BI-RADS Update: The Sixth Edition
Breast MRI

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SBI
IN AFFILIATION WITH CSBI

Disclosures

- None

Breast MRI Subcommittee

- Wendy Demartini, MD, Chair
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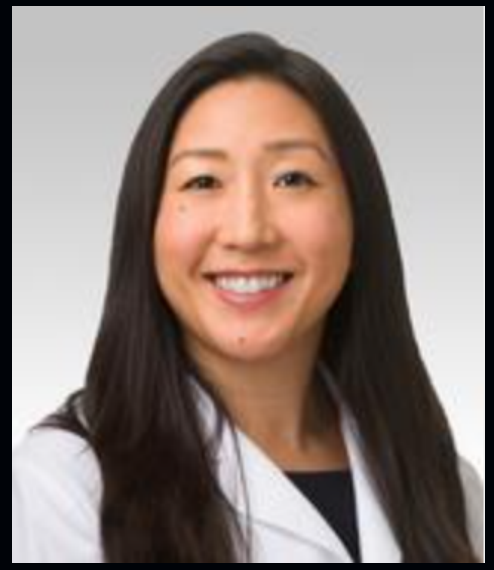
- Katja Pinker, MD, PhD
- Habib Rahbar, MD
- Lilian Wang, MD



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ACR BI-RADS MRI

- Section I: Clinical Information and Comparisons
- Section II: Acquisition Parameters
- Section III: Lexicon
- Section IV: Reporting System
- Section V: Breast Implant Evaluation
- Section VI: Guidance
- Appendix: MRI Lexicon Classification Form, Sample Clinical Reports

Clinical Information and Comparisons

- New structured categories for major clinical indications, associated optional subcategories and relevant clinical histories
  - Facilitate auditing of outcomes
- Specify major clinical indication and when possible, optional subcategory
- Comparison and correlation to prior exams:
  - May not be needed for all exams
  - Diagnostic: Current Breast Cancer
  - Report dates of prior imaging

Clinical Information and Comparisons

Major Indication	Optional Subcategory Indication	Relevant History to Report (if known)
I. Asymptomatic Screening	Elevated Risk Dense Breasts Prior Breast Cancer Completed Treatment Other	Gene mutation Estimated cancer risk
II. Diagnostic: Work-Up	Clinical Findings Imaging Findings Follow-up Category 3 Follow-up after Biopsy Implant Assessment Other	Clinical finding type Imaging finding type
III. Diagnostic: Current Breast Cancer	Extent of Disease Before Definitive Surgery Response During or After Neoadjuvant Therapy Other	Location and size of cancer on prior imaging evaluation

Acquisition Parameters

- Standard “Full Protocol” Contrast Enhanced MRI
  - First 60-120 sec after contrast injection: “early ” phase (previously “initial”)
- Abbreviated Contrast Enhanced MRI
  - Total scan time usually <10 minutes
  - At minimum: 3-plane localizer, T1W- pre and single post-contrast series
  - No delayed phase kinetics
- Diffusion Weighted Imaging
  - Non-contrast MRI technique that measures mobility of water molecules in tissue
  - Augments DCE information, help distinguish benign vs malignant findings
  - Guidelines for reporting DWI findings not component of BI-RADS at this time

Lexicon

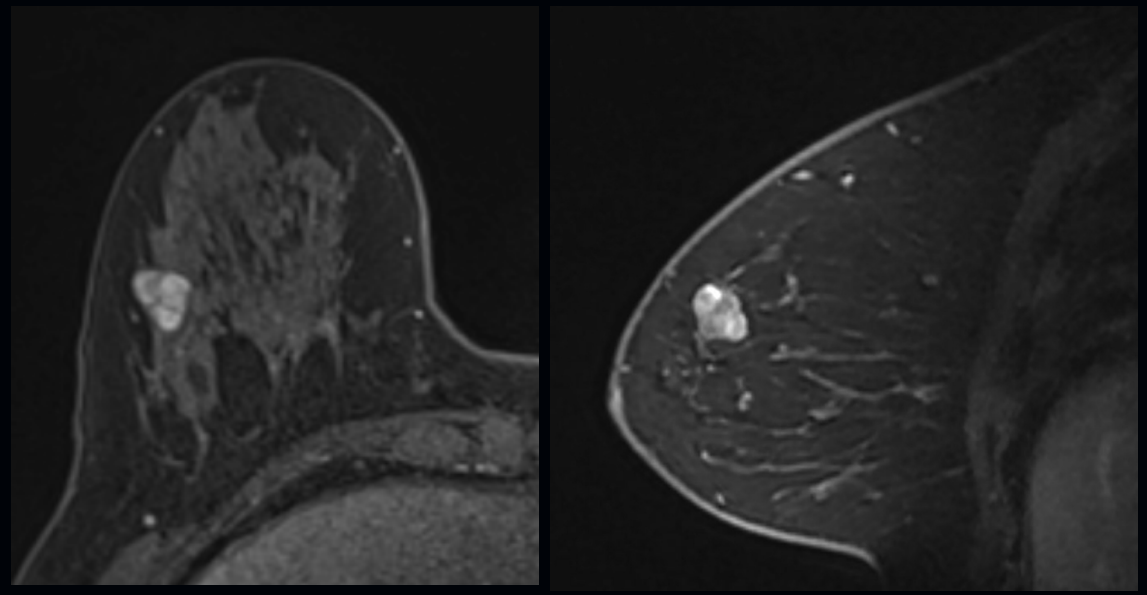
Focus

- Removal of “Focus”
  - Most small dots of enhancement are benign
  - Modern MRI techniques allow characterization of unique enhancing findings <=5 mm as masses or non-mass enhancement
  - Inconsistent understanding and use of term in clinical practice and literature

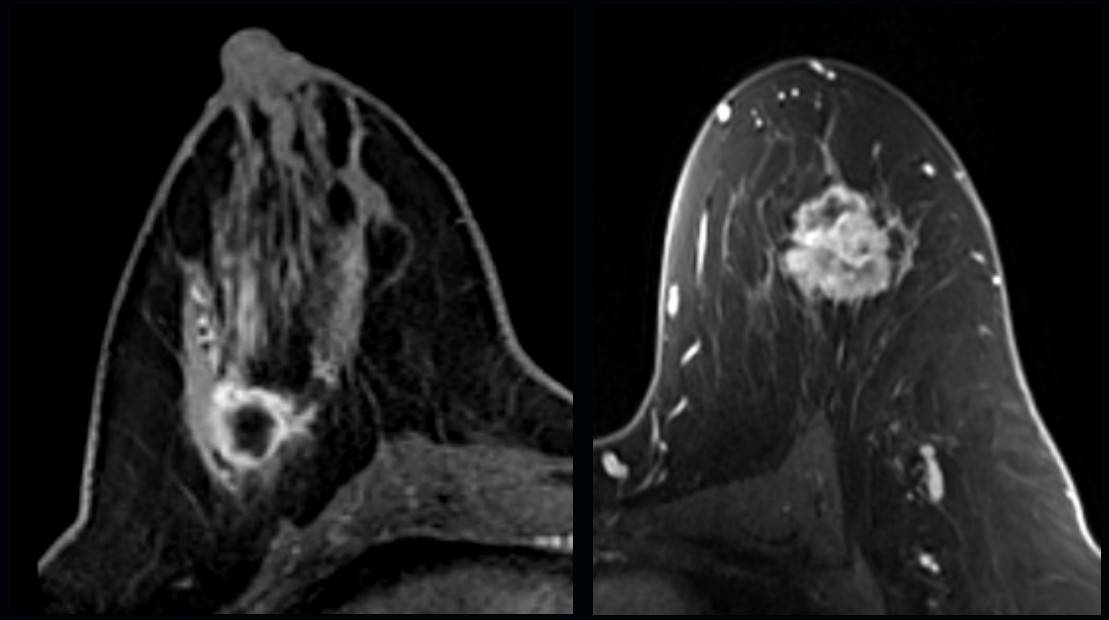
Lexicon

Masses

- Shape: Lobular (previously included in oval category)
- Margin, not circumscribed: Indistinct (historically irregular)
- T2 Signal Intensity: Hyperintense or not hyperintense



Shape: Lobular



Margin: Indistinct

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Lexicon

Masses

- T2 signal intensity
  - Subjective assessment
  - Hyperintense: uniformly bright throughout mass, “lymph node bright”
  - Increased T2 signal favors benignity in setting of particular features
    - Oval/lobular mass with circumscribed margins and homogeneous internal enhancement or dark internal septations: probability of malignancy <=2%[1]
  - Does not need to be reported for masses that are definitively benign or suspicious based on morphology

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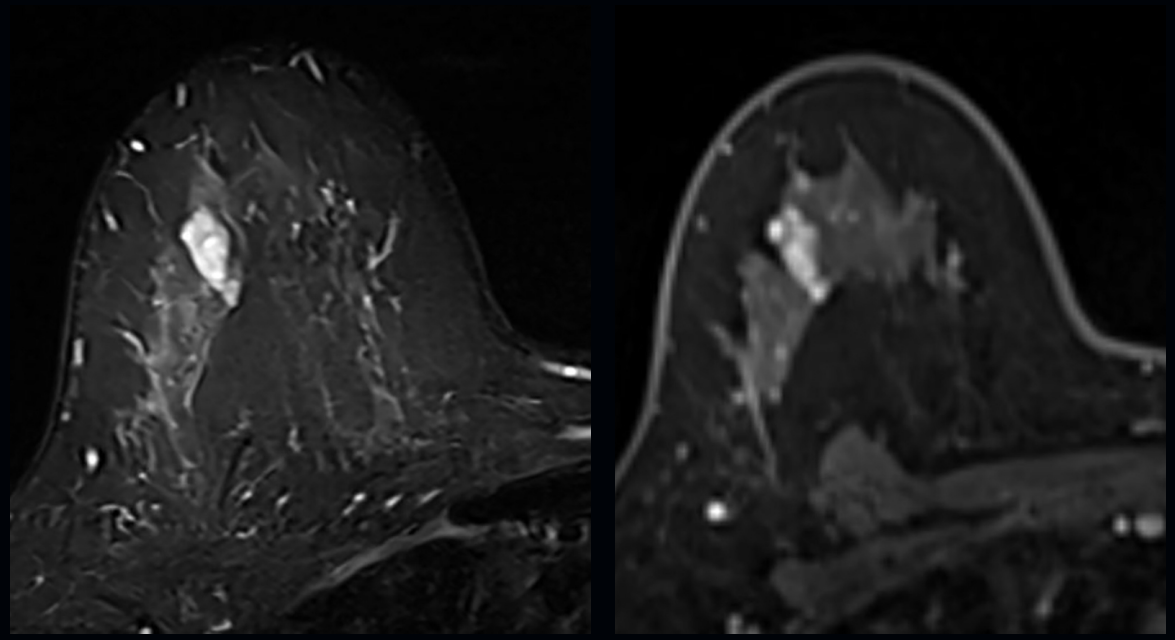
[1]Grimm LJ, et al., J Breast Imaging 2019;1(1):37–42.

