

An Integrated Approach to the Evaluation and Reporting of Breast Biopsy Findings

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No Disclosures

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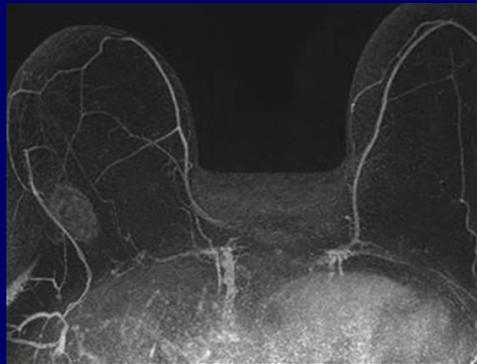
The Triple-Test **for Diagnosis of Breast Disease**

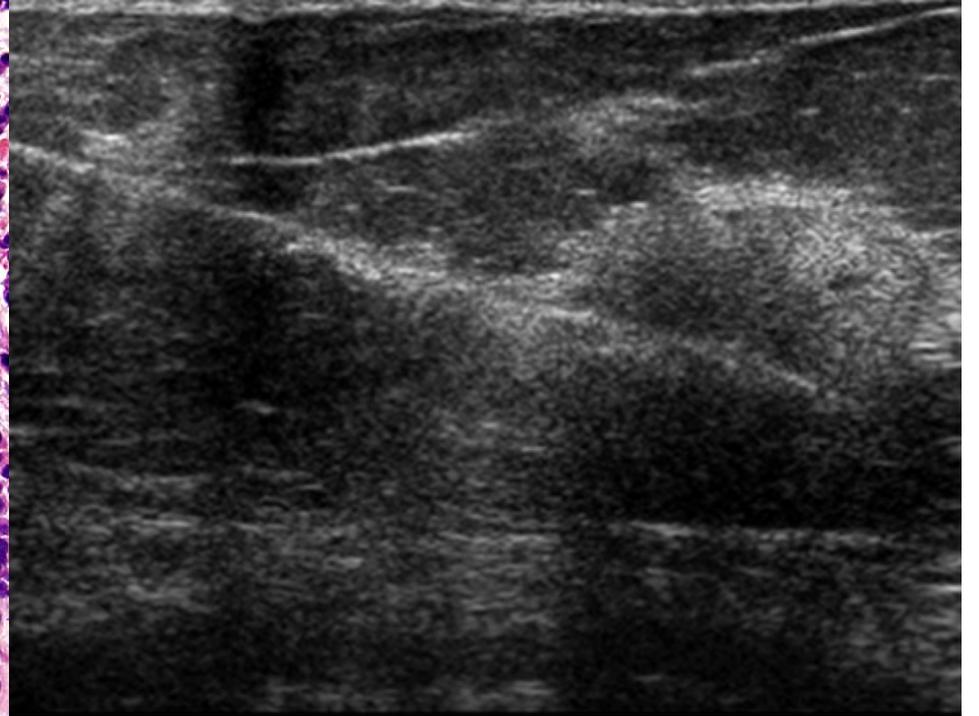
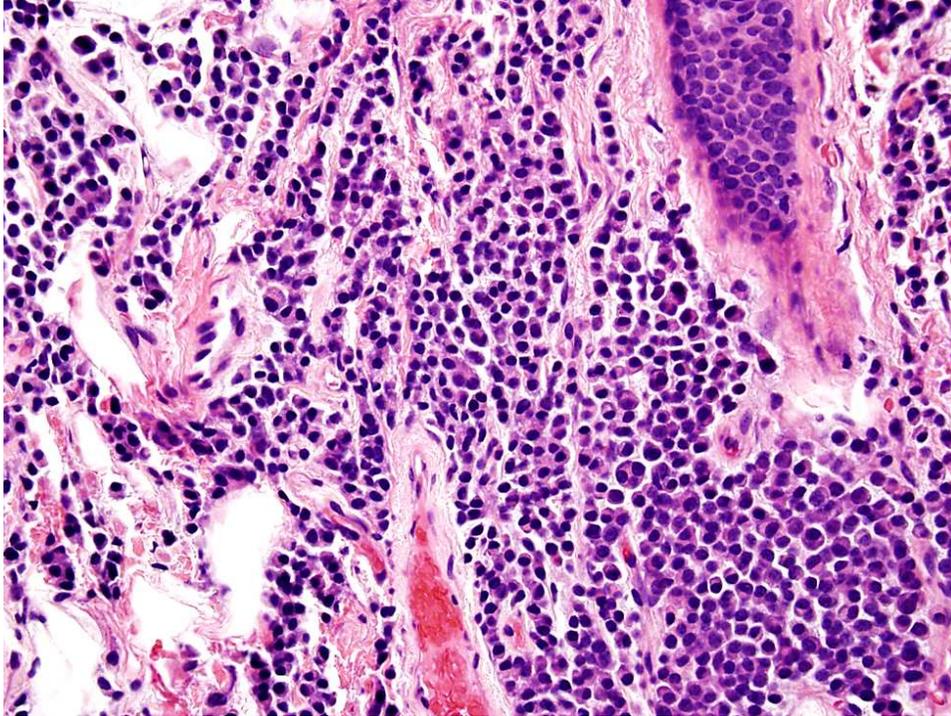
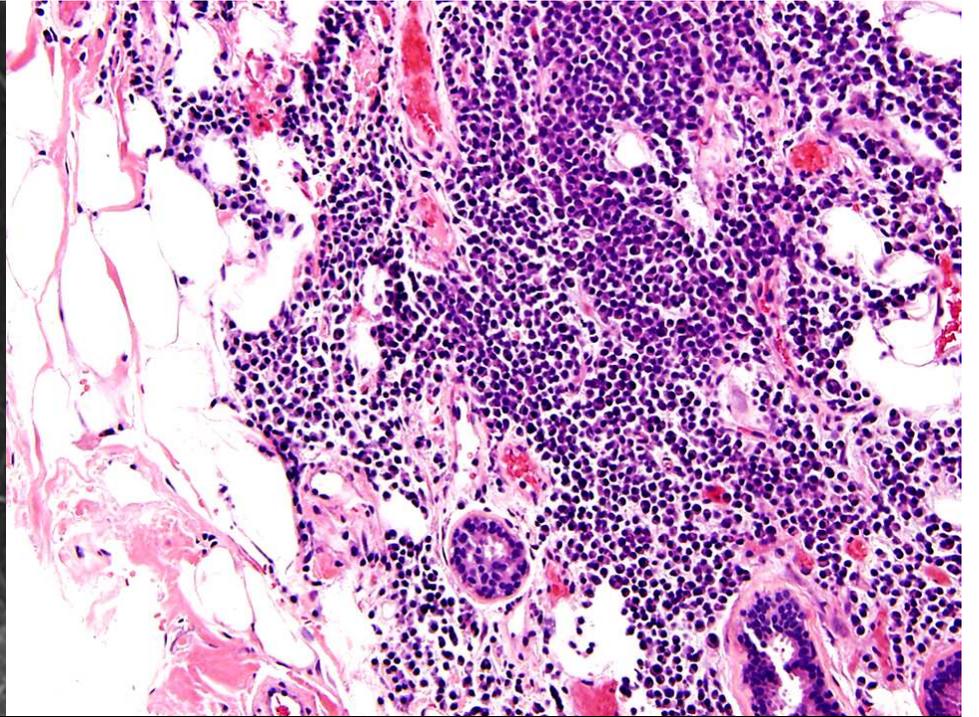
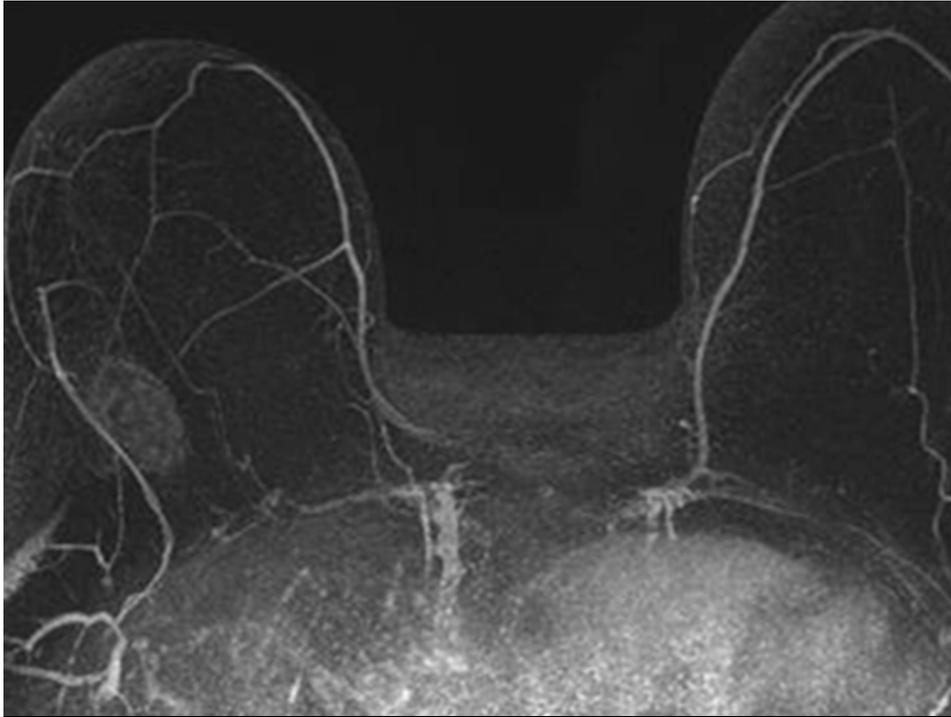
Physical Examination

Radiology

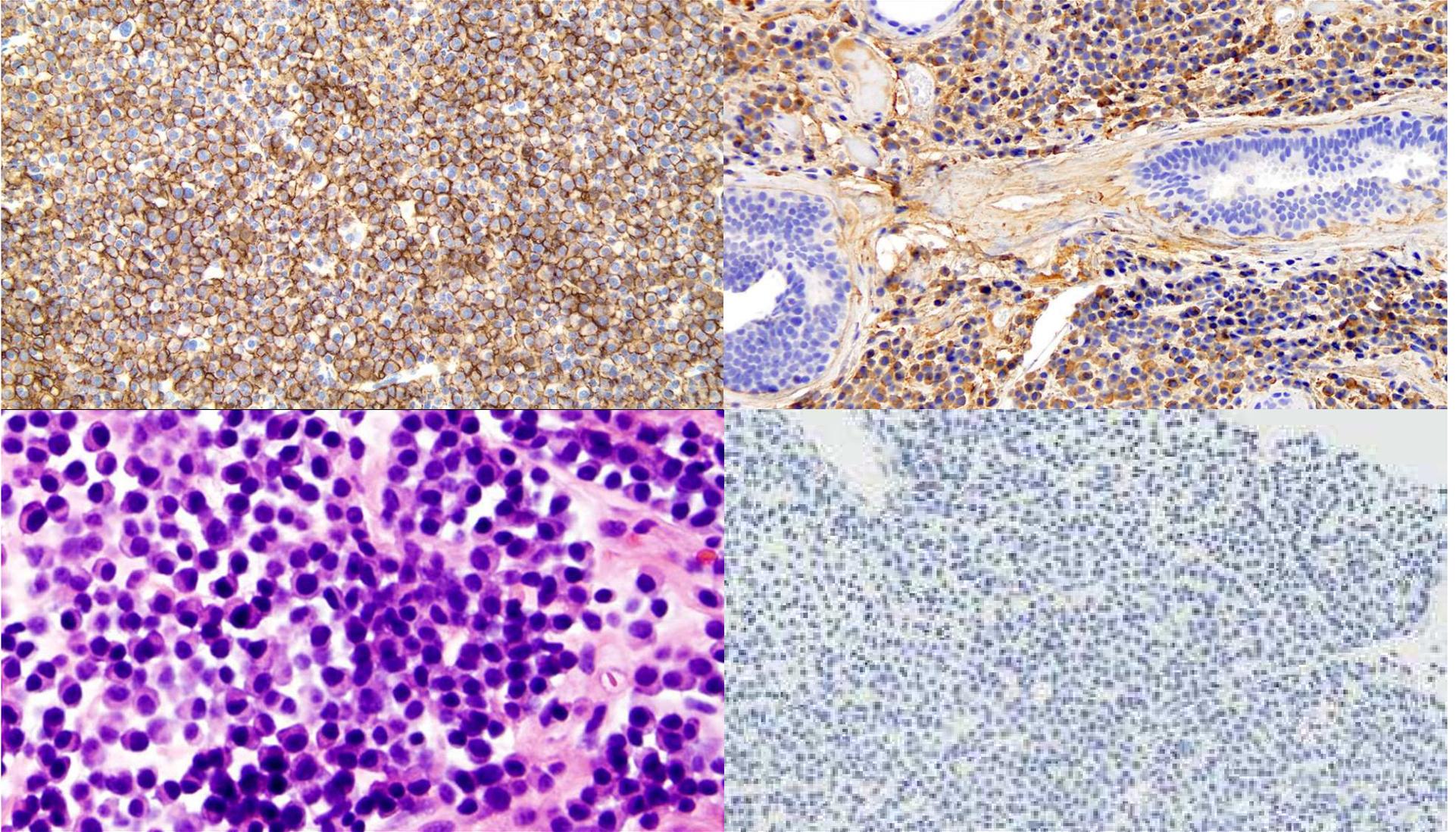
Pathology

54-Year-Old Mass



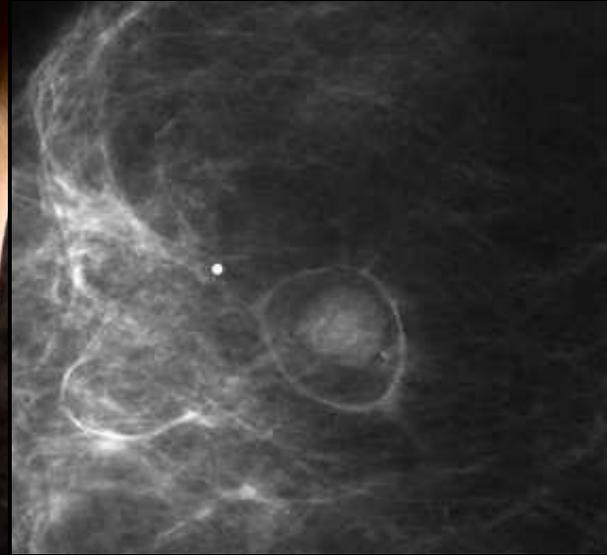


Passing Triple-Test

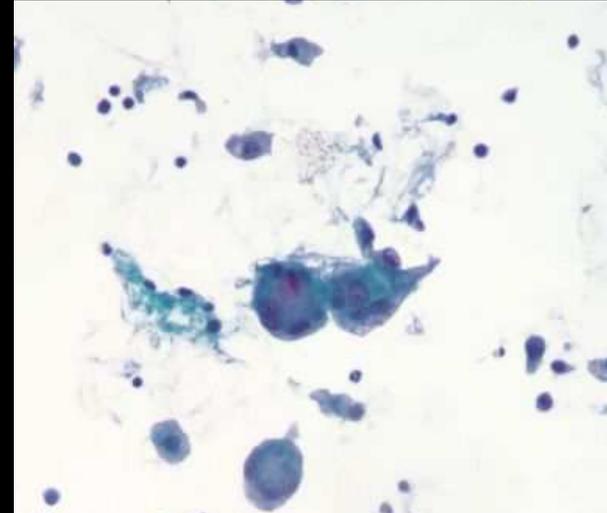


Mammary Plasmacytoma

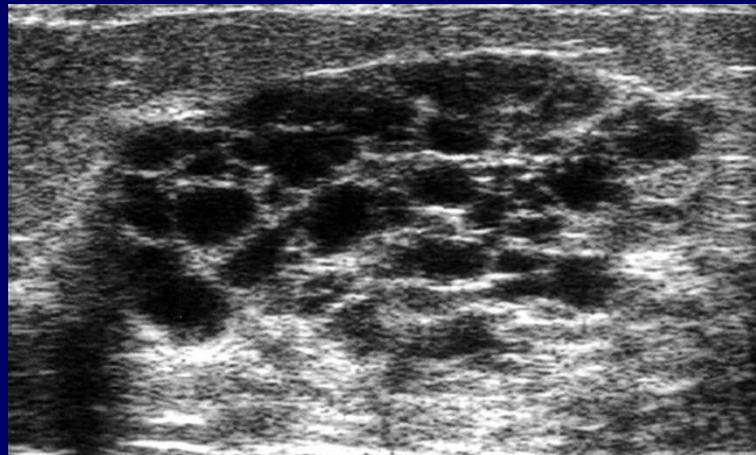
Passing Triple-Test



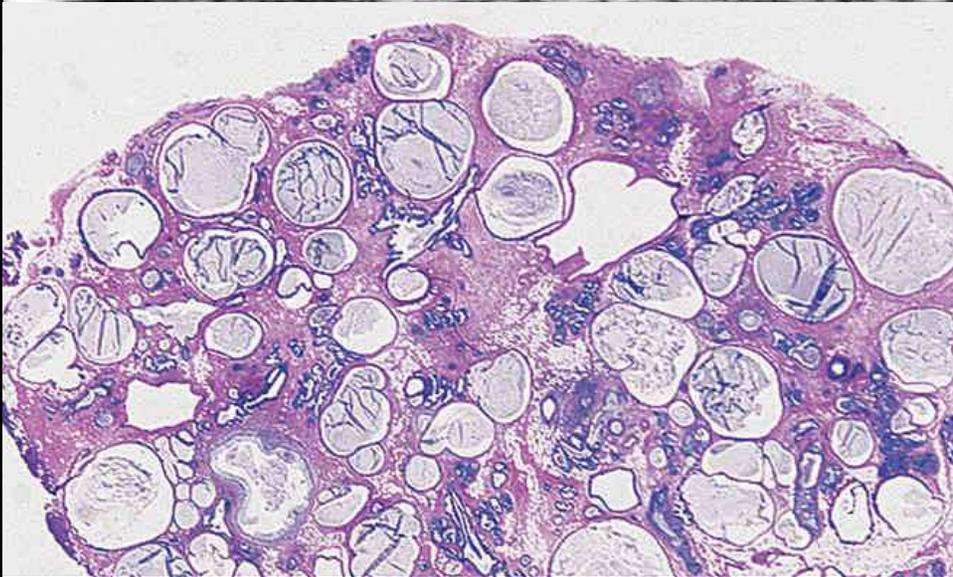
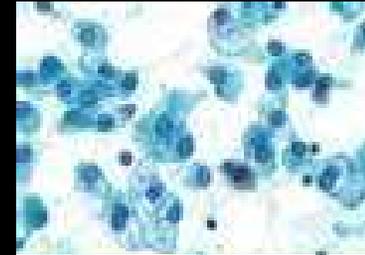
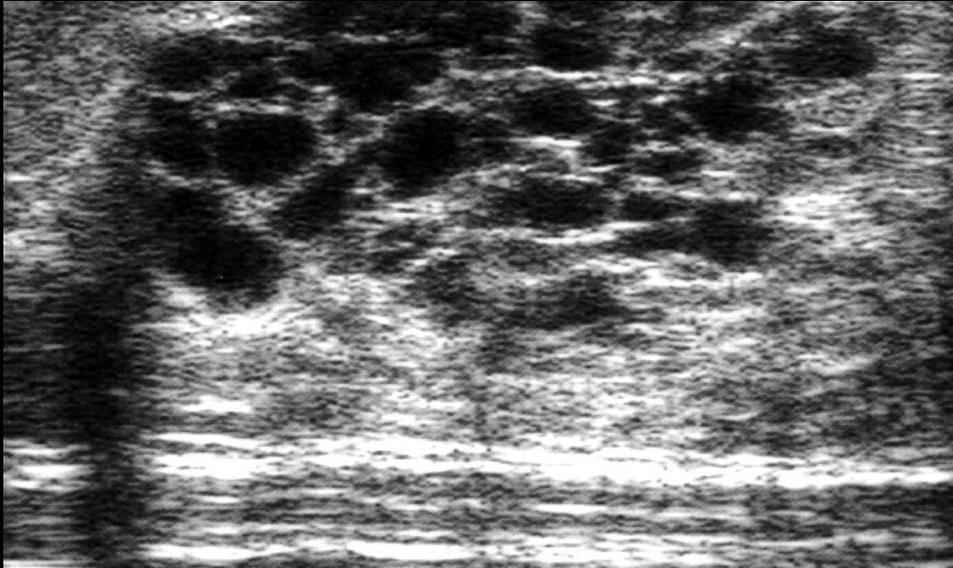
Fat Necrosis



33-Year-Old
Mass

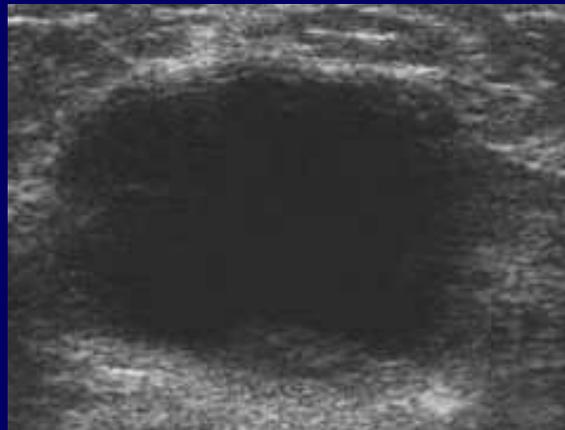


Failing Triple-Test

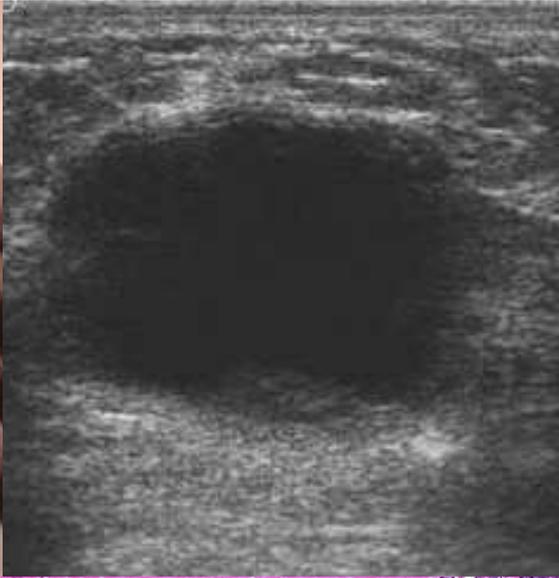


Juvenile Papillomatosis, Swiss Cheese Dz

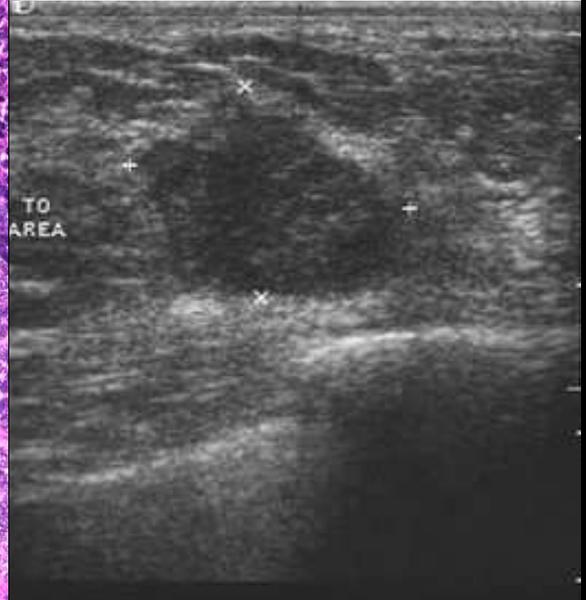
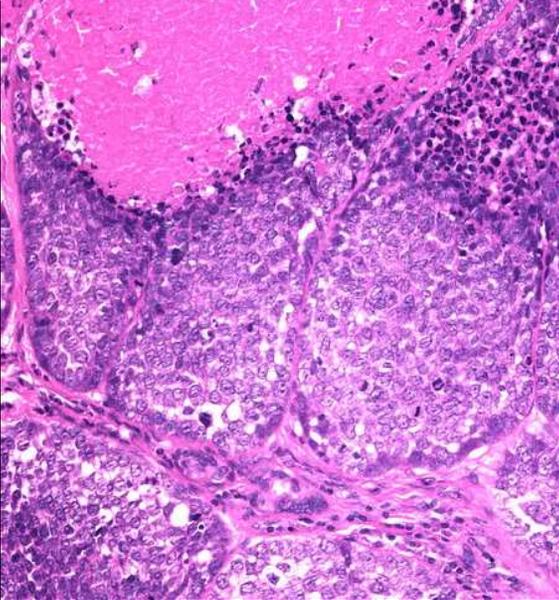
39-Year-Old
Cystic Mass



Failing Triple-Test



Cystic Ca



The Triple-Test

191 patients

Sensitivity: 95%

Specificity: 100%

Steinberg et al: Can J Surg 1996;39:302

The Double-Test

**Physical Examination
Radiology
Pathology**



Basics of Breast Imaging

BIRADS

The BIRADS Lexicon (Breast Imaging Reporting and Data System) was developed by the American College of Radiology, and is a system for reporting the results of mammography

Components of the Report

- **Breast tissue composition**
- **Findings**
- **Final assessment**

Composition of the Breast

- **Predominately fatty replaced**
- **Scattered fibroglandular densities**
- **Heterogeneously dense (may lower the sensitivity of mammography)**
- **Extremely dense (lowers the sensitivity of mammography)**

Mammographic Assessment of Masses

- **Shape**
- **Margins**
- **Density**
- **Presence of a fatty halo**
- **Associated signs**
- **Interval change**

Shape of Mass

- Round
- Oval
- Lobular
- Irregular
- Architectural Distortion

Margins of Mass

- **Circumscribed**
- **Obscured**
- **Microlobulated**
- **Indistinct**
- **Spiculated**

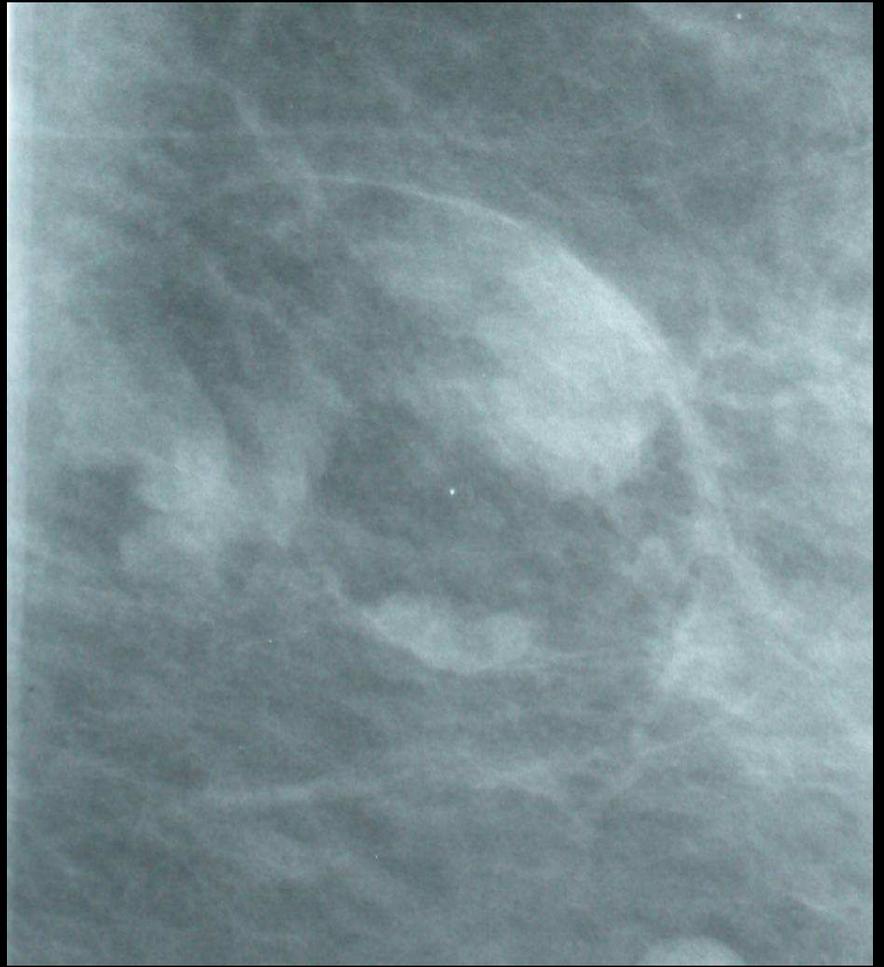
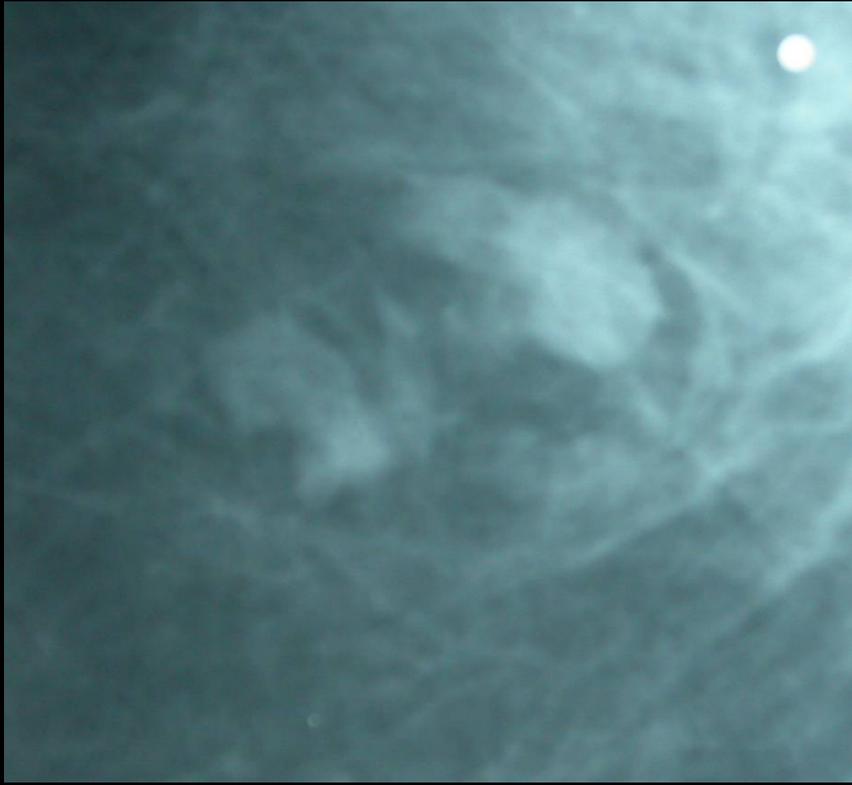
Density of Masses

- High
- Isodense
- Low
- Fat-containing



Radiolucent Circumscribed Masses

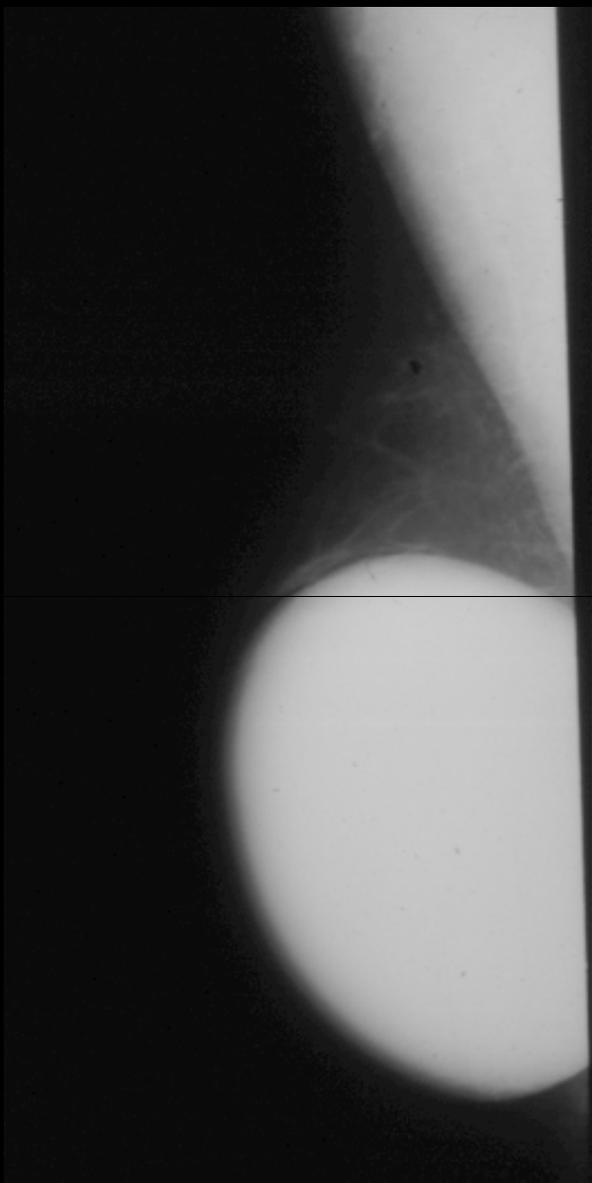
- Lipoma
- Galactocele
- Oil cyst

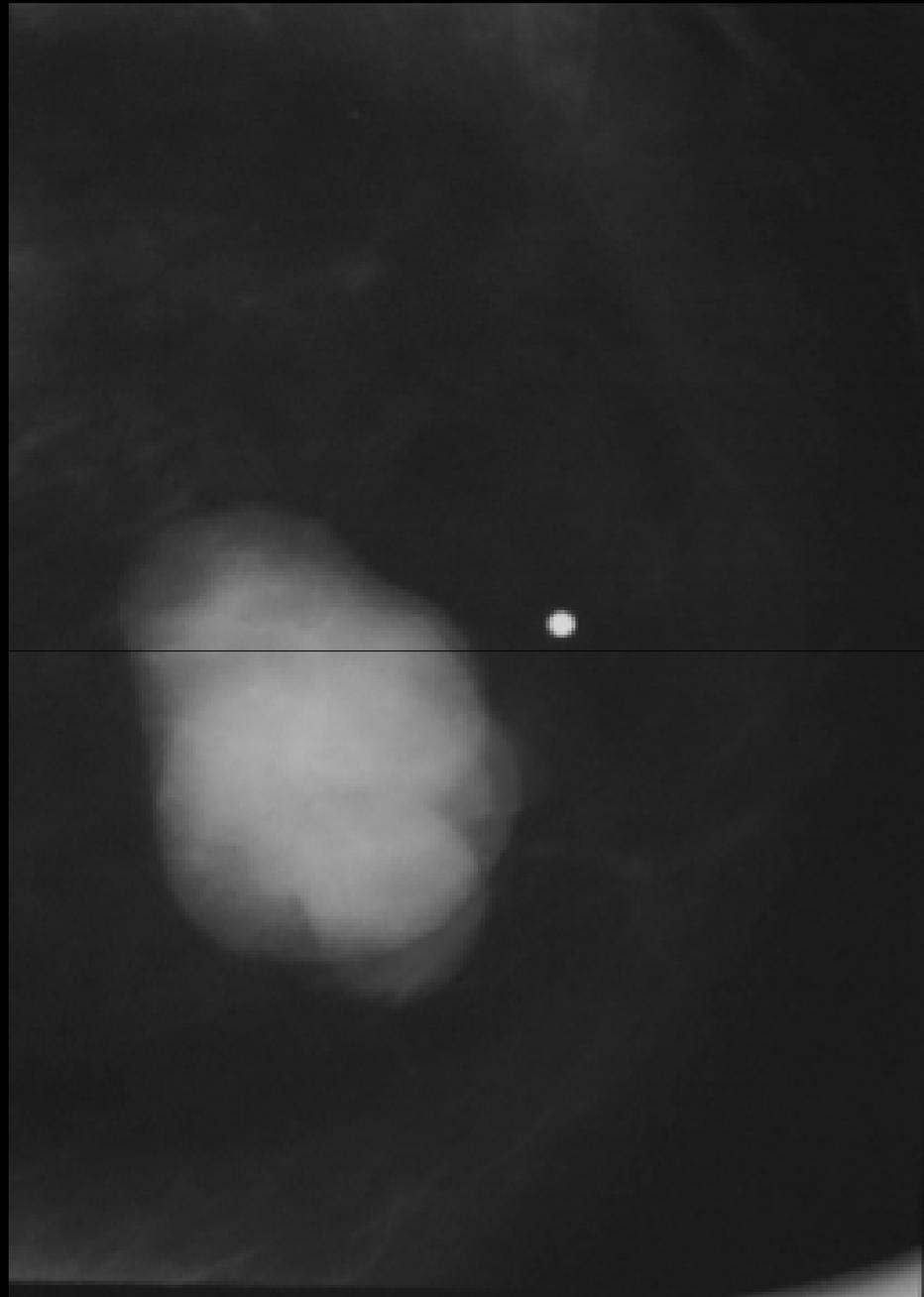


Mixed Density Circumscribed Masses

- Lymph node
- Hamartoma
- Galactocele
- Skin Lesion

**Fat-containing circumscribed masses
are benign**



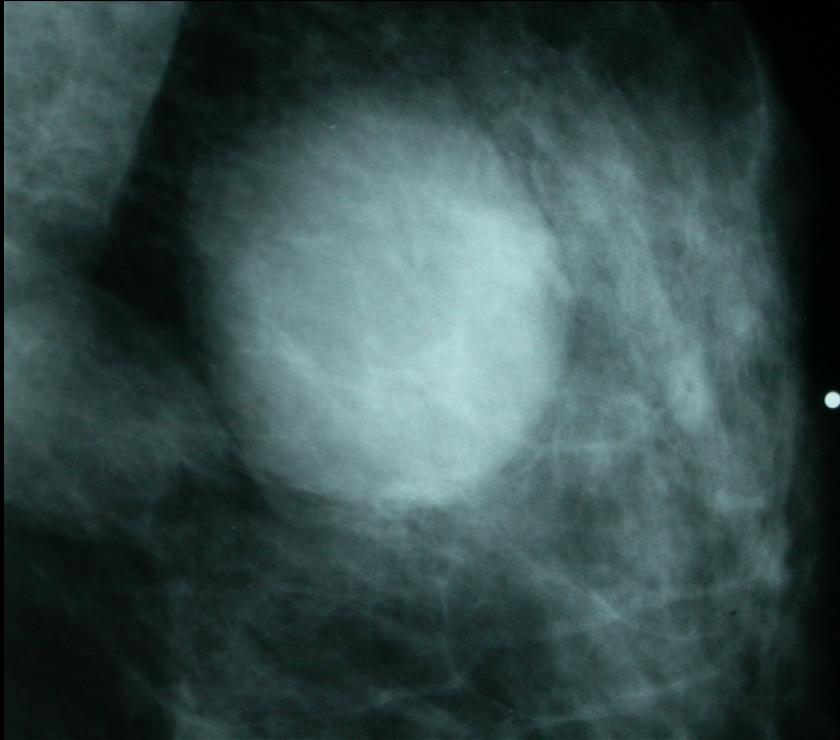


Isodense Circumscribed Masses

- Cyst
- Fibroadenoma
- Papilloma
- Sebaceous cyst
- Inclusion cyst
- Phylloides tumor
- Hematoma
- Abscess
- Sclerosing lobular hyperplasia
- Enlarged node
- Galactocele
- Skin Lesion
- Metastasis
- Carcinoma

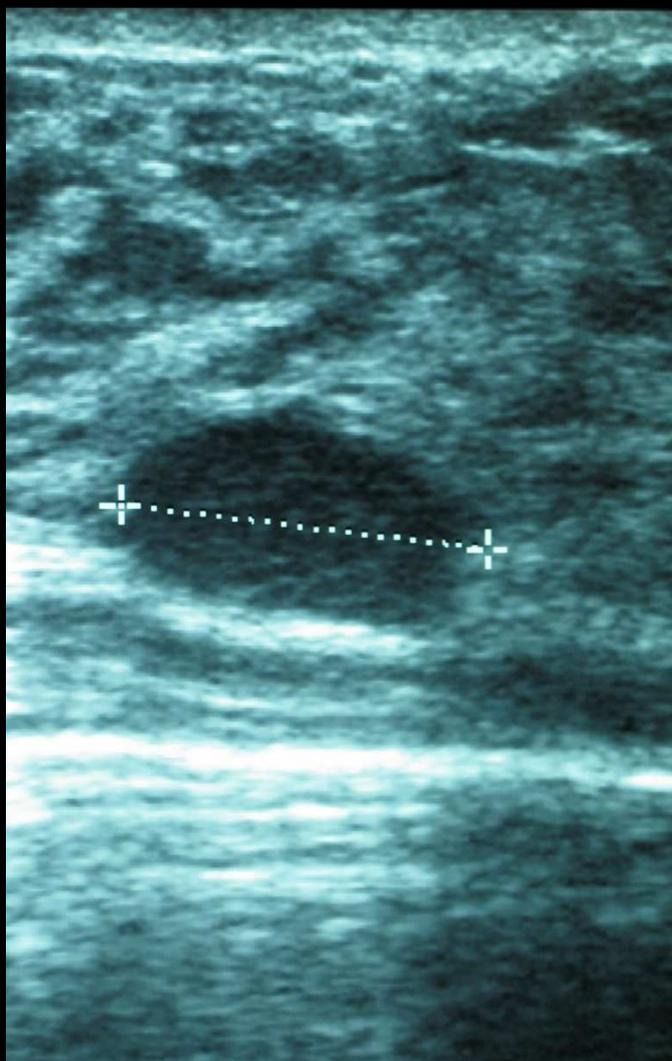
Work-up of the Isodense Circumscribed Mass

- **Spot compression to assess margins**
- **Other findings - calcifications**
- **Ultrasound (cyst vs solid, solid characteristics)**
- **Comparison with prior films**
- **Clinical exam/history**



Characteristics of Breast Cysts

- **Anechoic**
- **Well defined wall**
- **Round or oval shape**
- **Posterior acoustic enhancement**
- **May have thin septae**



