Outline

• Index Patient
• Pregnancy Associated Breast Cancer
• Imaging Modalities
  – Mammography
  – Ultrasound
  – MRI
• Pathology
• Treatment and Outcome
Index Patient

- 30 year old woman, 50 days post-partum and breast feeding who felt a lump in her right breast at 12 o’clock, 2cm from nipple, firm and irregular

- PMH
  - Hepatitis B
  - Second child
  - No personal or family history of breast or ovarian cancer
Pregnancy Associated Breast Cancer: Presentation and Incidence

- Breast cancer diagnosed during pregnancy or in first postpartum year
- Presentation
  - >90% present with a breast mass
- Incidence
  - 1/3000 pregnant women
  - Anticipate more diagnoses as women choose to have children later in life
Pregnancy Associated Breast Cancer: Features and Diagnosis

• **Features**
  - Typically poorly differentiated, advanced stage
  - Lower frequency of ER and PR expression (25% vs. 55-60%)

• **Difficult Diagnosis**
  - Physiologic breast changes
  - Desire to limit fetal radiation exposure
  - Can lead to diagnostic delays
Breast Anatomy

Anatomy of the female breast. The nipple and areola are shown on the outside of the breast. The lymph nodes, lobes, lobules, ducts, and other parts of the inside of the breast are also shown.
Breast Changes during Pregnancy

- Proliferation of ducts and lobules leads to increased density and nodularity
- These changes make it harder to detect
  - small changes
  - architectural distortion
Differential Diagnosis: Palpable Breast Mass Associated with Pregnancy

- Gestational and secretory hyperplasia
- Galactocele (milk retention cyst)
- Lactating adenoma
- Fibroadenoma
- Mastitis / Abcess
- Cyst
- Carcinoma
## Palpable Breast Masses

**Clinical Condition:**
Woman age 30-39 years of age, initial evaluation. (See [Appendix 3](http://www.acr.org/~/media/ACR/Documents/AppCriteria/Diagnostic/PalpableBreastMasses.pdf) for additional steps in the workup of these patients.)

<table>
<thead>
<tr>
<th>Radiologic Procedure</th>
<th>Rating</th>
<th>Comments</th>
<th>RRL*</th>
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<td>US breast</td>
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<td>If imaged initially with US, see variants 7-10 for additional imaging.</td>
<td>O</td>
</tr>
<tr>
<td>Mammography diagnostic</td>
<td>8</td>
<td>If imaged initially with mammography, see variants 2-5.</td>
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<td>MRI breast without and with contrast</td>
<td>2</td>
<td></td>
<td>O</td>
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<tr>
<td>MRI breast without contrast</td>
<td>1</td>
<td></td>
<td>O</td>
</tr>
<tr>
<td>FDG-PEM</td>
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<td></td>
<td>★★★★</td>
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<tr>
<td>Tc-99m sestamibi BSGI</td>
<td>1</td>
<td></td>
<td>★★★★</td>
</tr>
<tr>
<td>Image-guided fine needle aspiration breast</td>
<td>1</td>
<td></td>
<td>Varies</td>
</tr>
<tr>
<td>Image-guided core biopsy breast</td>
<td>1</td>
<td></td>
<td>Varies</td>
</tr>
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</table>

**Rating Scale:** 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate

**Relative Radiation Level**
Mammography: Overview

• Low-dose x-rays
  – 2 views: cranial-caudal, mediolateral oblique

• Indications/Use
  – Palpable masses
  – Avoid during first trimester

• Worrisome Findings
  – Spiculated masses
  – Architectural distortion
  – Calcifications

• Sensitivity as low as 68% in women with dense breasts
Mammography: Views

Schematic representation of CC and MLO views. The breast is divided into anterior, middle and posterior depths to aid lesion localization.

CC: craniocaudal; MLO: mediolateral oblique; Ant: anterior; Mid: middle; Post: posterior; Axill: axillary.
Mammography: Locating Lesions

The location can also be indicated as a clock position. Each breast is divided into clock positions with the nipple as the center.