Lexicon

Masses: T2 Signal Intensity

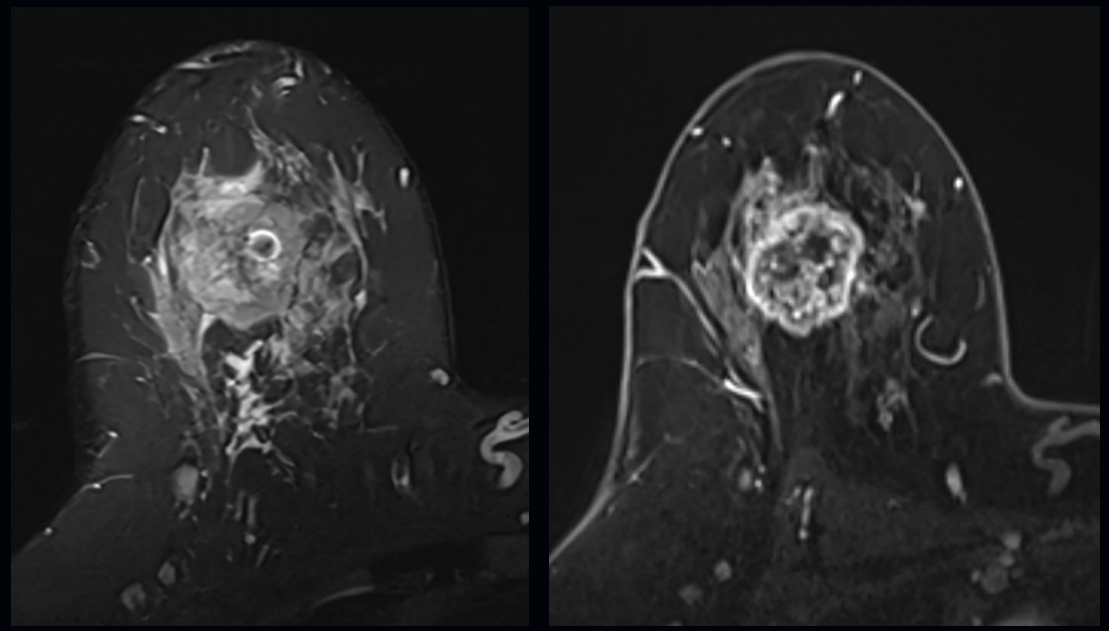
Hyperintense



STIR Early Post-contrast

Fibroadenoma

Not Hyperintense



STIR Early Post-contrast

Invasive ductal carcinoma

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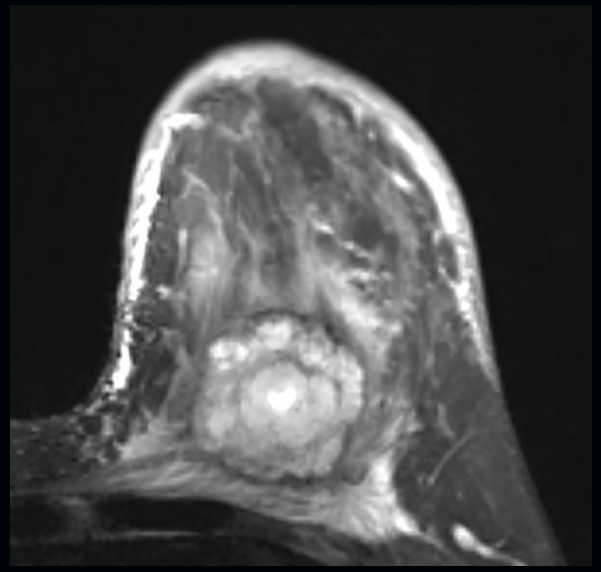
Lexicon

Associated Features: Peritumoral Edema

- Peritumoral Edema
  - Hyperintense T2 signal in tissue surrounding a malignant or suspicious finding
  - For malignancies, if extensive associated with increased risk of lymph node metastases
  - May also be seen due to post-biopsy change



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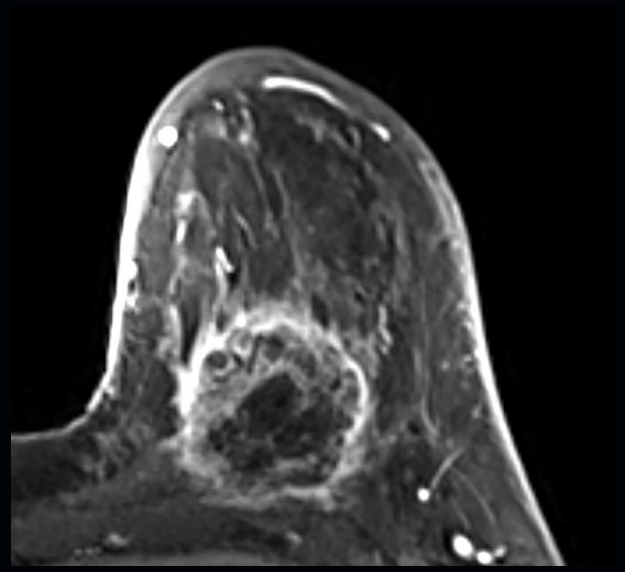


Early post-contrast

Lexicon

Lymph Nodes

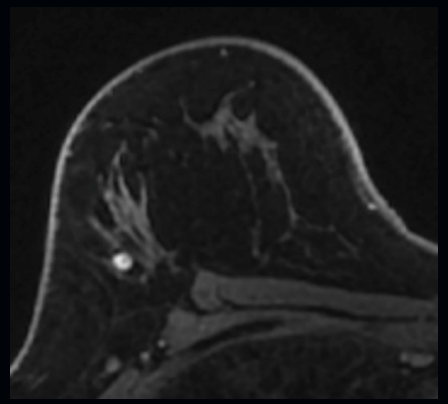
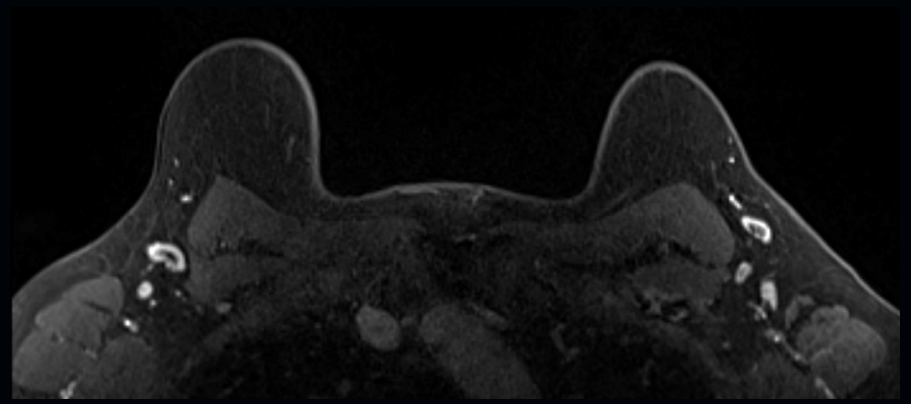
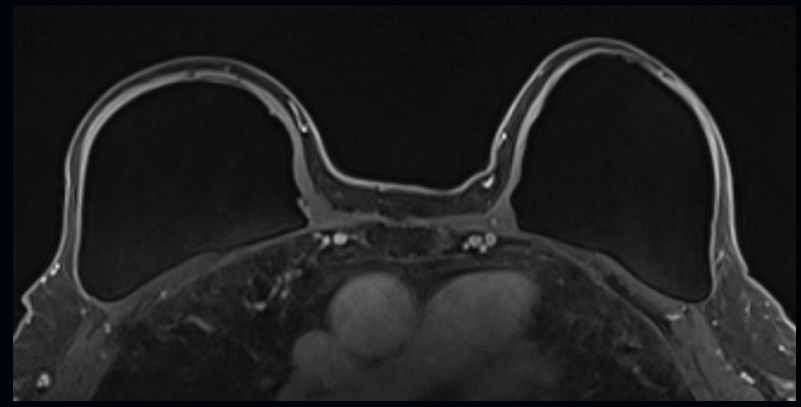
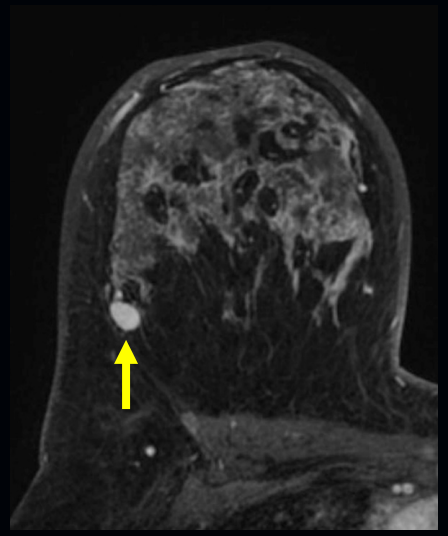
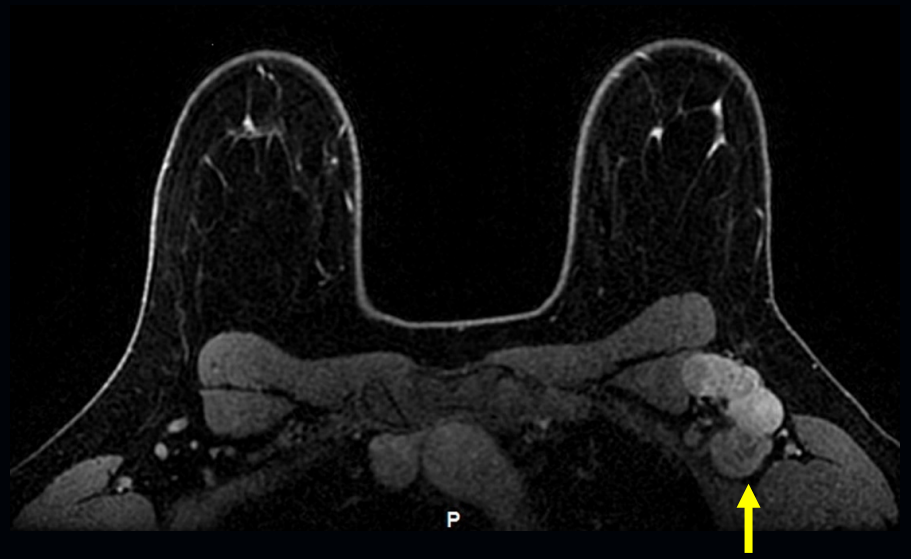
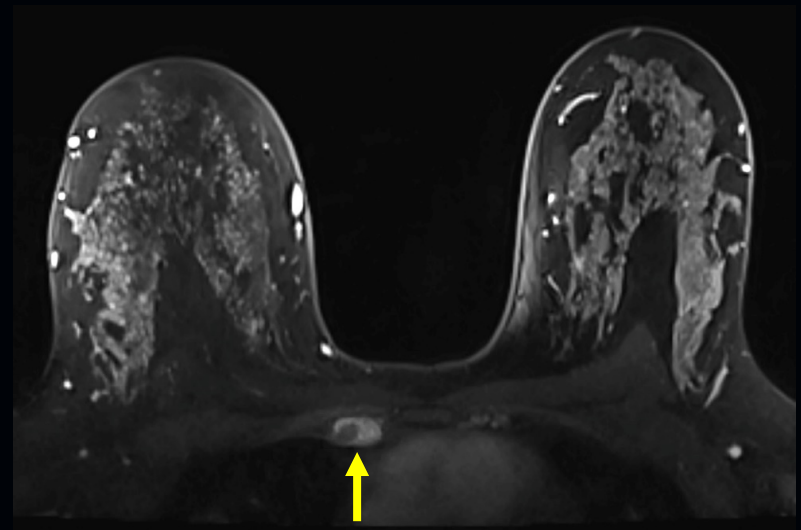
- Intramammary
- Axillary
- Internal mammary