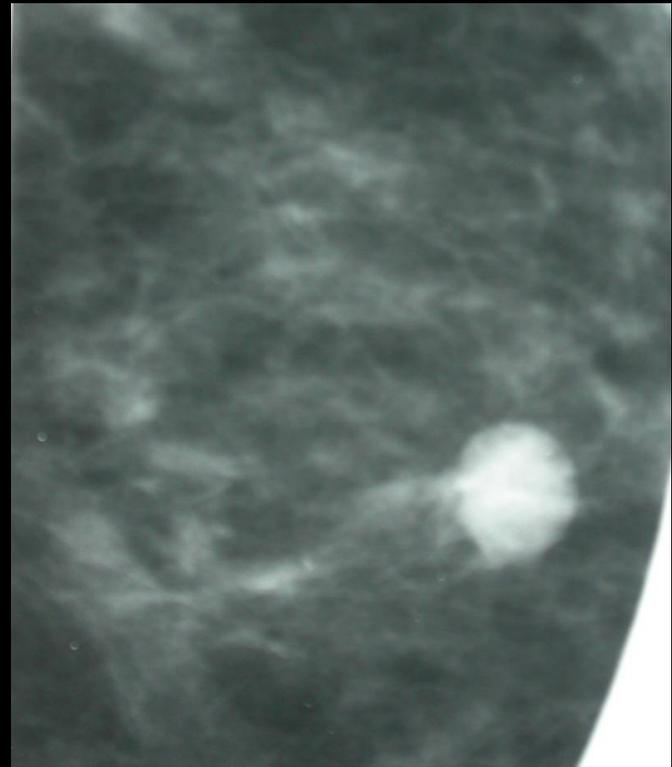
Features of Benign Solid Masses

- **Lack of any malignant features**
- **Intensely hyperechoic or**
- **Elliptical hypoechoic mass with thin echogenic pseudocapsule**
- **Two or three gentle lobulations with an echogenic pseudocapsule**

Malignant Features of Breast Masses on Sonography

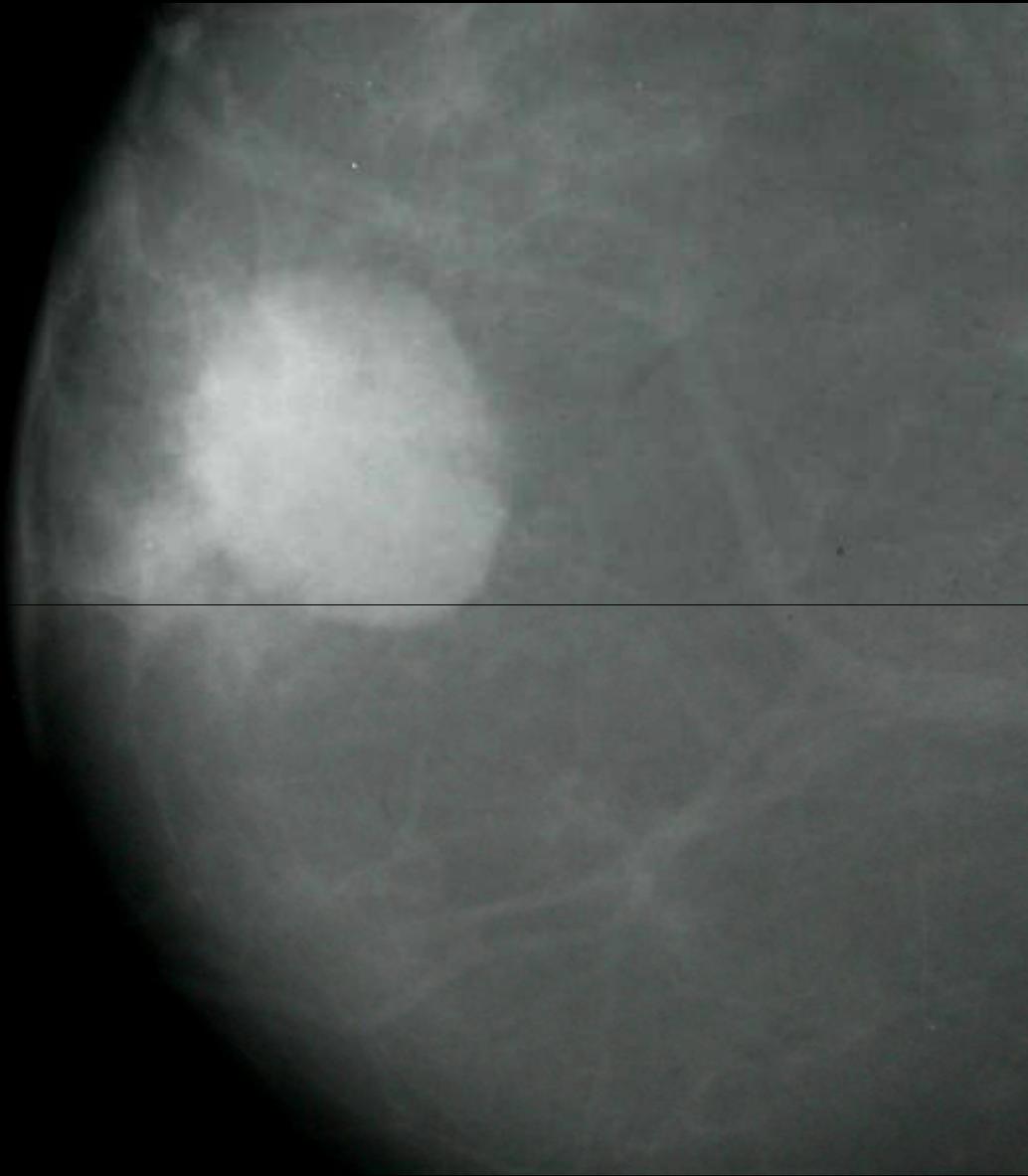
- **Vertical orientation**
- **Irregular or spiculated margins**
- **Microlobulation**
- **Angular margins**
- **Hypoechoic**
- **Shadowing**
- **Surrounding edema (hyperechoic zone)**
- **Distortion of surrounding structures**
- **Linear, ductal extensions**





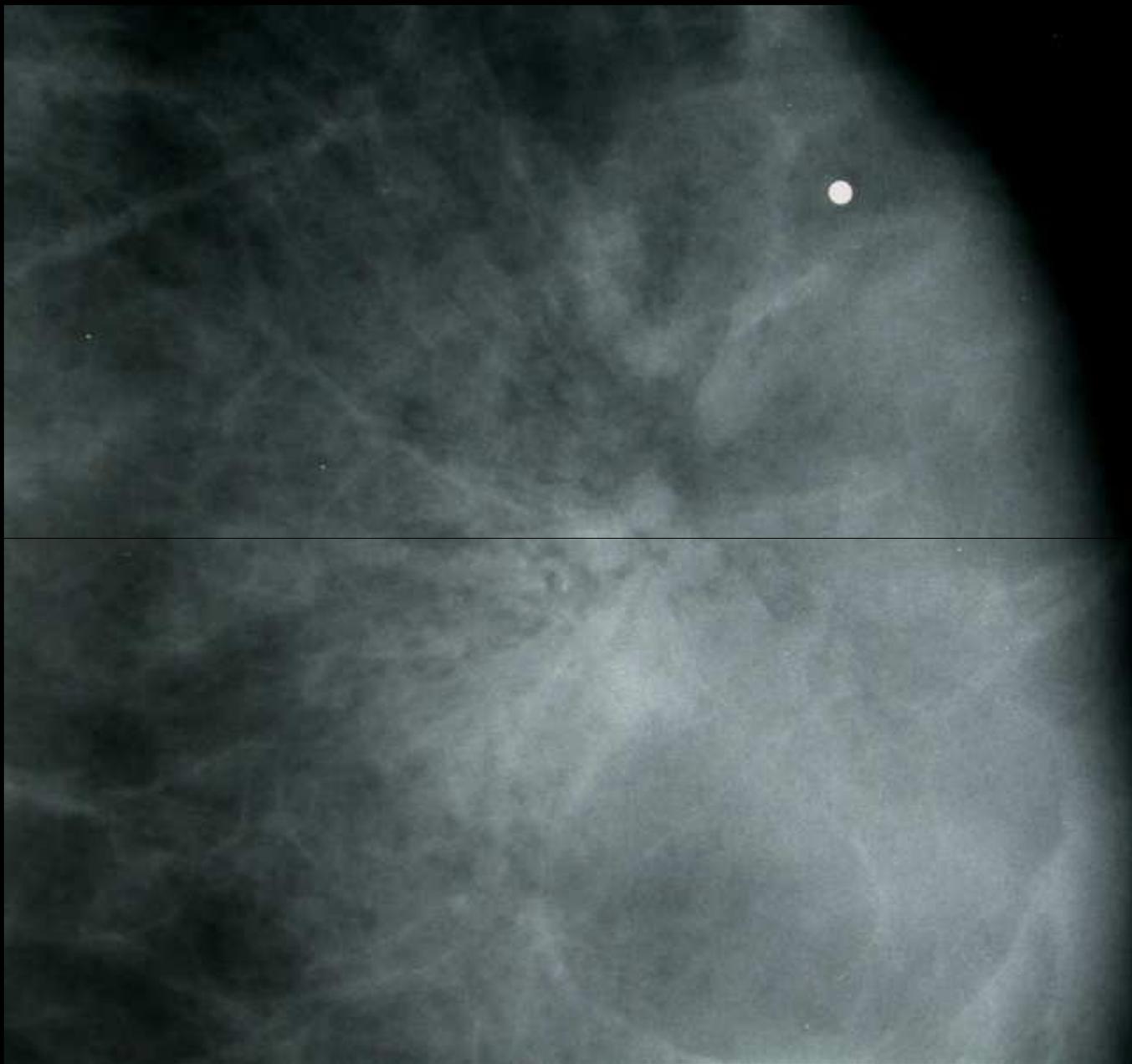
Circumscribed Cancers

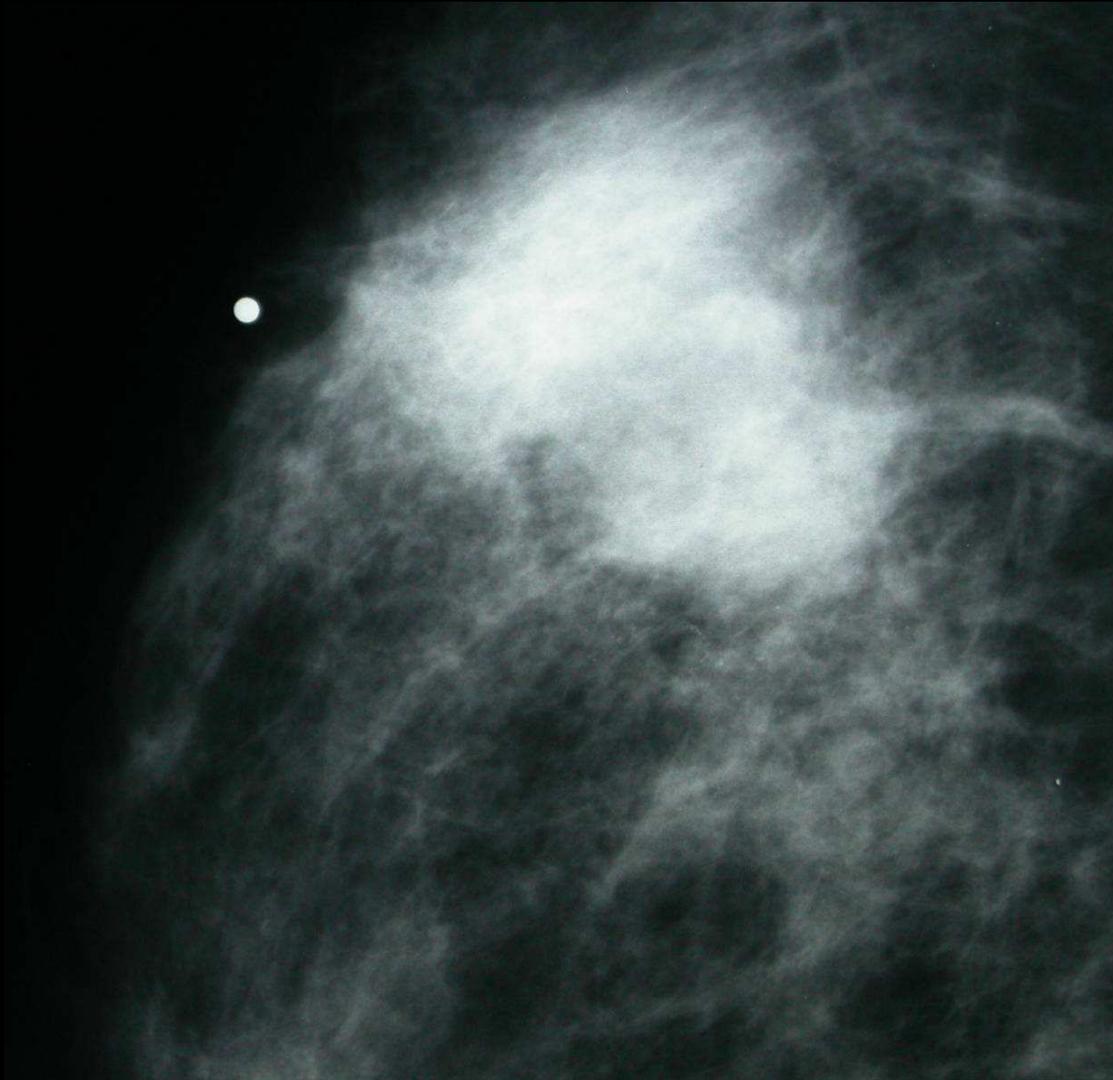
- **Invasive ductal,NOS**
- **Medullary**
- **Mucinous**
- **Papillary**

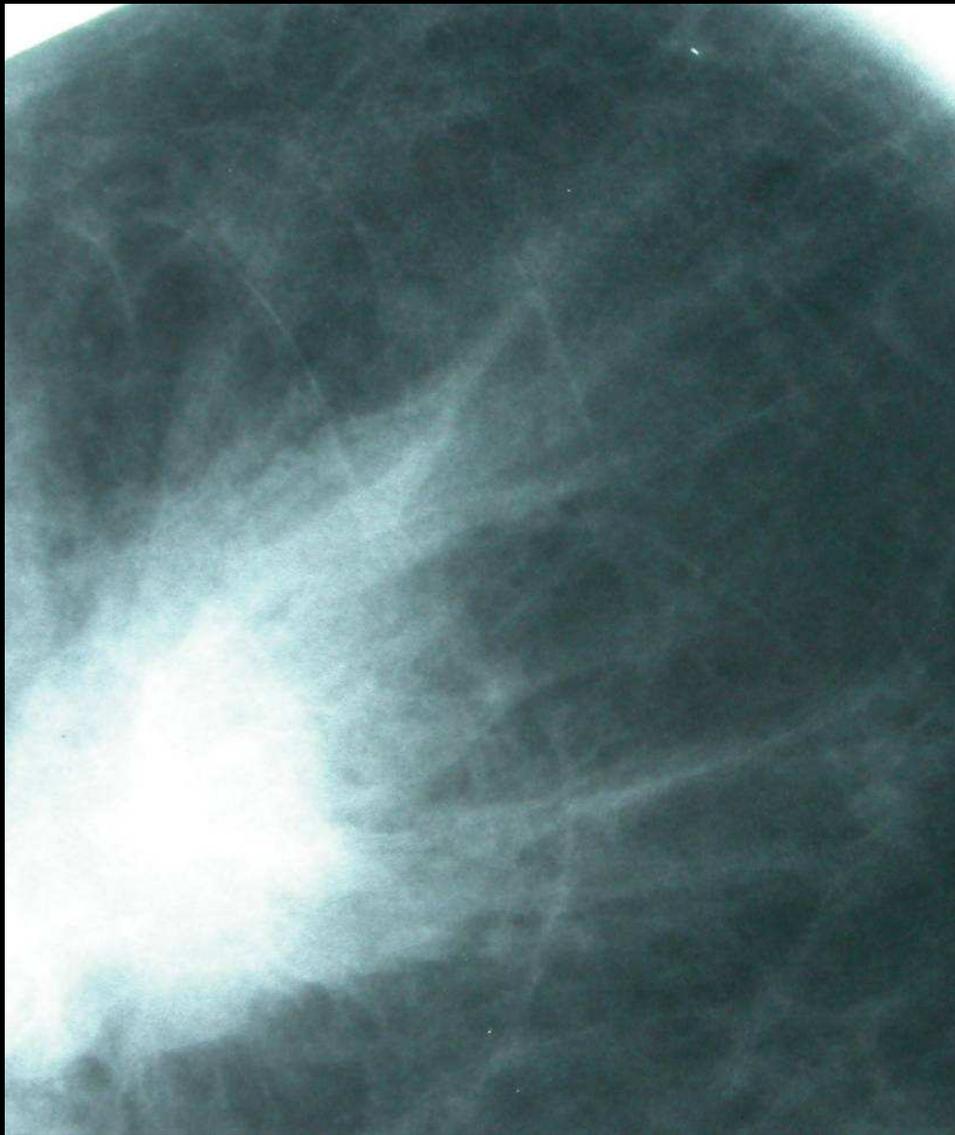


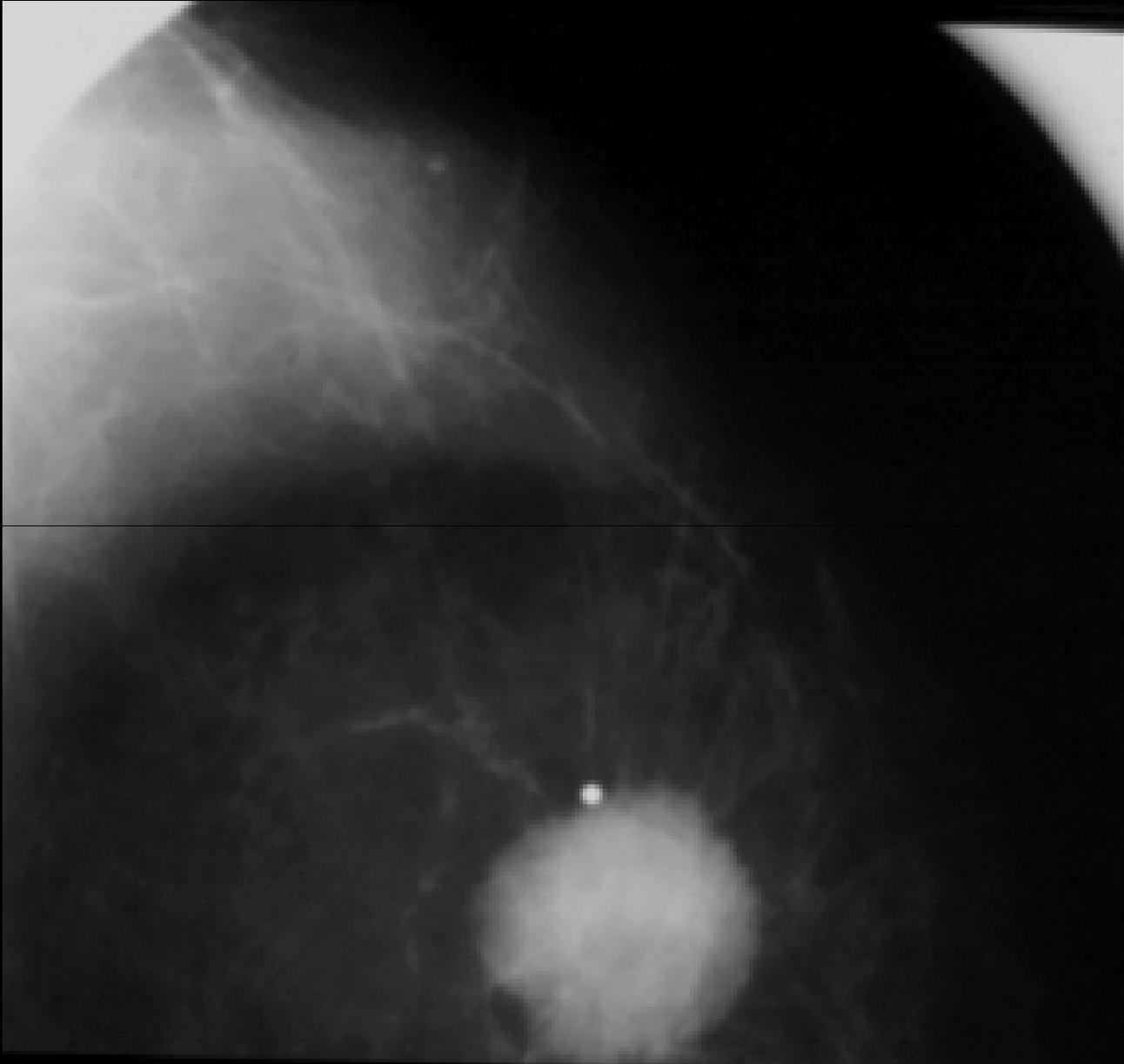
Indistinct or Spiculated Masses

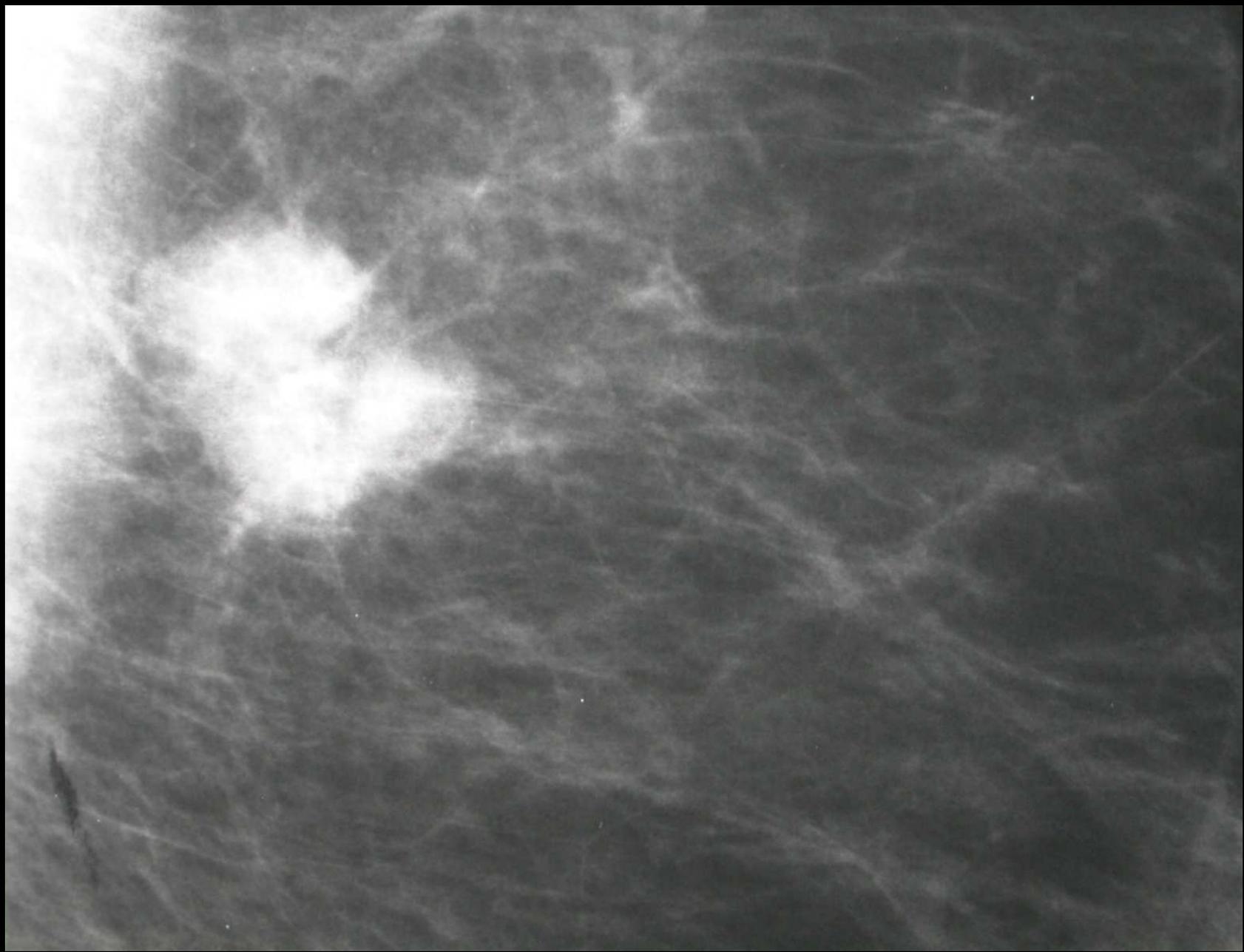
- Carcinoma
- Lymphoma
- Radial scar
- Scar
- Hematoma
- Abscess
- PASH
- Fibrocystic change
- Sclerosing adenosis
- Sebaceous cyst
- Granular cell tumor
- Fibromatosis

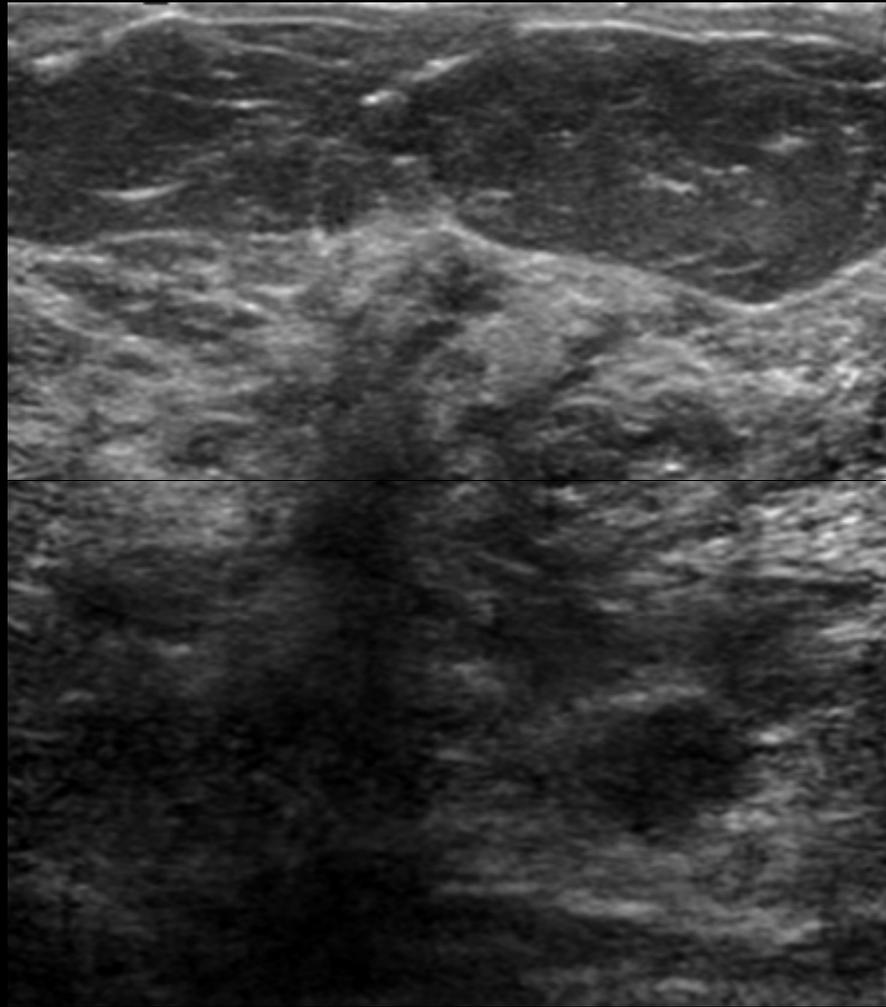


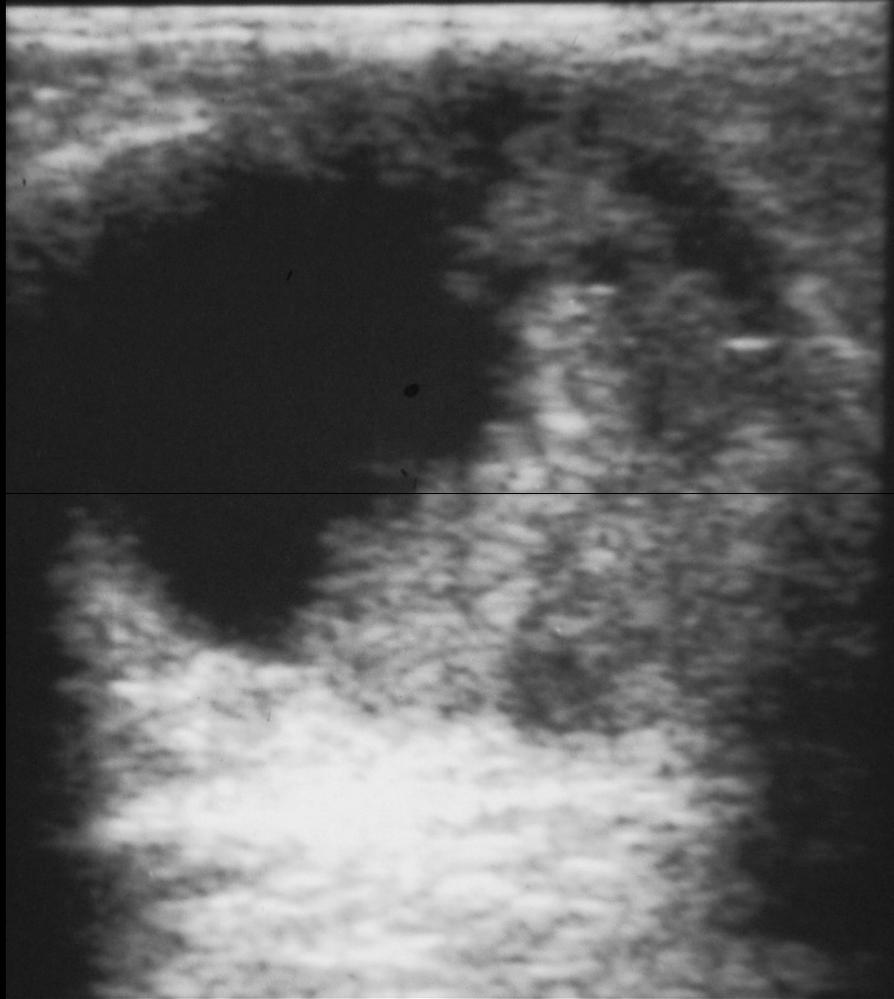










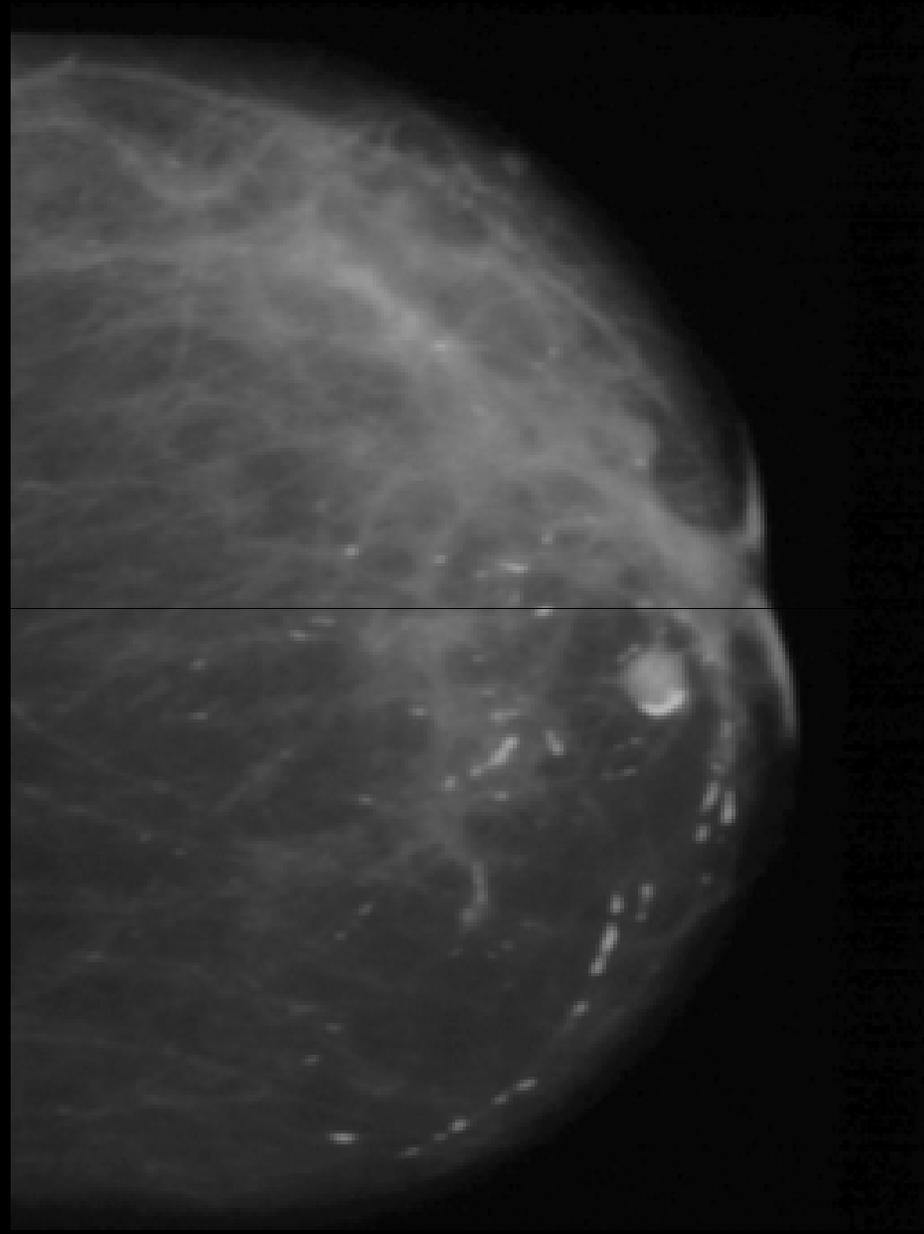


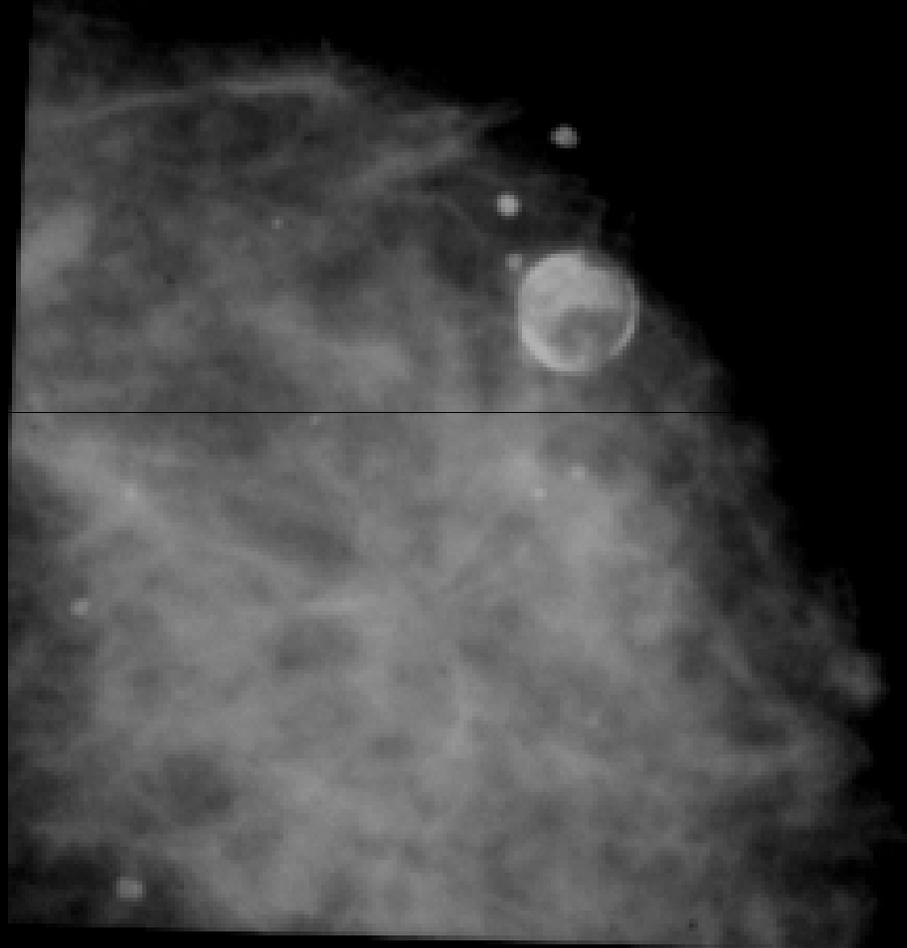
Analysis of Calcifications: Benign Type

- **Skin calcification (dermal)**
- **Vascular calcification (arterial)**
- **Coarse (popcorn-like) (fibroadenoma)**
- **Large rodlike (secretory)**
- **Round (fat necrosis, fibrocystic)**

Analysis of Calcifications: Benign Type

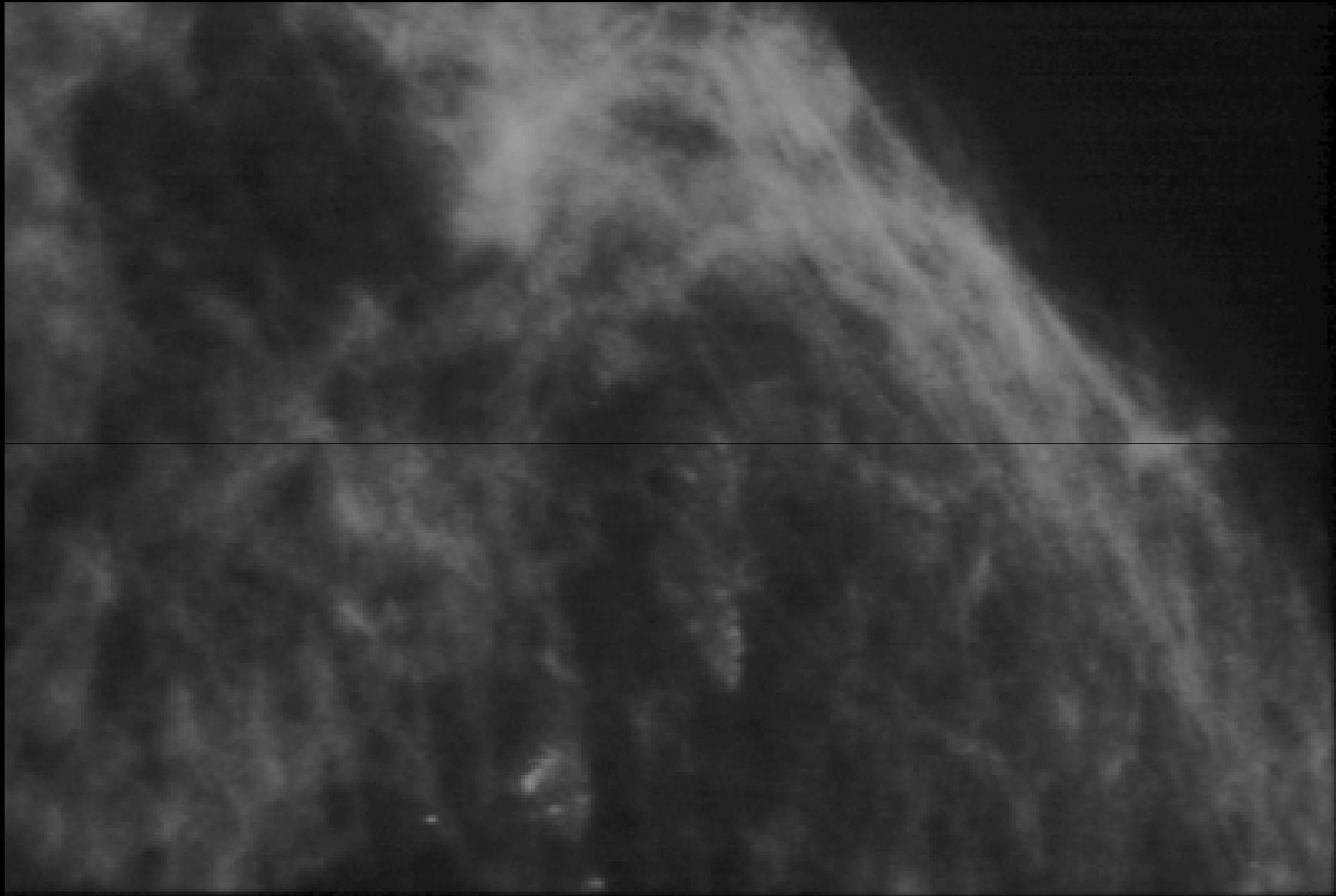
- **Lucent-centered/spherical (fat necrosis, cysts)**
- **Eggshell/rim (fat necrosis, oil cysts)**
- **Milk of calcium**
- **Suture**
- **Dystrophic (fibrosis, fibroadenoma, scar)**
- **Punctate (fibrocystic)**

