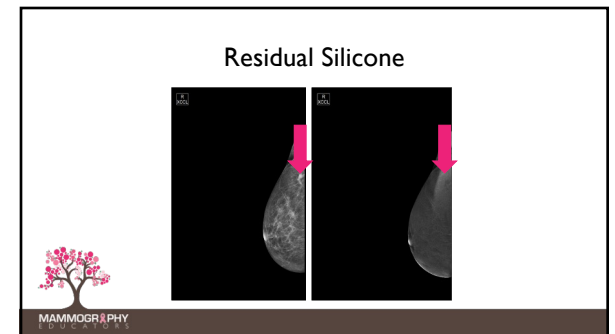
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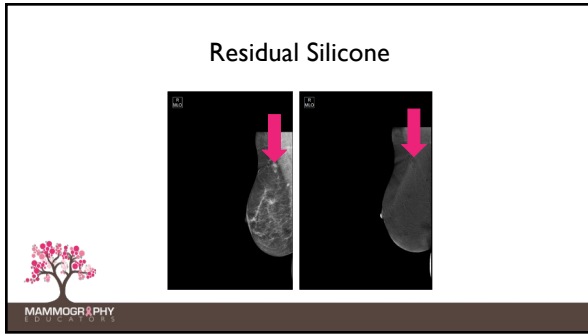
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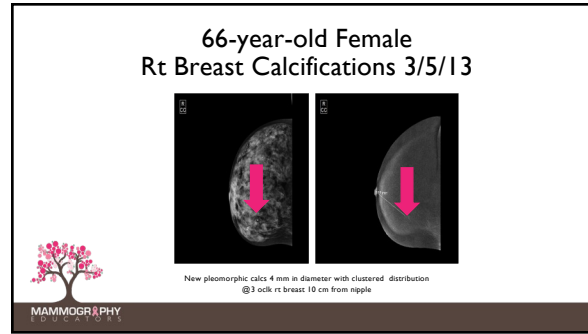
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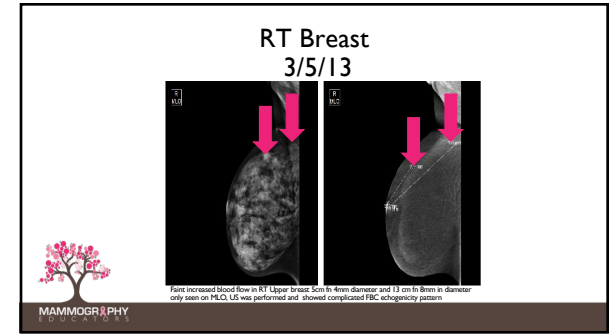
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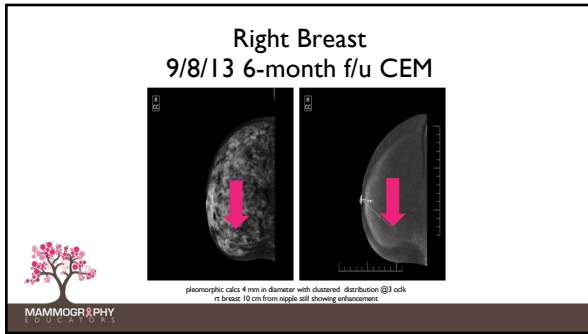
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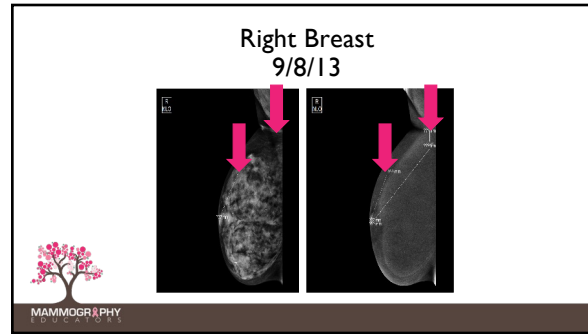
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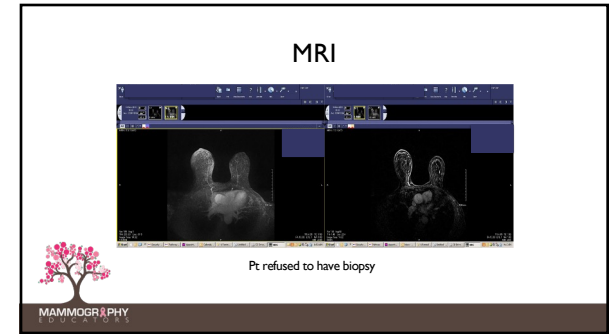
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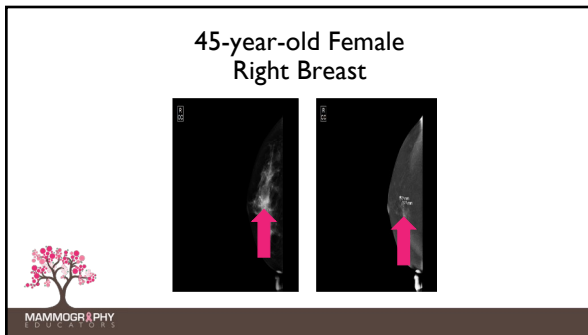
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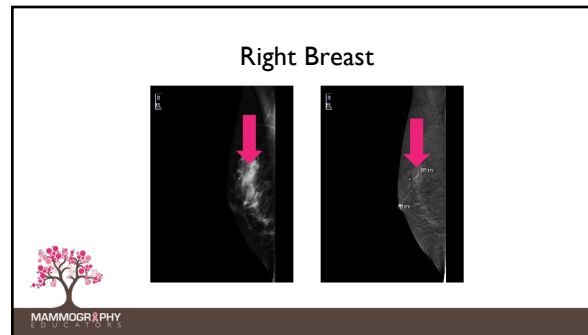
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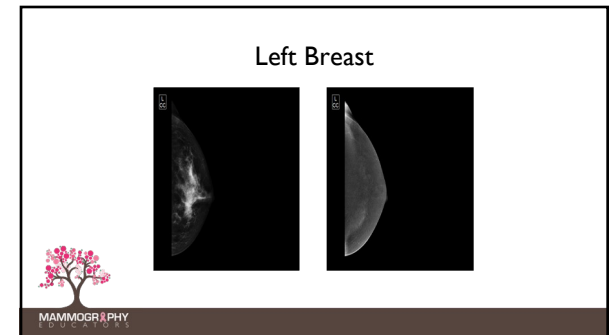