Lymph Nodes

- Normal:
  - Circumscribed
  - Reniform
  - Homogeneous enhancement
  - T2 hyperintense
  - Fatty hilum (difficult to see if small)
  - Early fast and delayed washout kinetics
- Abnormal:
  - Subjectively enlarged
  - Asymmetric cortical thickness or size
  - Increased in size compared to priors
  - Loss of reniform shape/rounding
  - Absence of fatty hila in larger nodes

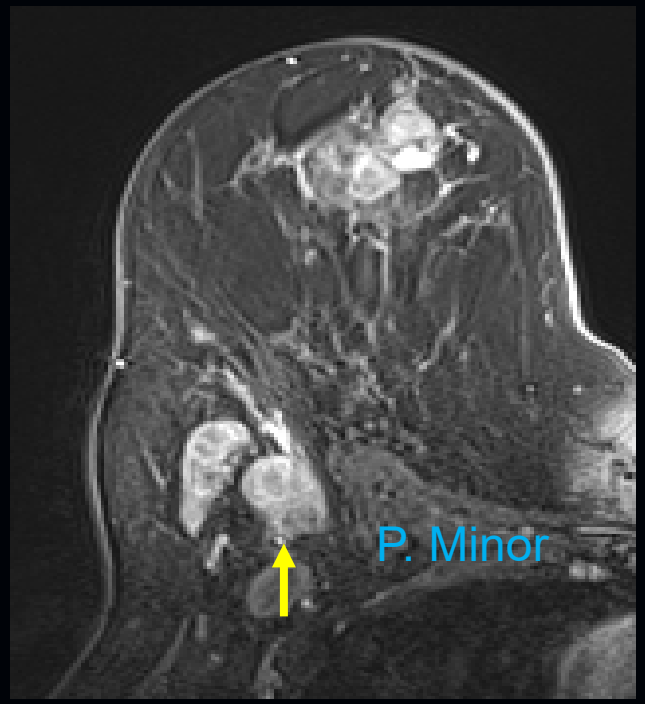
*No size or cortical thickness threshold to distinguish benign from suspicious
Cortical thickness >3 mm not applicable to MRI

Lymph Nodes

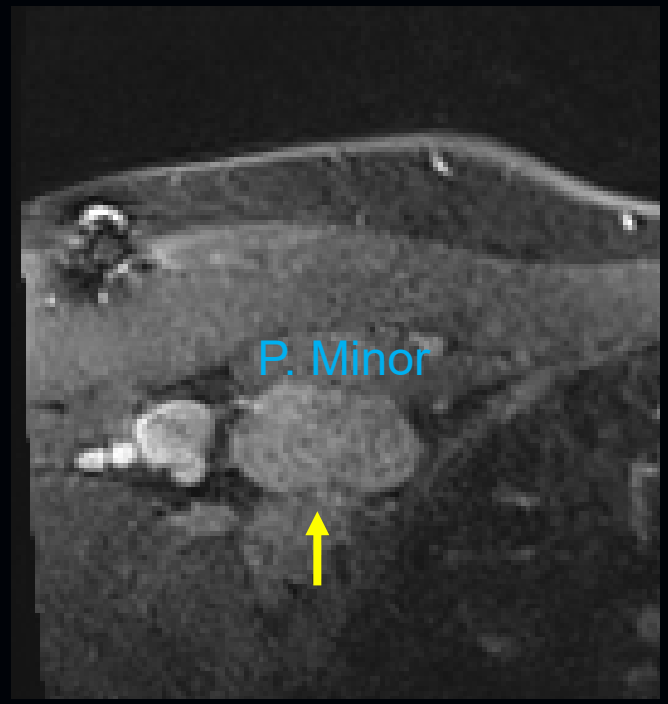
	Intramammary	Axillary	Internal Mammary
Normal			
Abnormal			

Lymph Nodes: Axillary

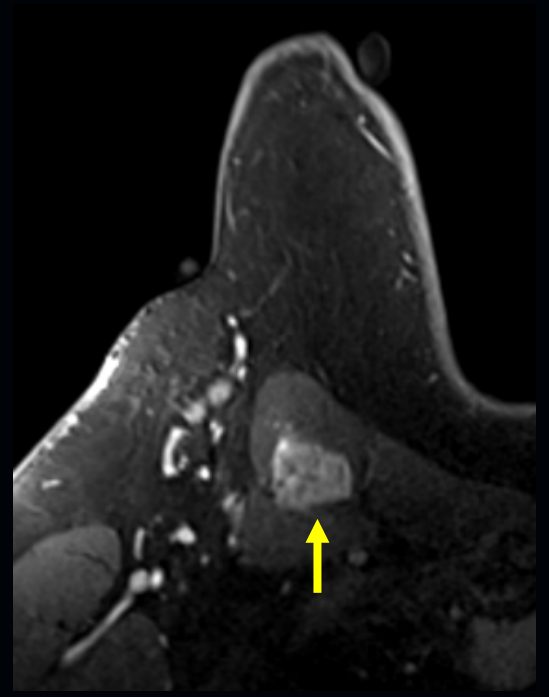
- Categorized into levels based on relationship to pectoralis minor muscle