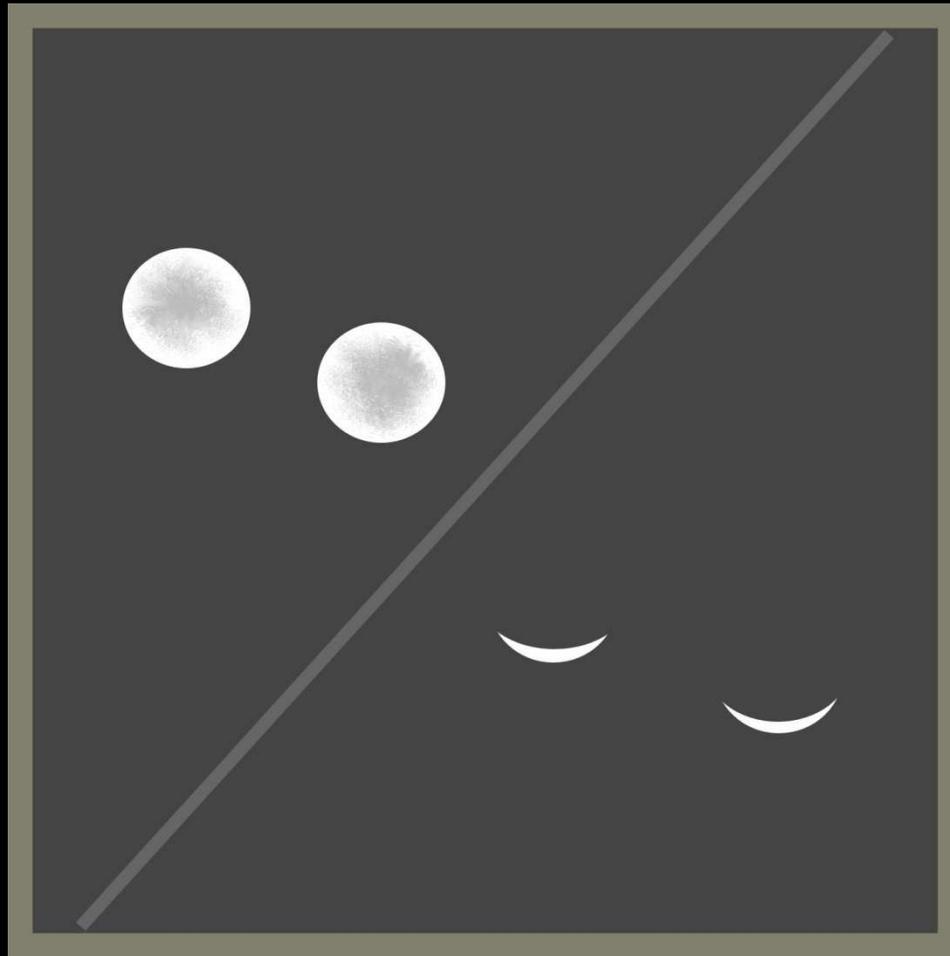


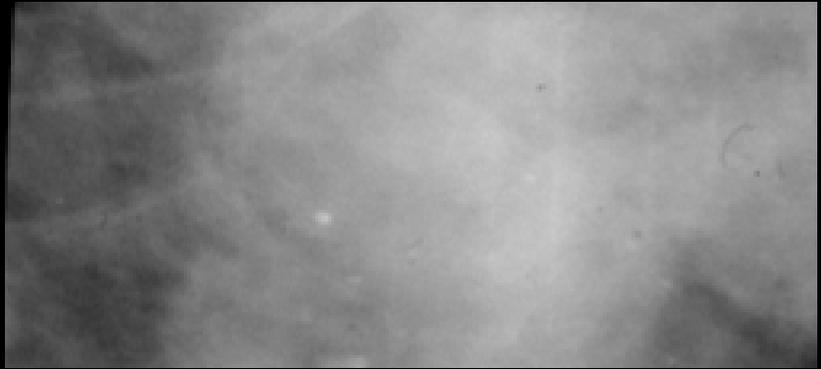
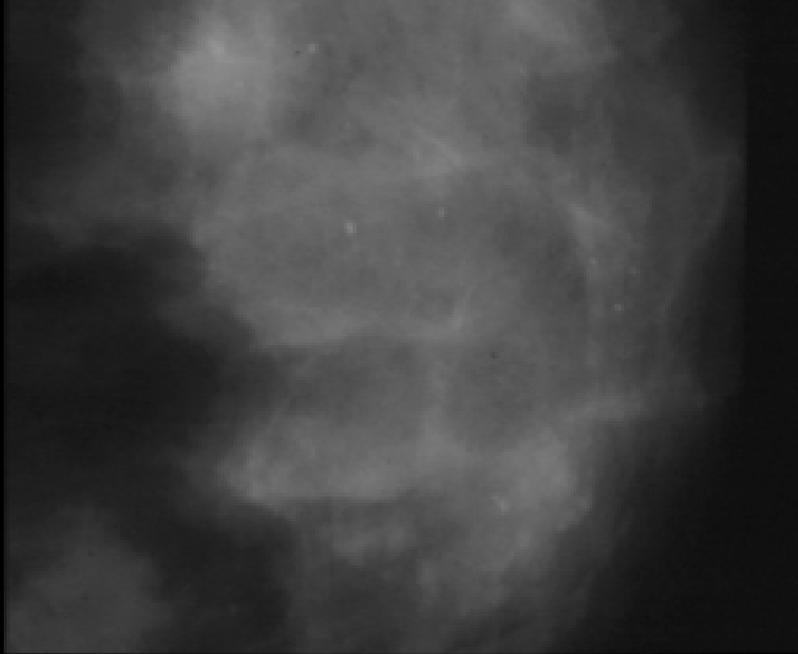
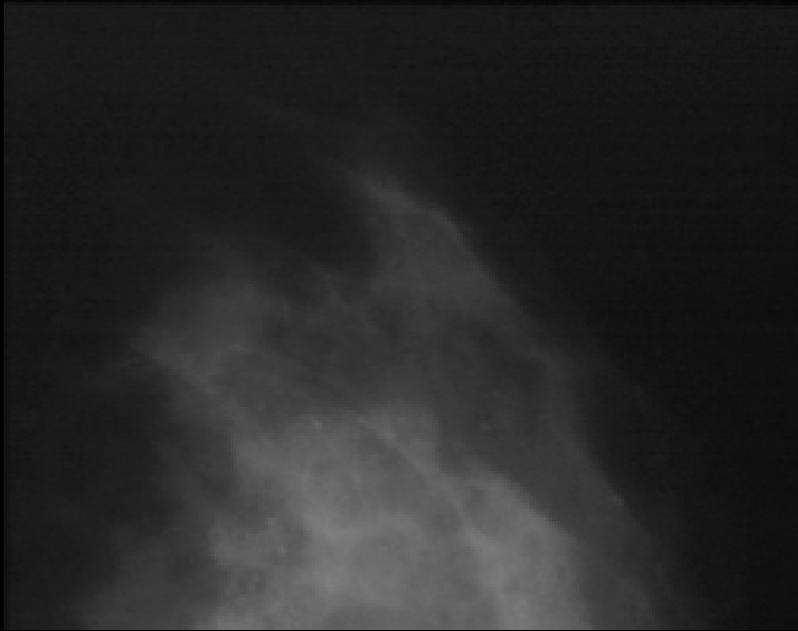






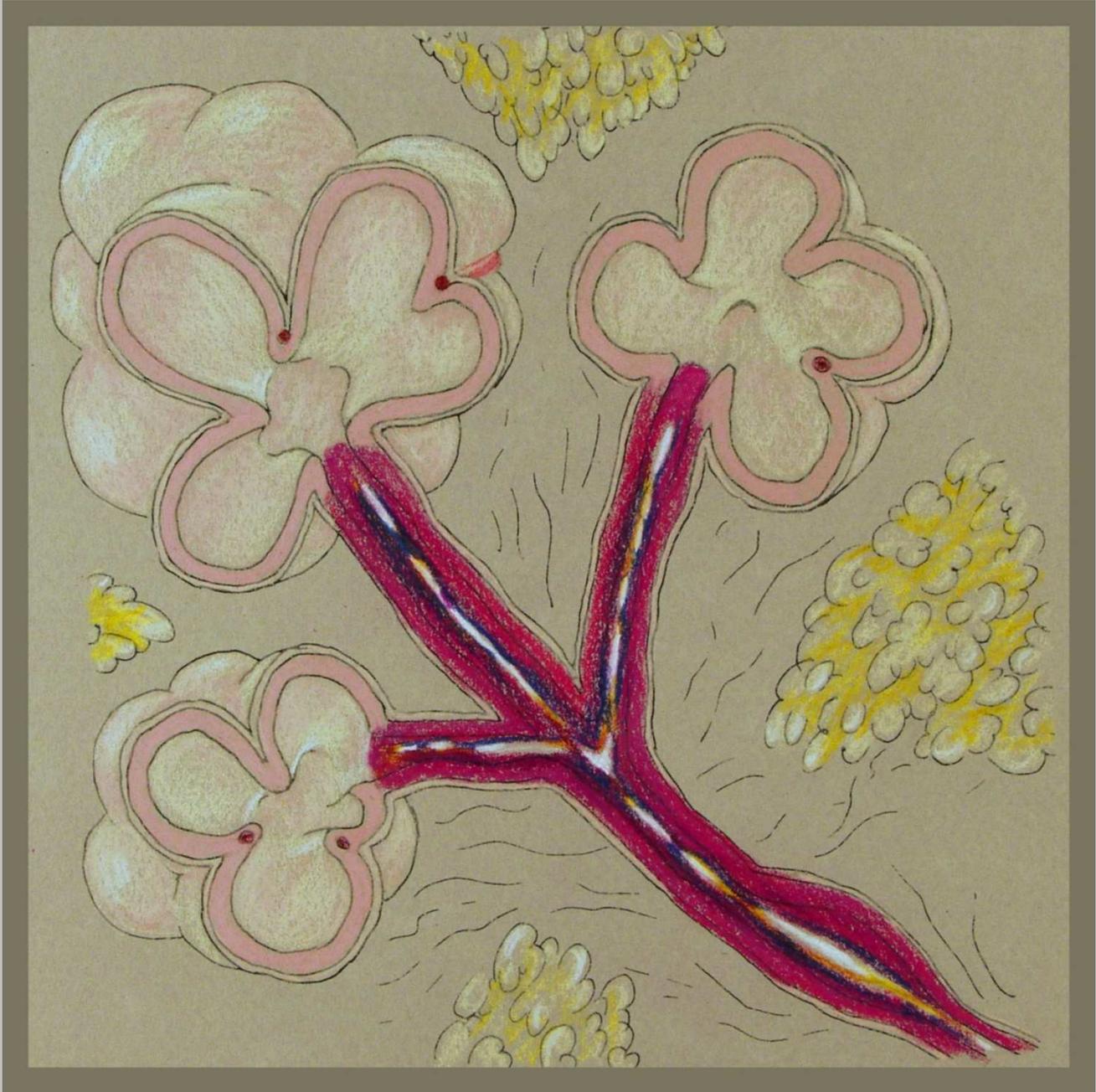


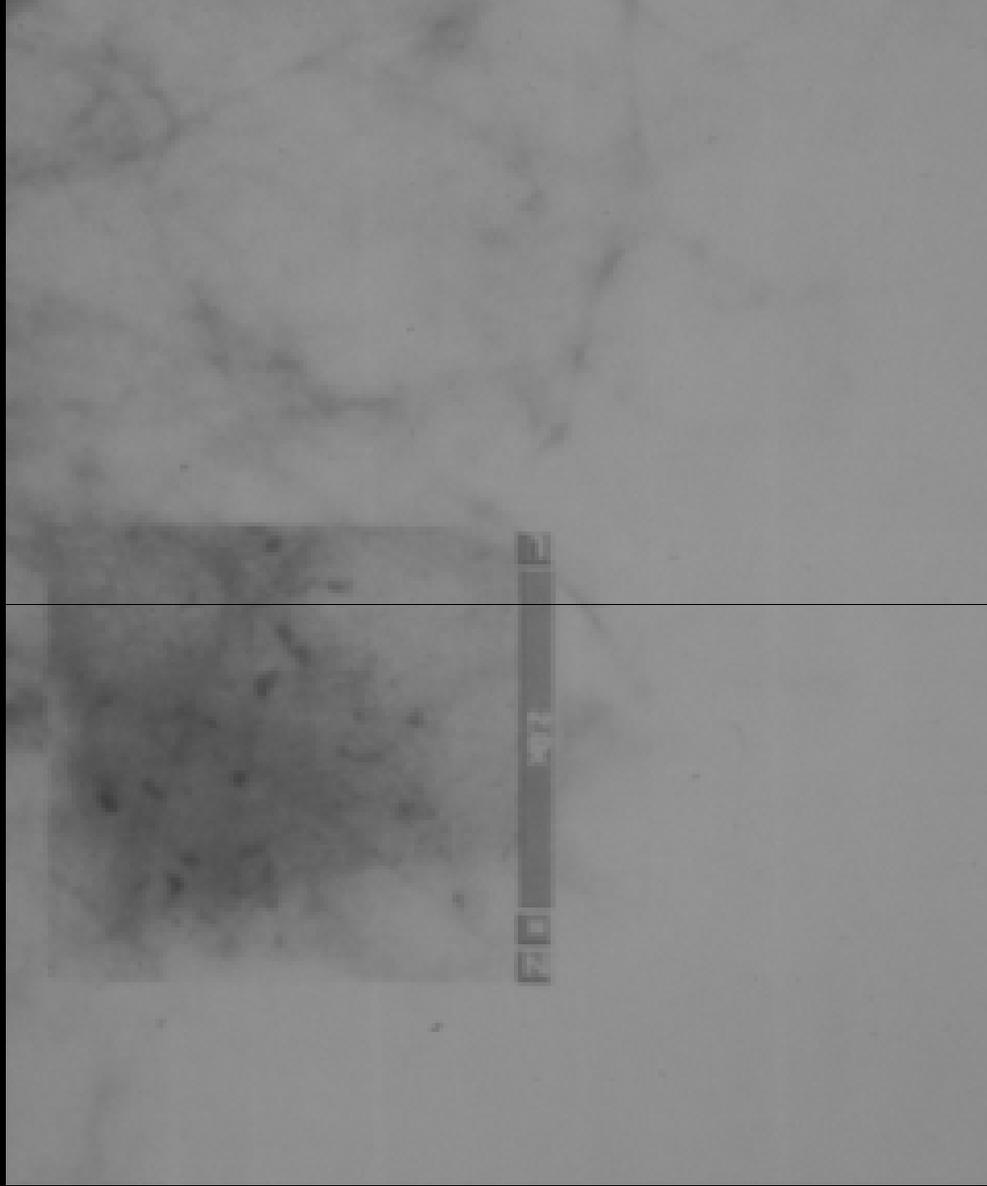


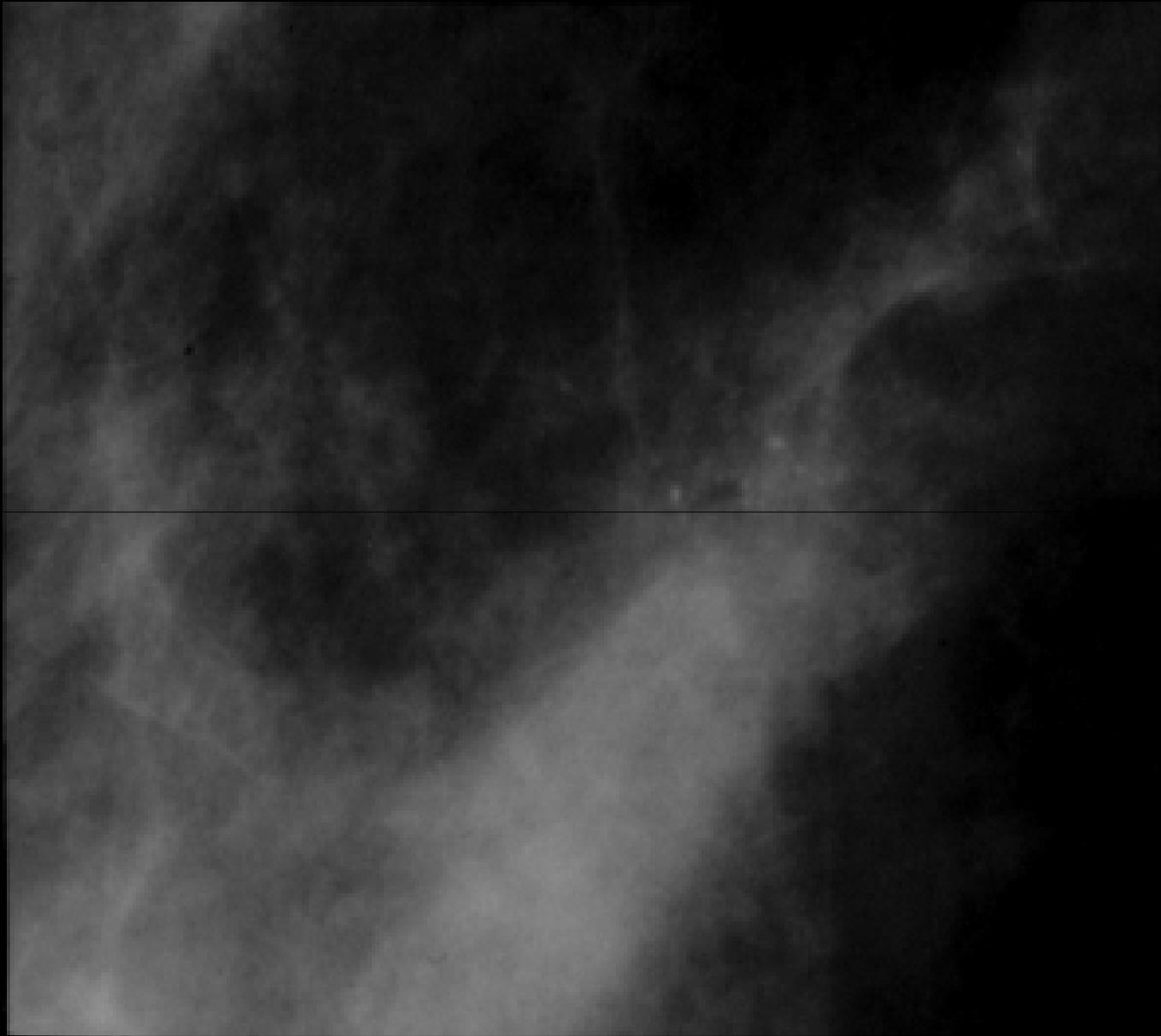


Analysis of Calcifications: Intermediate Concern

- **Amorphous/indistinct (Fibrocystic changes, ductal carcinoma in situ)**

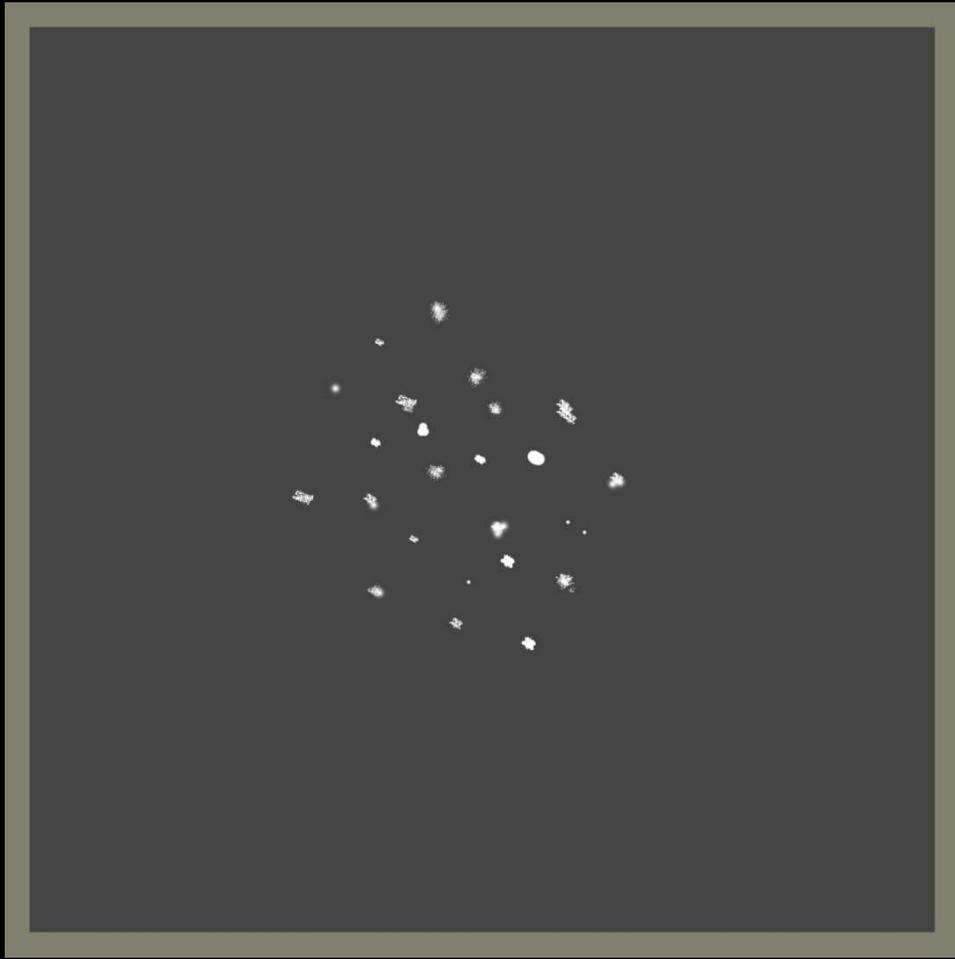


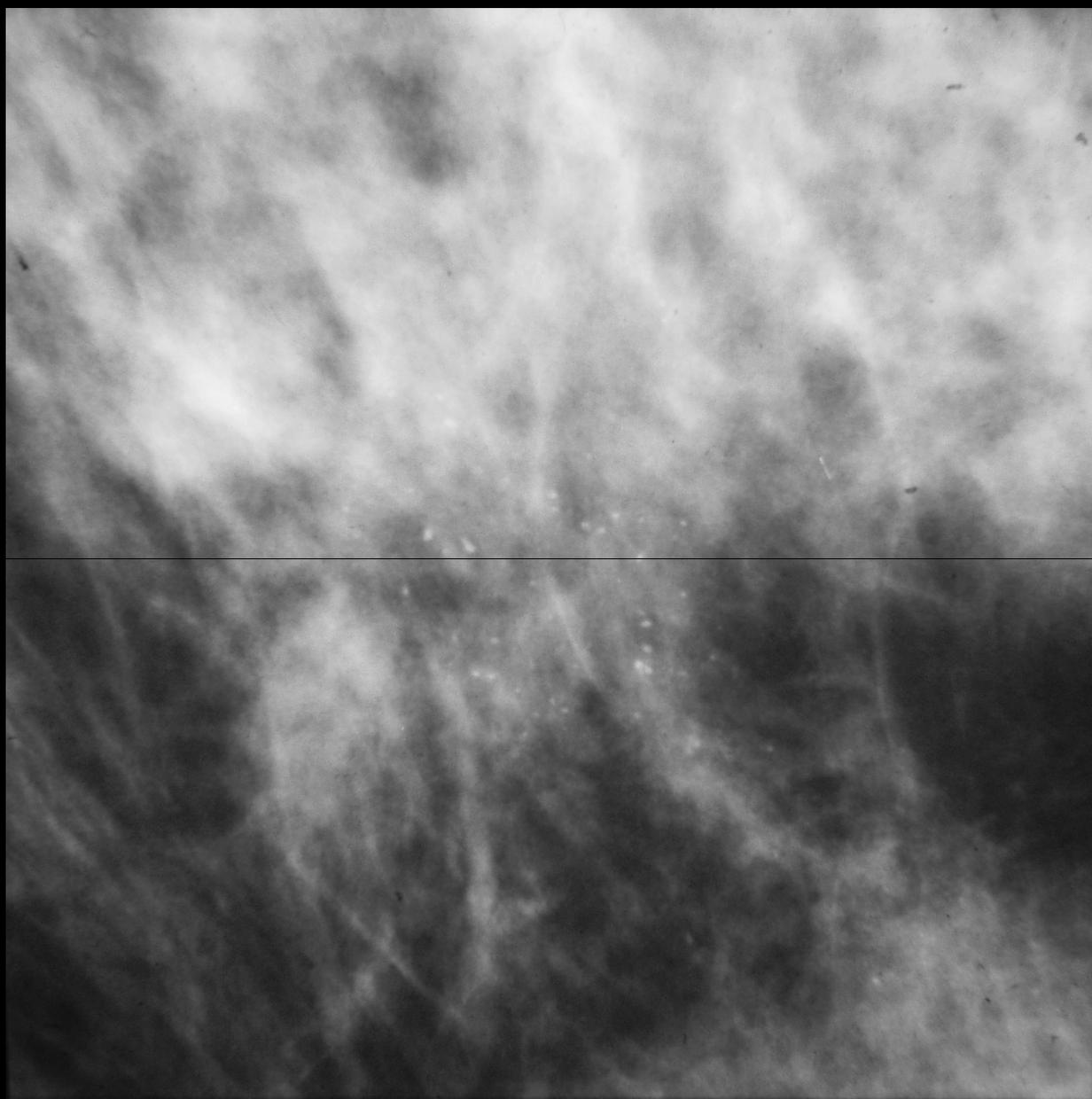




Analysis of Calcifications: Suspicious

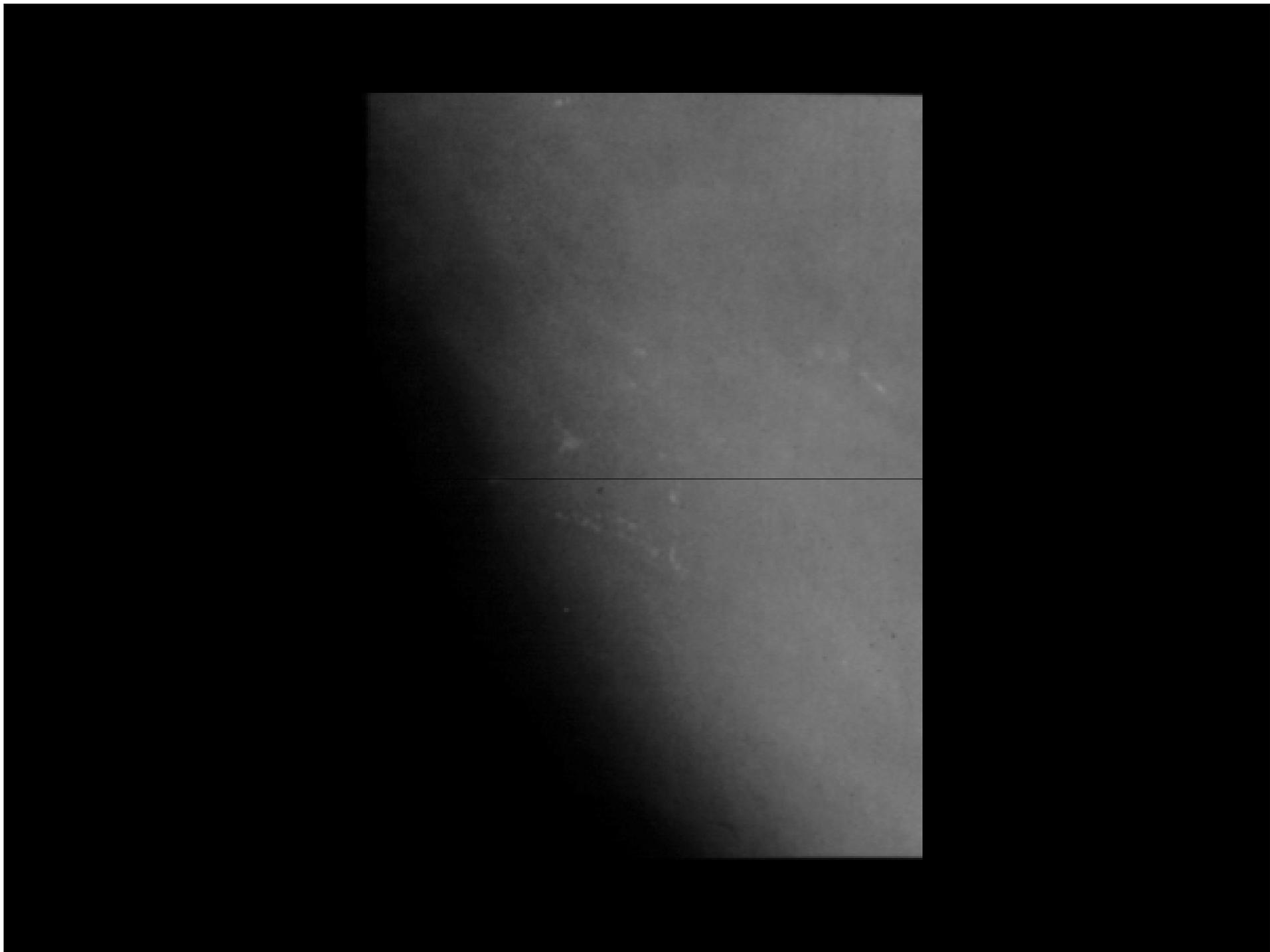
- **Pleomorphic/heterogenous (DCIS, fibrocystic, fibrosis, fibroadenoma, ADH)**
- **Fine, linear, branching (DCIS, rarely fibrosis)**

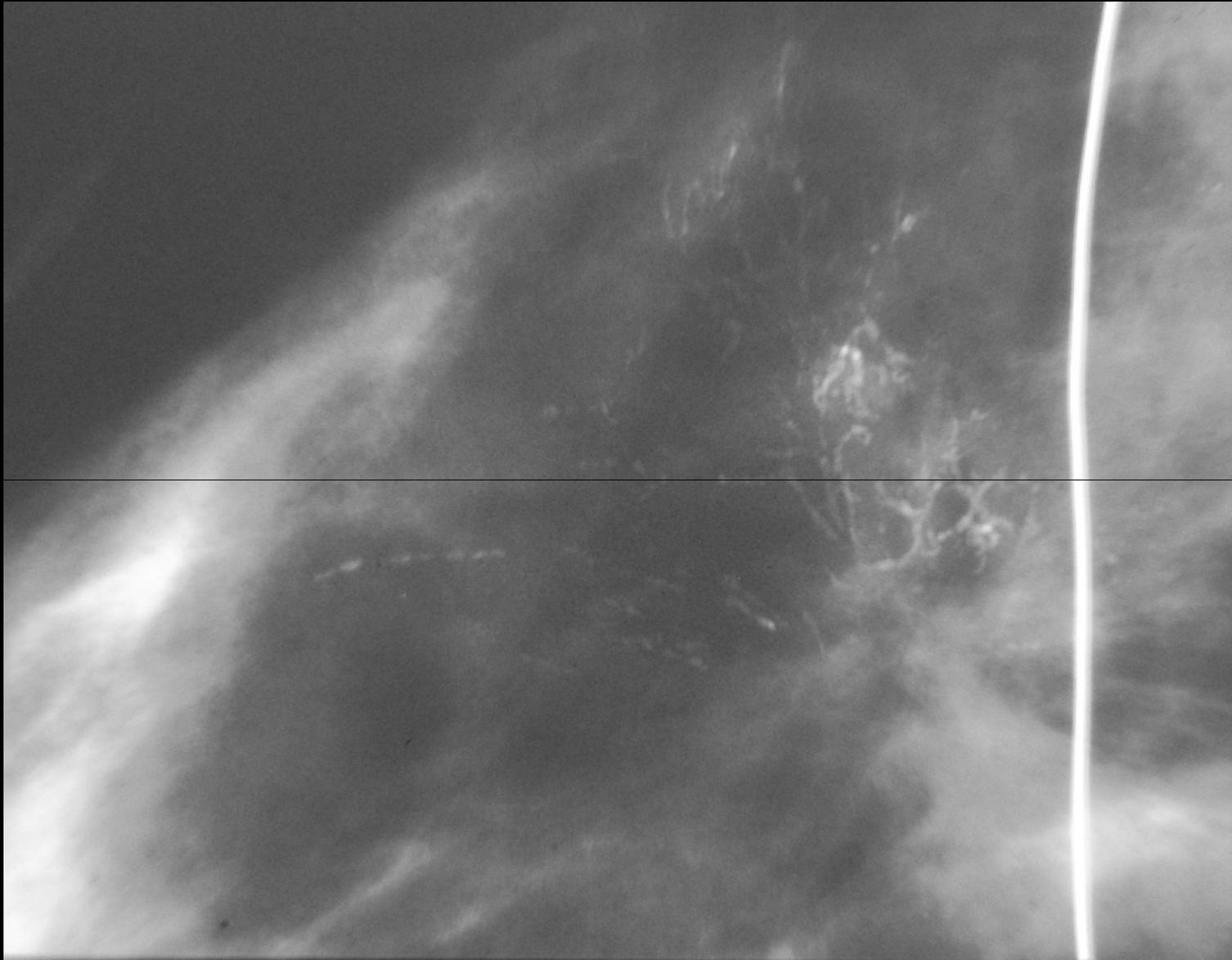












Distribution of Calcifications

- **Grouped/clustered**
- **Linear**
- **Segmental**
- **Regional**
- **Diffuse/scattered**
- **Multiple groups**

Breast MRI

- **Breasts are positioned in a specialized coil and exposed to a magnetic field**
- **Tissues appear different depending on the amount of water they contain**
- **Contrast is given and is rapidly seen in blood vessels**
- **Breast cancers have more and different blood vessels that are demonstrated by the contrast**

Breast MRI

- **Description of MRI findings using BIRADS**
- **Masses described based on morphology and kinetics**
- **Rapid inflow and washout of contrast is found in malignancies and some benign lesions**
- **Non mass- like enhancement may represent DCIS or ILC**

Roles of Breast MRI

- **Screening for breast cancer in high risk women**
- **Evaluation of the extent of cancer in women who are newly diagnosed with breast cancer**
- **Evaluation of response of the tumor to chemotherapy prior to surgery**
- **Evaluation of the patient treated with lumpectomy and radiation for possible recurrence of tumor**
- **Implant rupture evaluation**

BIRADS Assessment

- **0 – Needs additional evaluation**
- **1 – Negative**
- **2 – Benign finding: routine follow-up**
- **3 – Probably benign: early mammography follow-up**
- **4 – Suspicious: biopsy**
 - **a. low suspicion**
 - **b. intermediate**
 - **c. moderate**
- **5 – Highly suspicious for malignancy: biopsy**
- **6 – Known cancer**

BIRADS 4 Lesions

- **Amorphous microcalcifications**
- **Fine pleomorphic microcalcifications**
- **Indistinct mass**
- **Enlarging circumscribed mass**
- **Solid palpable mass**
- **Architectural distortion**

BIRADS 5 Lesions

- **Spiculated mass**
- **Fine linear or branching microcalcification**
- **New segmental or linear, amorphous or pleomorphic microcalcifications**
- **Combination of the above**

BIRADS 5 Lesions

	<u>PPV</u>
■ Spiculated mass	81%
■ Irregular mass	73%
■ Linear microcalcifications	81%
■ Segmental microcalcifications	76%
■ Linearly arranged microcal	68%

Positive Predictive Value

- **BIRADS 4** **34%**
- **BIRADS 5** **81%**

Liberman et al, AJR, 1998

Reasons for Percutaneous Breast Biopsy

- **To diagnose a BIRADS 4 lesion as benign and avoid unnecessary surgery**
- **To diagnose a BIRADS 4 or 5 lesion as malignant and better plan surgical management**
- **To diagnose multicentric breast cancer**

Change in Management Following Percutaneous Biopsy: BIRADS 5 Lesions

- **BIRADS 5 Masses**

CNB reduced 2nd masses surgeries in 77% of patients

- **BIRADS 5 Calcifications**

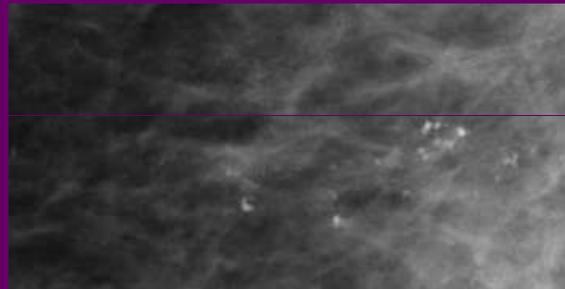
CNB reduced 2nd surgeries in 42% of patients

Liberman et al, AJR 165: 551, 1995

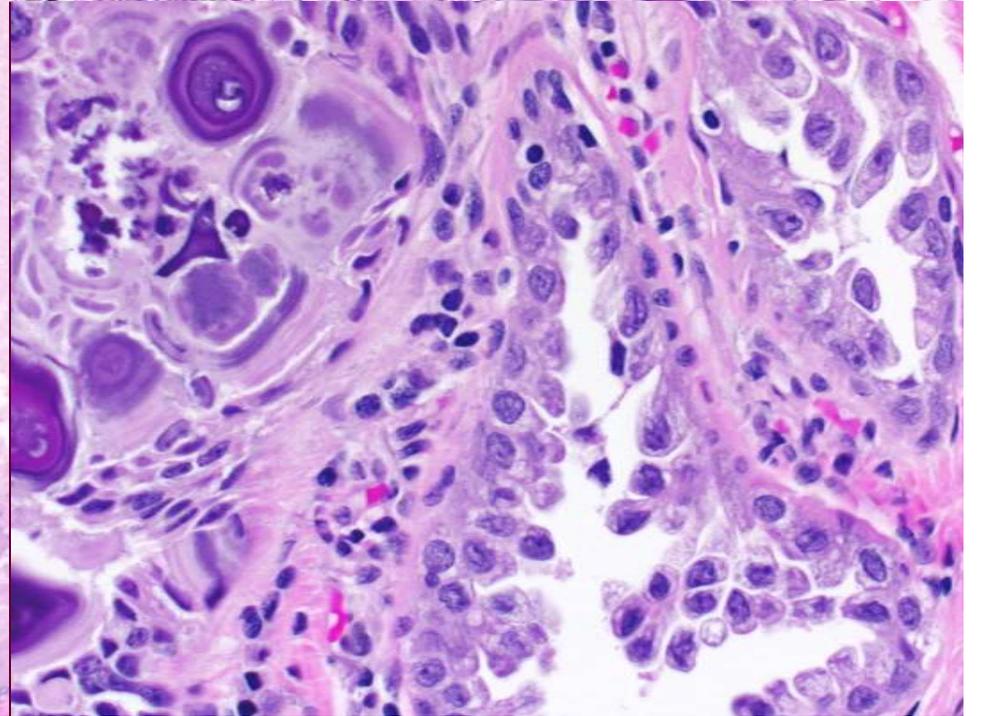
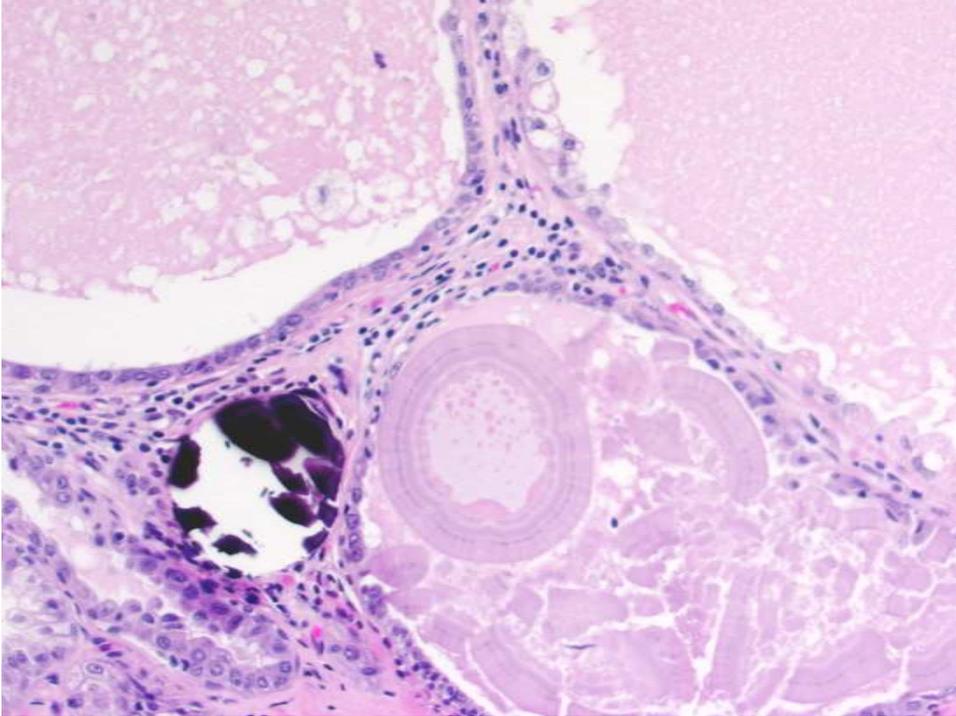
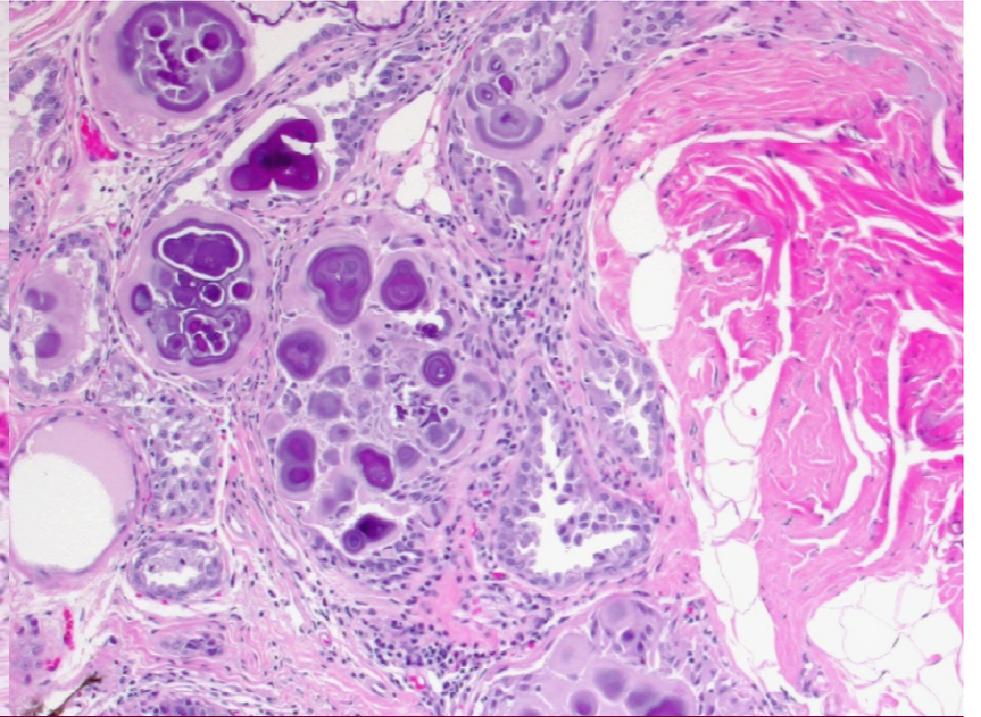
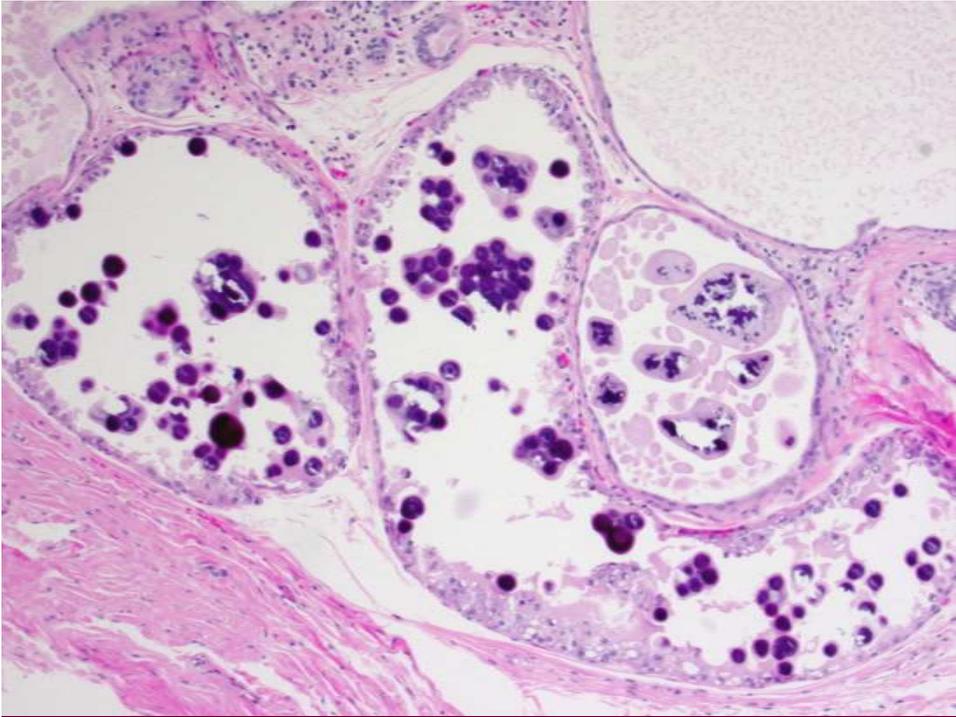