UpToDate, Venkataraman
Companion Patient #1: Breast Tissue Changes during Pregnancy

Radiologic evaluation of breast disorders related to pregnancy and lactation, Sabate

Mammogram MLO view
Our patient: Mammogram CC view

7 cm area
pleomorphic branching calcifications

nipple

BB marking palpable lump
12 o'clock
2 cm
Our patient: Mammogram MLO view

7 cm area
pleomorphic branching calcifications

nipple

BB marking palpable lump
12 o'clock
2cm
Our Patient: BI- RADS 5

<table>
<thead>
<tr>
<th>BI-RAD class</th>
<th>Description</th>
<th>Probability of malignancy (%)</th>
<th>Follow-up</th>
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<tbody>
<tr>
<td>0</td>
<td>Needs additional evaluation</td>
<td></td>
<td>Diagnostic mammogram, ultrasonographic image</td>
</tr>
<tr>
<td>1</td>
<td>Normal mammogram</td>
<td>0</td>
<td>Yearly screening</td>
</tr>
<tr>
<td>2</td>
<td>Benign lesion</td>
<td>0</td>
<td>Yearly screening</td>
</tr>
<tr>
<td>3</td>
<td>Probably benign lesion</td>
<td>&lt; 2</td>
<td>Short interval follow-up</td>
</tr>
<tr>
<td>4&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Suspicious for malignancy</td>
<td>20</td>
<td>Biopsy</td>
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<tr>
<td>5</td>
<td>Highly suspicious for malignancy</td>
<td>90</td>
<td>Biopsy</td>
</tr>
<tr>
<td>6</td>
<td>Biopsy-proven malignancy</td>
<td>100</td>
<td>Treatment</td>
</tr>
</tbody>
</table>

**TABLE 4: BI-RAD classification of mammographic lesions**

**BI-RAD = Breast Imaging Reporting Data System**

<sup>a</sup> The ACR recommends that each site be divided into three subcategories: 4A, low suspicion; 4B, intermediate suspicion; and 4C, moderate concern but not classic for malignancy.

[www.cancernetwork.com](http://www.cancernetwork.com), Jardines
Our Patient: Core Biopsy

Our patient was referred for a core biopsy to further characterize the lesion in her R breast. This was done under ultrasound guidance.
Ultrasound Overview

• Sonogram, no radiation

• Indications
  • Evaluation of clinical and mammographic findings
  • Palpable masses in women < 30yo
  • Women who are pregnant or lactating

• Worrisome Findings
  • Heterogeneous echotexture
  • Irregular margins / non-oval shape
  • Acoustic shadowing
  • Echogenic foci
  • Increased vascularity
Ultrasound: Locating Lesions

www.ultrasoundpaedia.com
Ultrasound: Normal Breast

Skin
Fat
Breast Tissue with diffuse echogenicity
Pectoralis muscle

Ultrasound characterization of breast masses, Gokhale
Ultrasound: Lactating Breast

Breast tissue with diffuse hyper-echogenicity

Radiologic evaluation of breast disorders related to pregnancy and lactation, Sabate
Our Patient: R Breast Lesion on Ultrasound

Irregular borders
Echogenic foci
Distal Shadowing
Pectoralis muscle

Right Breast Ultrasound, Anti-radial
4.6 x 1.5cm lesion at 1 o’clock, 4cm from nipple
“Highly suspicious for carcinoma”
Our Patient: Increased Vascular Markings on Ultrasound

Right Breast Ultrasound, Anti-radial

Blood vessels
Our Patient: Right Axillary Lymph Nodes

Ultrasound R Axillary Lymph Nodes, <3mm diameter
Not concerning for metastatic spread
Narrowed Differential Diagnosis Based on Imaging Findings

- Gestational and secretory hyperplasia
- Calcified Fibroadenoma
- Carcinoma
- Scar Calcification
Our Patient: Next Steps