Level 1

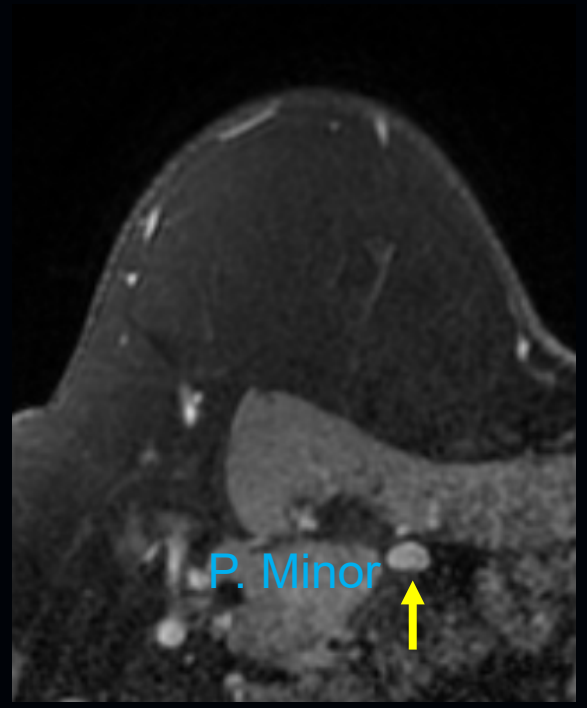


Level 2



Level 2

Rotter's node



Level 3

Lymph Nodes: Internal Mammary

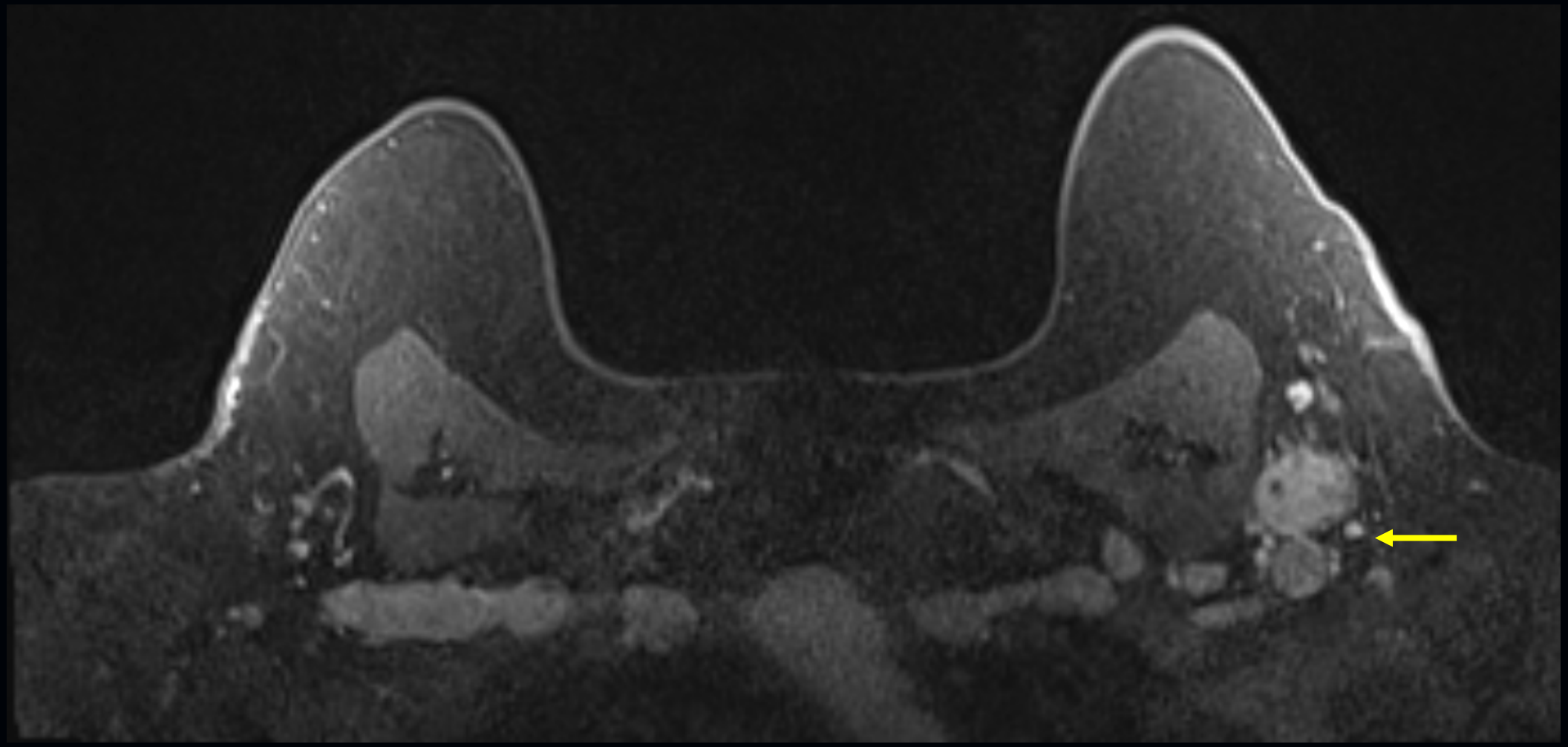
- Visibility does not make it abnormal or suspicious
- Limited data regarding quantitative size features predictive of malignancy
  - Asymptomatic screening: normal nodes may measure up to 9-10 mm in long axis[1,2]
  - Patients with current cancer: size >= 5 mm most helpful for predicting malignancy[3]

[1]Mack M, et al., AJR Am J Roentgenol. 2015;205(1):209-214.
[2]Ray KM, et al., Clin Imaging. 2015;39(5):791-793.
[3]Kinoshita T, et al., Radiat Med. 1999;17(3):189-193.

Lymph Nodes: Reporting Details and BI-RADS Assessments

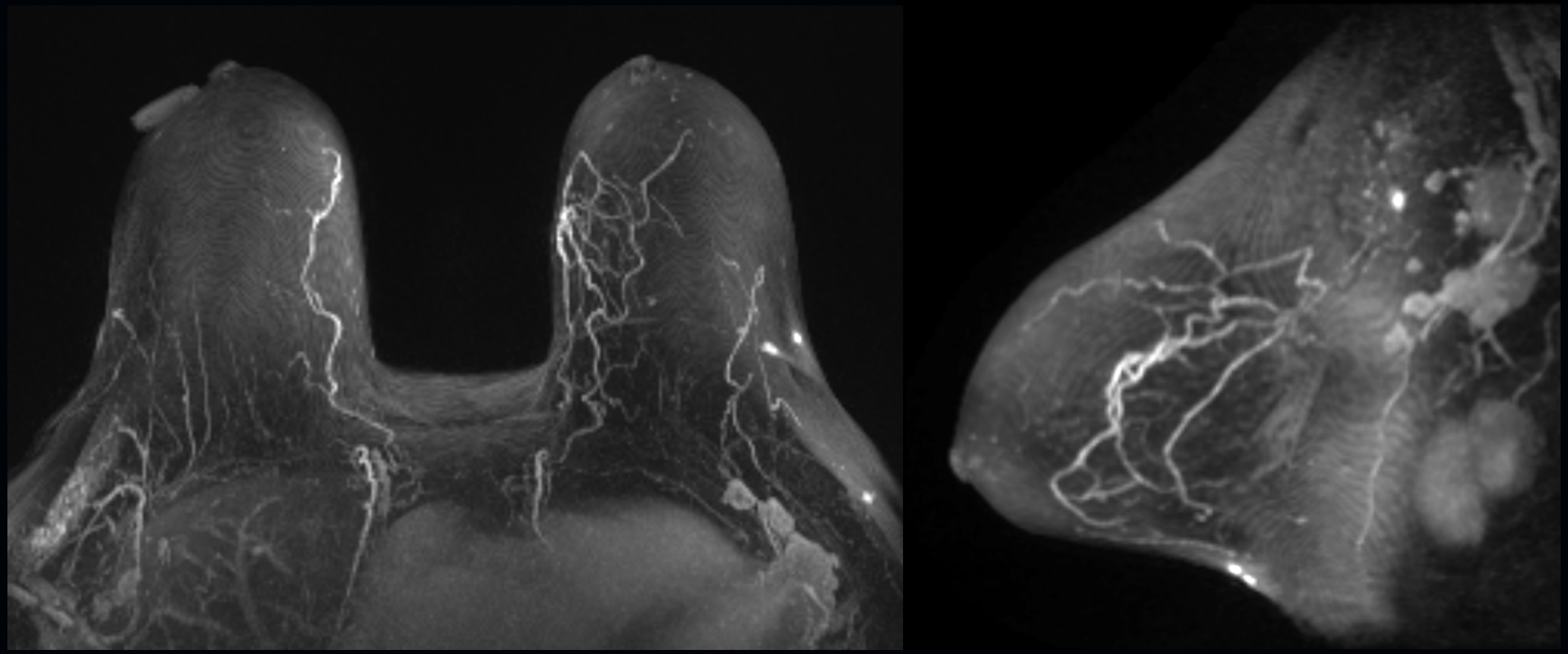
- Reporting details:
  - Abnormal axillary: describe axillary level(s) and number
  - Abnormal internal mammary: provide location by intercostal space
- BI-RADS assessments:
  - If ipsilateral known malignancy or suspicious finding(s), describe but do NOT give separate BI-RADS assessment
  - If isolated finding, give BI-RADS assessment based on level of suspicion
    - Includes abnormal axillary lymph nodes contralateral to known malignancy

Lymph Nodes: Reporting Details and BI-RADS Assessments



Asymptomatic Screening: Elevated risk due to CHEK2 mutation

Lymph Nodes: Reporting Details and BI-RADS Assessments



BI-RADS Category 4
Metastatic melanoma

Reporting System

Assessment Categories

- BI-RADS 0
- BI-RADS 3
- BI-RADS 4
  - Optional subcategories
- BI-RADS 6
  - Guidance when BI-RADS 6 vs BI-RADS 4/5

BI-RADS Category 0

- Additional imaging for further *characterization* of breast MRI findings, not for *detection* to guide follow-up or biopsy
- MRI-directed ultrasound to guide potential US biopsy: Category 4 or 5

BI-RADS Category 3

- Data remain limited to guide appropriate use:
  - Single site retrospective design, heterogeneous populations and indications
- Evidence suggests can be employed in practice with malignancy rates <=2%[1]
- Use caution for non-baseline exams: malignancy rate up to 9%[2]
- Goal: frequency of use <=5% of examinations
- Use in current cancer patients discouraged

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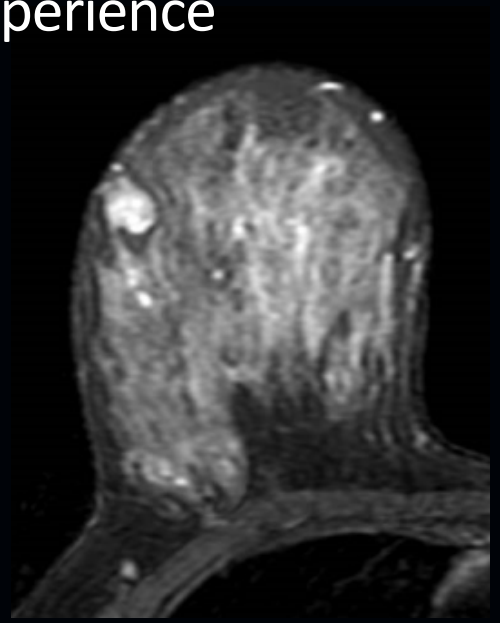
[1]Spick C, Bickel H, Polanec SH, Baltzer PA. Eur Radiol 2018;28(5):1919-1928.

BI-RADS Category 3

- Based on existing data and expert opinion:
  - Oval T2 hyperintense mass with circumscribed margins and homogeneous enhancement or dark internal septations, without suspicious kinetics
  - Use for other finding types infrequent, based on individual and practice experience



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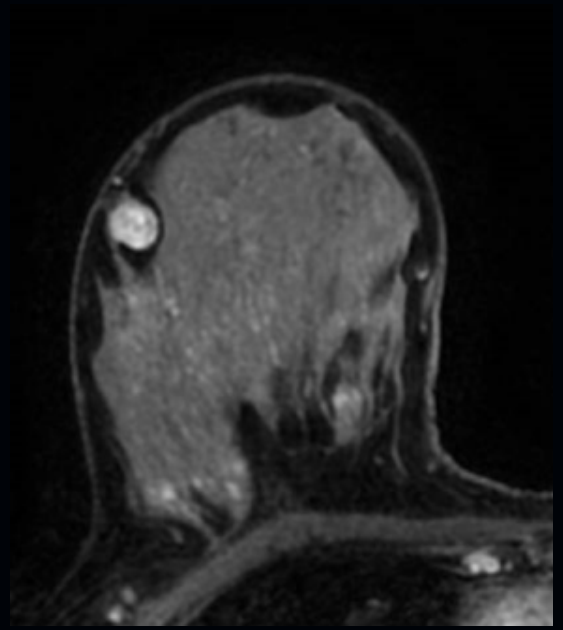
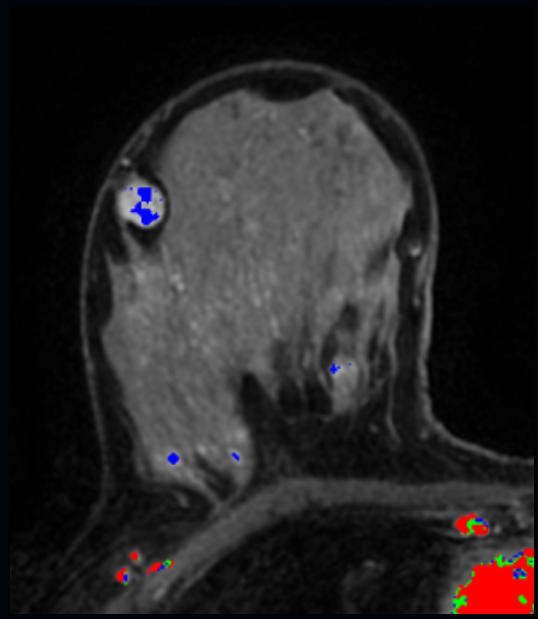


Early Post-contrast



Medium/Persistent

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Grimm LJ, et al., J Breast Imaging 2019;1(1):37–42.
Nguyen DL, et al., J Breast Imaging. 2022;4(5):460-473.