Case 1

History: 40-year-old. Suspicious micro-calcifications on baseline mammogram



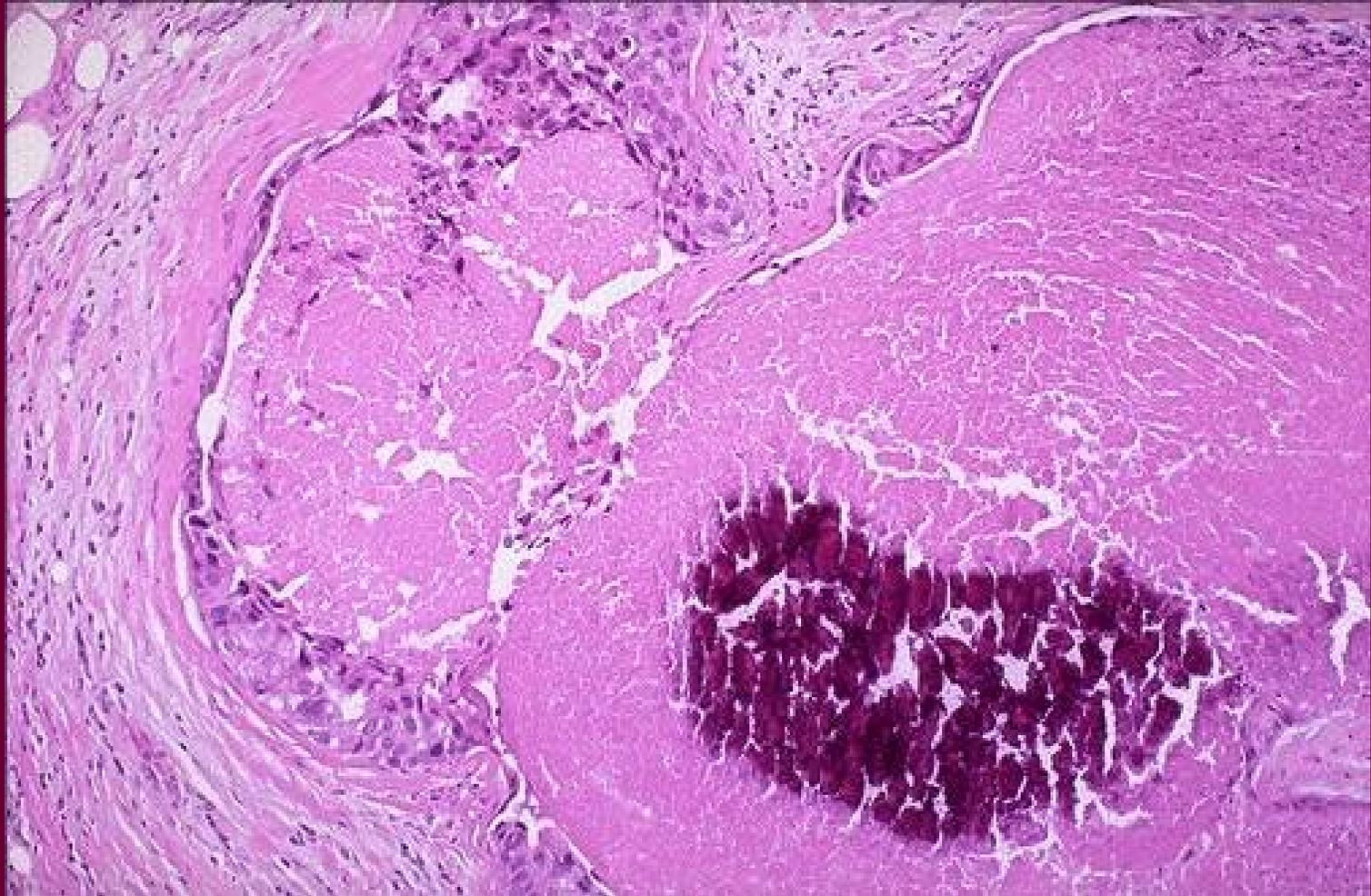
Mammogram: A cluster of pleomorphic calcifications including linear forms, some of which demonstrate linear orientation



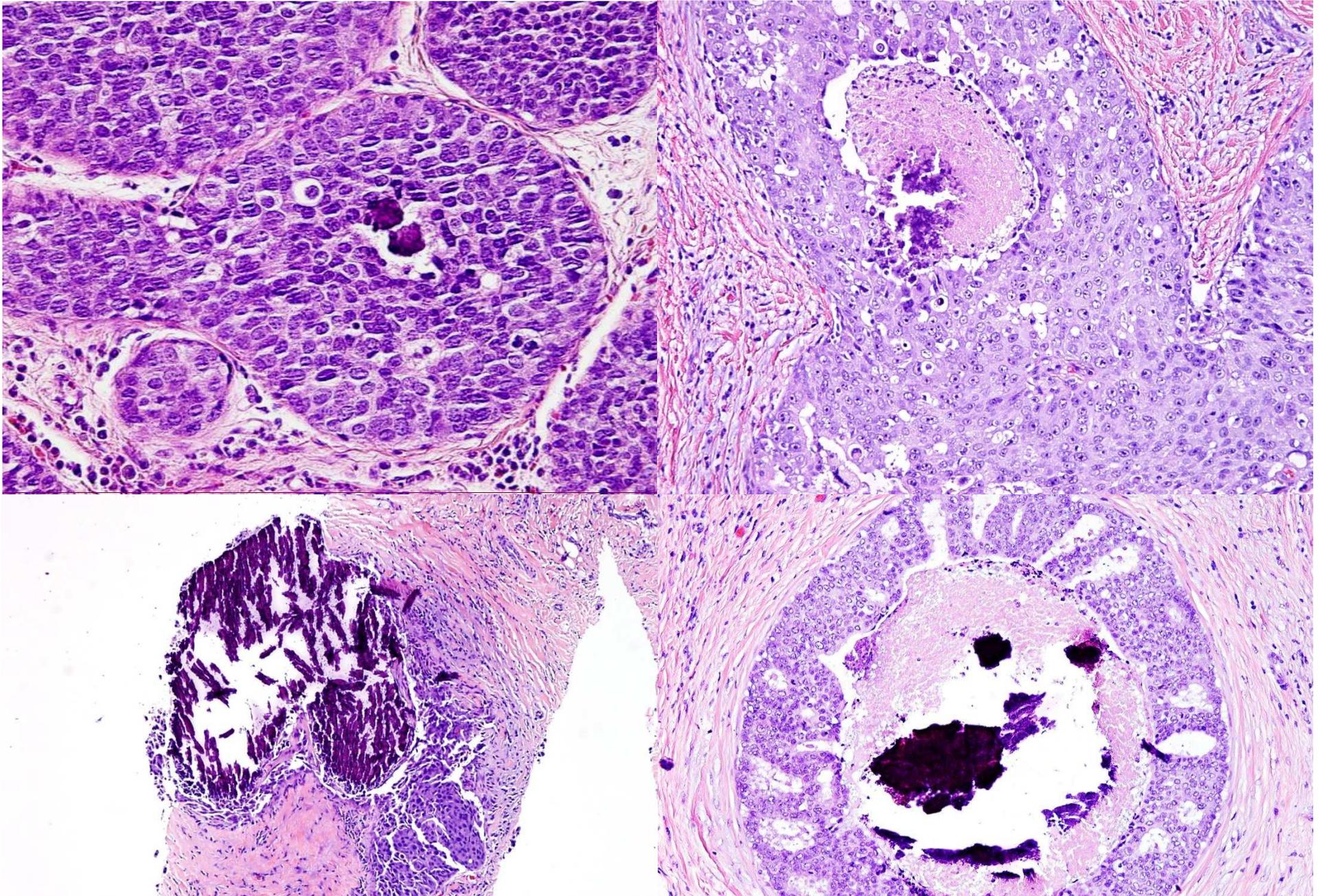
Mechanisms of Calcifications

Necrosis: Passive mechanism, necrotic debris undergo calcification, as in high-grade DCIS

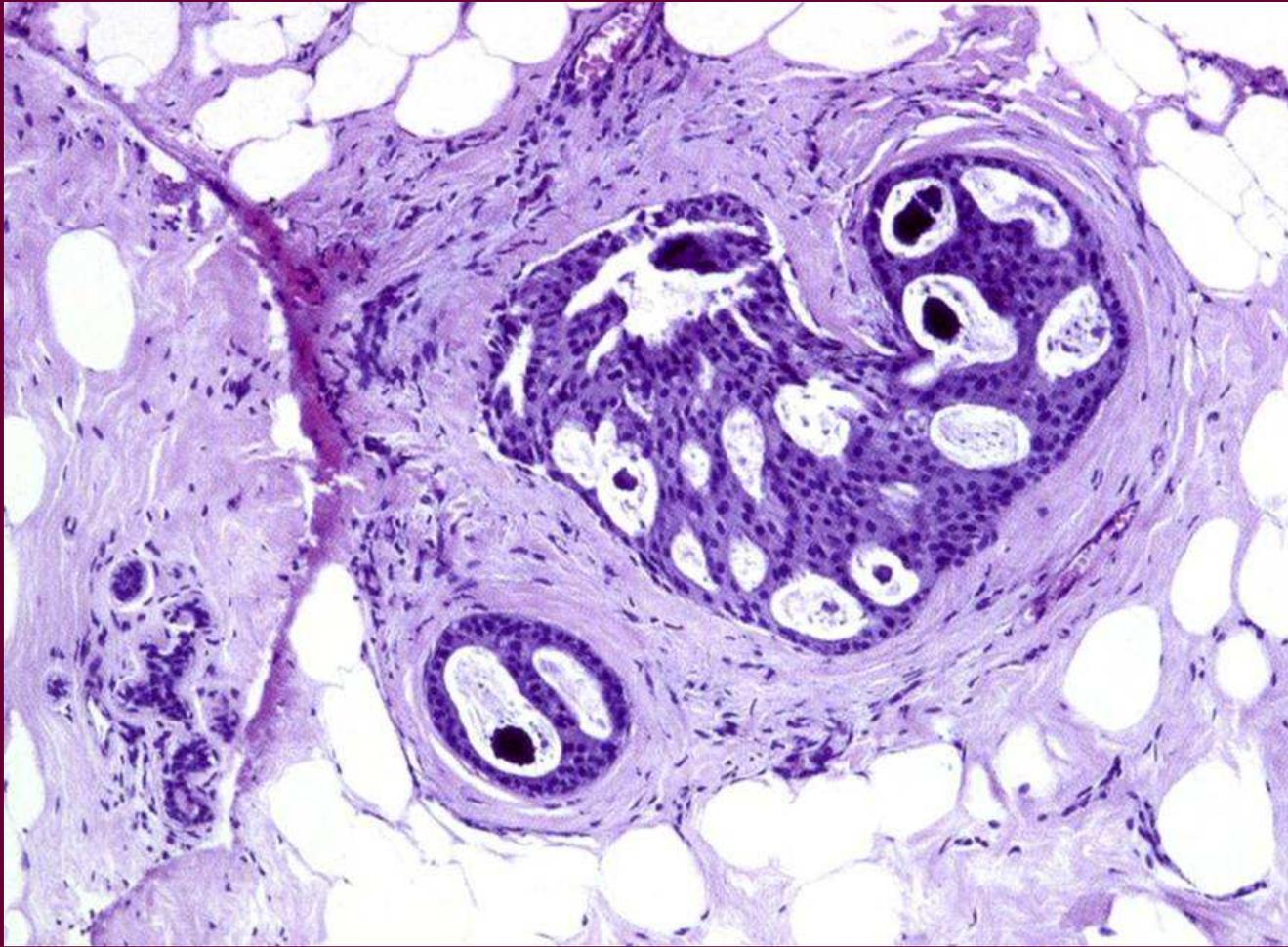
Secretion: Active mechanism, secretory vesicles that calcify, as in low-grade DCIS



Dystrophic Calcifications
Typically in High-Grade Duct Ca In Situ

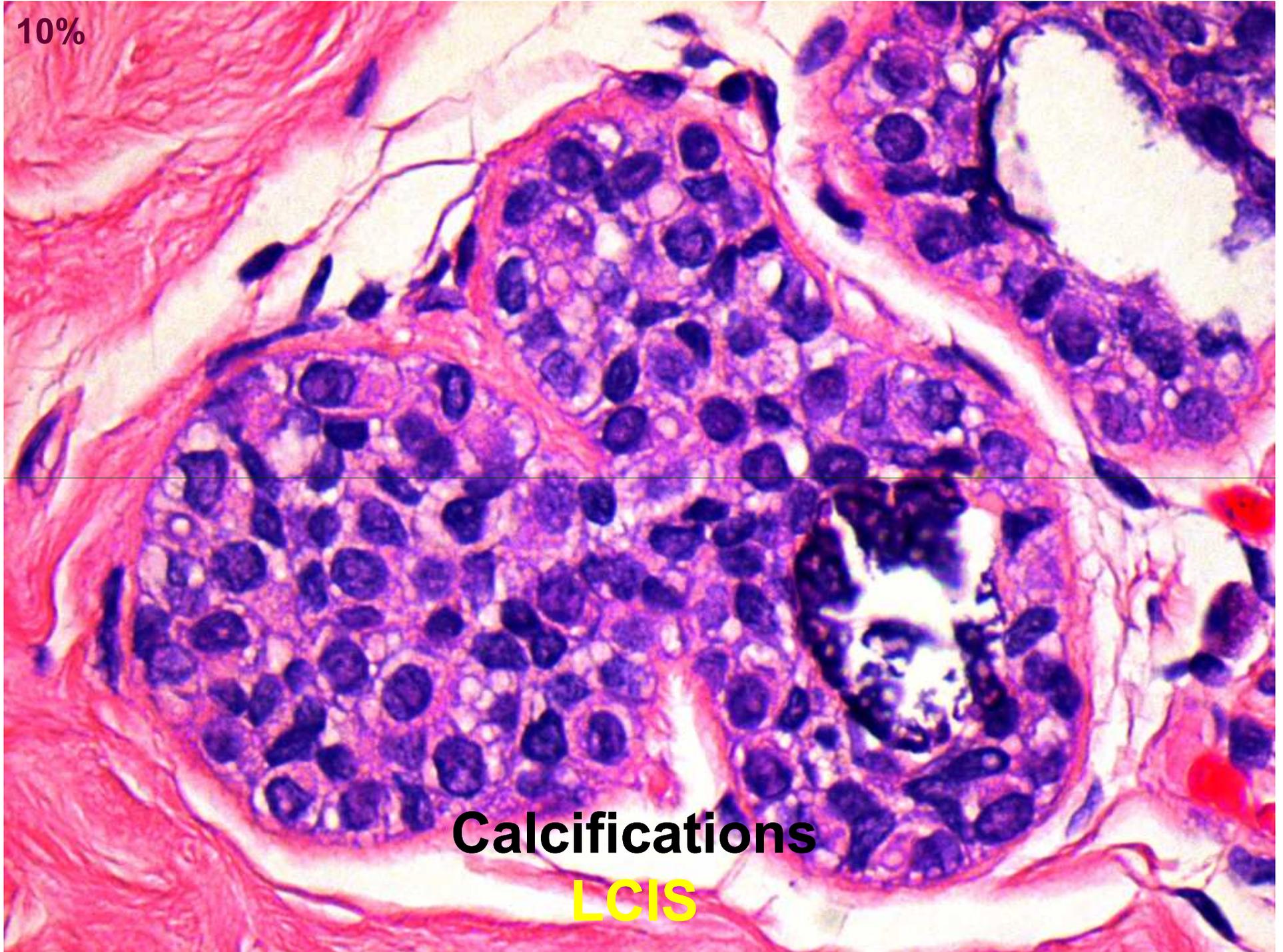


Calcifications in DCIS

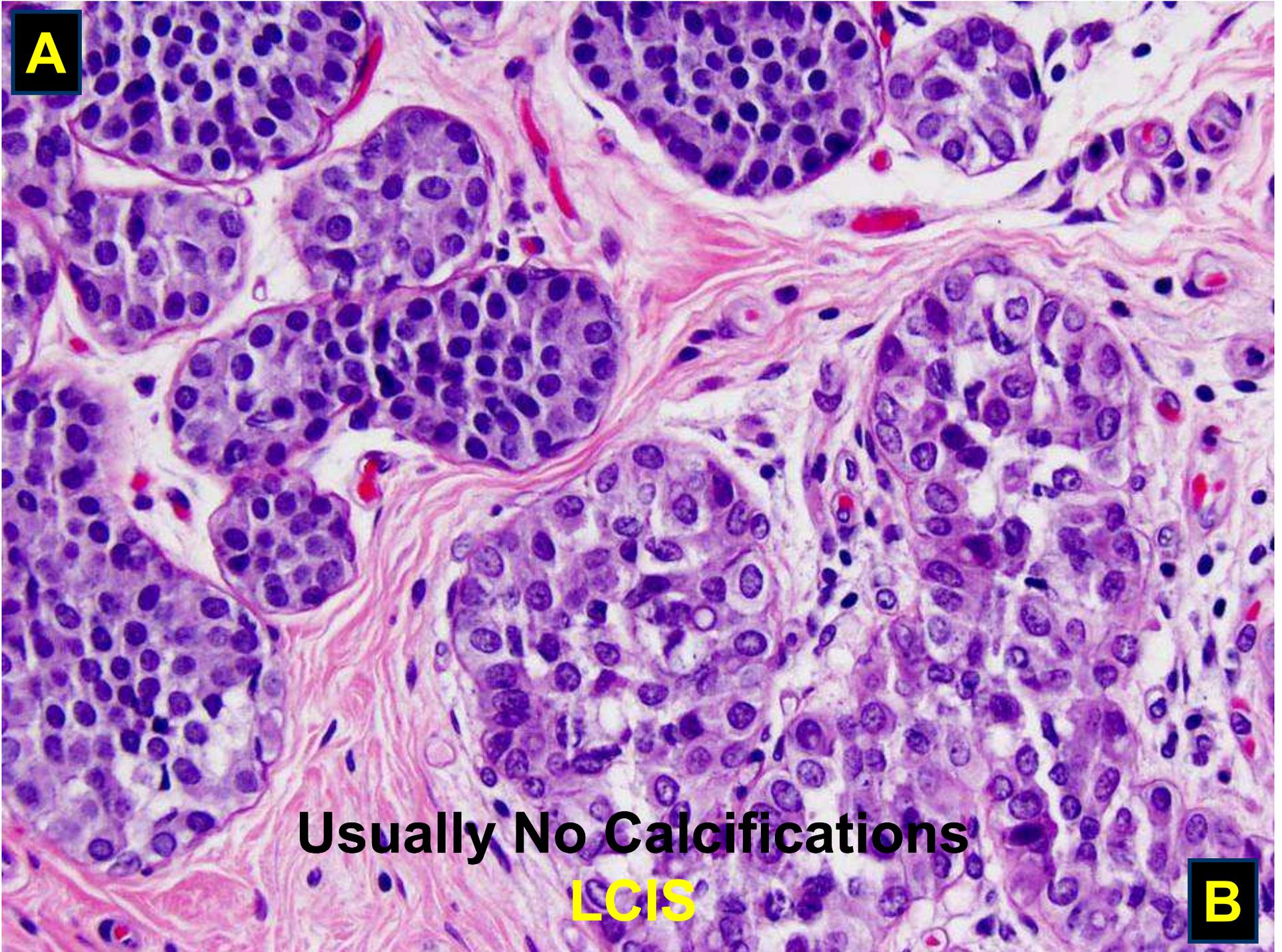


Calcium Phosphate
ADH

10%



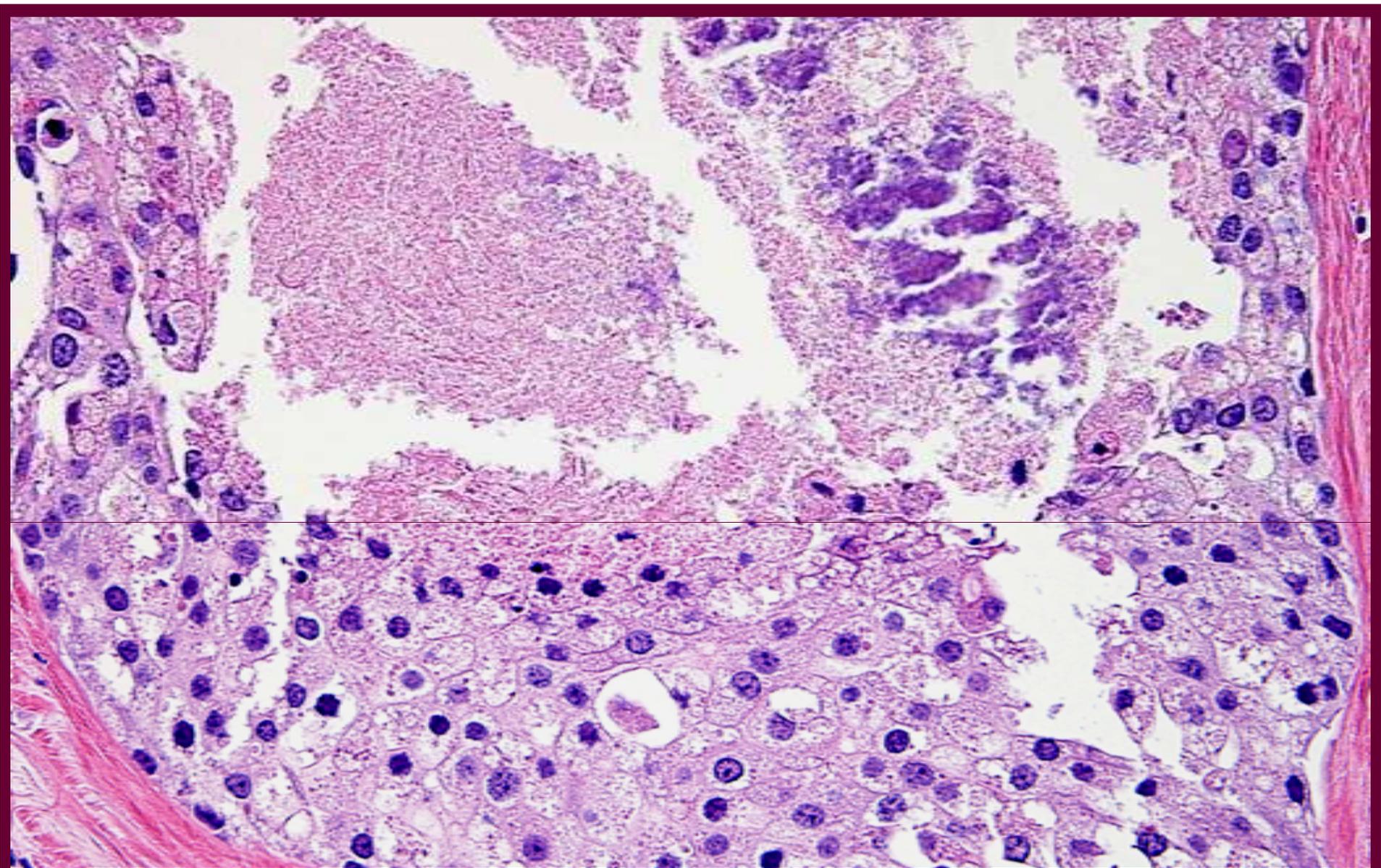
Calcifications
LCIS



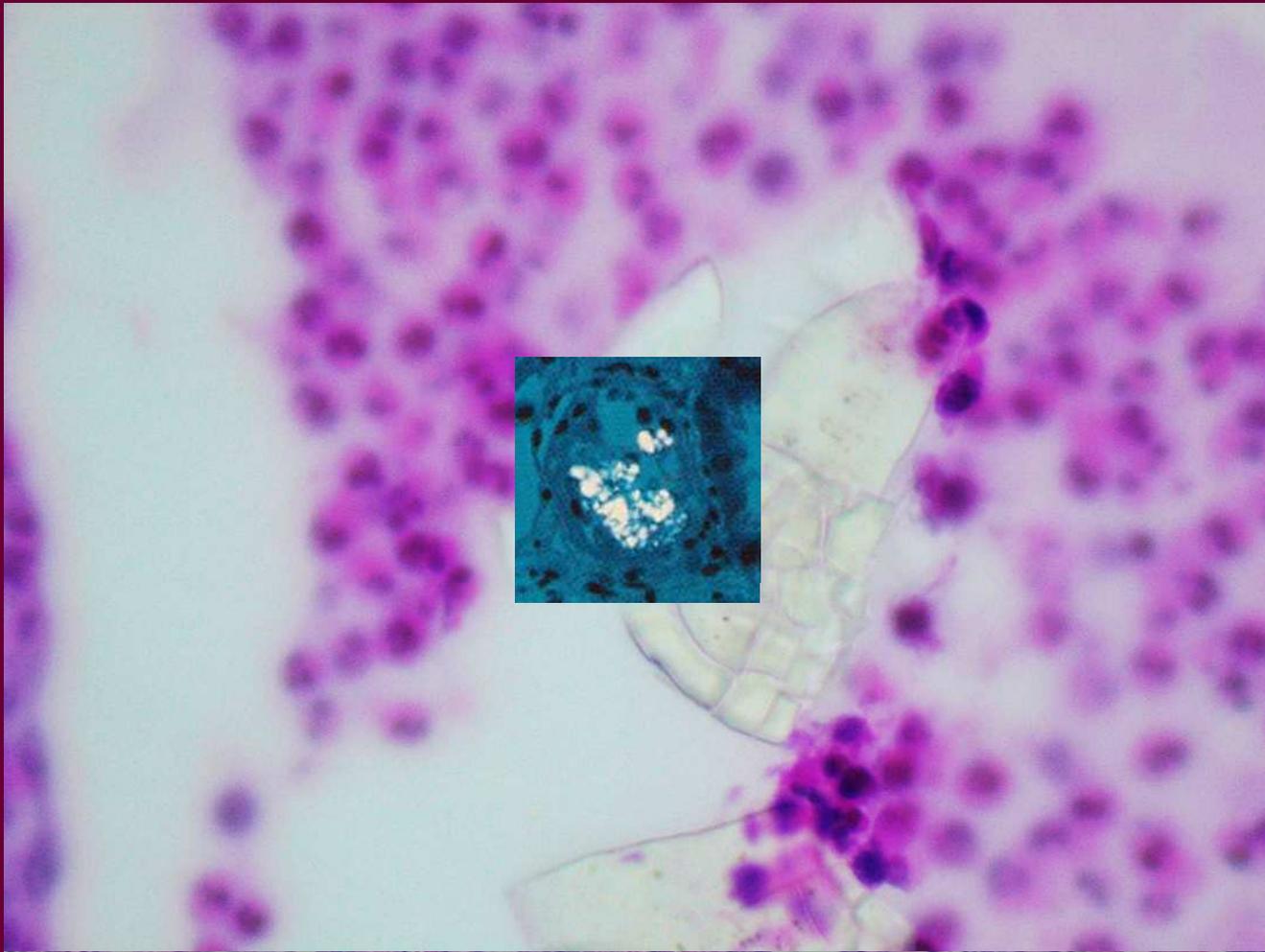
A

Usually No Calcifications
LCIS

B



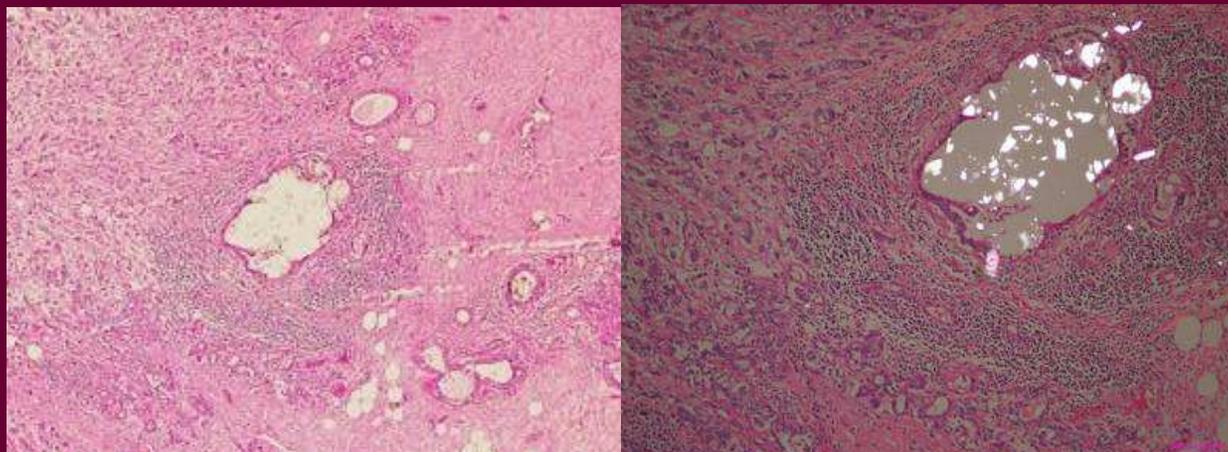
**LCIS Pleomorphic
Calcifications**

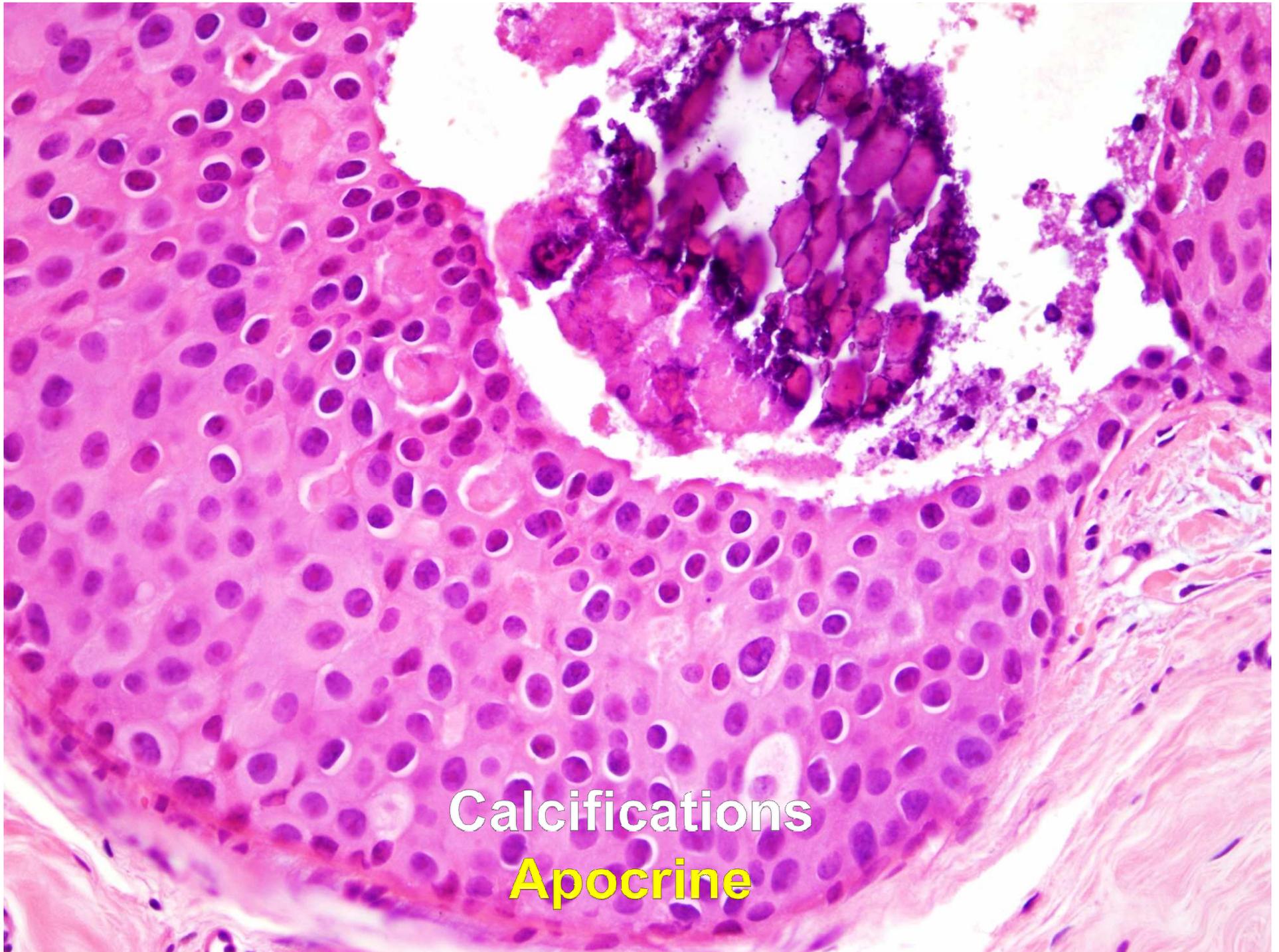


“Missing” Calcifications
Calcium Oxalate

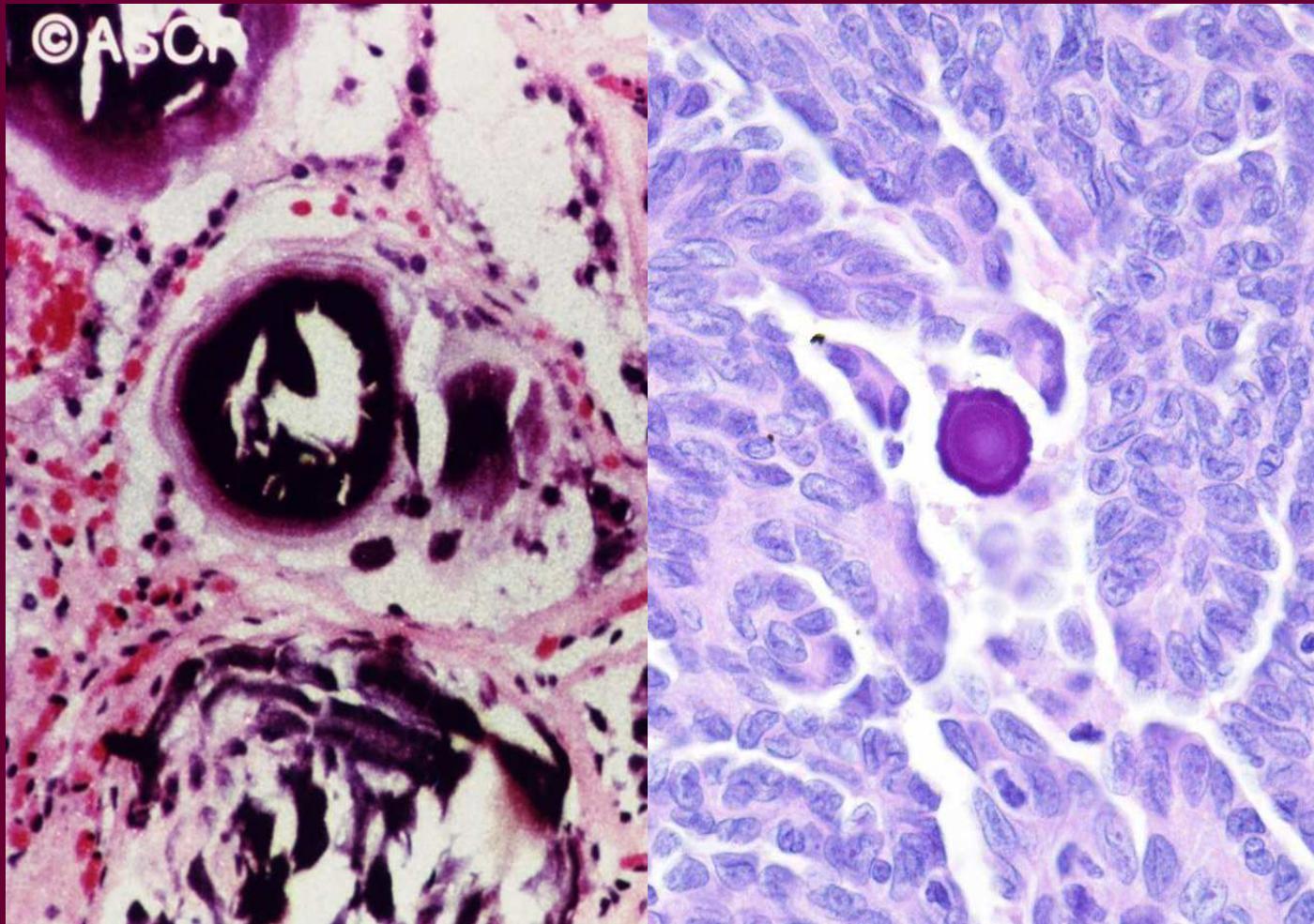
“Missing” Calcifications
Calcium Oxalate Crystals

Almost Always in Apocrine Cysts
Need Polarization for Identification
Almost Never Malignant

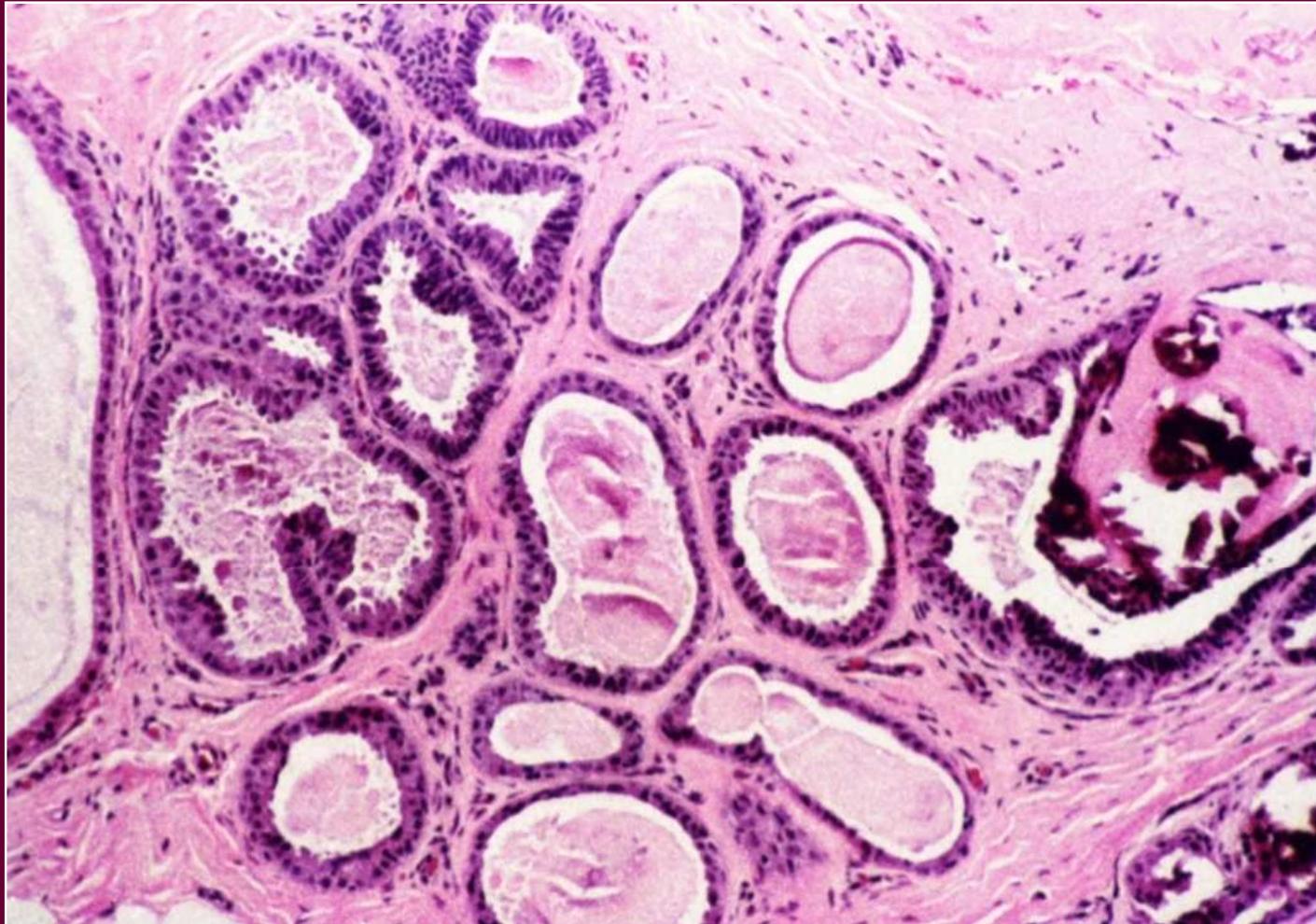




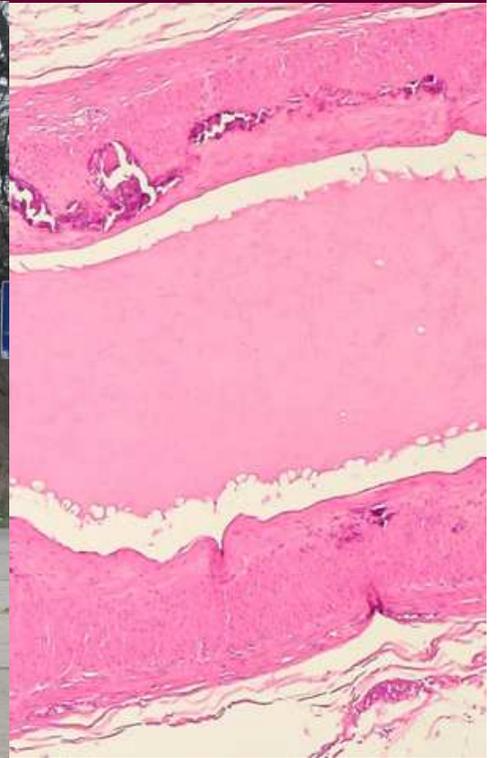
Calcifications
Apocrine



**Psammomatous Calcifications in
Pregnancy-Like Change & Papillary Lesions**

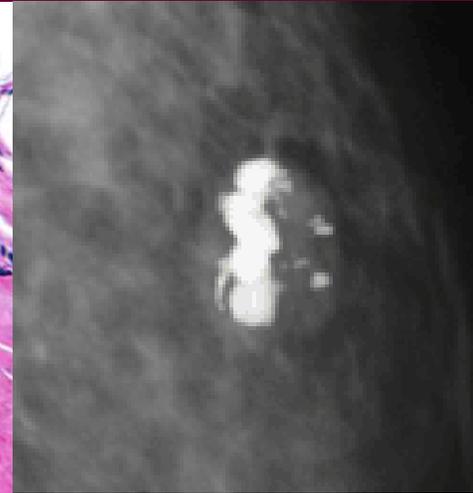
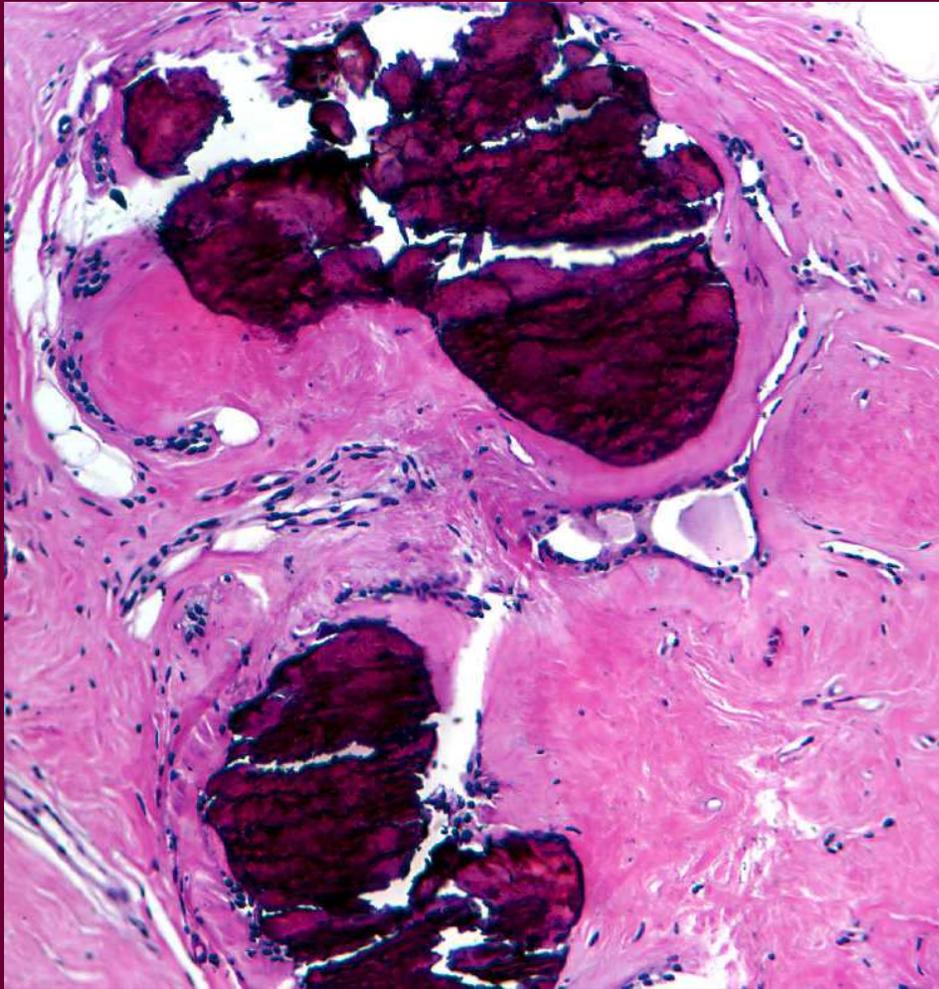