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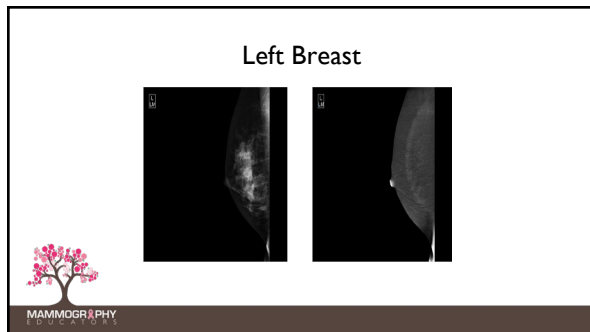
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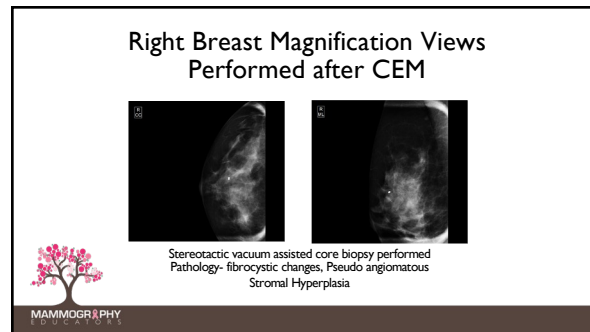
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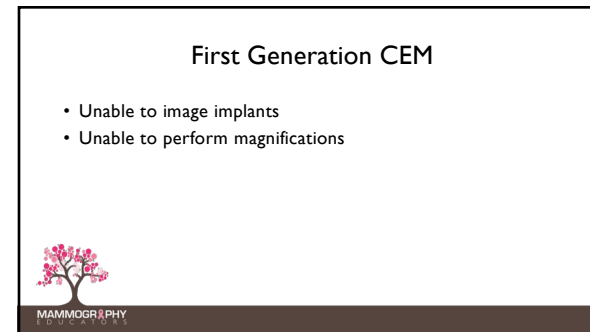
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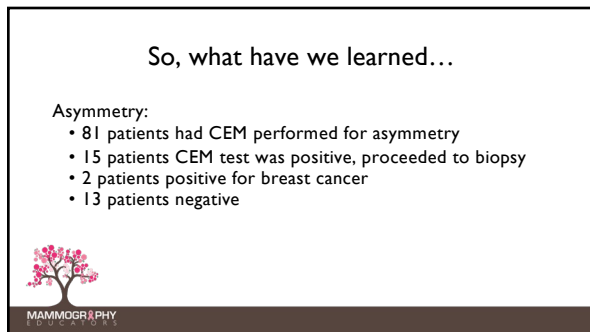
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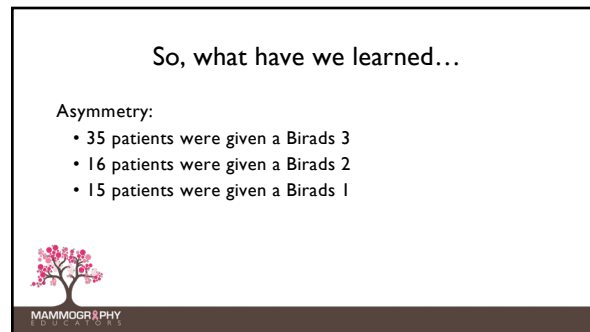
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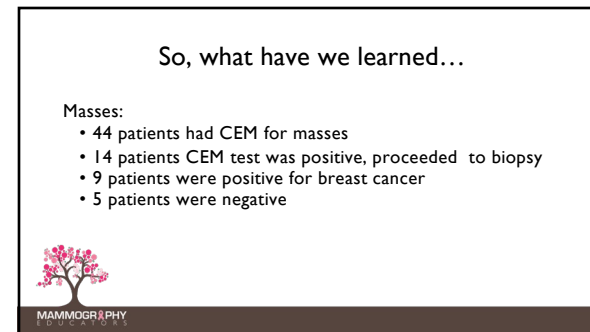
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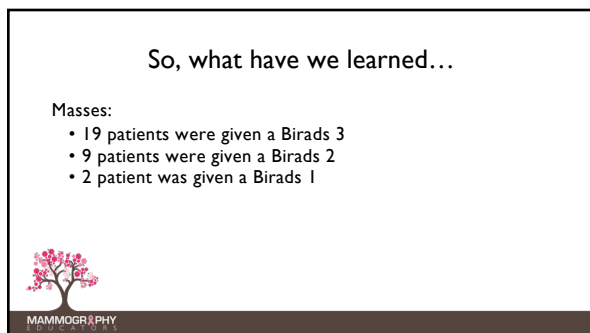
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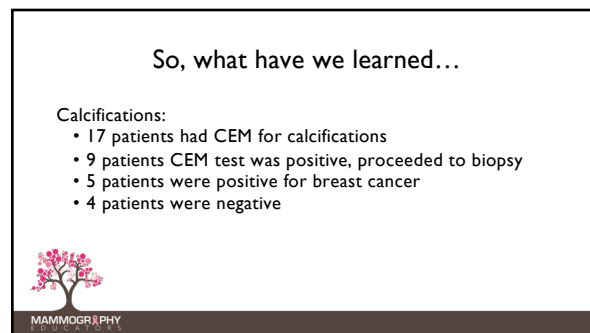
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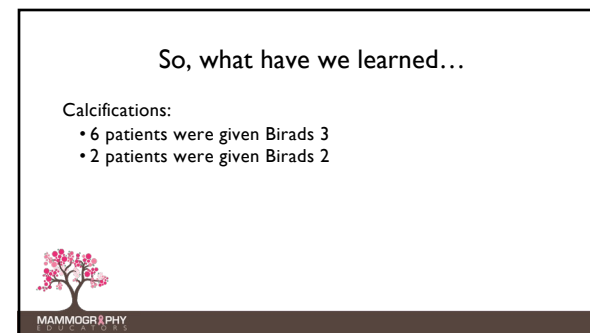
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So, what have we learned...