BI-RADS Category 4

- Optional use of Category 4 subdivisions 4A, 4B, and 4C
  - 4A: >2 to <= 10%
  - 4B: >10 to <=50%
  - 4C: >50 to <95%
- Use of subdivisions shown to result in probabilities of malignancy in established cut-point ranges[1]
- Benefits: more meaningful audit, aid in assessing radiology-pathology concordance, and facilitate communication with patients, providers, and pathologists
- Types of findings to place in each subcategory largely intuitive

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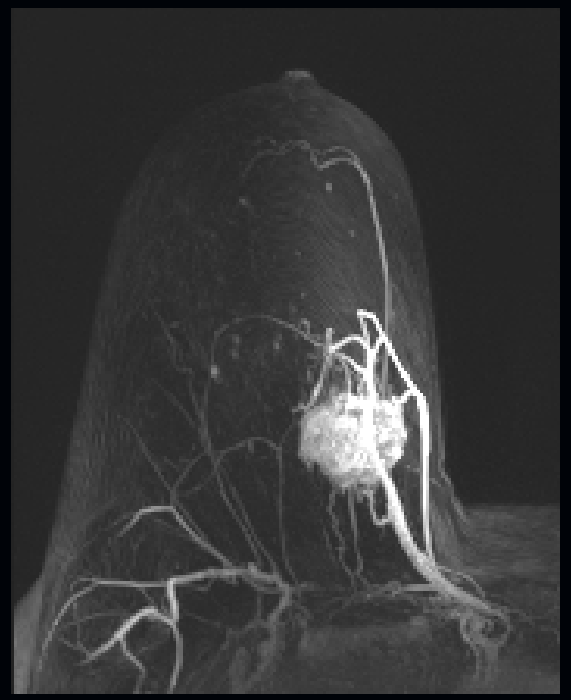
[1]Strigel RM, et al. AJR Am J Roentgenol. 2017;208(6):1392-1399.

BI-RADS Category 6

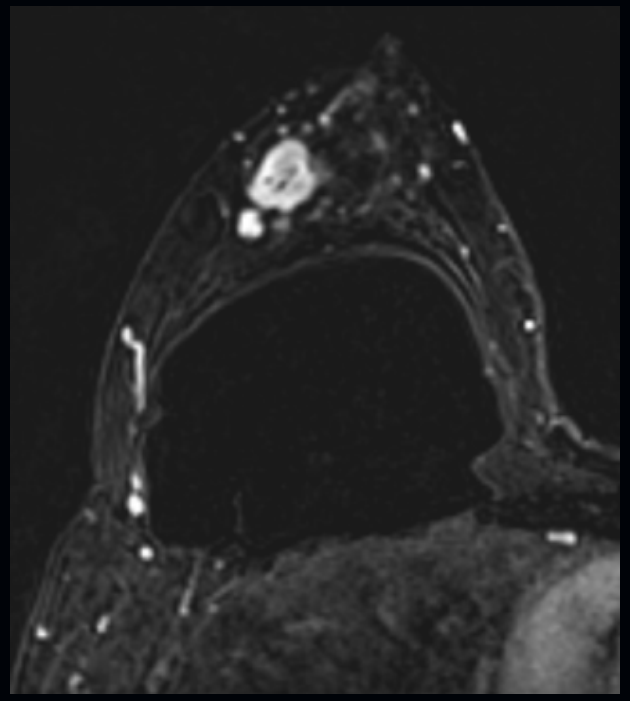
- Biopsy-proven malignancy *prior* to surgery, including when no enhancement seen
- More extensive enhancing findings with high certainty of malignancy
  - Contiguous or more extensive findings of same morphology
- Separate additional close findings (ACFs) suspicious but not definitively malignancy
  - Within 2 cm of biopsy proven malignancy
  - Do not increase extent by more than 2 cm
  - Would not change surgical management, i.e. prompting larger surgical excision
- Report sizes and relationship of ACFs relative to known malignancy
- If not high certainty of malignancy or ACF, give separate BI-RADS assessment (0, 4, 5)