**“Ossifying” Calcifications
in Columnar Cell Lesions**

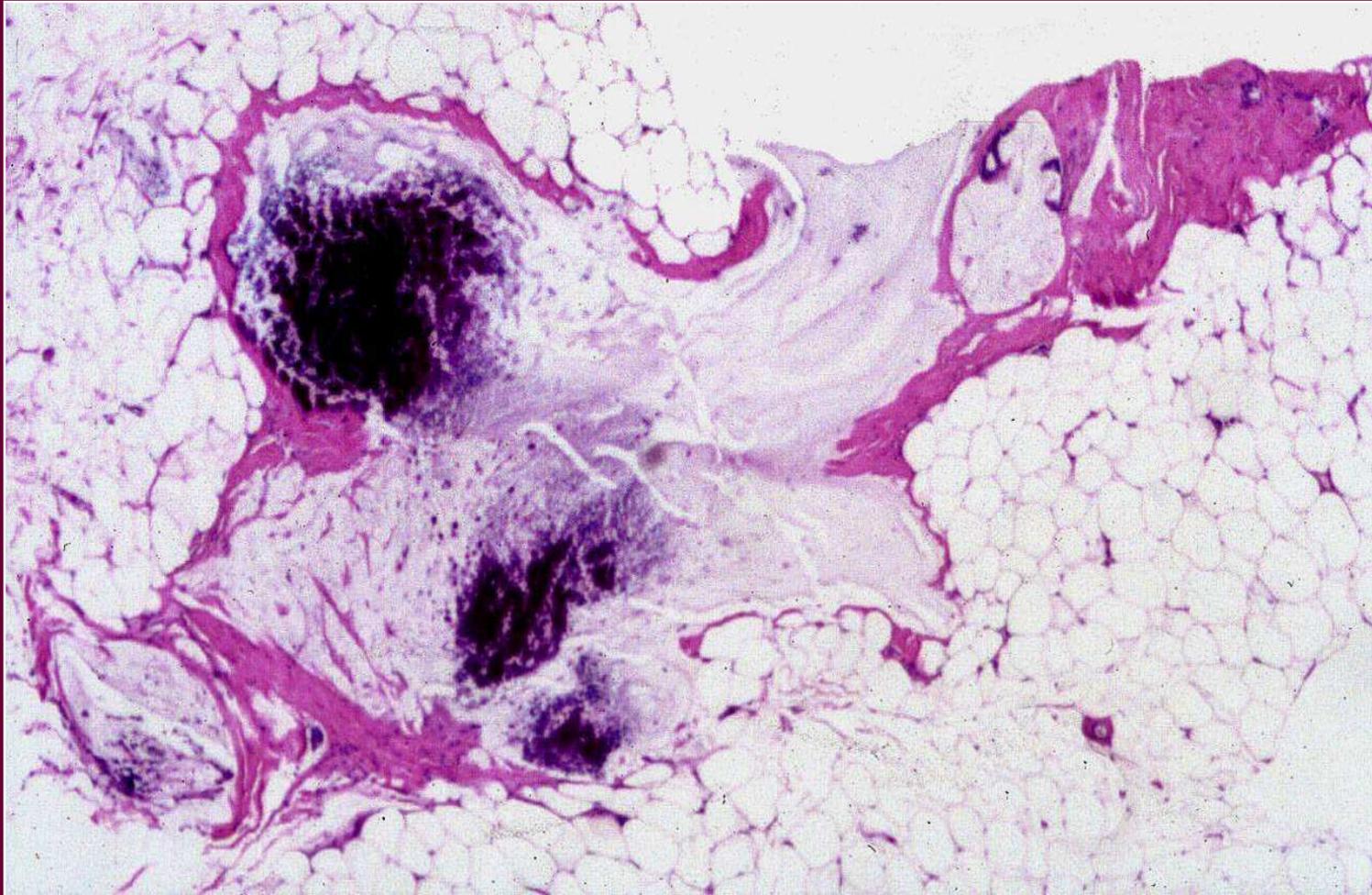


Vascular Calcifications

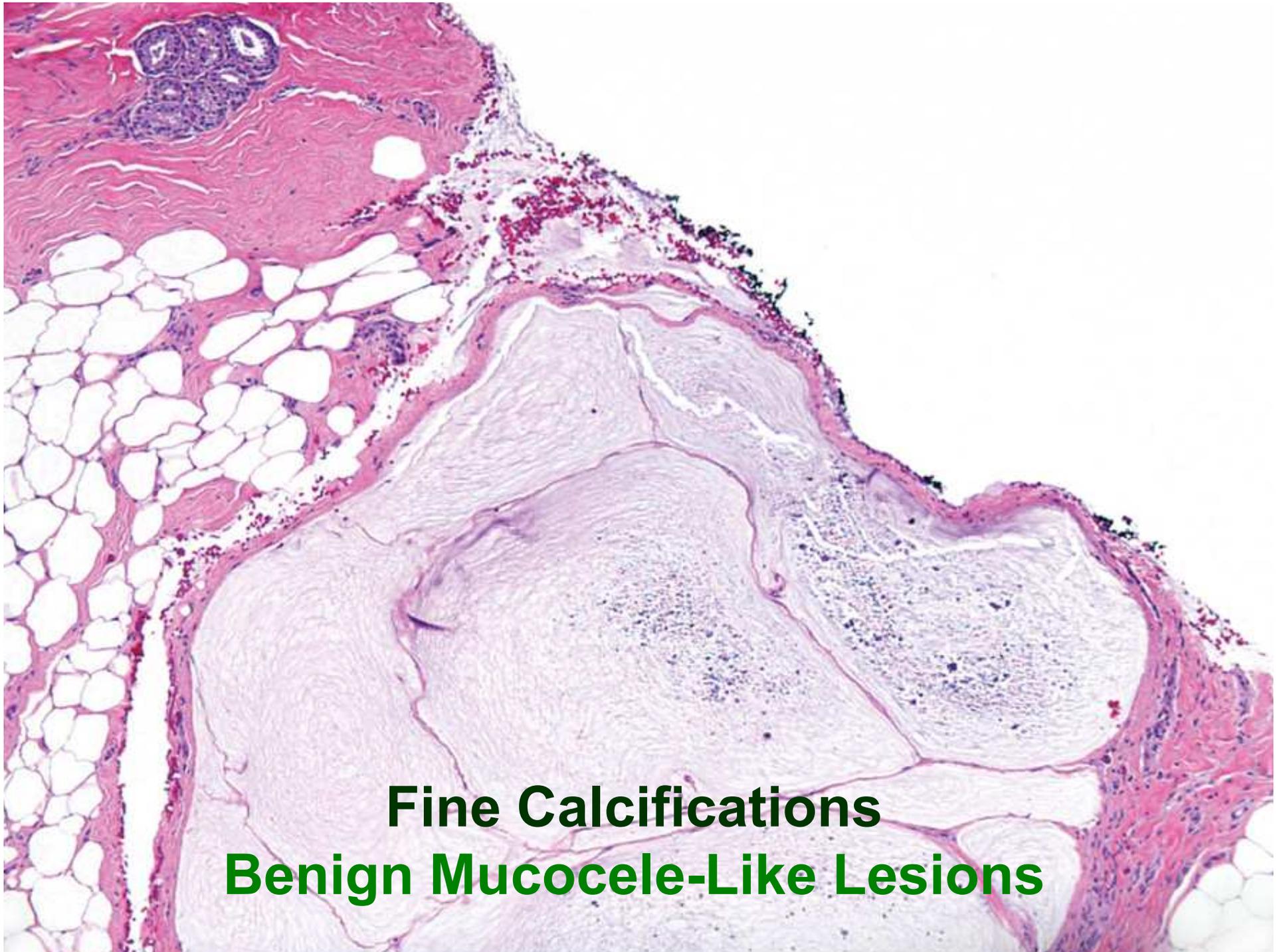
50+, Diabetics



Stromal Calcifications
Fibroadenoma



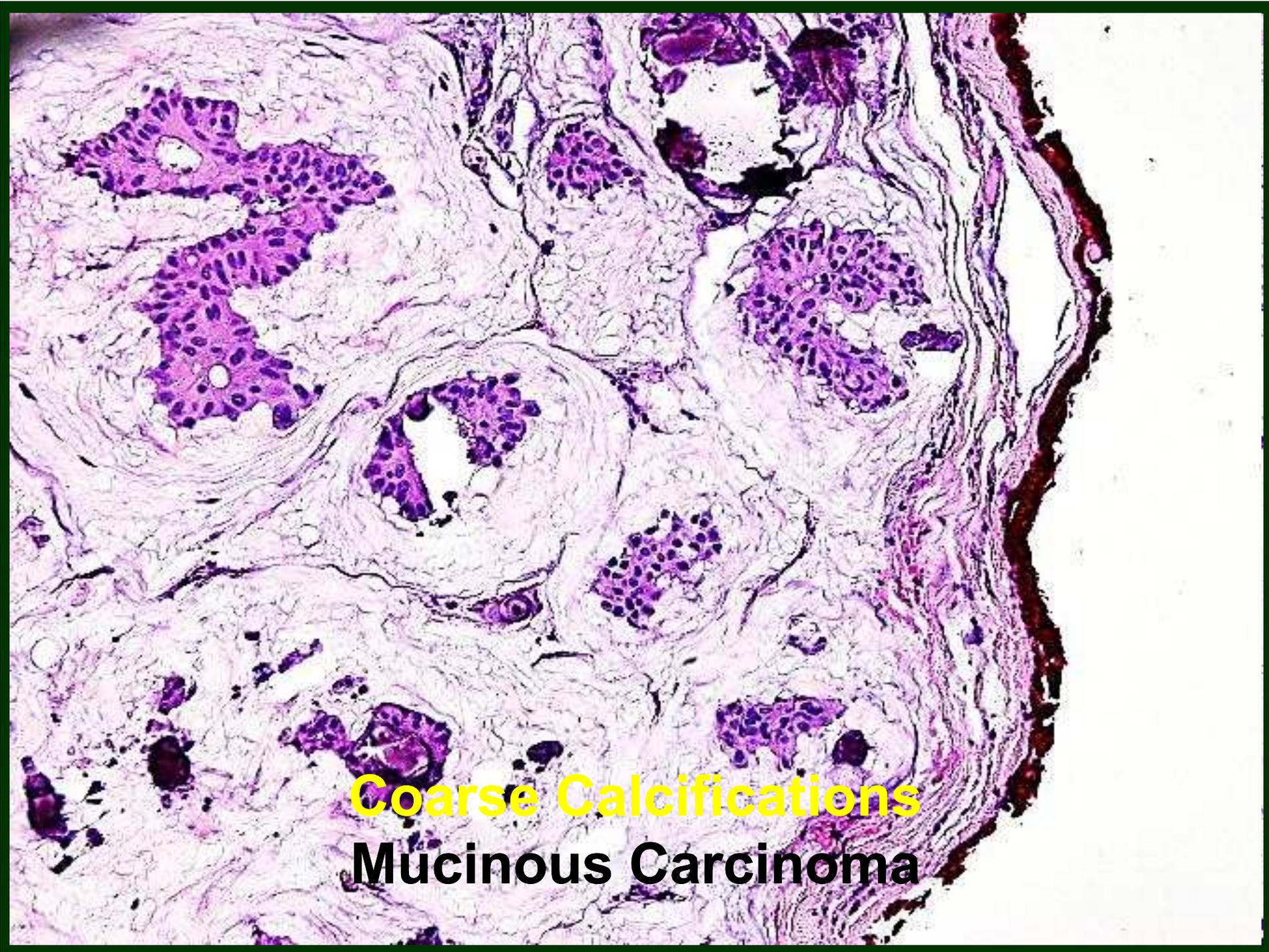
“Unusual” Calcifications
Benign Mucocele-Like Lesions



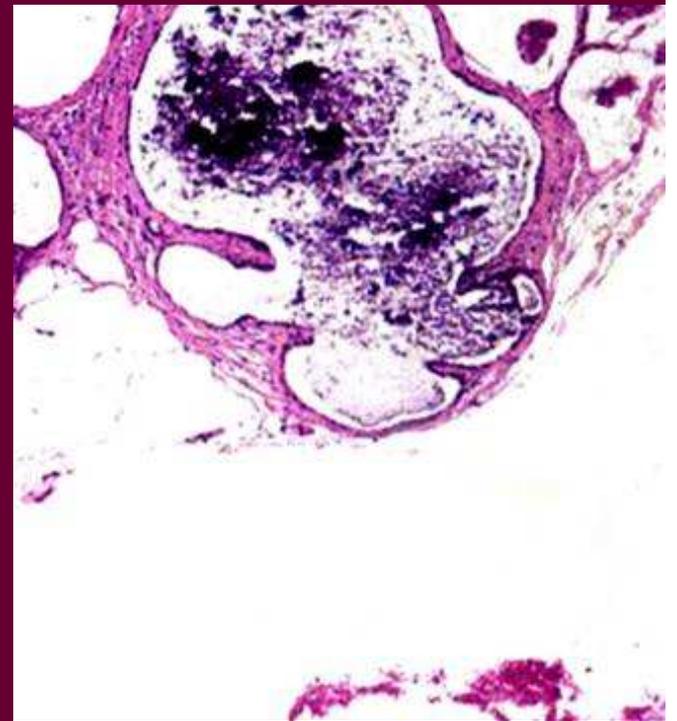
Fine Calcifications
Benign Mucocele-Like Lesions

Mucocele-Like Lesions

- **53 Lesions, 2 Bilateral Cases**
- **Mean Age 48 (24-79)**
- **25 Benign, 28 Malignant**
 - **15/28 Mucinous Ca**
 - **13/28 DCIS, Micropap or Cribriform**
- **Malignant lesions had coarser ca++**



Coarse Calcifications
Mucinous Carcinoma



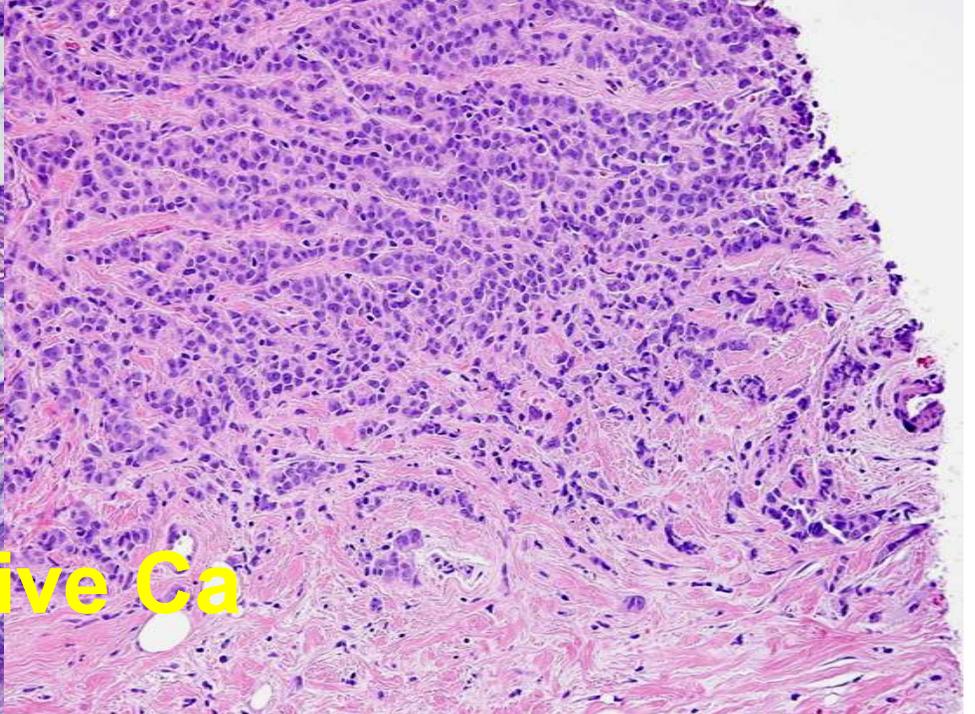
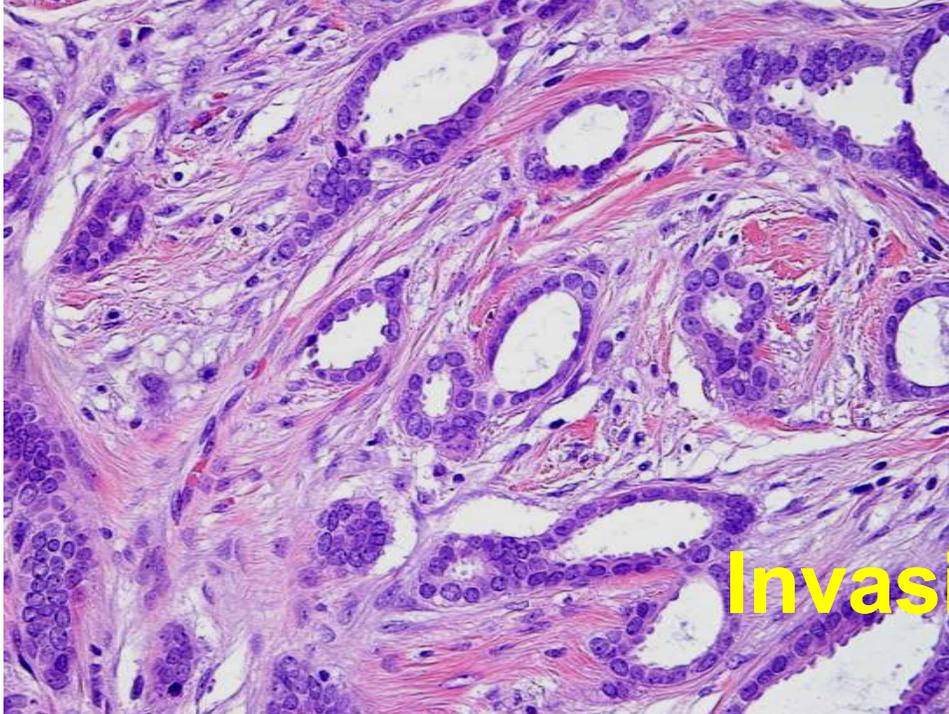
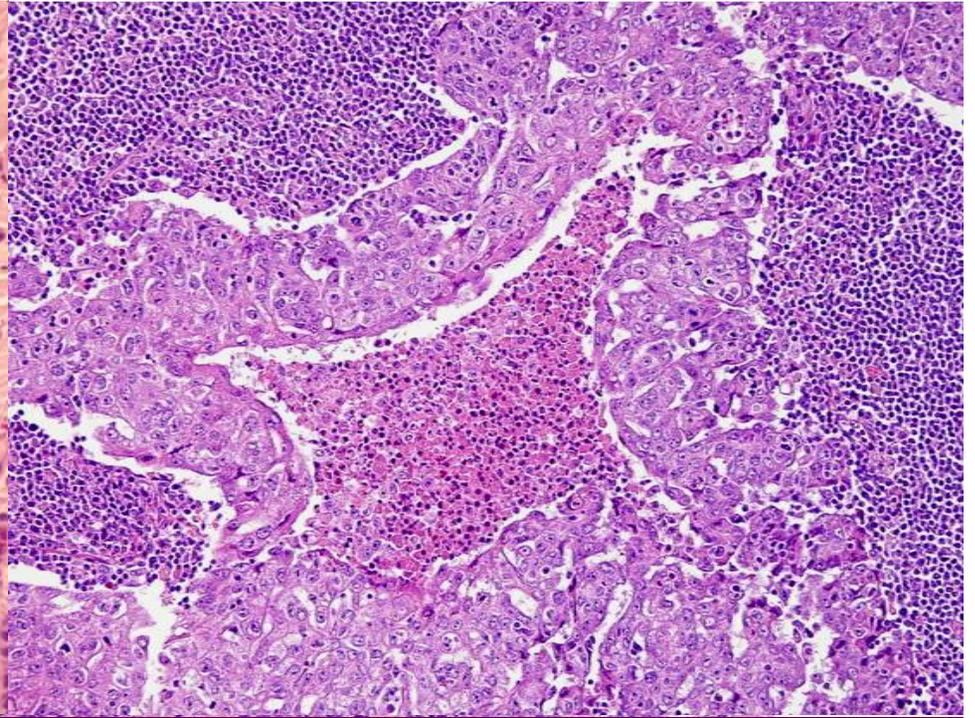
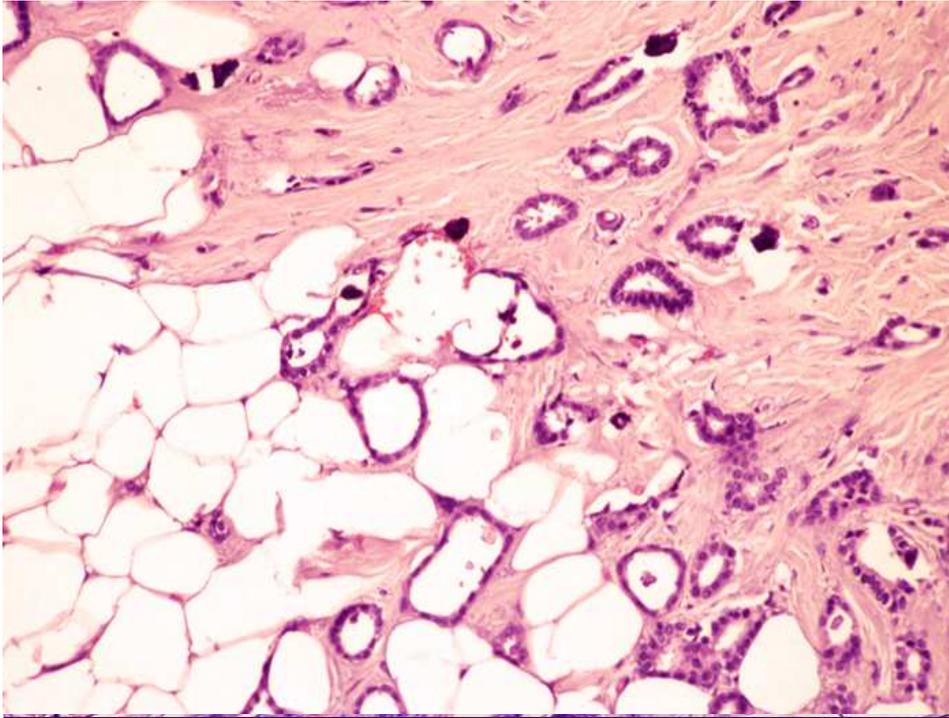
Calcifications in Invasive Carcinoma

50% of invasive ca have calcifications

Younger patients, <40, with invasive carcinoma have calcifications in 88%

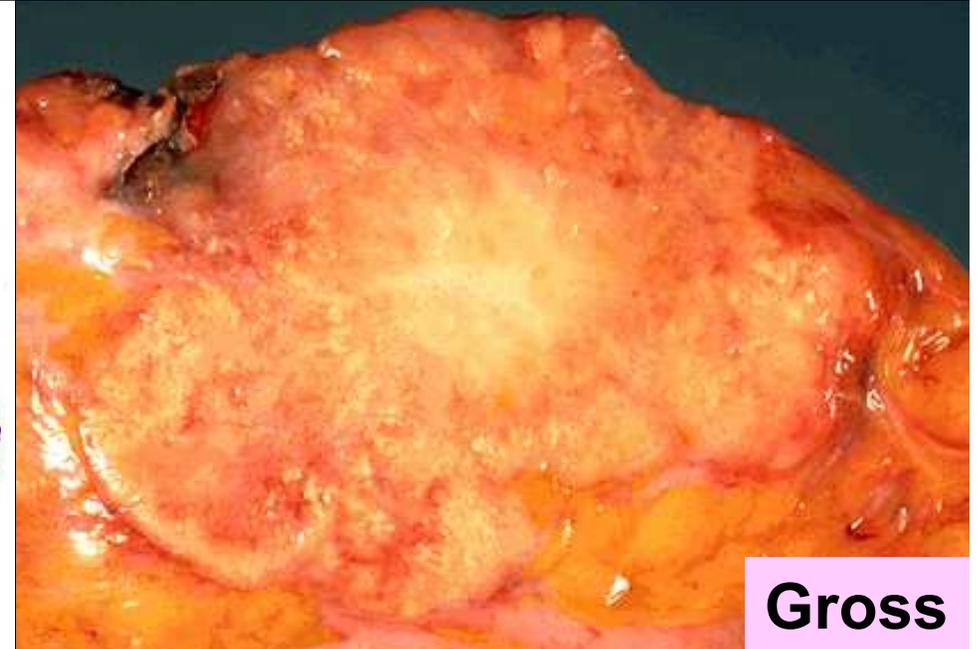
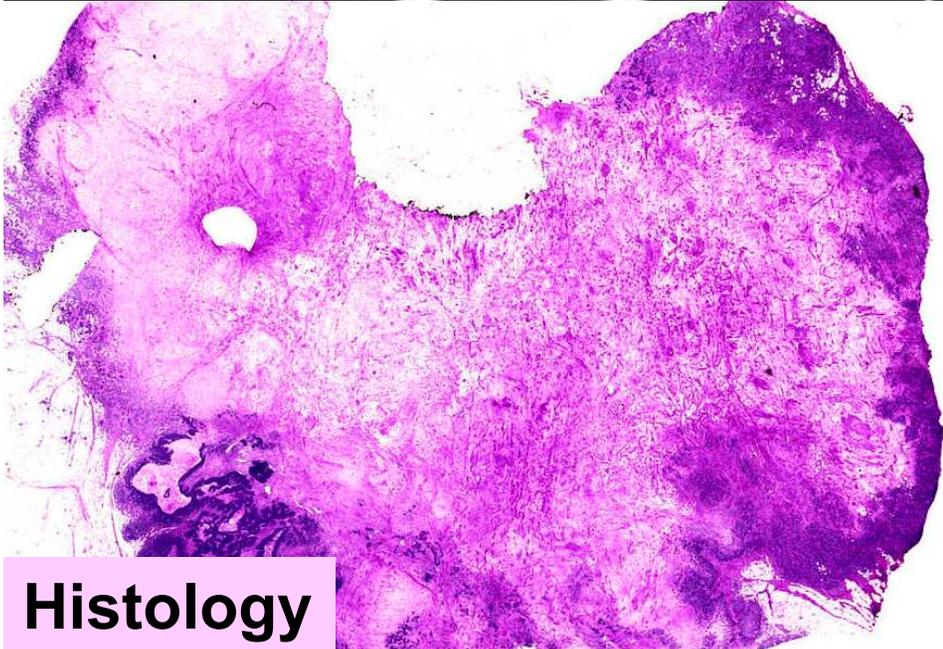
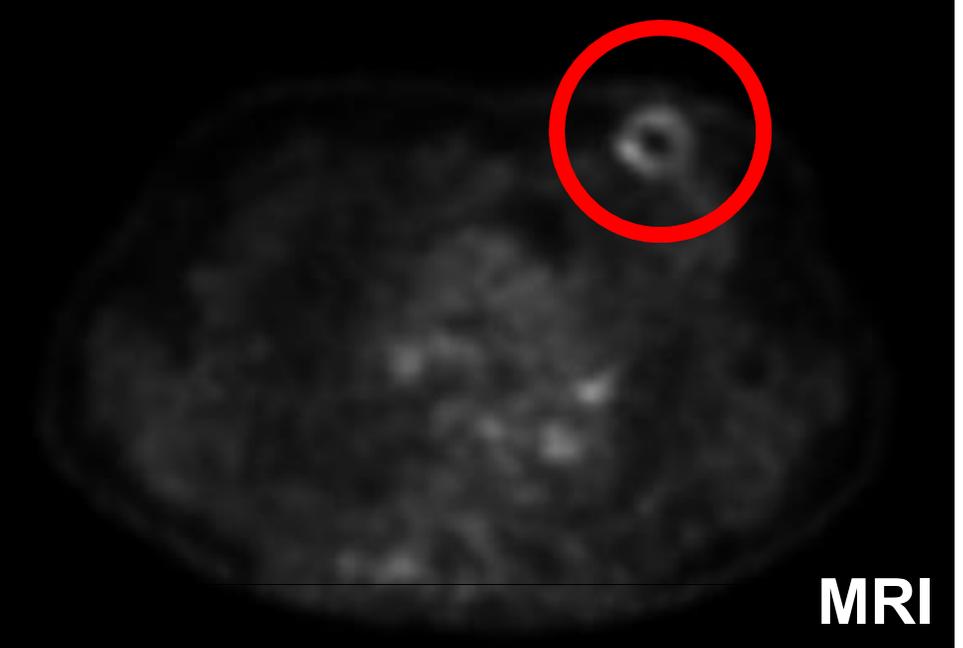
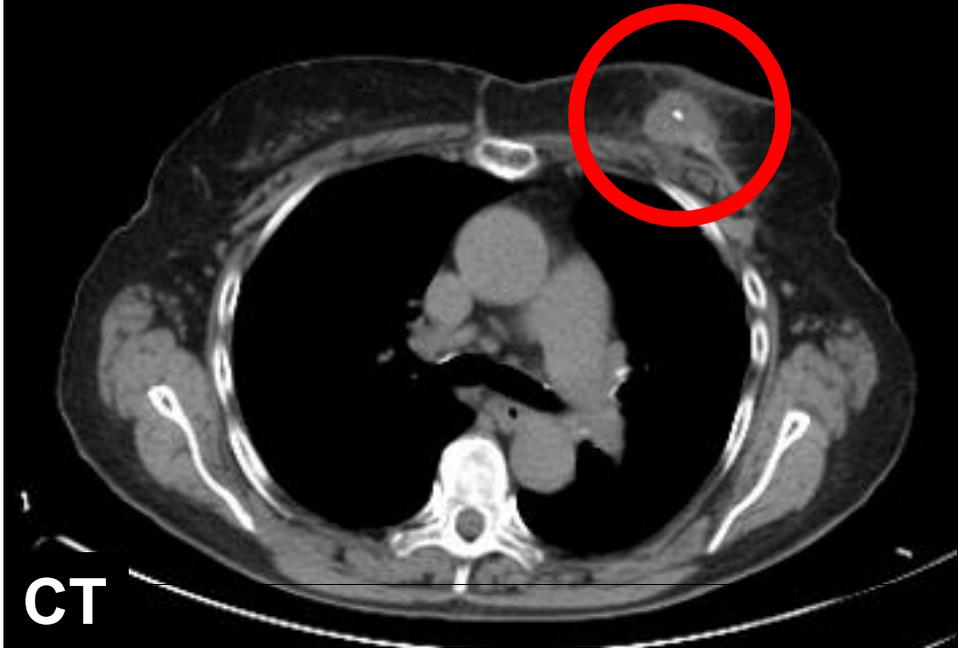
Older patients, >70, with invasive carcinoma have calcifications in 22%

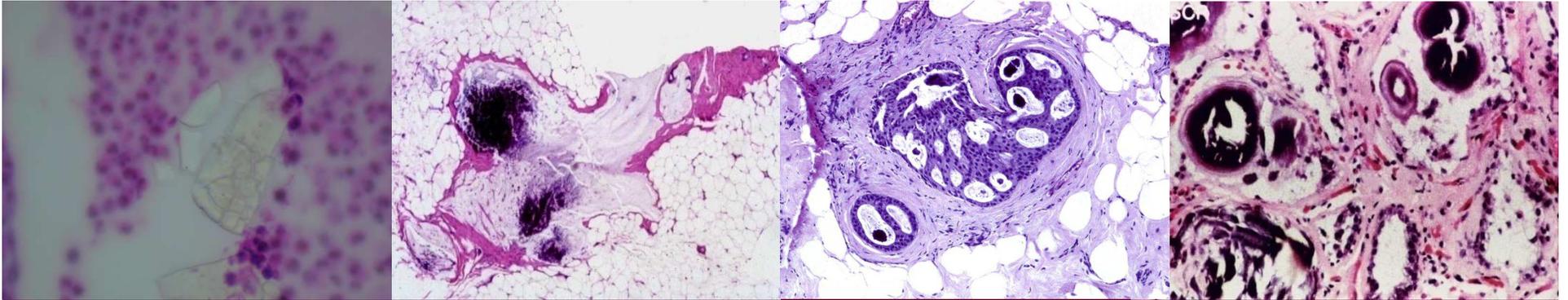
Br J Radiol 2000;73:698



Invasive Ca

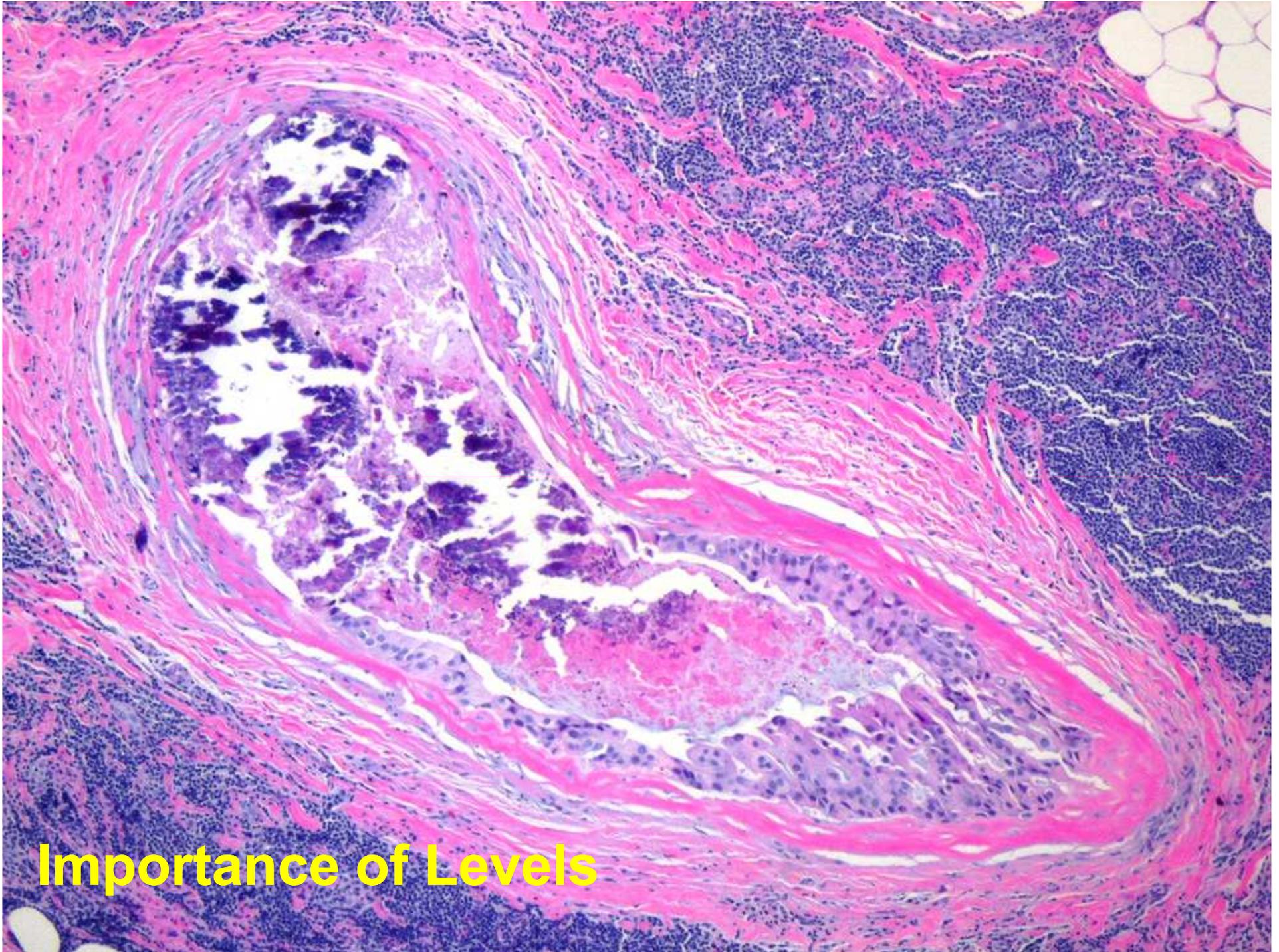
Typical Triple-Negative Carcinoma



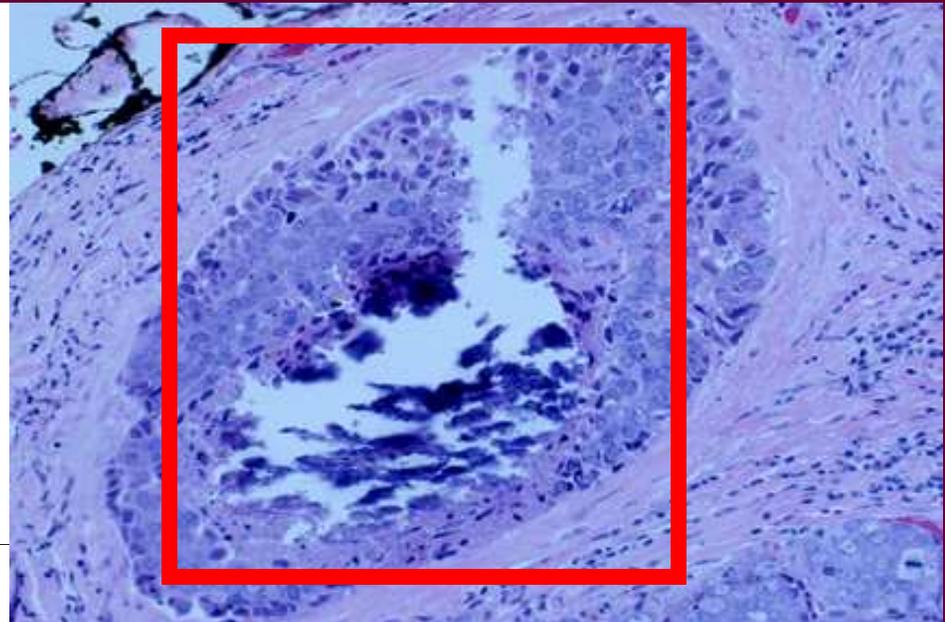
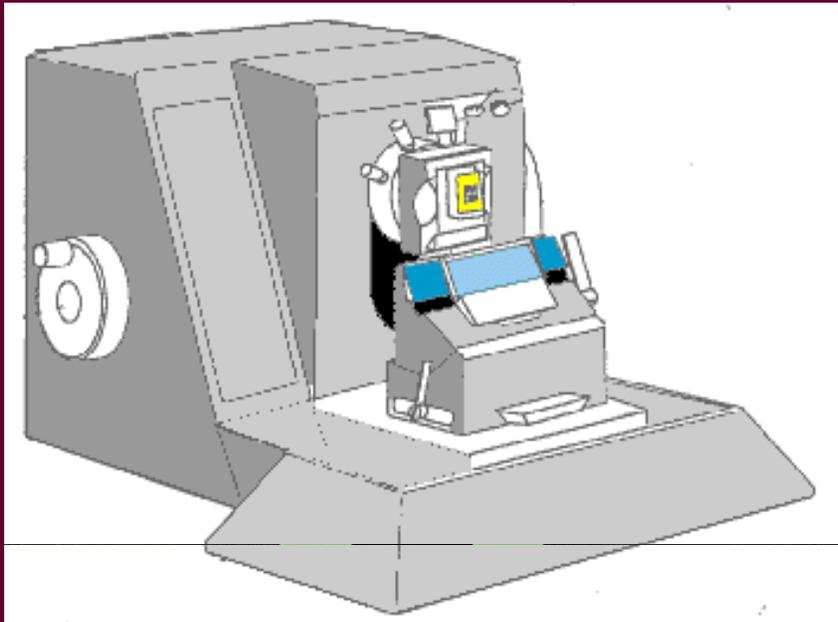