• This lesion was reported as “highly suspicious for carcinoma” on ultrasound
• The patient then had a breast MR to evaluate for occult lesions
MRI: Overview

• No radiation, no mechanical compression, multiple planes
• Limited specificity because of enhancement of benign tissue

Indications

• Not indicated in pregnancy
• Definition of disease extent: detects lesions not found on conventional imaging in 10% of women
• Occult primary tumor
• Evaluation of Breast Implants
• Worrisome Findings
  • High T1 signal, intermediate T2 signal
  • Type 2 or 3 kinetics
## MRI: Enhancement

### Table 1.1  Basic signal characteristics in breast MRI

<table>
<thead>
<tr>
<th></th>
<th>T1 signal</th>
<th>T2 signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyst fluid</td>
<td>LOW (dark)</td>
<td>HIGH (bright)</td>
</tr>
<tr>
<td>Fatty tissue</td>
<td>HIGH (but dark with IR)</td>
<td>HIGH (but dark with IR)</td>
</tr>
<tr>
<td>Fibroglandular tissue</td>
<td>INTERMEDIATE (gray)</td>
<td>INTERMEDIATE (gray)</td>
</tr>
<tr>
<td>Invasive cancer/DCIS</td>
<td>HIGH (after gadolinium)</td>
<td>INTERMEDIATE (gray)</td>
</tr>
</tbody>
</table>

IR = fat suppression

*Handbook of breast MR, Price*
3 main kinetic patterns (left) are associated with different proportions of benign and malignant lesions (right)
MRI: Equivocal Masses

Assess mass morphology and visual enhancement pattern

- **BENIGN**
  - No action

- **EQUIVOCAL**
  - 6 month follow-up

- **SUSPICIOUS**
  - Biopsy

**KINETICS**

- **Type 1**
- **Type 2 or 3**

*Handbook of breast MR, Price*
Please take a minute to review this image.

Findings will be revealed on the next slide.
Our patient: MRI

Breast MRI: T1 with Gadolinium contrast, Axial

Architectural Distortion
Increase enhancement
Chest Wall
Our Patient: MRI Results

- **R breast**
  - Non-mass-like enhancement in R upper inner breast
  - Mixed kinetics

- **L breast**
  - Non-mass-like enhancement in central upper L breast from posterior breast to nipple
  - Mixed kinetics
Our Patient: Interventions

Our patient underwent an MRI guided biopsy of her L breast and a R breast mastectomy
Our Patient: Biopsy Pathology

Right breast: Ductal carcinoma in-situ

Left Breast: Breast parenchyma with lactational changes
Evaluation for Metastatic Disease in Pregnant Patients

- Chest: CXR with fetal shielding
- Liver: US
  - MRI without contrast if necessary, avoid in 1st trimester
- Brain: MRI without contrast
- Bone: low dose bone scan or skeletal MRI
  - *Alk phos increases during pregnancy due to placental production, cannot use as a marker of bone mets
Our Patient: Evaluation for Metastatic Disease

Our patient’s workup for metastatic disease was negative.
Our Patient: Staging and Prognosis

Our patient had stage IIA cancer

<table>
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<tr>
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<td>I</td>
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<td>Any N</td>
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Bartella, *Radiologic clinics of North America*

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<td>54</td>
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Our Patient: Treatment and Outcome

• Final Pathology
  • Invasive Ductal Carcinoma Stage IIa
  • ER/PR negative, HER-2/nu amplified

• Treatment
  • Surgery
  • Chemotherapy
  • Radiation

• Genetic Testing
  • BRCA 1 and 2 negative

• Surveillance
  • no evidence of recurrent disease
Summary

- PABC is rare, but becoming more common
- PABC is typically poorly differentiated, advanced stage, ER/PR negative
- Can be difficult to diagnose on mammography
- US is preferred imaging modality
- MRI can be useful to evaluate disease extent
References

Acknowledgements

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