5 > 4 > 0 > 6 > 3 > 2/1

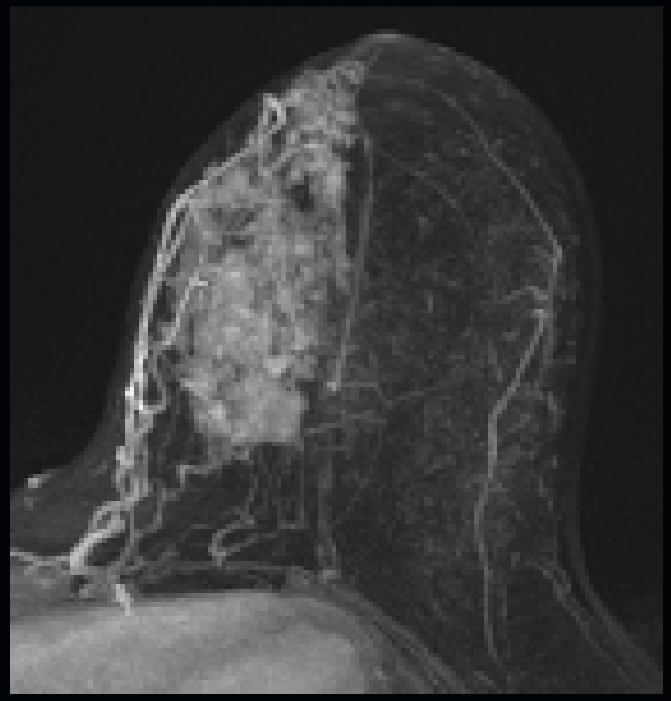
BI-RADS Category 6

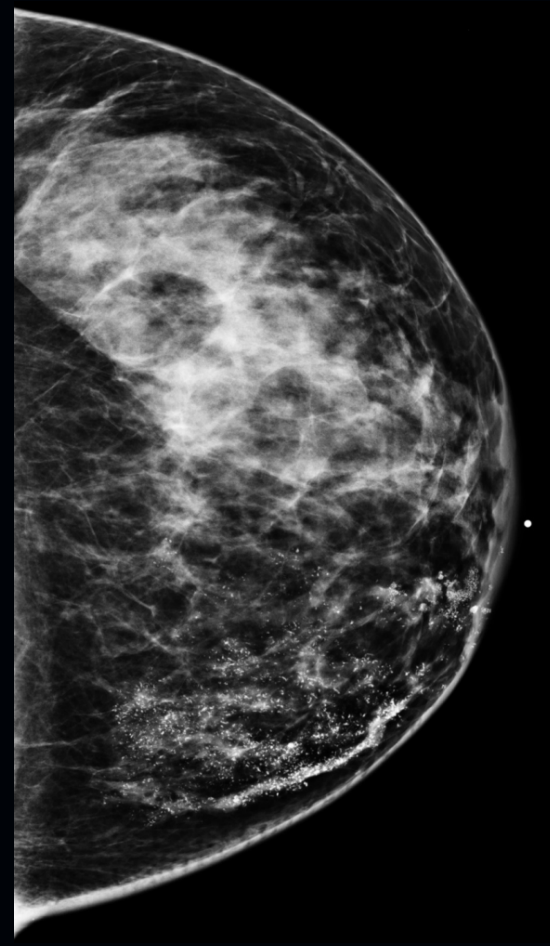


Known malignancy



ACF





Contiguous, same morphology, extent matches pleomorphic calcifications on MG

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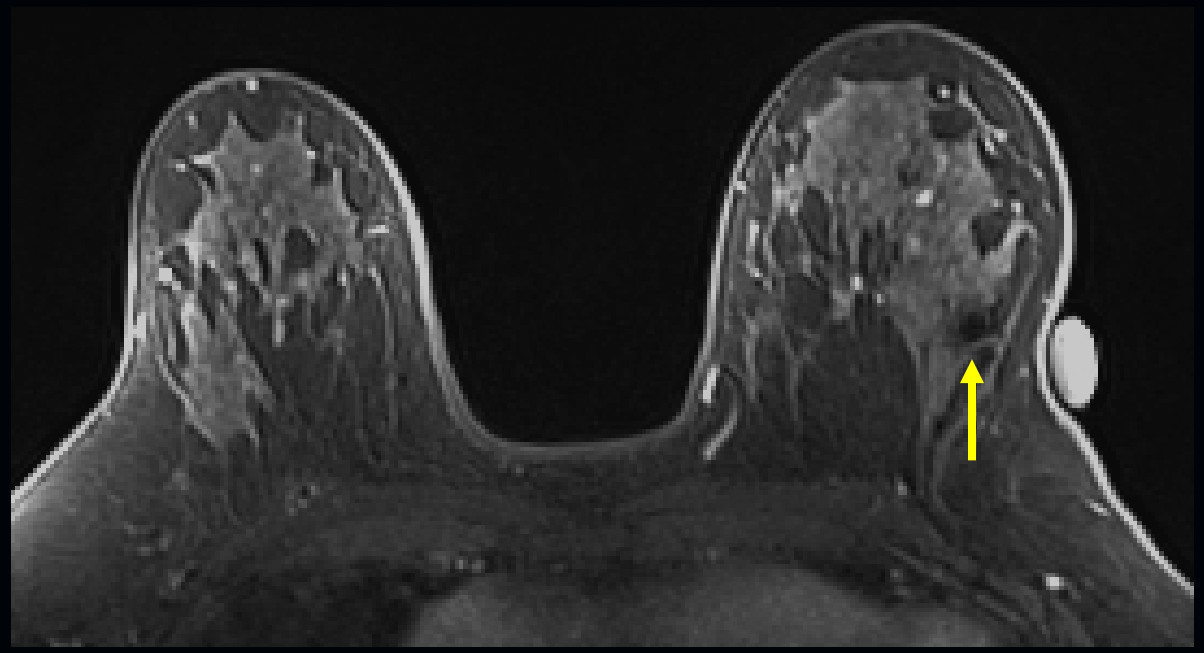
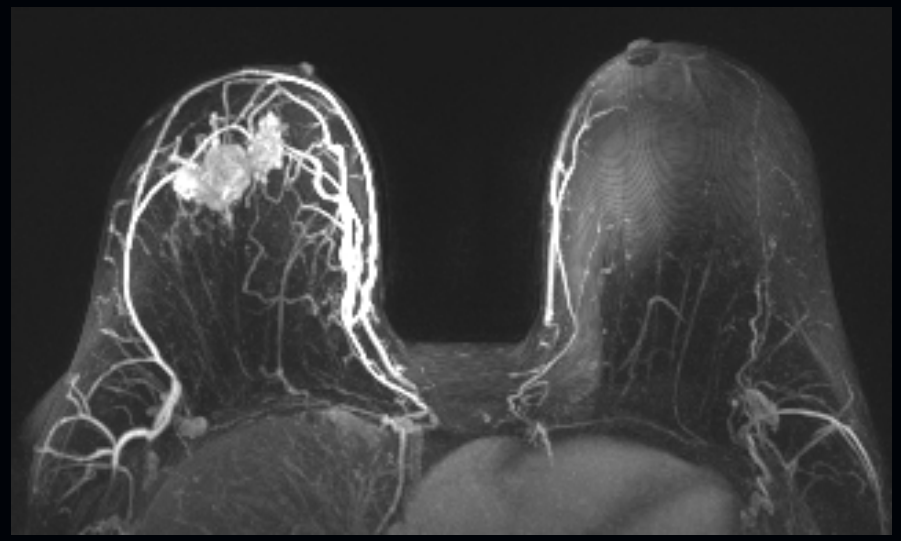
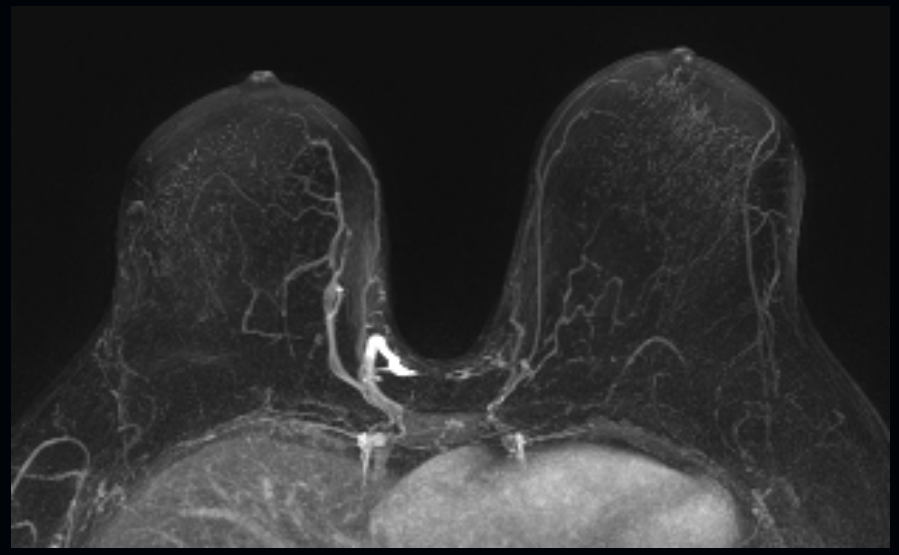
BI-RADS Category 6



No enhancement at site of biopsy proven malignancy.



Pre Chemotherapy



Post Chemotherapy

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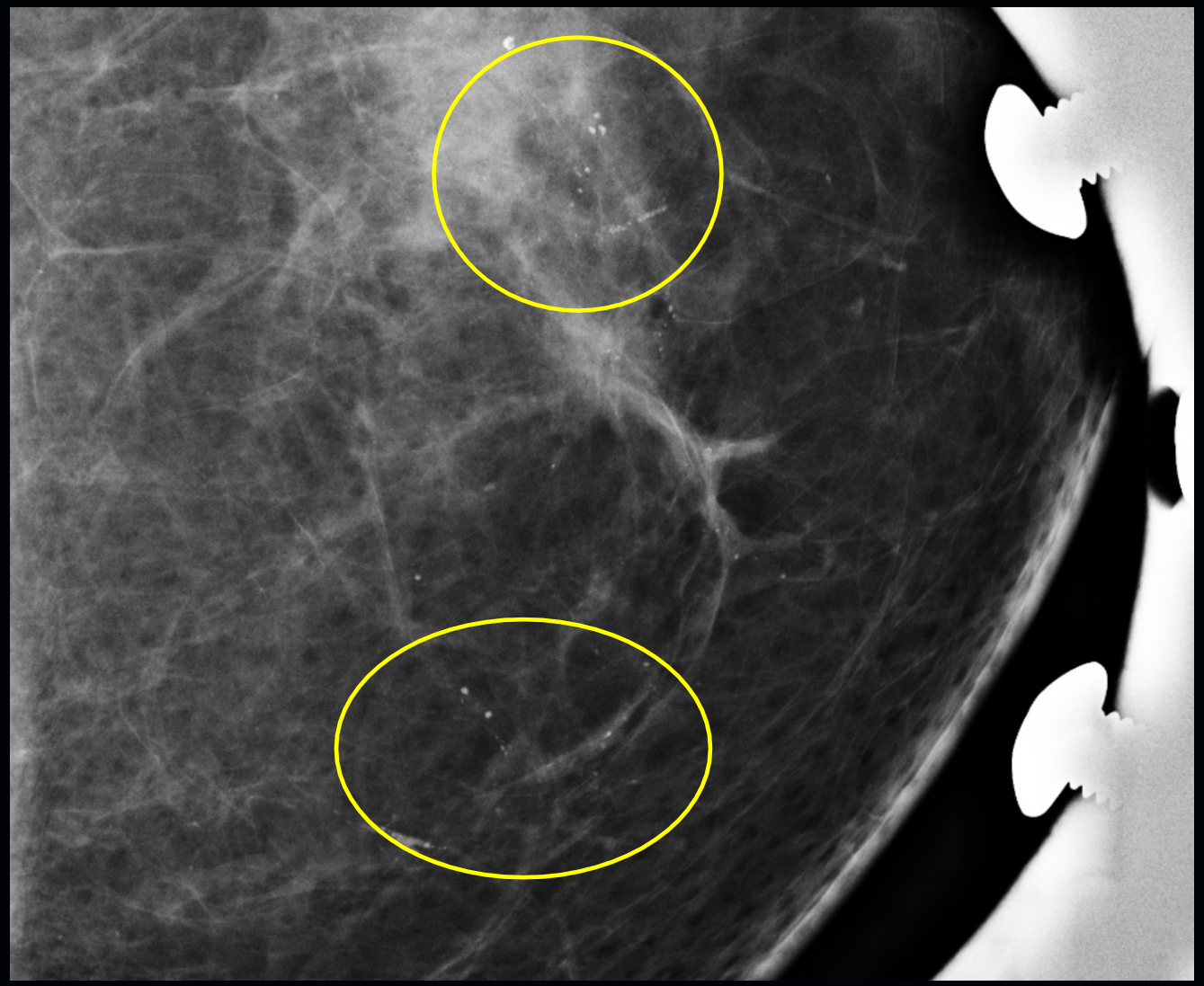
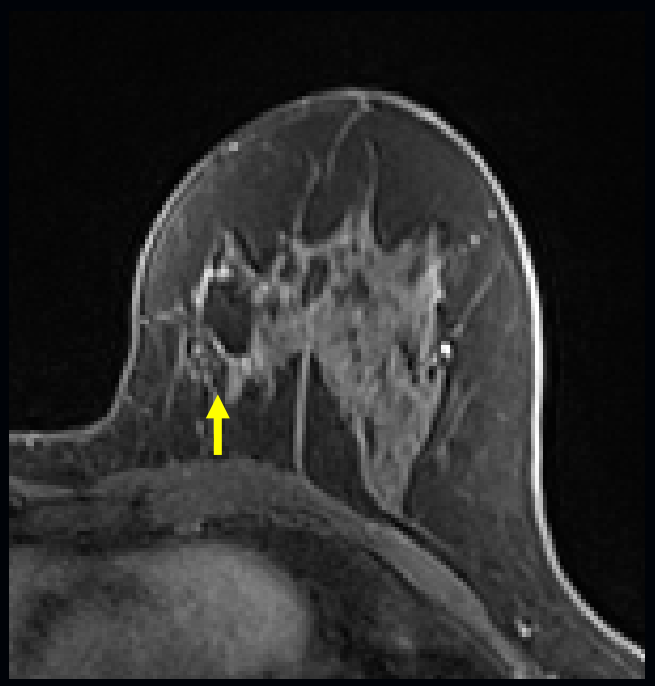
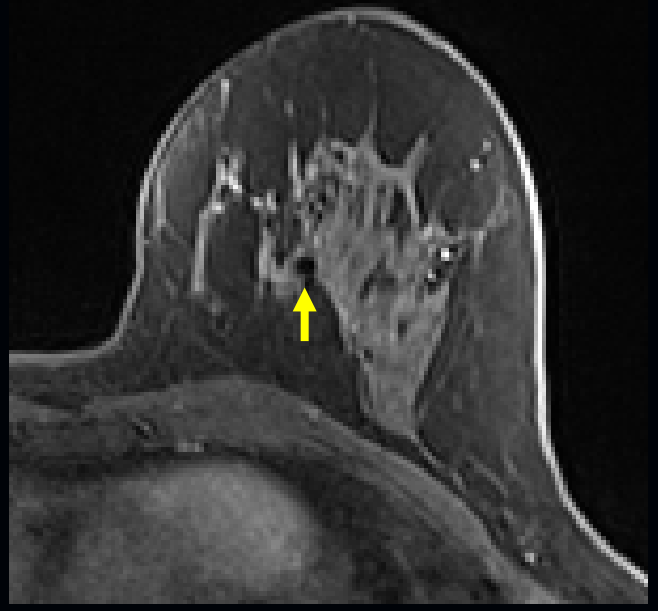
BI-RADS Category 6 vs 4/5