- If Biopsy is for Ca⁺⁺, report presence
- If no Ca⁺⁺, look for Ca⁺⁺ oxalate
- If still no Ca⁺⁺, x-ray blocks, obtain levels
- If still no Ca⁺⁺, review mammogram
- Consider loss of Ca⁺⁺ in preparation
- Ca⁺⁺ may be aspirated into mammotome

AJR 2003;180:275



Importance of Levels

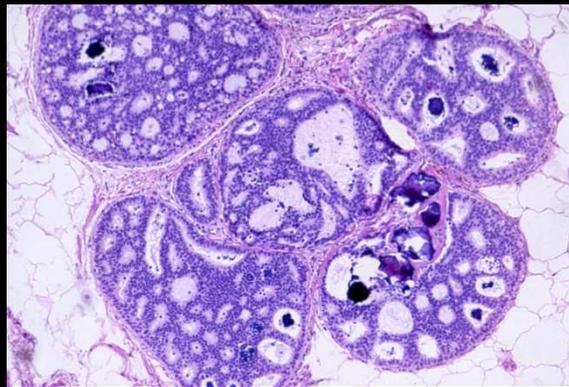


Loss of Calcifications
During Specimen Preparation

Case 2

Radiation Oncologist & Surgeon's Query:

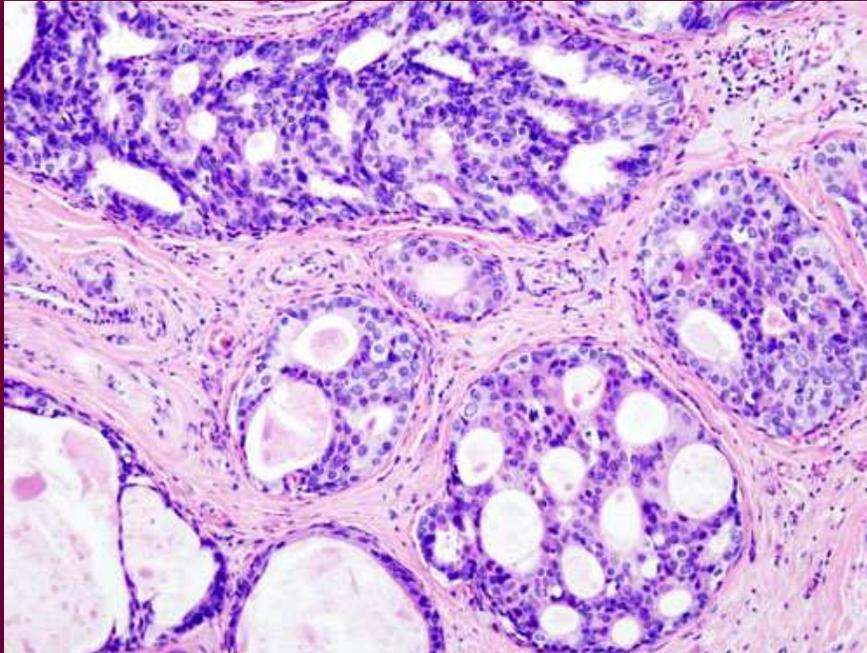
**Diagnosis of DCIS on Core,
No Residual DCIS on Excision,
Extent of DCIS?**



DCIS on 1 Slide: **2mm**

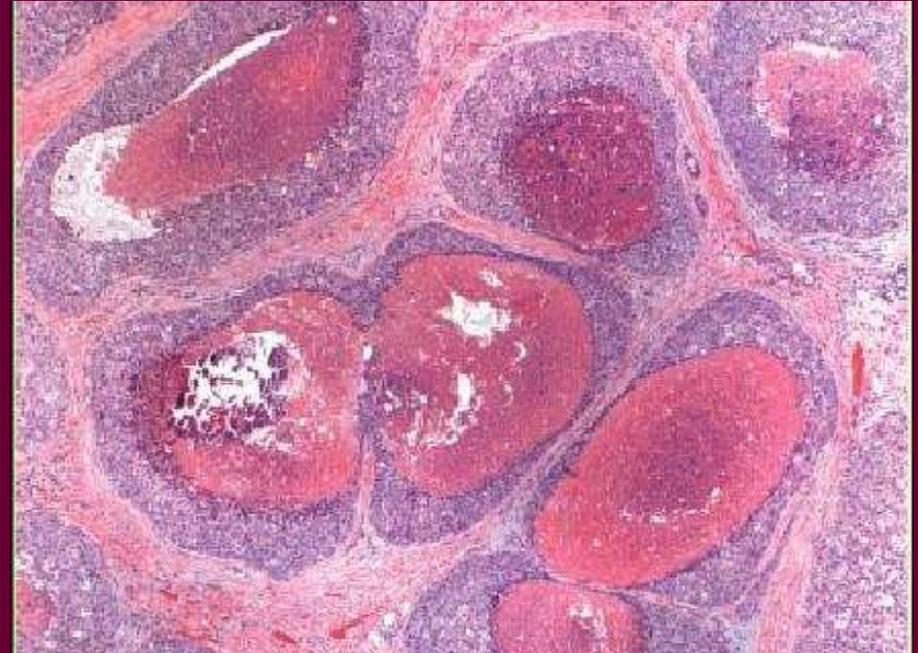
“Size” of DCIS

- **Direct Measurement from Slide**
- **# Consecutive Sections Involved**
- **# Ducts Involved**
- **Key: Sectioning of Specimen**
- **Correlation with Imaging**



Calcifications in DCIS

Low-grade

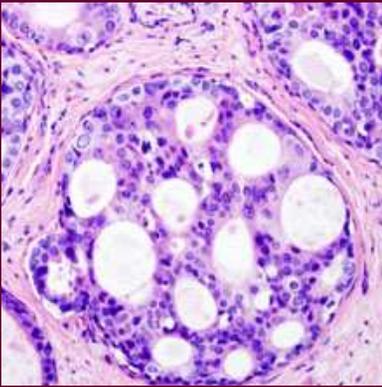


High-grade

Caveat: Calcifications in DCIS

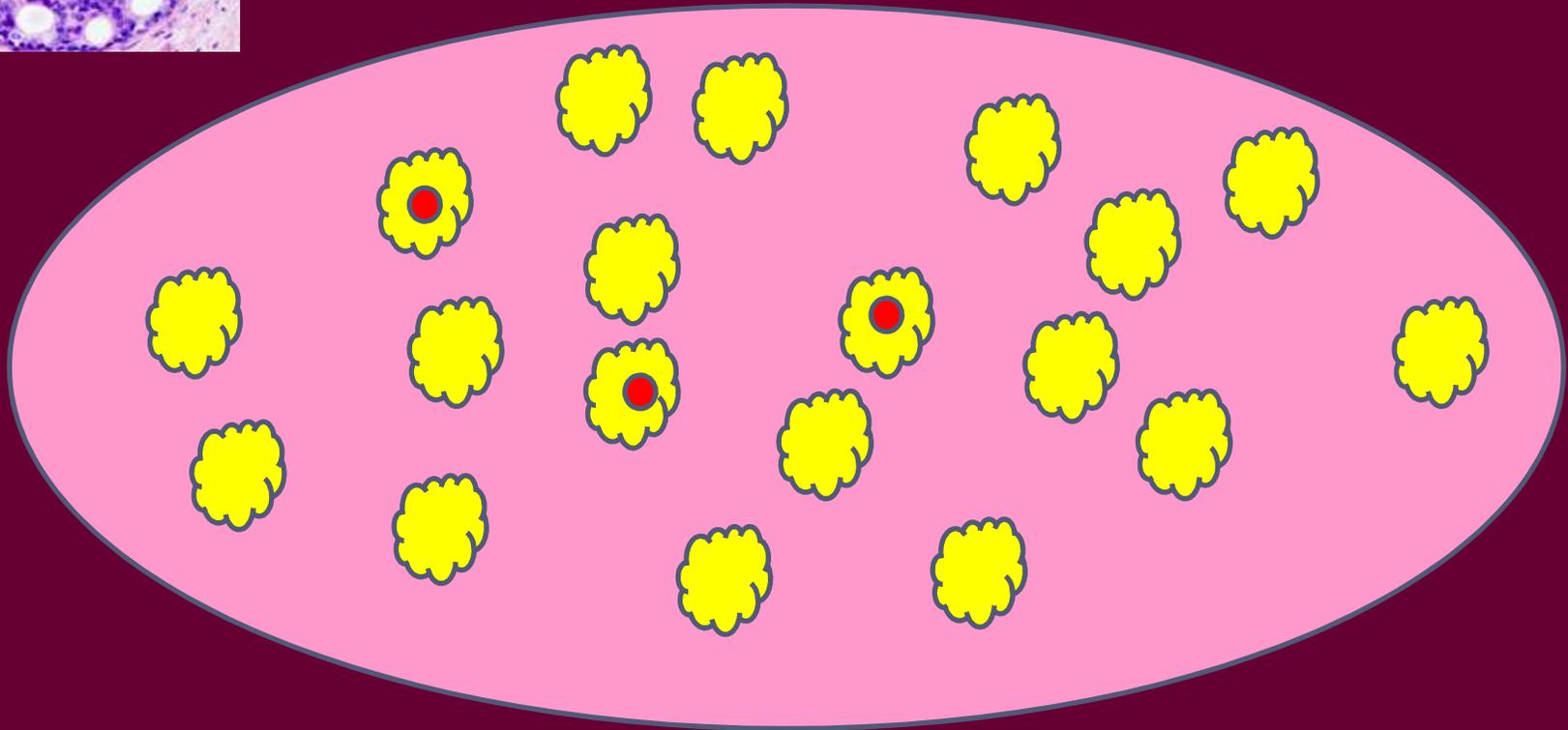
High-grade DCIS undergoes calcification more often and more diffusely: can be used to assess extent

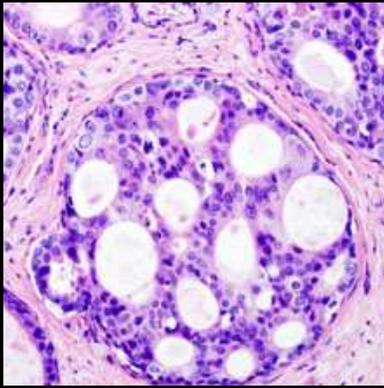
Low-grade DCIS undergoes calcification less often and less diffusely: cannot be used to assess extent



Low-Grade DCIS

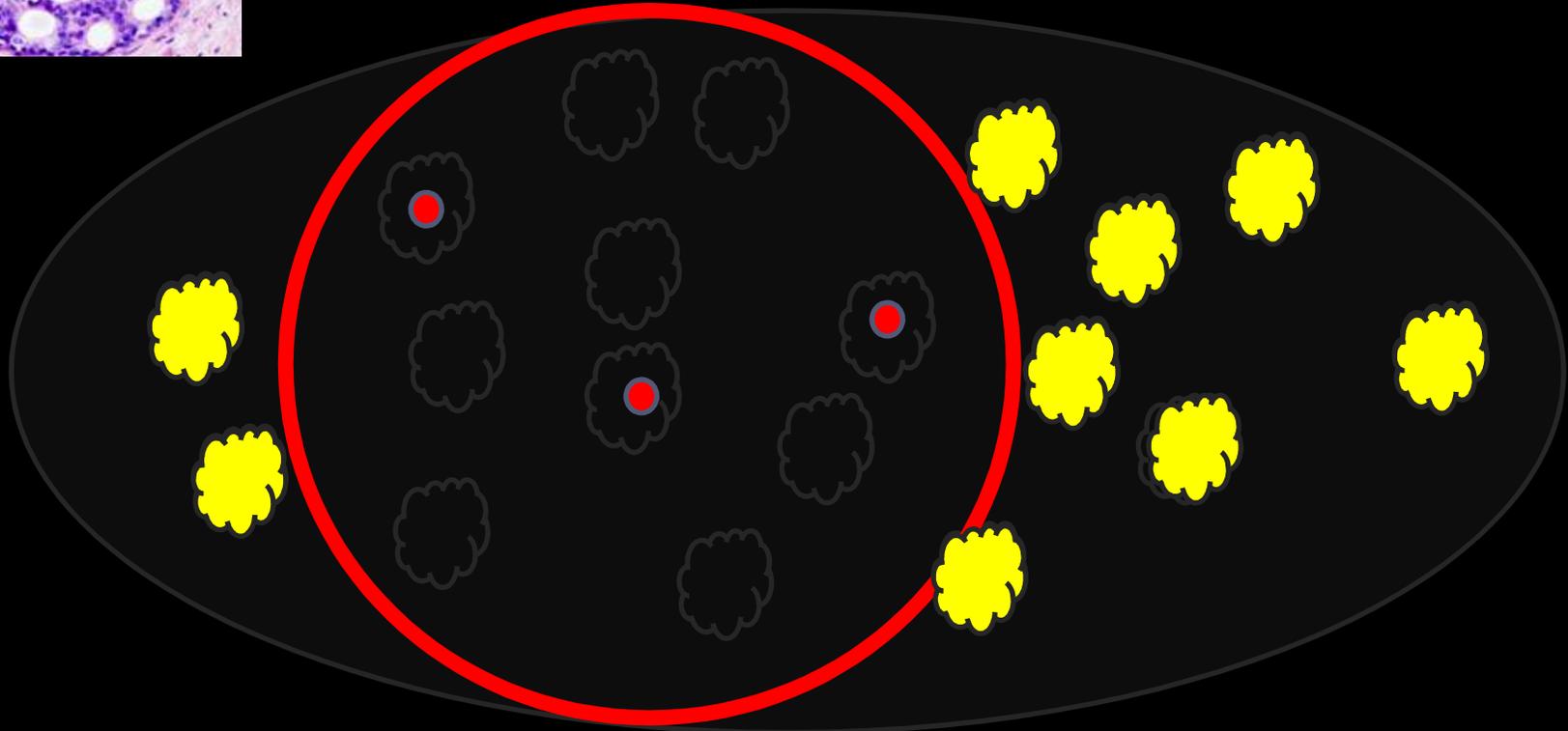
Calcifications in Red

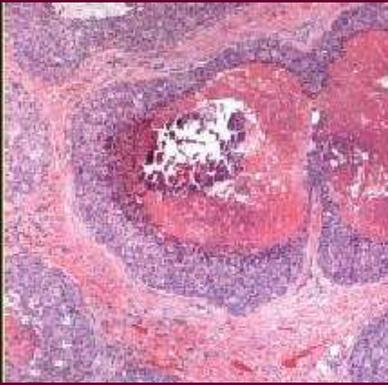




Low-Grade DCIS

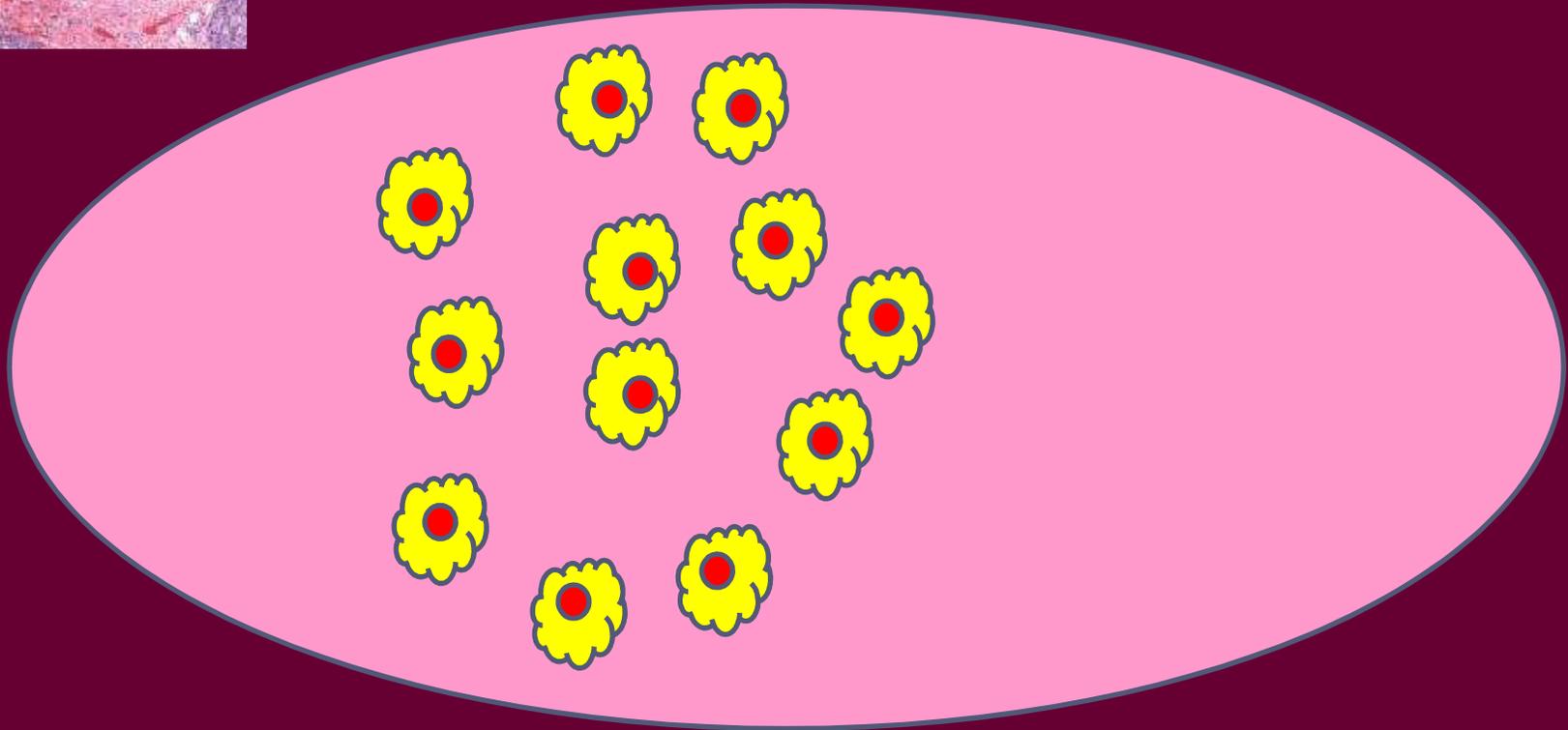
Mammogram

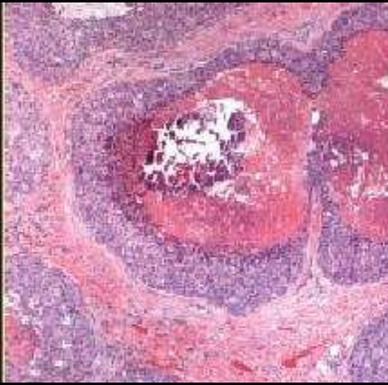




High-Grade DCIS

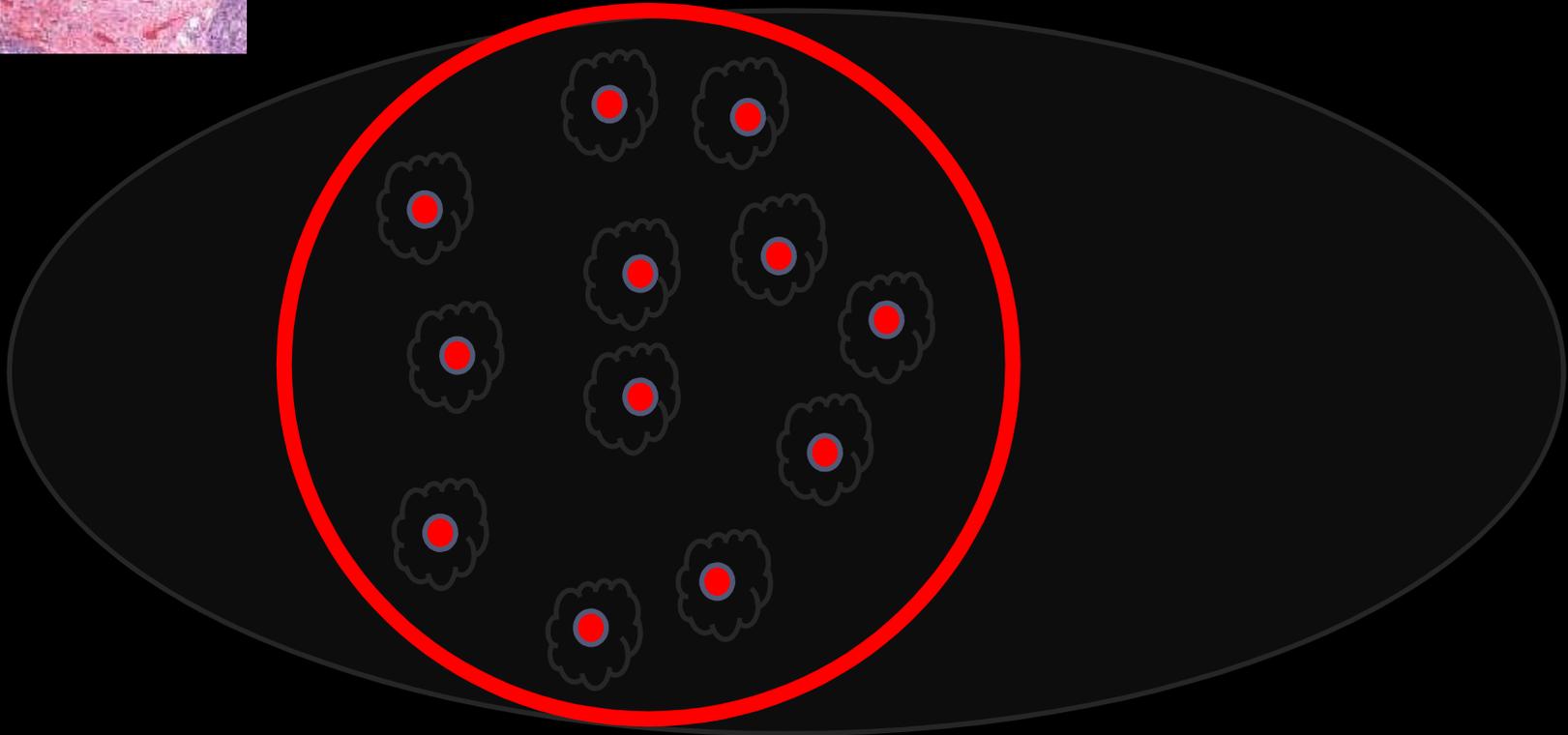
Calcifications in Red

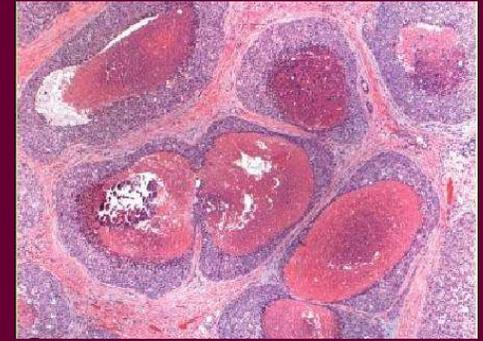
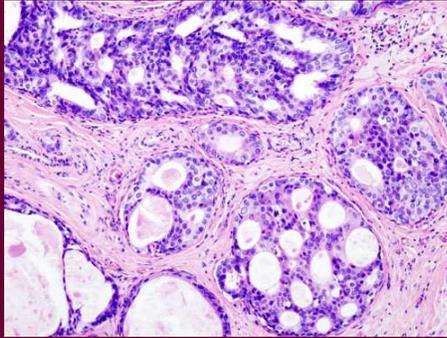




High-Grade DCIS

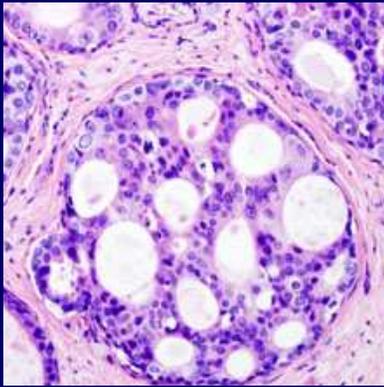
Mammogram





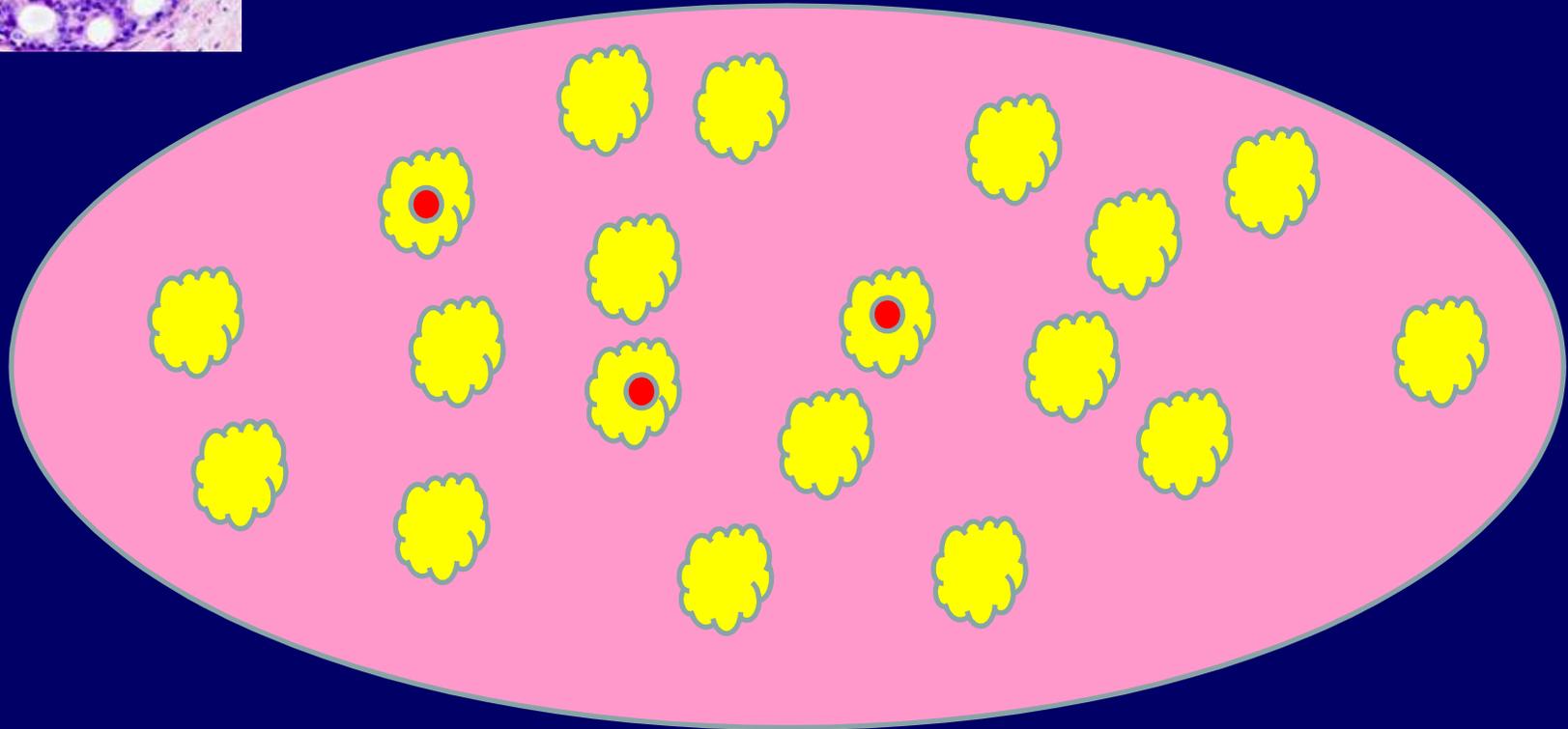
Calcifications in DCIS

- In ~95% of high-grade DCIS
- In ~50% of low-grade
- Mammographic size of higher-grade DCIS more accurate than lower-grade
- Pos margins common in low-grade DCIS

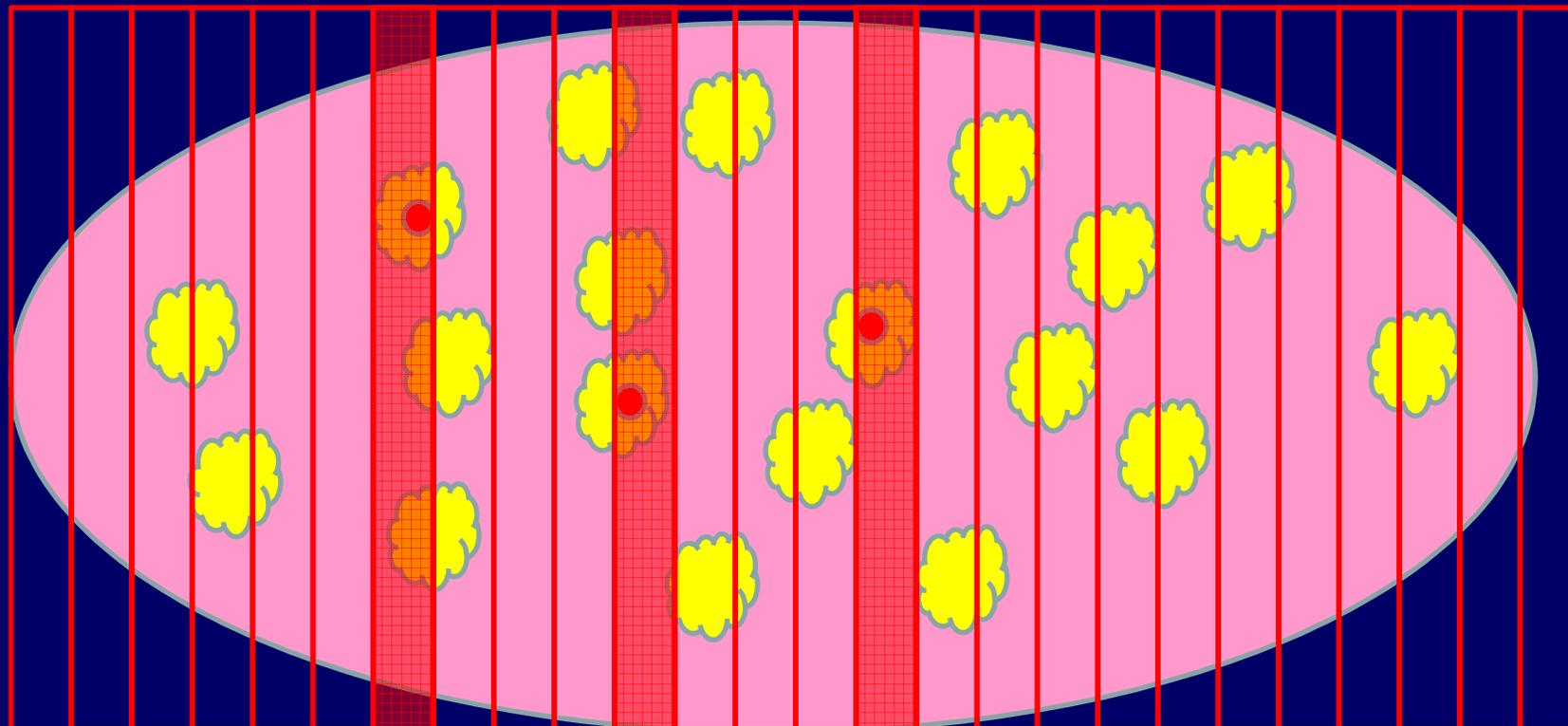


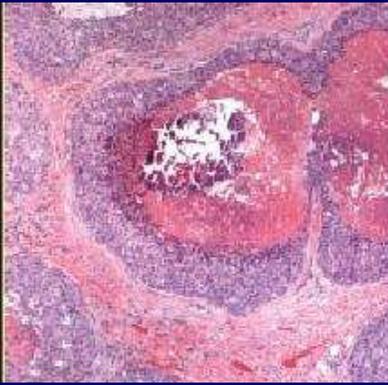
Low-Grade DCIS

Calcifications in Red



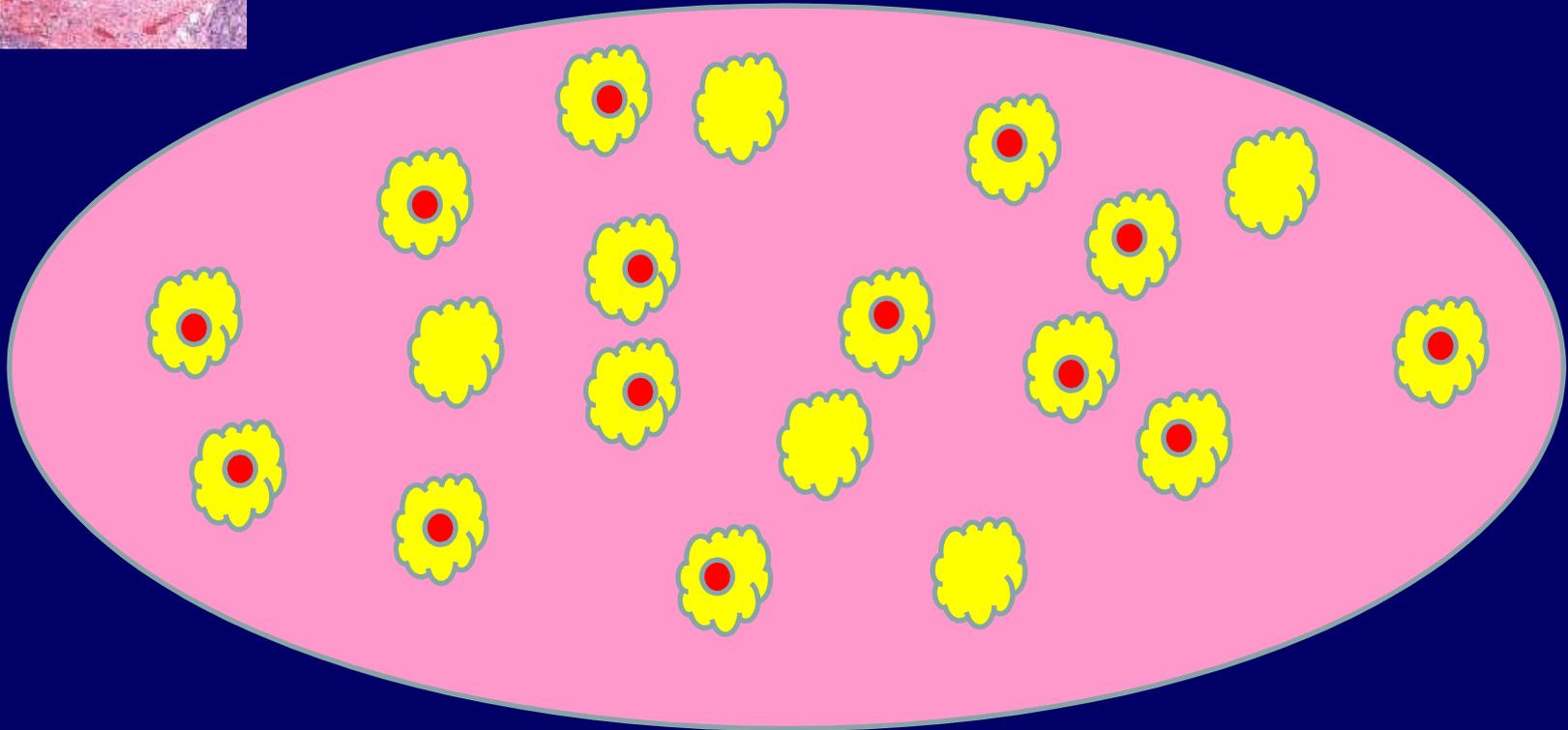
Low-Grade DCIS



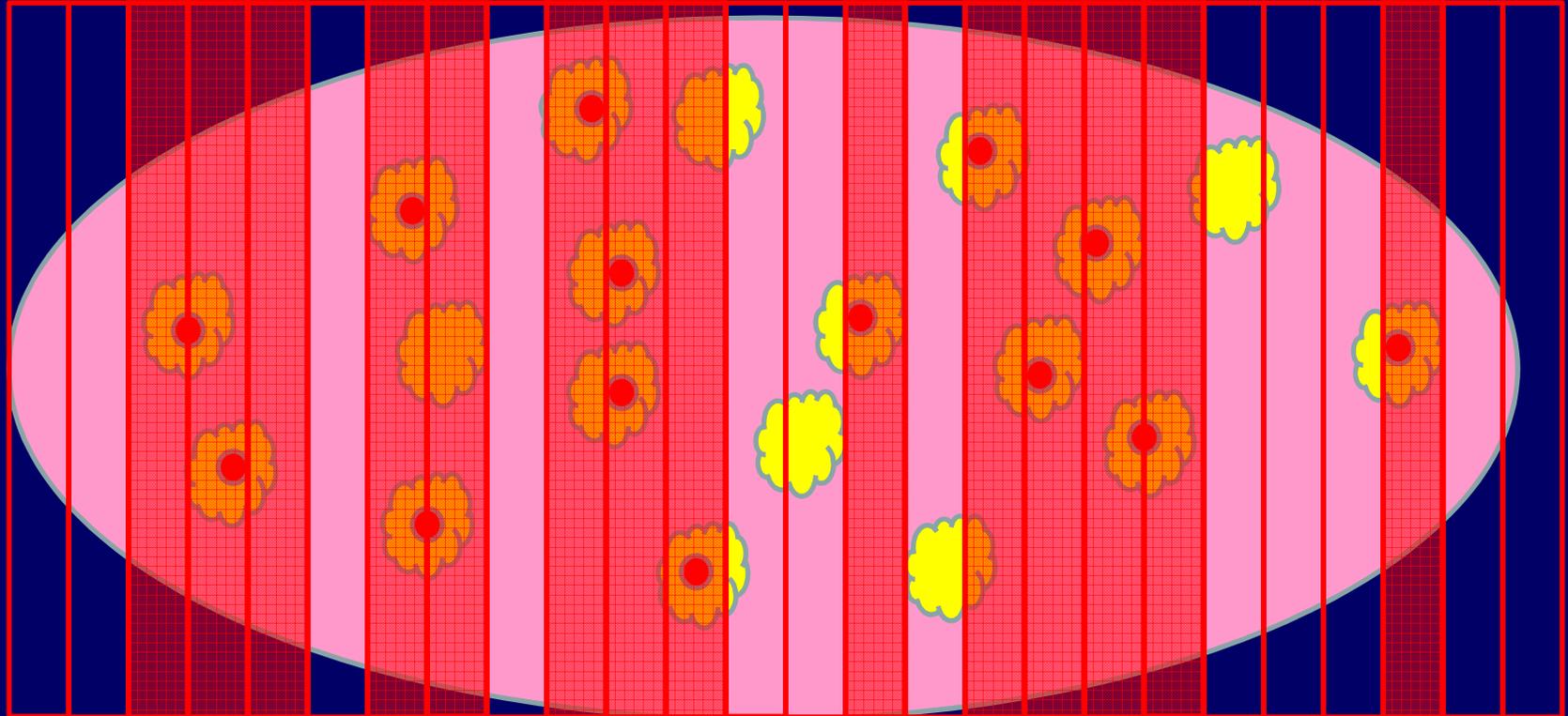


High-Grade DCIS

Calcifications in Red

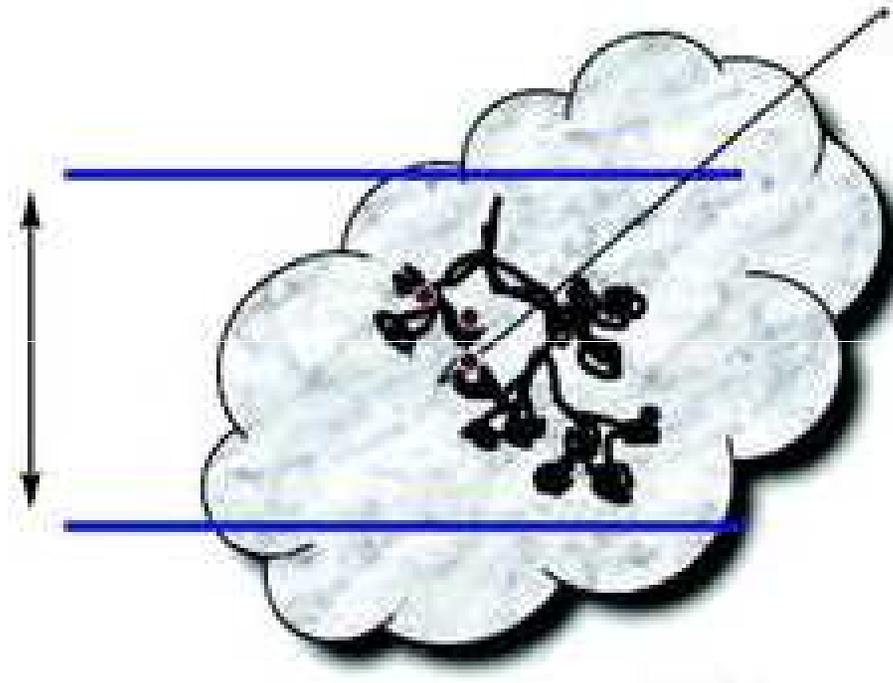


High-Grade DCIS



Extent of DCIS

Different Methods Used



Arch Pathol Lab Med_2009;133:15-25.