Dense Breast/High Risk:

- 23 patients had CEM for dense breasts or high-risk factors (negative mammogram)
- 2 patients CEM was positive, one proceeded to biopsy
- 1 patient positive for breast cancer



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So, what have we learned...

Dense Breast/High Risk

- 1 patient was given Birads 3
- 19 patients were given Birads 2
- 2 patients were given Birads 1



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23 Months

165 CEM exams performed
15 cancers detected



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How CEM has helped us...

- Patients who have Asymmetry or Architectural distortion - A negative CEM allows us to place them into short-term follow-up
- Patients who have multiple masses on U/S - The CEM test helps in determining the dominate mass to biopsy and a negative CEM allows us to place into short-term follow-up.



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How CEM has helped us...

Patients who have calcifications – The CEM test helped determine which patients went to biopsy and made us feel comfortable with those who went to short-term follow-up.



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How CEM has helped us...

- Two patients diagnosed with breast cancer from outside facilities had CEM tests prior to surgery. The test found cancer in the contralateral breast and was helpful with pre-surgical planning in both.
- One patient from outside facility, CEM found multi-focal lesions prior to surgery.



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How CEM has helped us...

- Three patients had CEM for pre-surgical treatment planning.
- One patient with dense breasts, negative mammogram, detected early breast cancer through CEM.



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How CEM has helped us...

- Three patients had CEM for pre-surgical treatment planning.
- One patient with dense breasts, negative mammogram, detected early breast cancer through CEM.



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Why CEM?

- Option for patients who have dense breasts with an inconclusive work-up
- Patients who have had U/S and they have multiple complex masses



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Why CEM?

- Reduces unnecessary biopsies and increased patient anxiety
- Option for patients who cannot have a MRI, due to a physical limitation or insurance issues



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Why CEM?

- No cross training needed
- Correlation is within the same modality and easy to reproduce
- It's affordable
- Results are immediate
- Patient feedback has been positive



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