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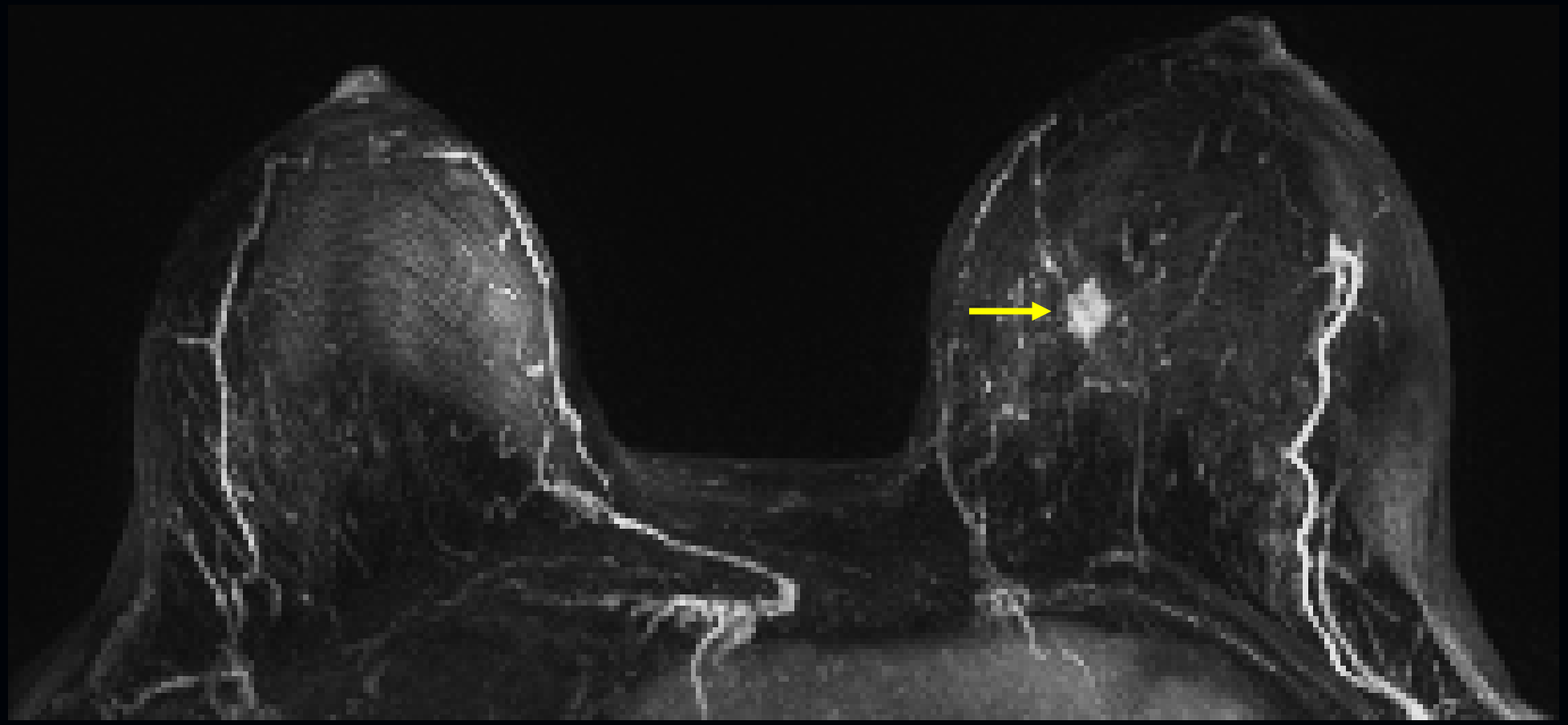
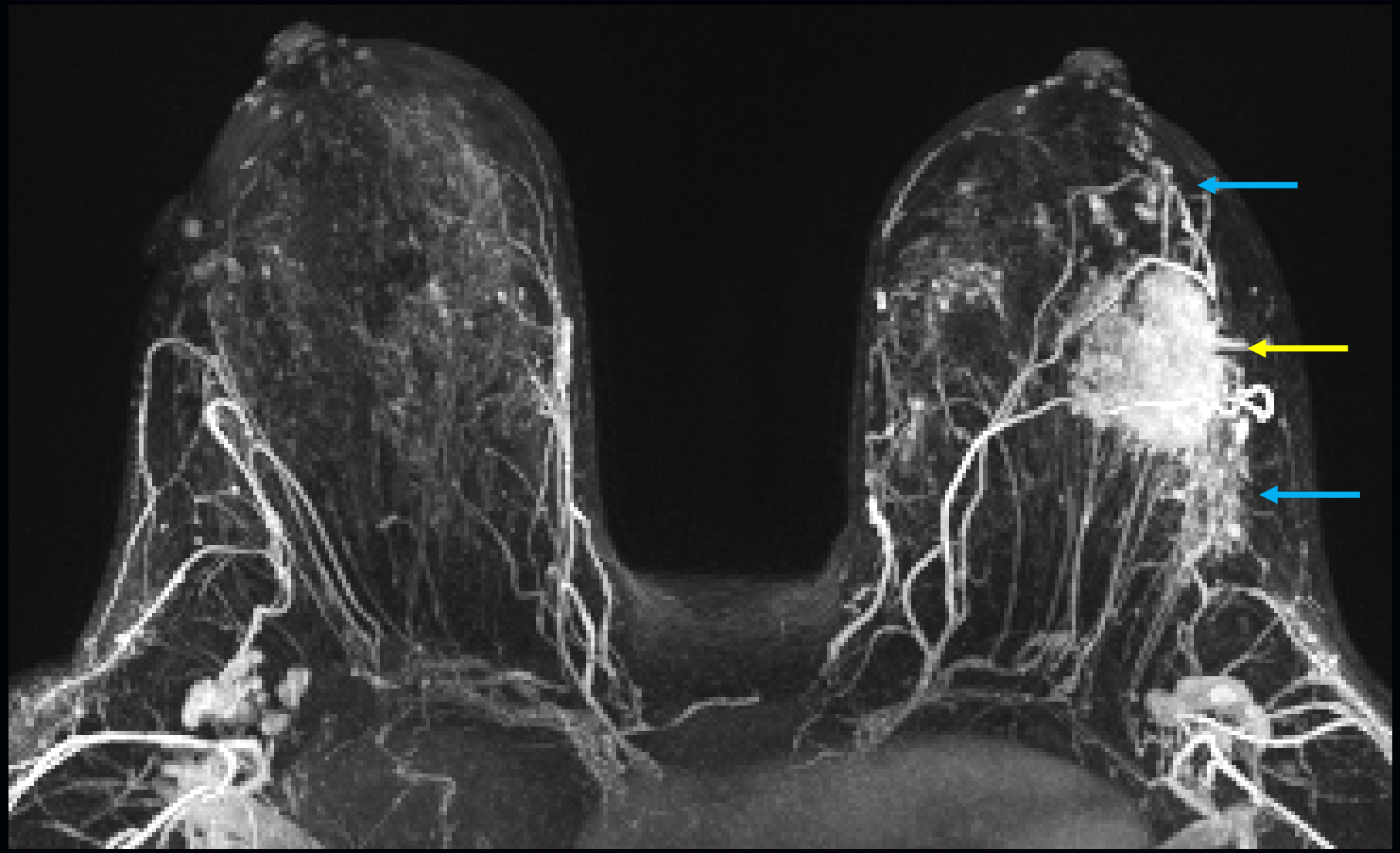
BI-RADS Category 6 vs 4/5



A 1.0 cm irregular mass at 9 o’clock, 2.5 cm anterior and medial to the medial biopsy clip.

BI-RADS Category 6 vs 4/5



2.8 cm left breast IDC at 1:00

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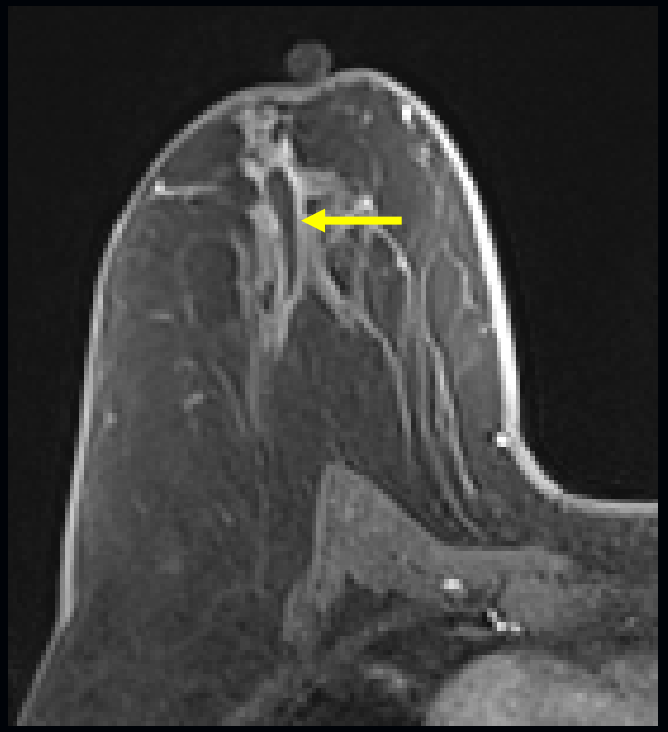
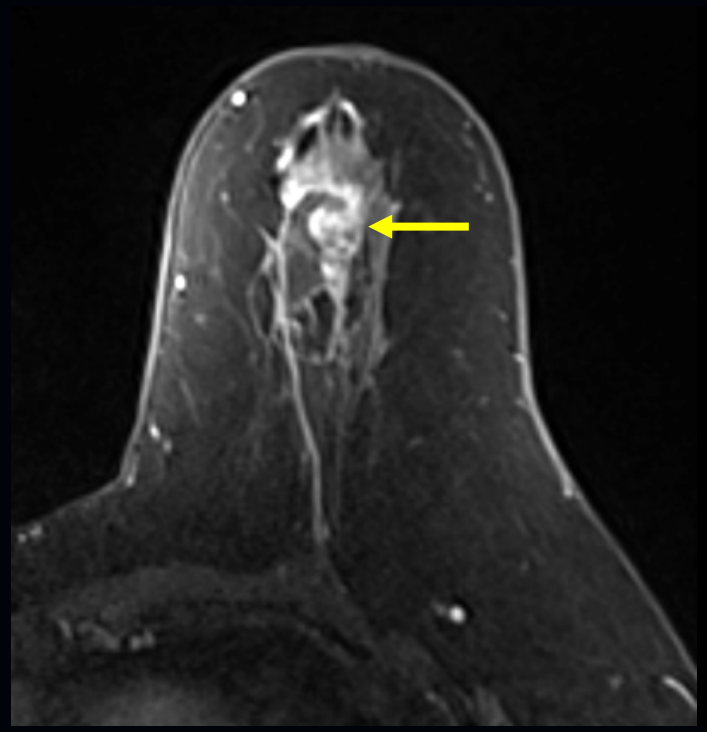
Post-Operative MRI