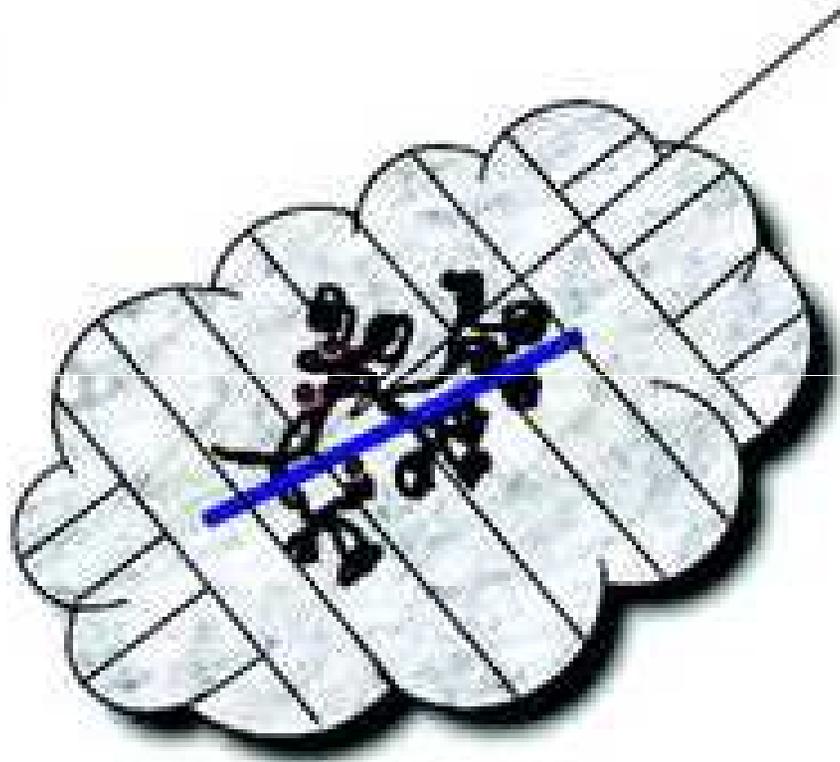
Extent of DCIS

If DCIS is only present on one slide,
Its extent on the slide can be measured



Extent of DCIS

Serial Sections with Mapping

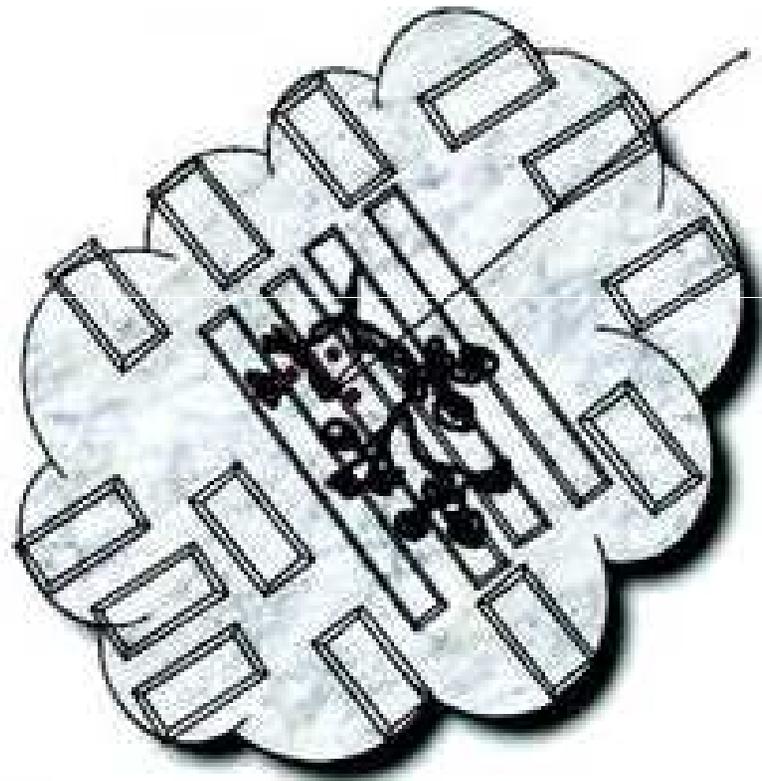


Arch Pathol Lab Med_2009;133:15-25.

Extent of DCIS

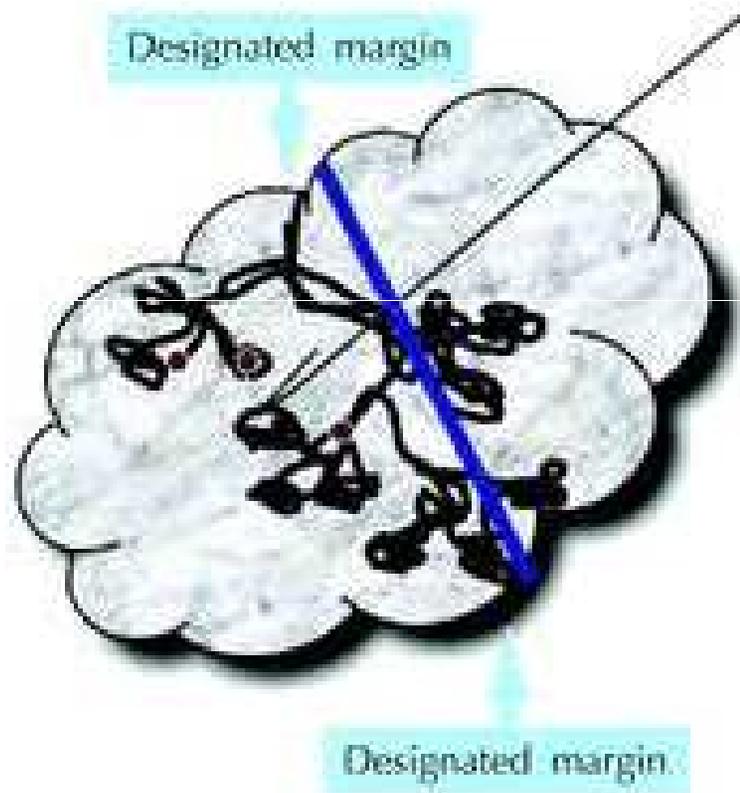
Non-Sequential Sectioning
Number of blocks with DCIS

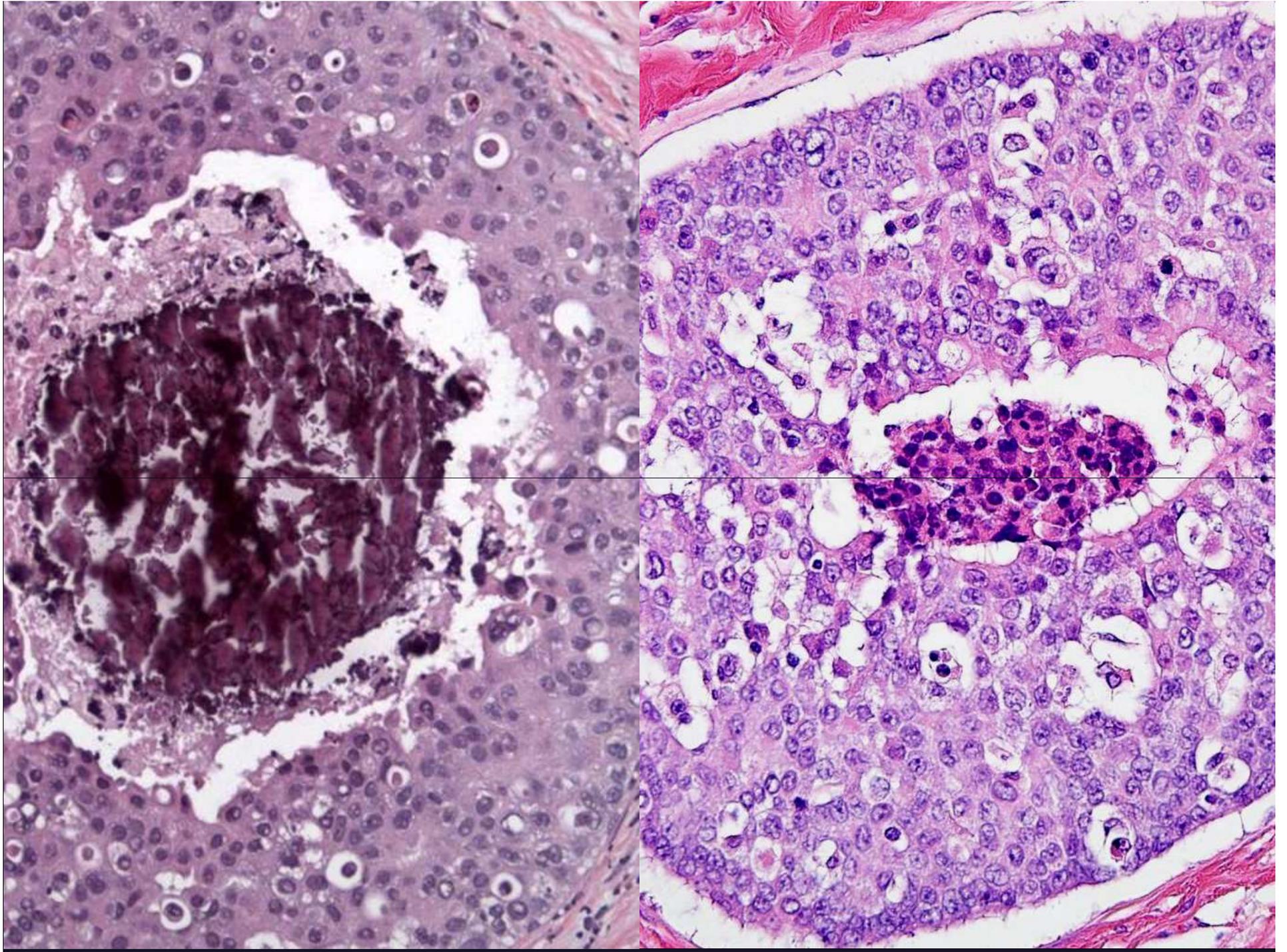
n x 0.4 cm



Extent of DCIS

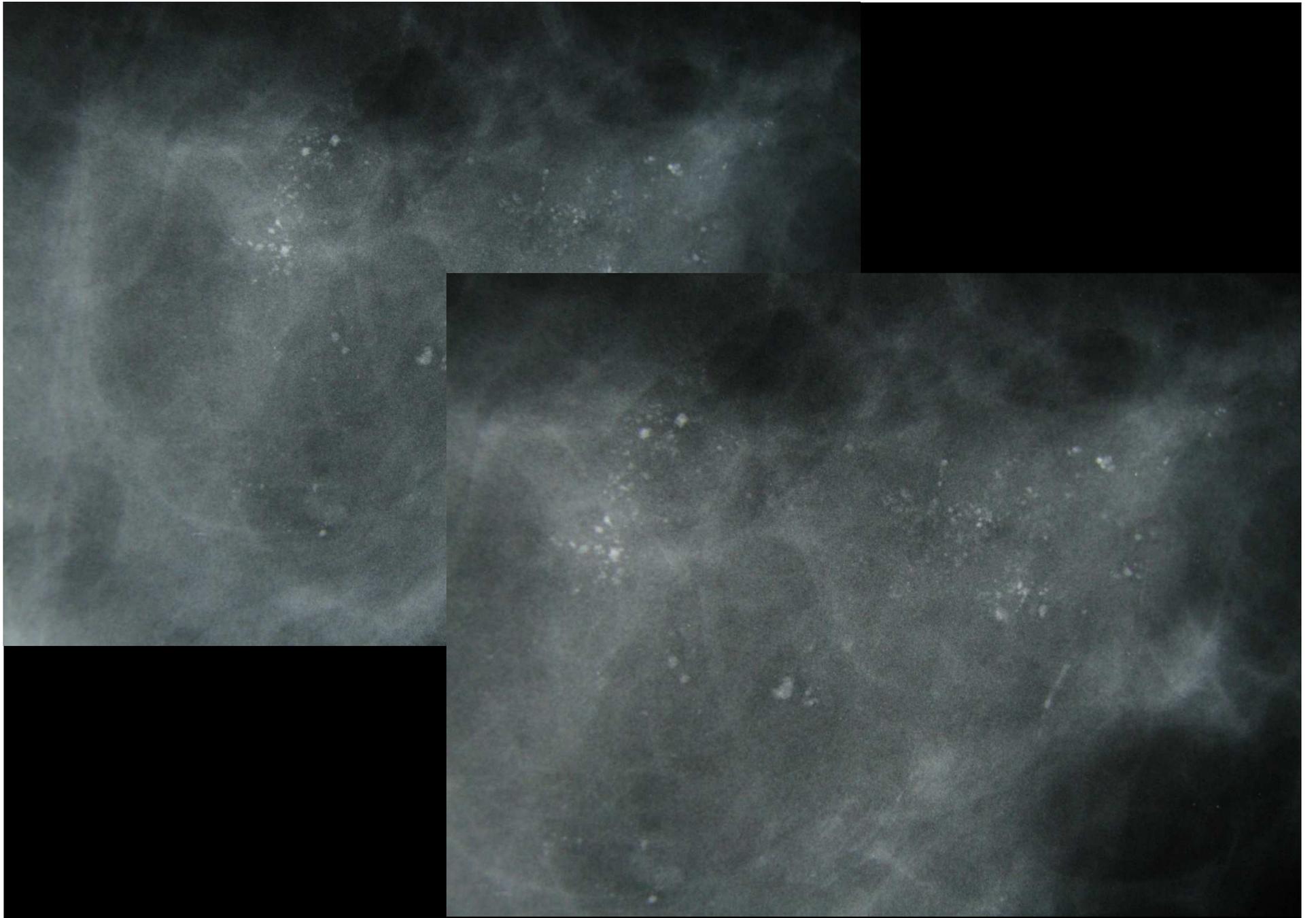
If DCIS involves opposing margins, distance between margins can be used to assess extent,



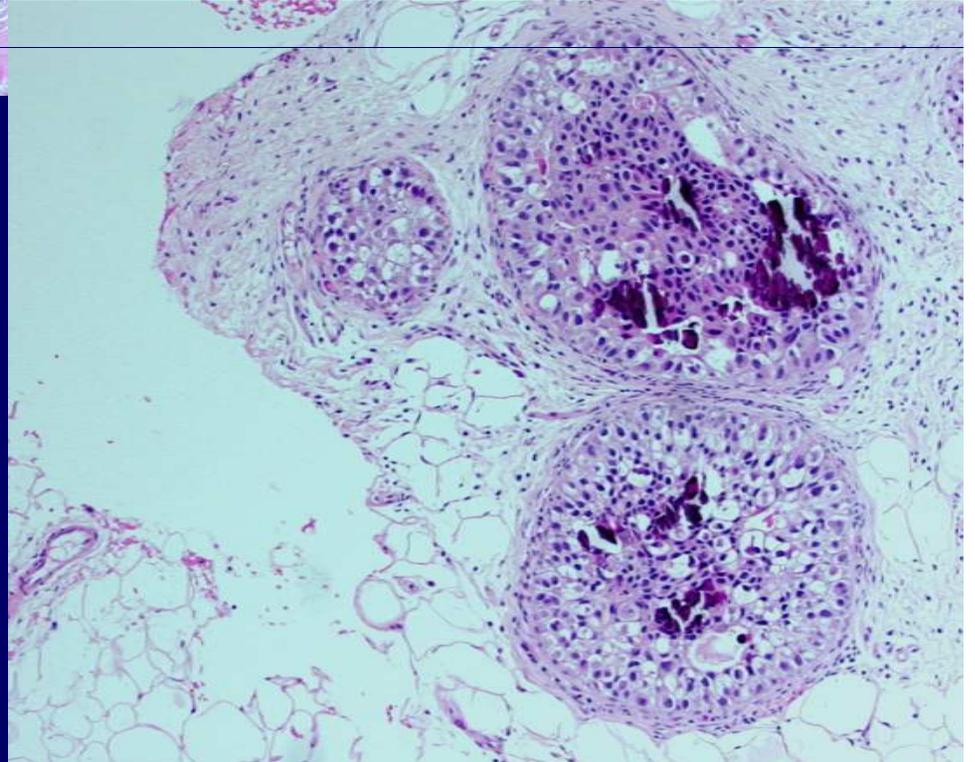
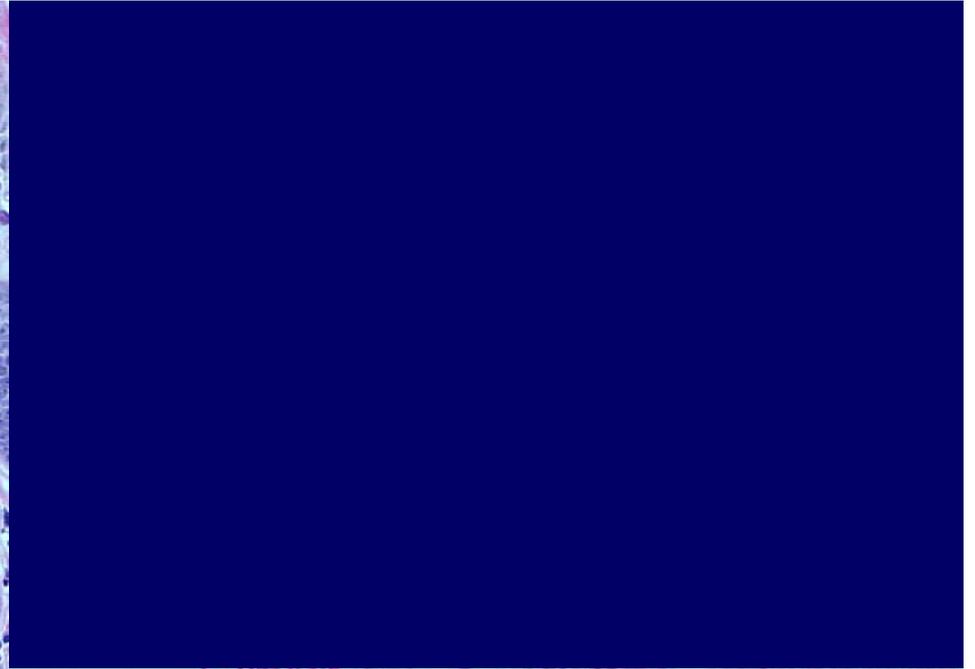
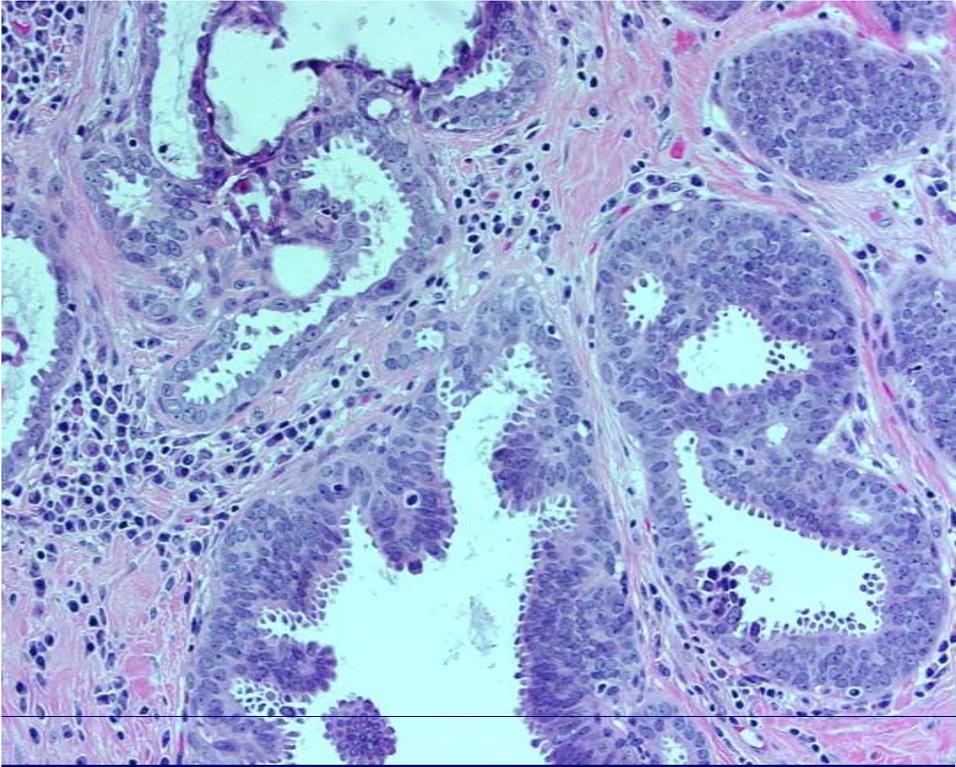


Case 3

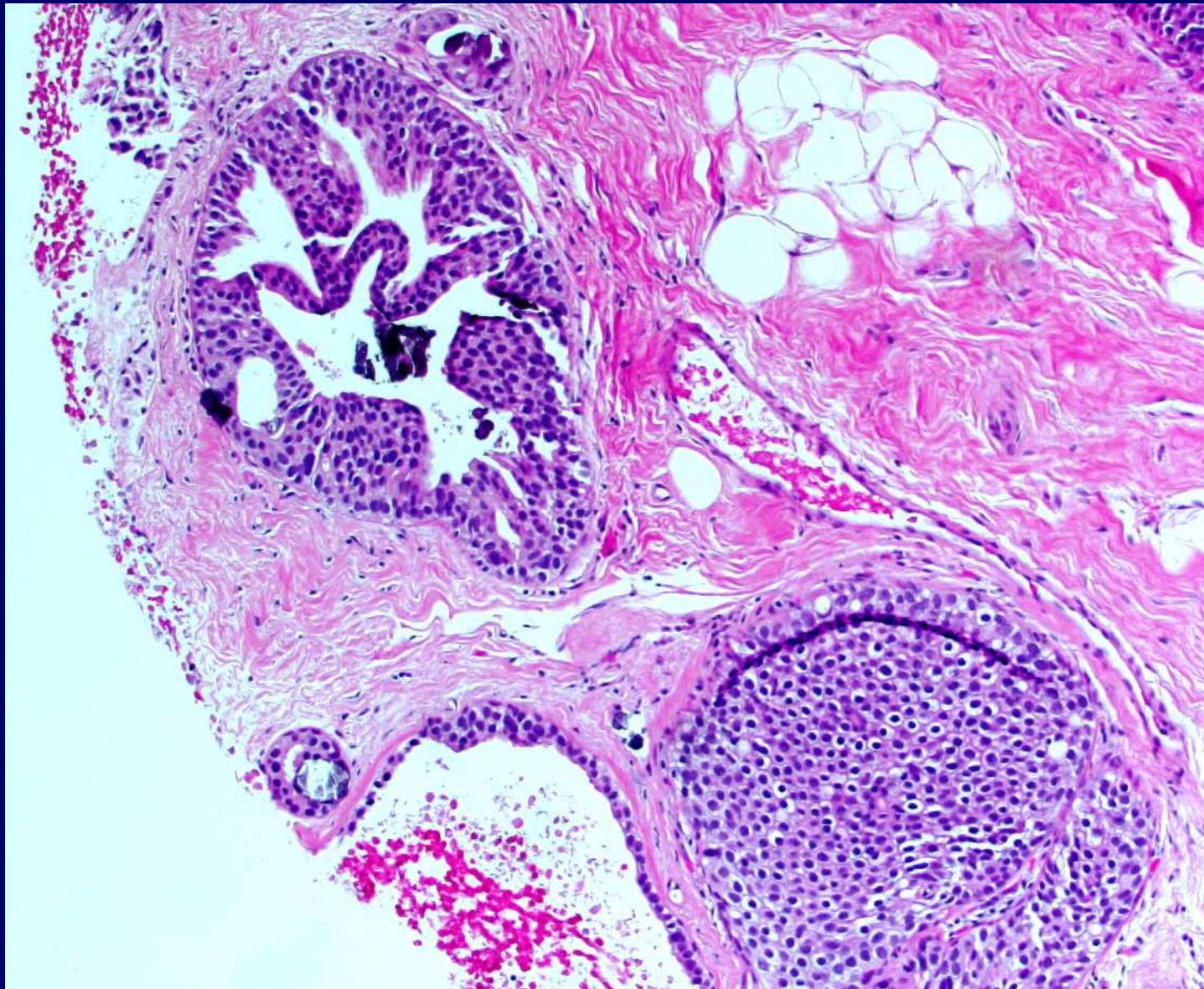
**77-year-old female,
with suspicious pleomorphic
calcifications in left breast**



Mammogram



ADH



LG DCIS multicentric on excision

Atypical Ductal Hyperplasia (ADH)

Flat Epithelial Atypia (FEA)

- **Previously misrepresented as part of FCC**
- **Common findings of FEA**
 - **with ADH, DCIS (LG) and IDC (esp. tubular carcinoma)**
 - **the similarities in their cytologic features and genetic alterations**

Am J Surg Pathol 2005;29:734; Virchows Arch 2007;451:883

Columnar cell lesions associated with breast calcifications on vacuum-assisted core biopsies: clinical, radiographic, and histological correlations

Rebecca Senetta¹, Pier Paolo Campanino², Giovanna Mariscotti², Sara Garberoglio², Lorenzo Daniele¹, Francesca Pennechi³, Luigia Macri¹, Martino Bosco¹, Giovanni Gandini² and Anna Sapino¹

Interobserver reproducibility in the diagnosis of flat epithelial atypia of the breast

Frances P O'Malley¹, Syed K Mohsin², Sunil Badve³, Shikha Bose⁴, Laura C Collins⁵, Marguerite Ennis⁶, Celina G Kleer⁷, Sarah E Pinder⁸ and Stuart J Schnitt⁵

Arch Pathol Lab Med 2009;133:879

Flat Ductal Intraepithelial Neoplasia of the Breast

A Review of Diagnostic Criteria, Differential Diagnoses, Molecular-Genetic Findings, and Clinical Relevance—

It Is Time to Appreciate the Azzopardi Concept!

Farid Moinfar, MD

Radiological Features of FEA

- Columnar cell lesions / FEA are not associated with BI-RADS 5 category and linear or branching calcifications

Modern Pathology 2009;22:762-769

- Calcifications associated with CCL/FEA range from 37% to 74%

Modern Pathology 2009;22:762; Am J Surg Pathol 1998;22:1521

- To excise or not to excise

Histologic Features of FEA

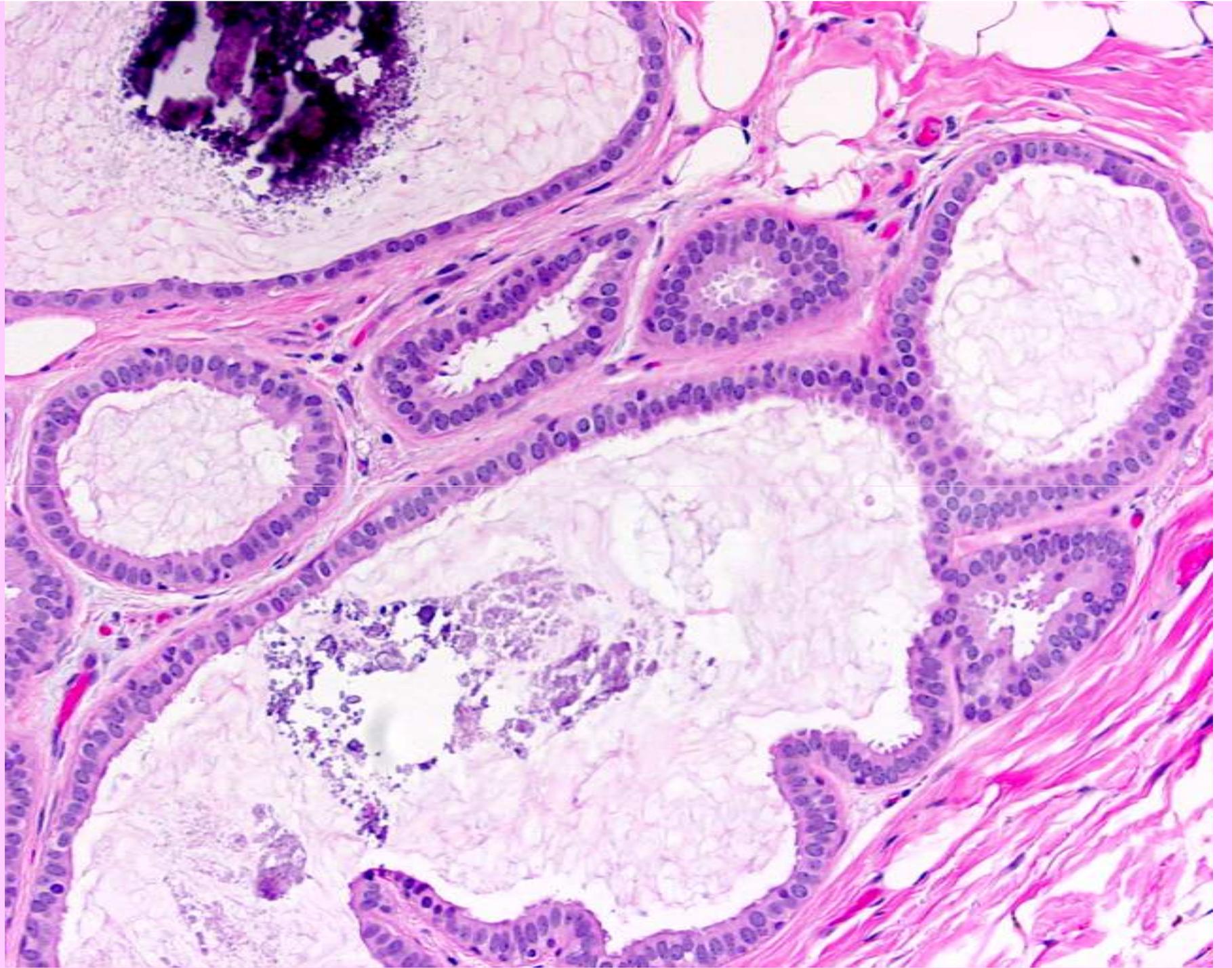
- Initially described as clinging carcinoma by Azzopardi

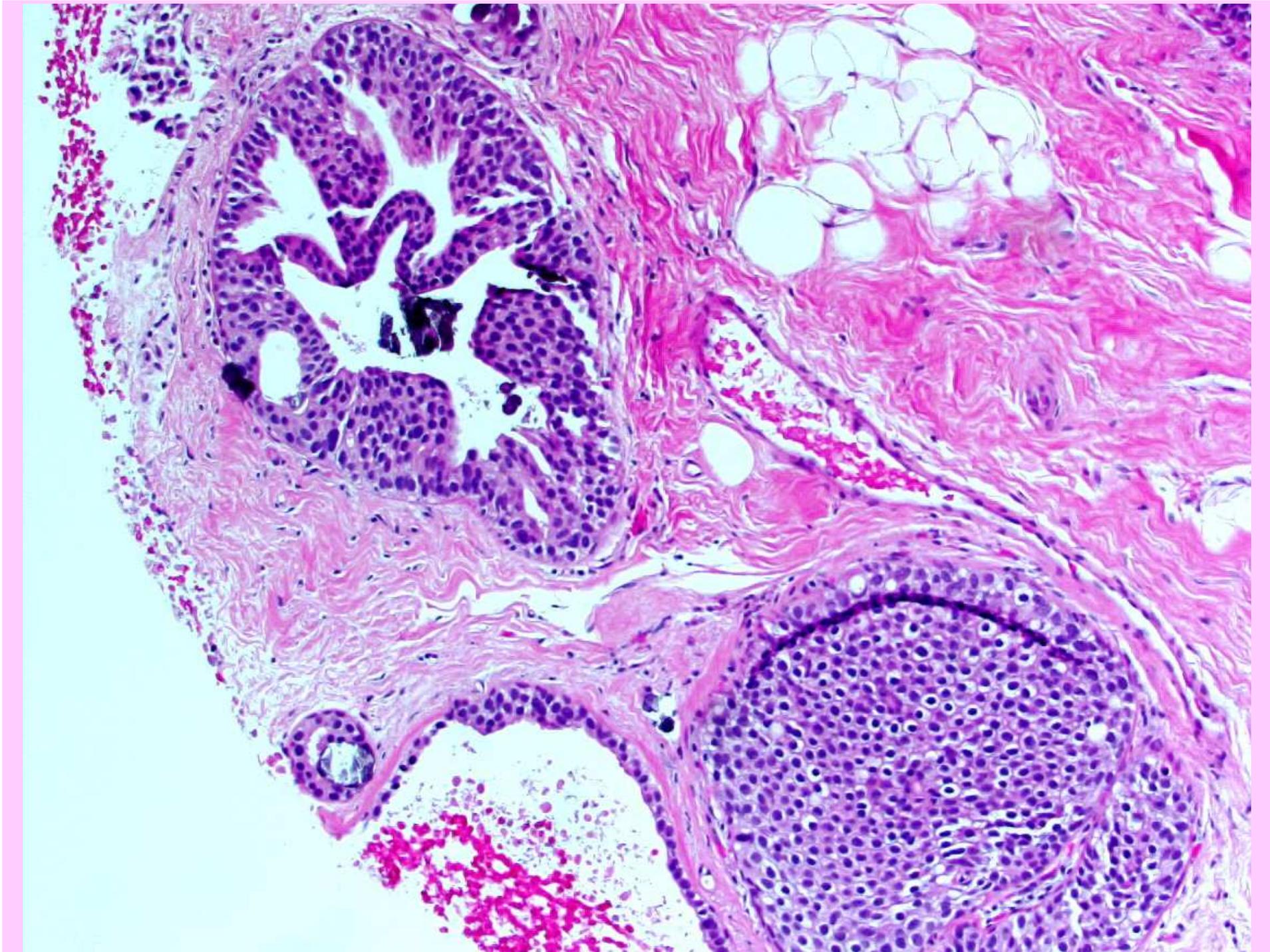
Azzopardi JG. Problems in Breast Pathology. Philadelphia, PA, WB Saunders, 1979; Seminars in Diagnostic Pathology 2010;27;31

- Primarily cytologic, cytologic atypia of luminal cells and without architectural disorder

Flat Epithelial Atypia

- Cytologic atypia include loss of polarity, hyperchromasia, nuclear enlargement, higher N:C ratio; monotonous appearance, regular chromatin distribution, regular nuclear membrane, nucleoli
- Rigid dilatation within lobules and small ducts with luminal secretion
- Occurrence of architectural atypia / complexity in what might be called
- FEA  ADH



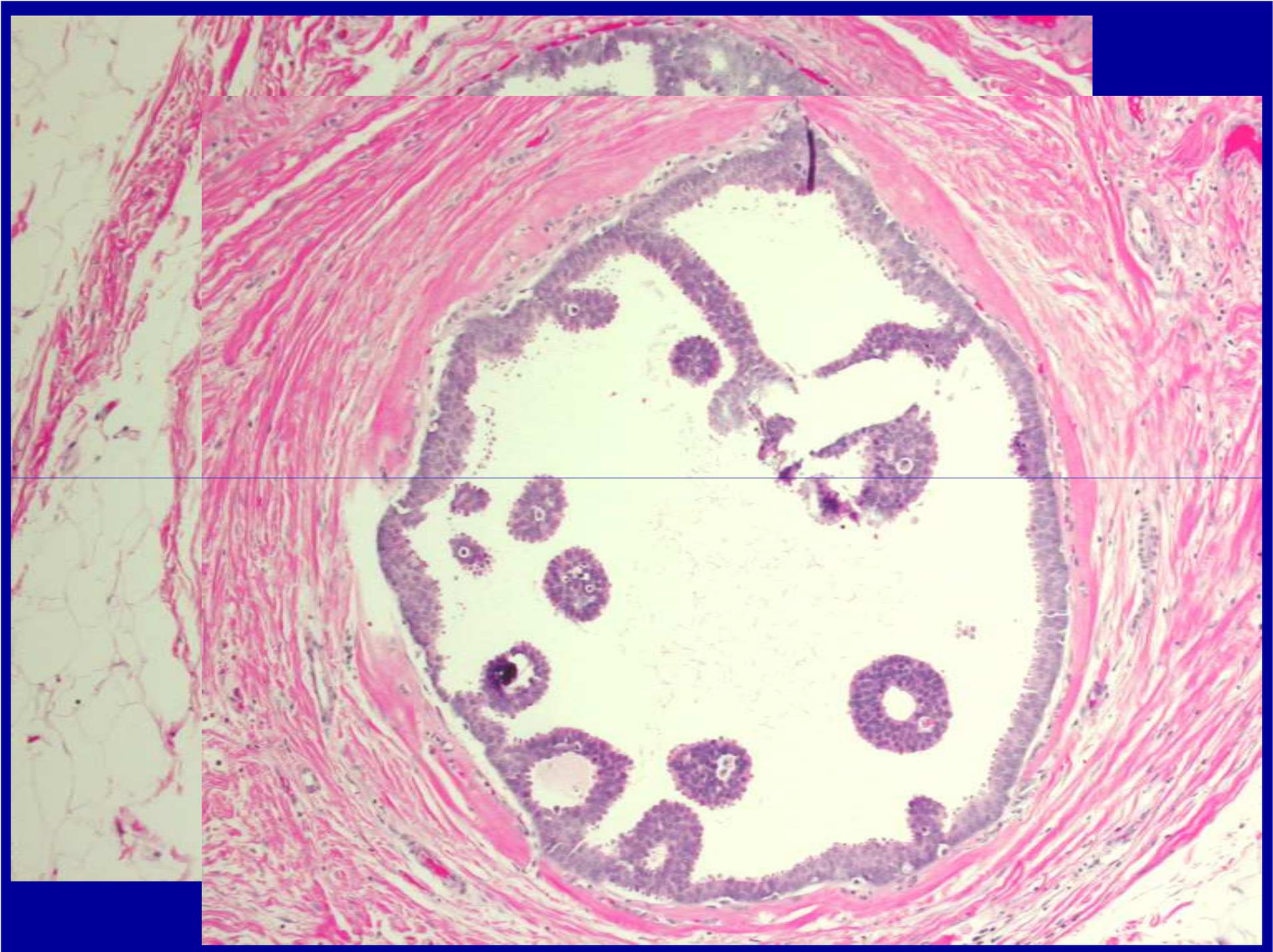


Micropapillary Carcinoma

- **No specific breast image feature – calcifications**
- **Tends to be multifocal and multicentric compared to other type of DCIS**

Features of Micropapillary DCIS

- **Plane of section may affect appearance, no fibrovascular cores**
- **Usually low grade, less commonly intermediate to high grade**
- **Nuclei does not usually vary much between cells at the base and tip of micropapillae**
- **Marked variation in nuclei – consider micropapillary hyperplasia**