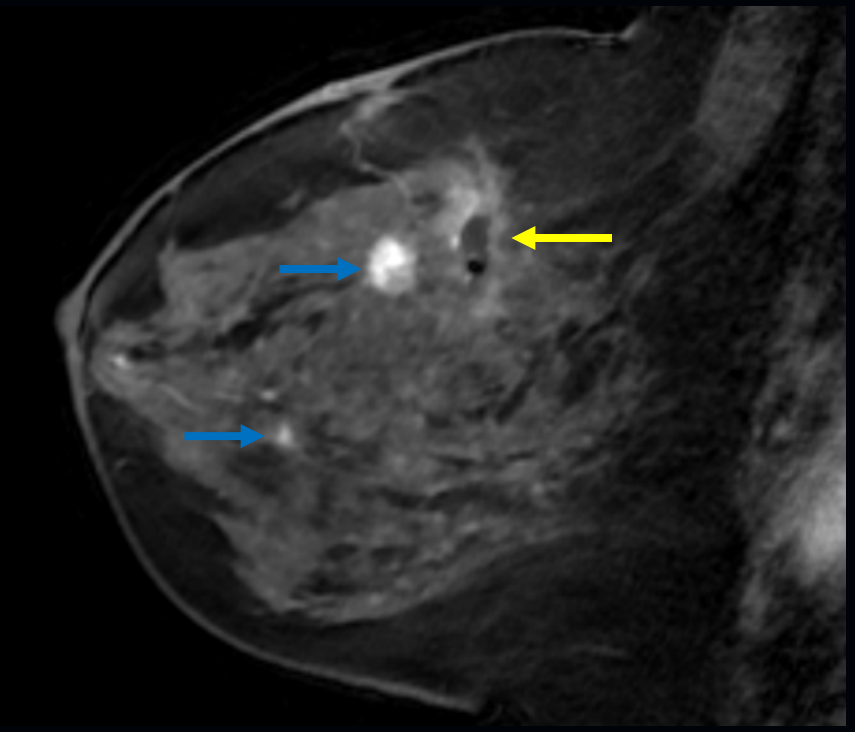
- In immediate post-operative period, *including with positive margins*, the assessment category should be based on the imaging appearance



BI-RADS 2



BI-RADS 6



BI-RADS 4/5

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Post-Operative MRI

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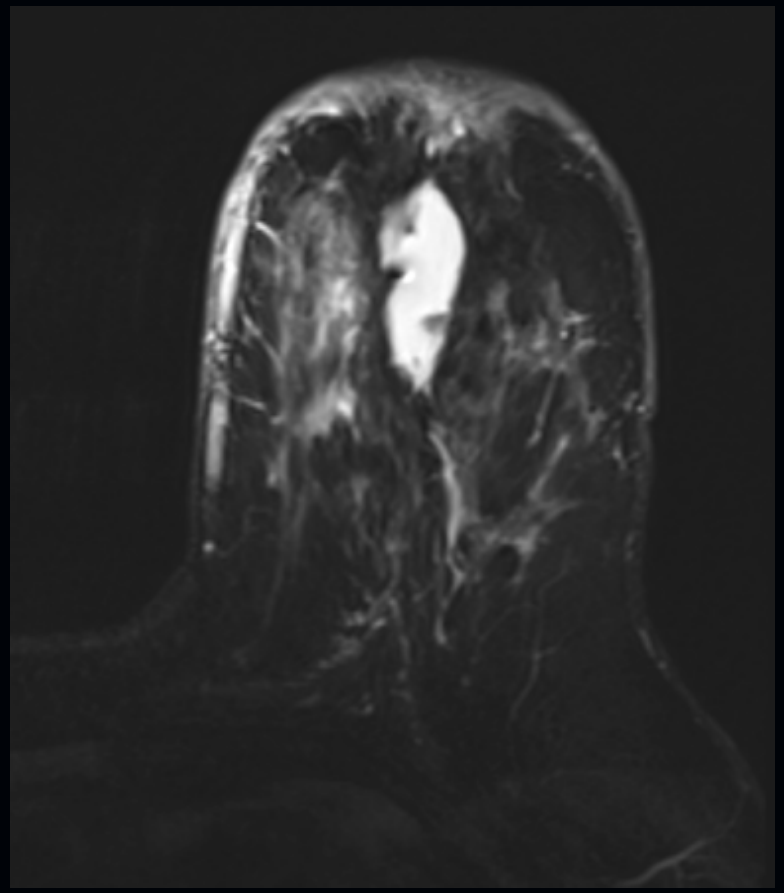
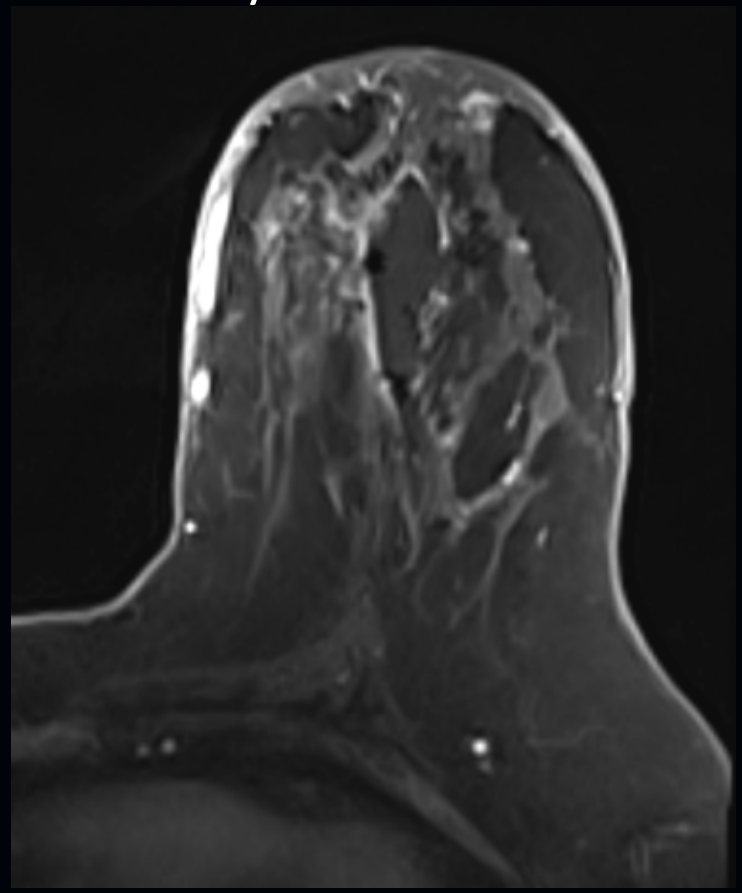


Post-operative seroma

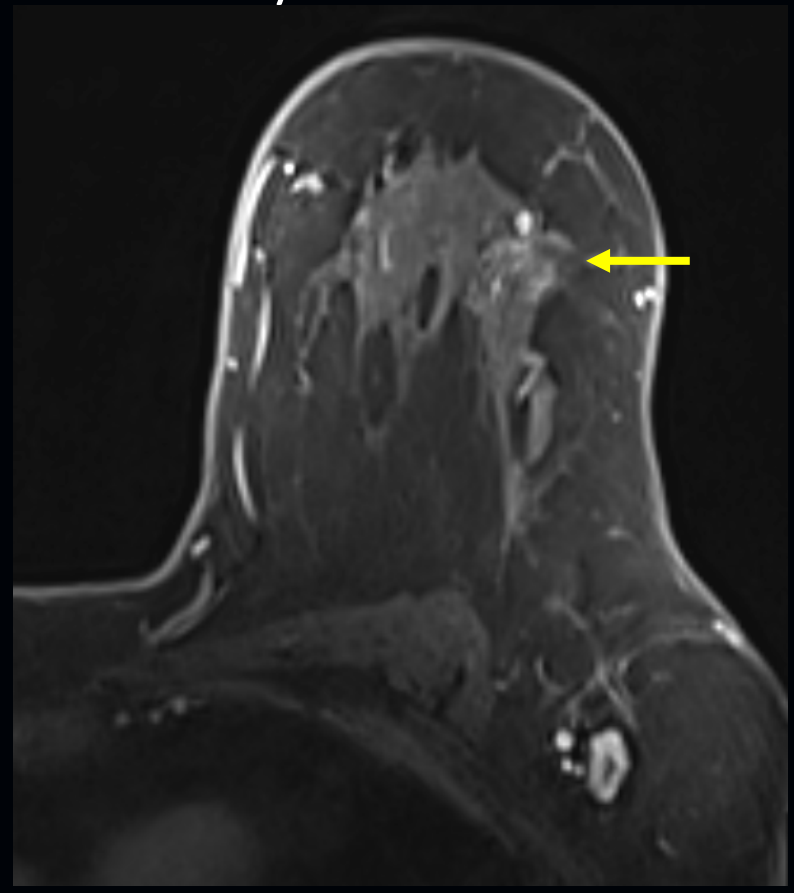
Early Post-contrast



No suspicious enhancement at surgical site

BI-RADS 2

Early Post-contrast



1.9 cm NME 3.5 cm superior/ lateral to lumpectomy site

BI-RADS 4

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Thank you!
Questions?
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