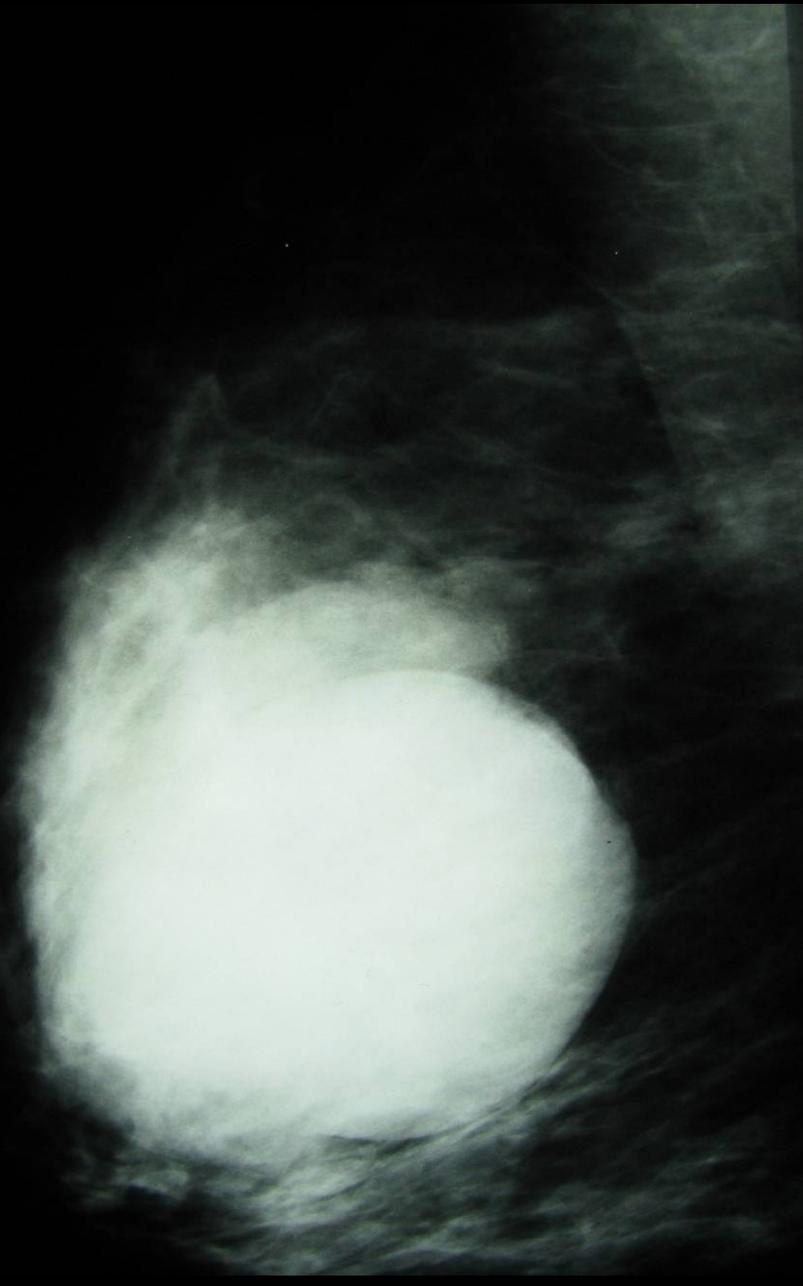


Case 4

History: 47-year-old with new breast mass

Mammogram: Round, well-circumscribed mass, measuring 4.0 x 3.0 x 2.0 cm

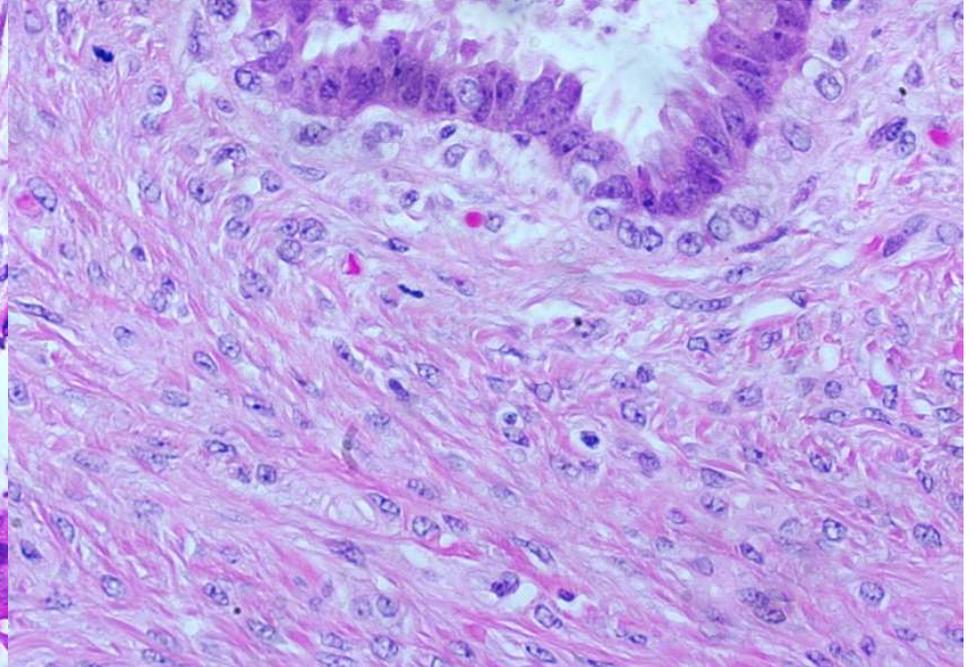
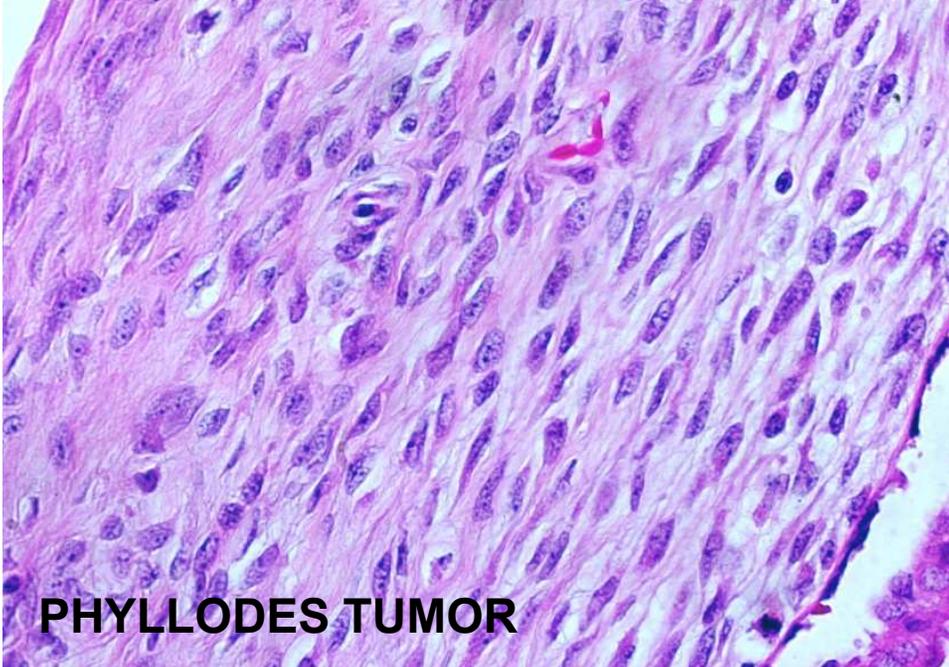
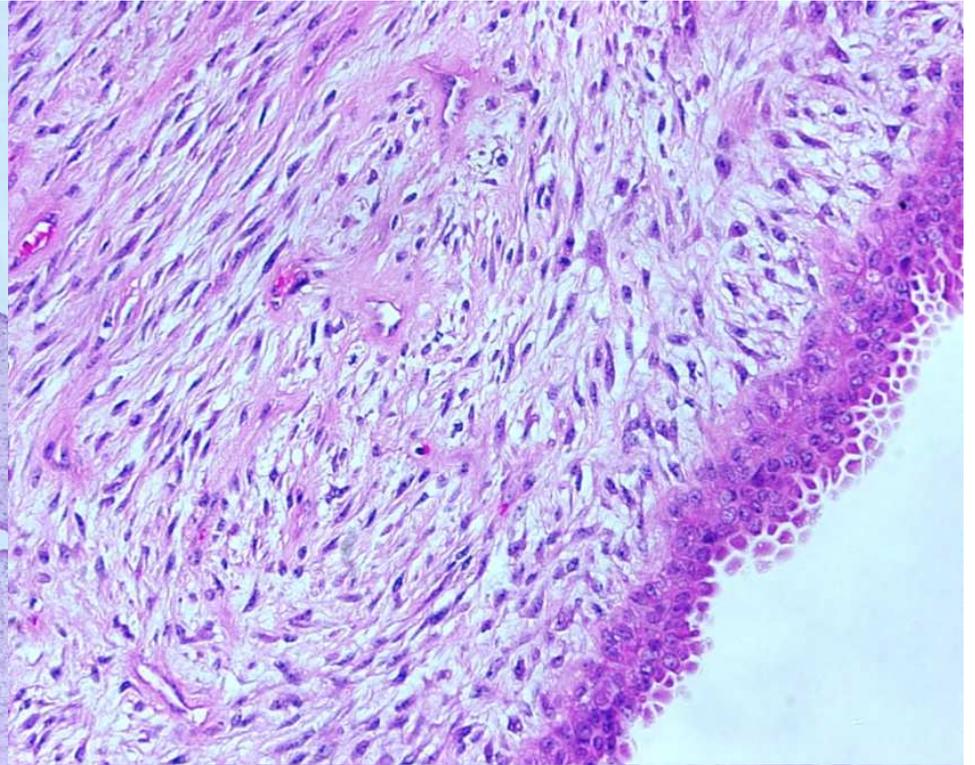
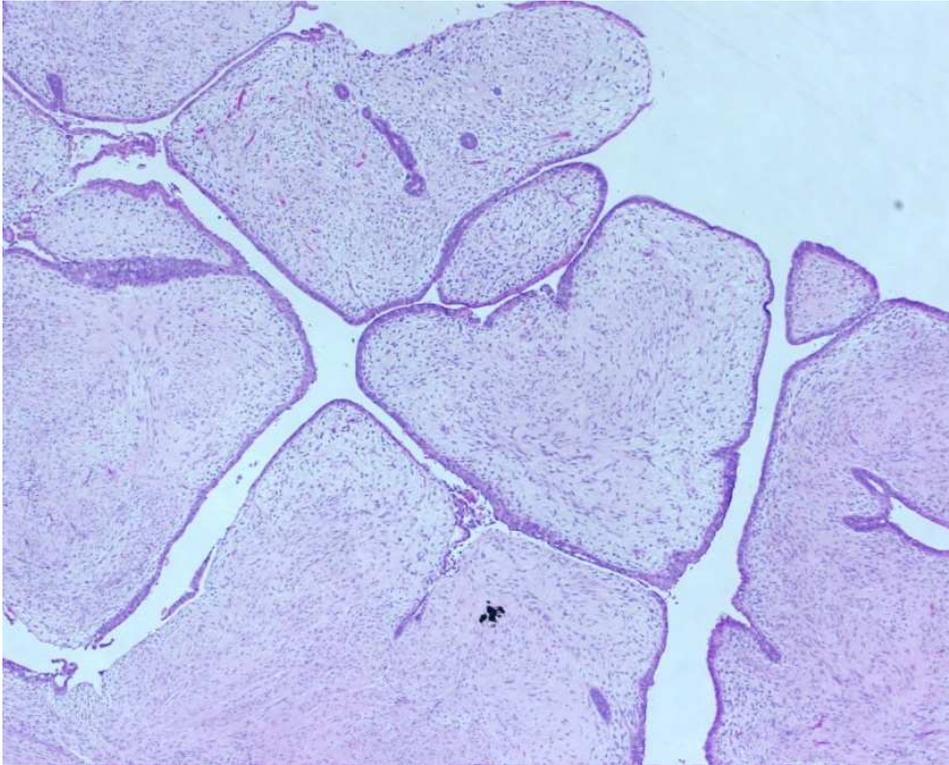
PK



Differential Diagnosis

Based on the imaging what are the differential diagnoses?

- A. Invasive ductal carcinoma
- B. Phyllodes tumor
- C. Fibroadenoma
- D. Mucinous Carcinoma
- E. High grade carcinoma
- F. All of the above



PHYLLODES TUMOR

Histopathology 2007, 51, 336–344. DOI: 10.1111/j.1365-2559.2007.02786.x

Histological features useful in the distinction of phyllodes tumour and fibroadenoma on needle core biopsy of the breast

A H S Lee, Z Hodi, I O Ellis & C W Elston

Histopathology Department, Nottingham University Hospitals, Nottingham, UK

Original Articles

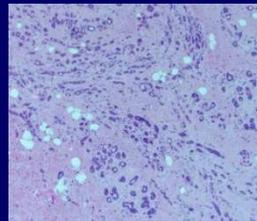
“Missed” Diagnoses of Phyllodes Tumor on Breast Biopsy: Pathologic Clues to Its Recognition

Sophia Yohe, MD, and I-Tien Yeh, MD

International Journal of
Surgical Pathology
Volume 16 Number 2
April 2008 137-142
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10.1177/1066896907311378
<http://ijsp.sagepub.com>
hosted at
<http://online.sagepub.com>

Fibroadenoma versus phyllodes

- **Stromal and epithelial proliferation, ? Interaction**
- **Criteria**
 - **Stromal mitoses**
 - **Stromal cellularity**
 - **Stromal atypia**
 - **Periductal stromal condensation**
 - **Infiltrating border or infiltration into fat**
- **Clover leaf pattern**
- **Tissue fragmentation**
- **Size >3 cm on imaging**
- **Age**
- **Stroma monoclonality**
- **Immunostains: Ki-67, Topoisomerase II inhibitor, CD117, CD10, p53**



Fibroadenoma versus Phyllodes

- Fibroadenoma-like area in phyllodes tumor, may lead to underdiagnosis (25%)
- ? Phyllodes arising in fibroadenoma

Int J Surg Pathol 2008;16(2):137-142

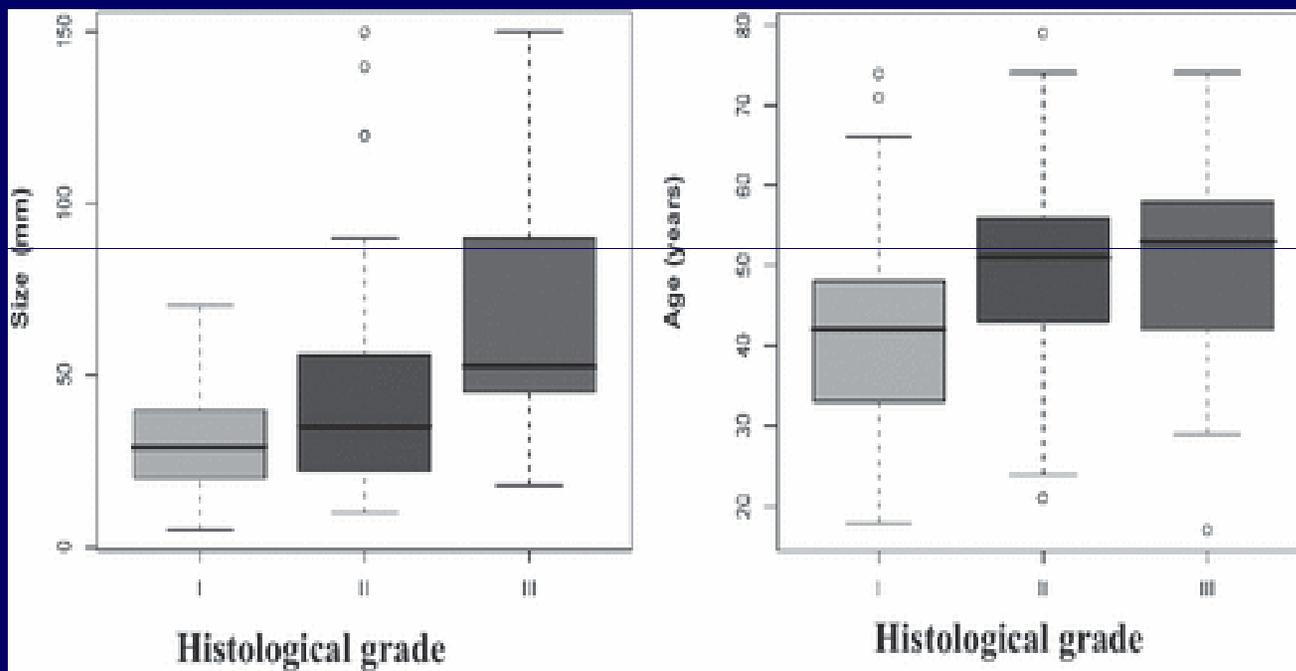
Cancer 1995;76:1779-1785

Am Surg 2005;71(4):348-353

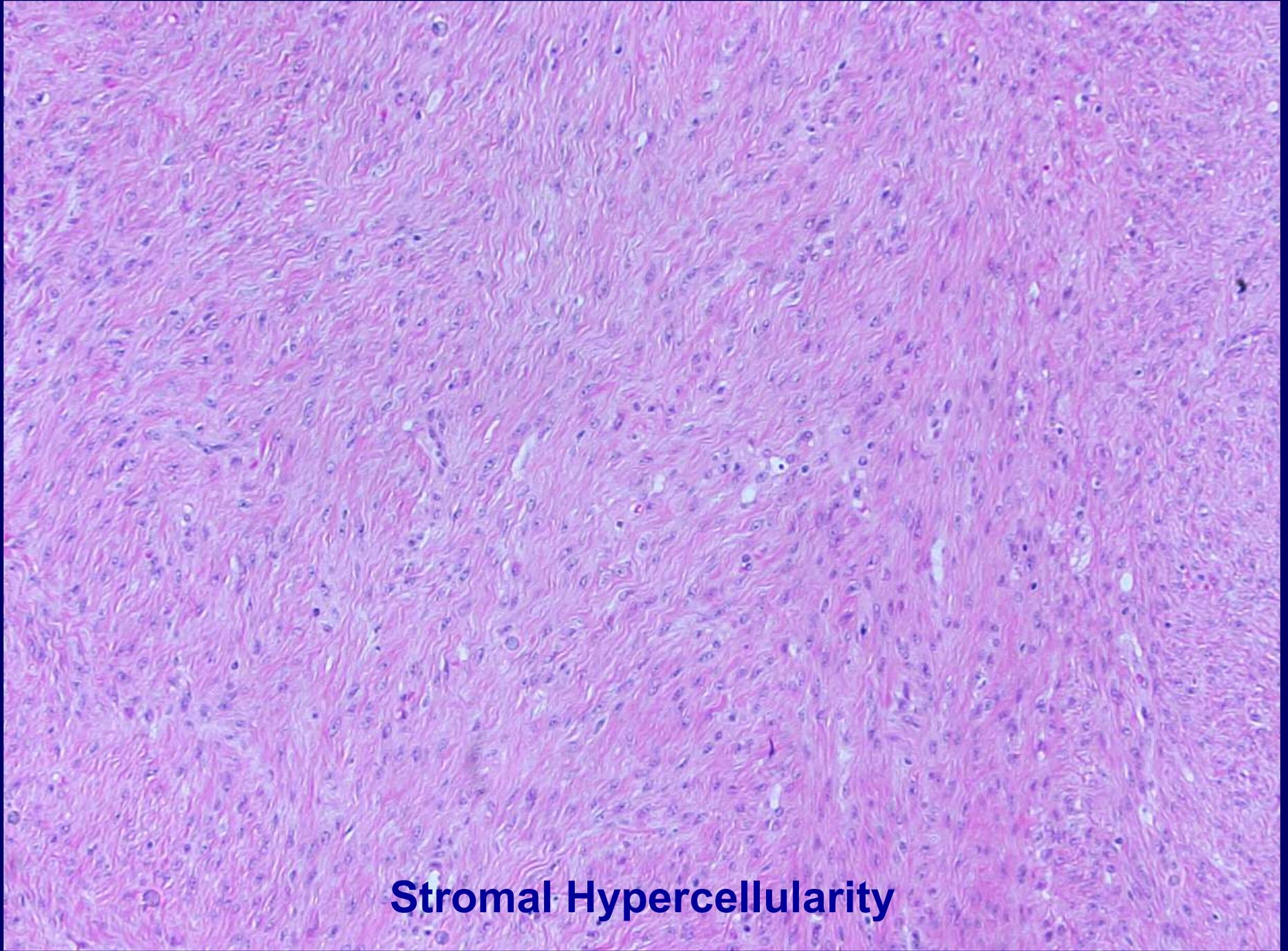
Cancer Research 1993;53(17):4071-4074

Am J Pathol 2000;156(3):1093-1098

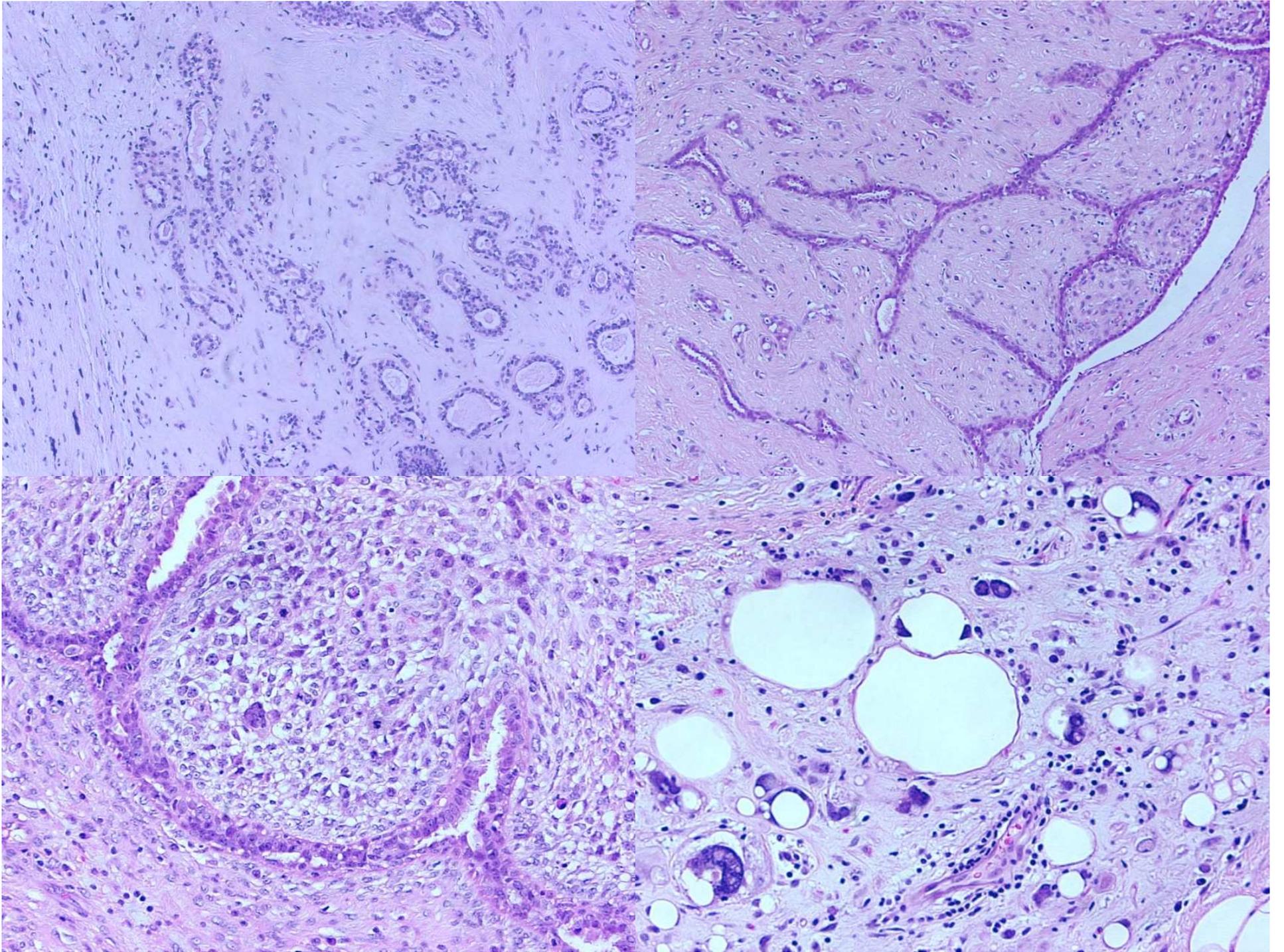
Phyllodes Tumor



Breast J 2011;17:129



Stromal Hypercellularity



Fibroadenoma vs Phyllodes on Core Biopsy

	Fibroadenoma	Phyllodes
Stroma	Homogenous	Heterogenous
Stroma cellularity	Low*	Moderate to high*
Stroma Mitoses	Less than 2 per 10 HPF*	2 or more per 10 HPF
Stroma atypia	No	Yes
Infiltrating borders	No	Yes
Periductal stroma condensation	No	Yes
Stroma heterogeneity	No	Yes
Clover leaf pattern	No	Yes
Fragmentation	Usually no	Yes
Size > 3.0 cm	Usually less	Usually more
Age	Younger	Older

Juvenile fibroadenoma may be moderately cellular & may have up to 3 mitosis

Main histologic features of the 3 tiered grading subgroups for phyllodes tumours.

	Benign	Borderline	Malignant
Stromal hypercellularity	modest	modest	marked
Cellular pleomorphism	little	moderate	marked
Mitosis	few if any	intermediate	numerous (more than 10 per 10 HPF)
Margins	well circumscribed, pushing	intermediate	invasive
Stromal pattern	uniform stromal distribution	heterogeneous stromal expansion	marked stromal overgrowth
Heterologeous stromal differentiation	rare	rare	not uncommon
Overall average distribution {1887}	60%	20%	20%

WHO Classification of Tumours: Pathology and Genetics of Tumours of Breast and Female Genital Organs. IARC: Lyon 2003

Progression of Fibroadenoma to Phyllodes Tumor Demonstrated by Clonal Analysis

Shinzaburo Noguchi, M.D., Hideoki Yokouchi, M.D., Tomohiko Aihara, M.D., Kazuyoshi Motomura, M.D., Hideo Inaji, M.D., Shingi Imaoka, M.D., and Hiroki Koyama, M.D.

Int. J. Med. Sci. 2006, 3

130

International Journal of Medical Sciences
ISSN 1449-1907 www.medsci.org 2006 3(4):130-134
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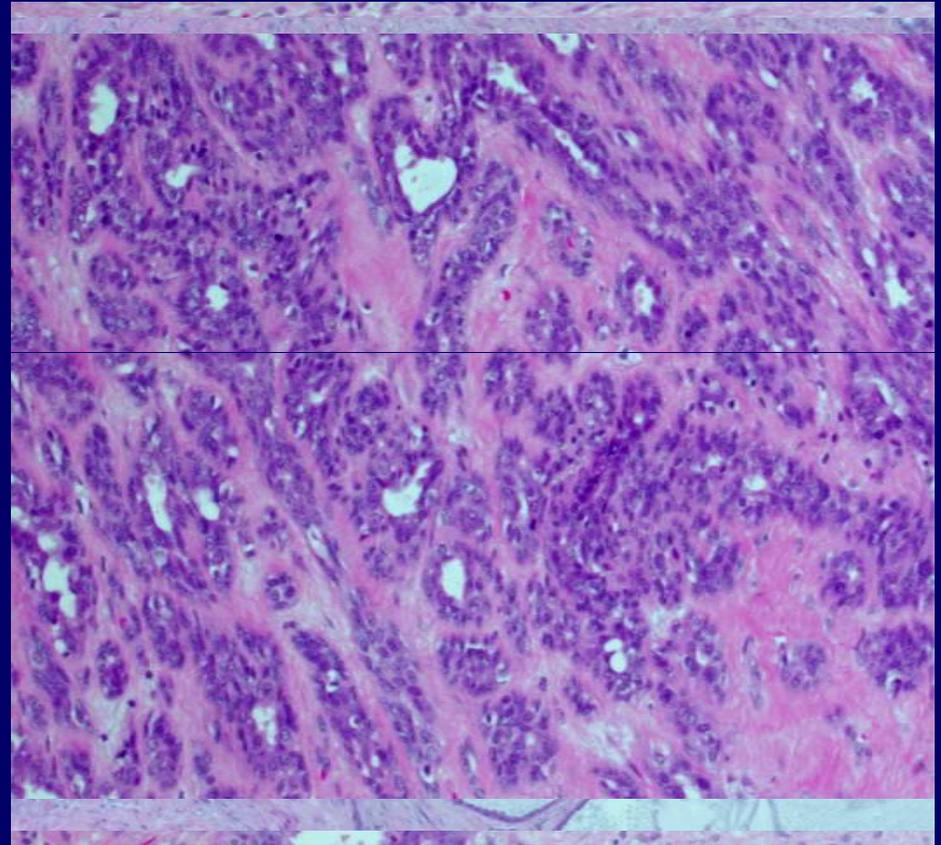
Case Report

Malignant phyllodes tumor with heterologous liposarcomatous differentiation and tubular adenoma-like epithelial component

L. Urie¹, I. Maslovsky², P. Vainshtein³, B. Yoffe³, D. Ben-Dor¹

Calcifications in fibroadenoma ? Complex fibroadenoma

- Calcifications in epithelial component
- Other features:
 - Papillary apocrine metaplasia
 - Sclerosing adenosis
 - Cysts >3 mm
- Significance is controversial



Breast Cancer Research and Treatment **50**: 185–191, 1998.
© 1998 Kluwer Academic Publishers. Printed in the Netherlands.

Report

Monoclonality in fibroadenomas with complex histology and phyllodal features

Masako Kasami,¹ Cindy L. Vnencak-Jones,² Suzanne Manning,² William D. Dupont,⁴ Roy A. Jensen,^{1,3} and David L. Page^{1,4}

¹*Division of Anatomic Pathology, ²Department of Pathology, and Departments of ³Cell Biology, and ⁴Preventive Medicine, Vanderbilt University Medical Center, Nashville, Tennessee, USA*

Summary of Case 4

- **Difficult on breast imaging to distinguish phyllodes and fibroadenoma**
- **Challenging on histology to distinguish cellular fibroadenoma and phyllodes**
- **Constellation of features rather than a specific feature useful**



Breast Imaging: Techniques

Equipment Selection

- **Stereotaxis**
- **Ultrasound**
- **MRI**
- **Needle types**

Stereotactic biopsy

- **Utilizes mammographic imaging**
- **Breast is compressed throughout the procedure and the biopsy is performed through an aperture in the compression plate**
- **Two fixed angle images from the zero point are obtained and are used to calculate the precise position of the lesion in X, Y & Z axes (stereotaxis)**
- **Biopsy needle is placed at this precise point for sampling**

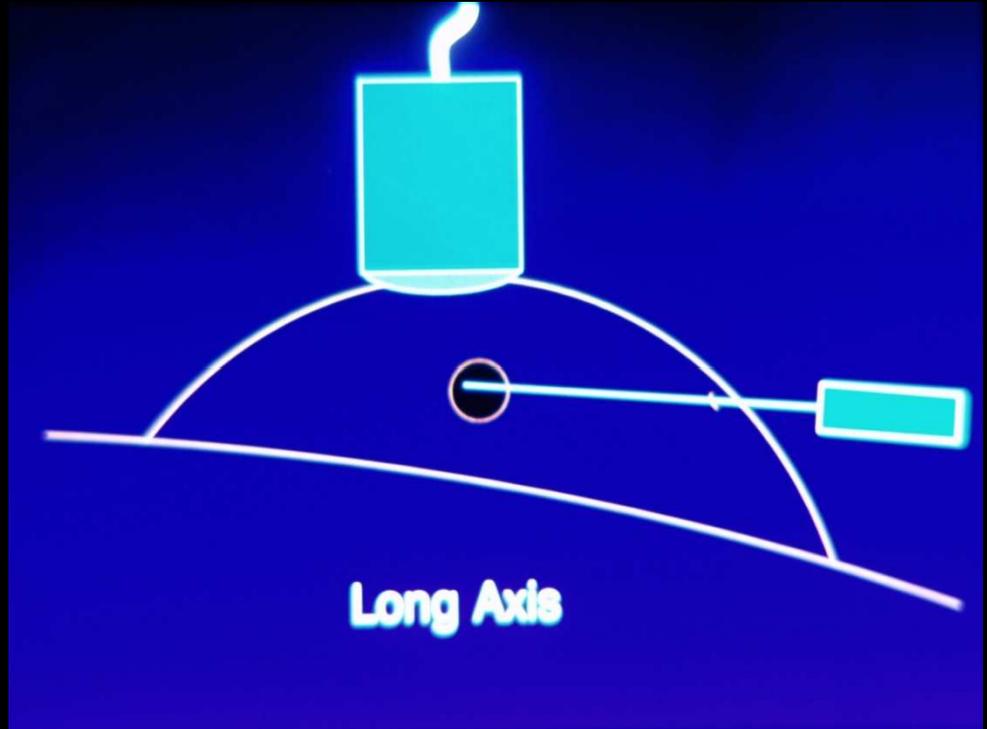
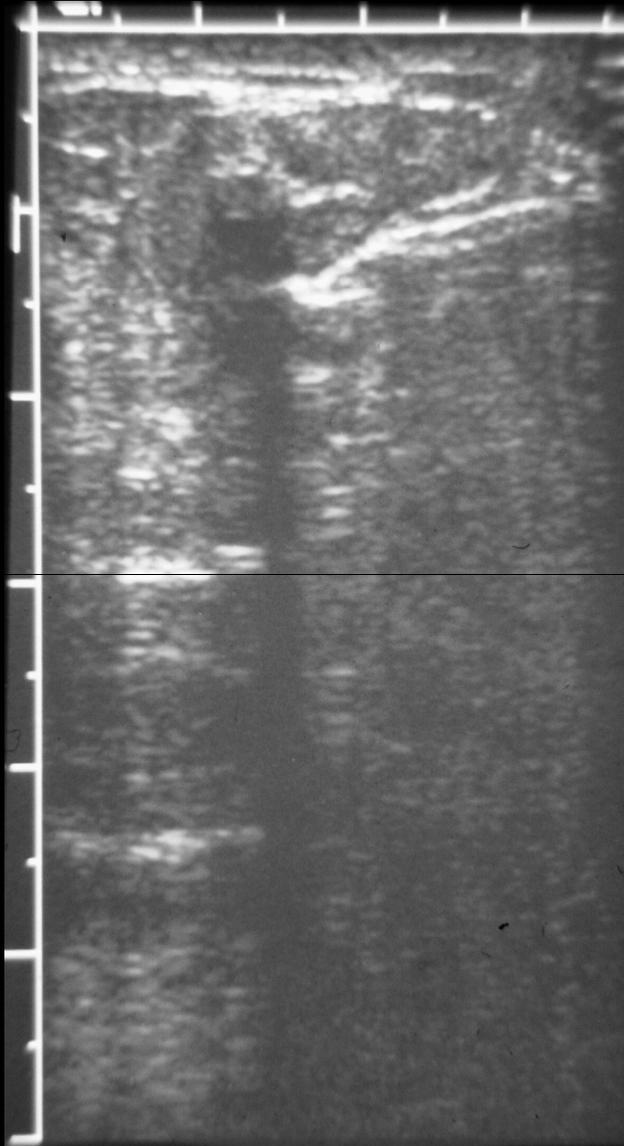
Types of Stereotactic Equipment

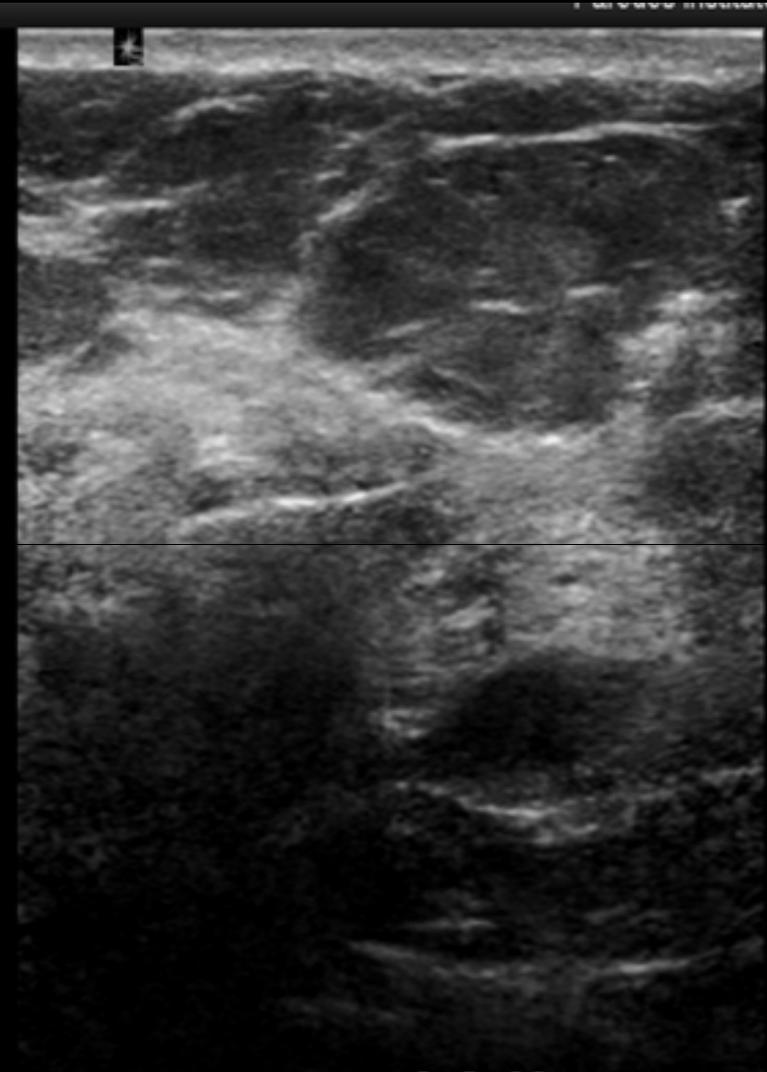
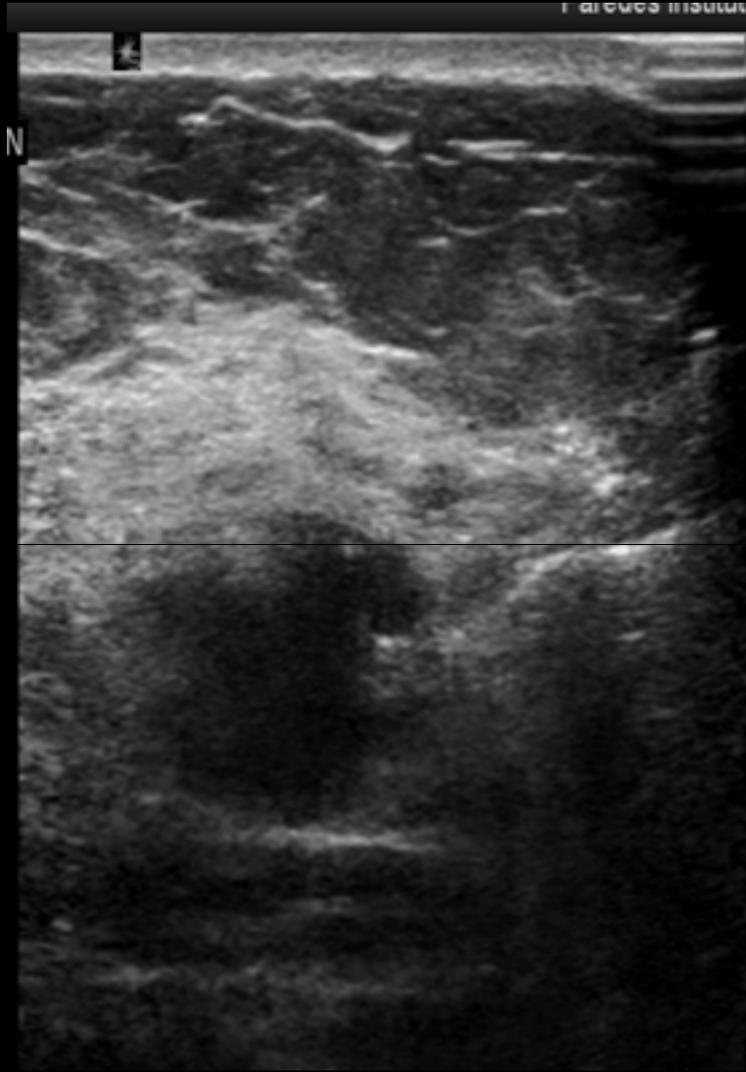
- **Add-on units to mammography machine**
 - **film screen acquisition**
 - **digital acquisition**
- **Prone table unit**
 - **film screen acquisition**
 - **digital acquisition**



Ultrasound-Guided Biopsy

- **Mass visualized with ultrasound**
- **Greater patient comfort without compression**
- **Real-time imaging of the needle as it samples the lesion**
- **Ideal for biopsy of the axilla, posterior and subareolar lesions**





MRI-Guided Biopsy

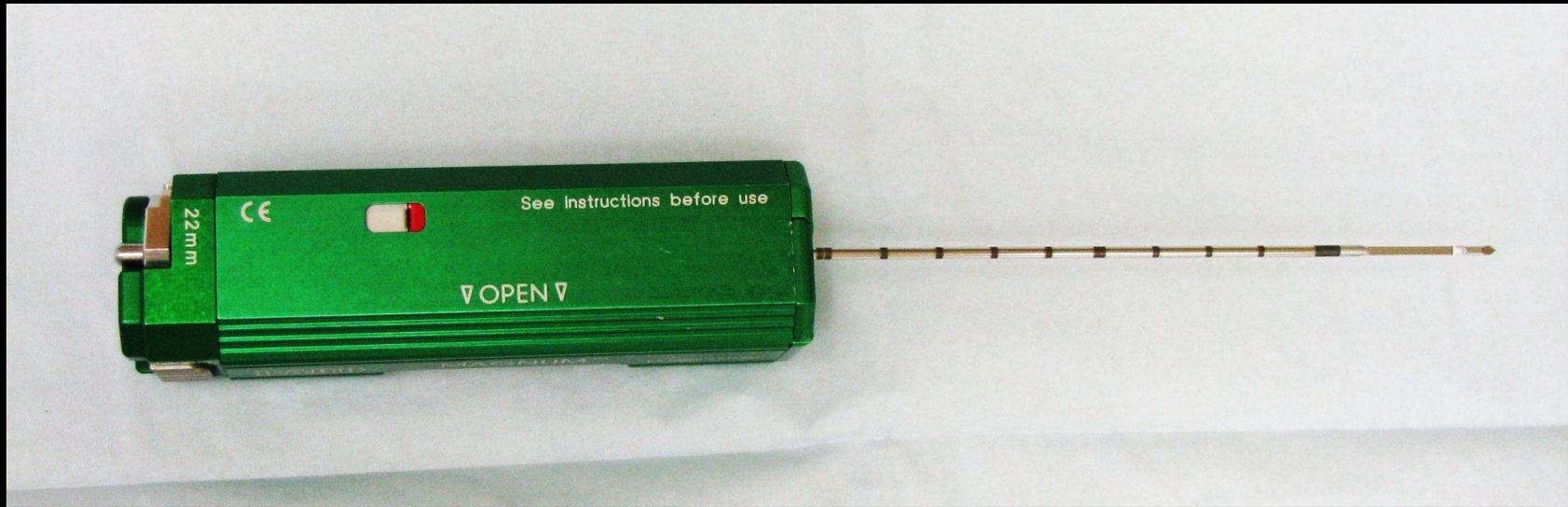
- **Vacuum assisted probes of 8-11g to acquire tissue samples**
- **Contrast is given and the area is targeted**
- **A compression grid overlies the breast during the procedure**
- **Biopsy team is in the MRI suite and the patient is brought out of the magnet for sampling**



MRI-Guided Biopsy

Types of Biopsy Devices

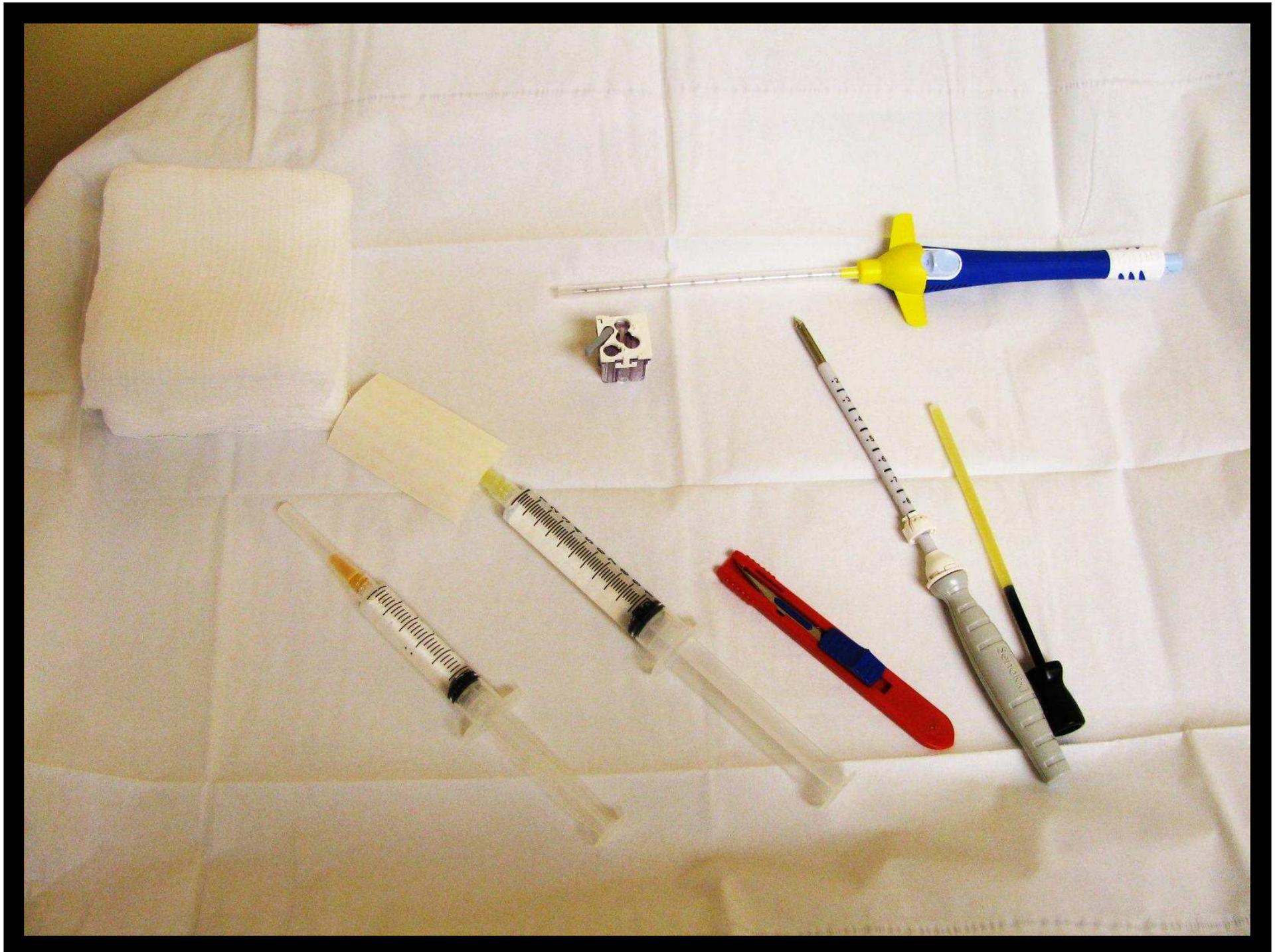
- **Fine needle aspiration (22-25g)**
- **Core needle biopsy- automated (14g)**
- **Vacuum assisted or aspiration/cutting probes (14-8g)**

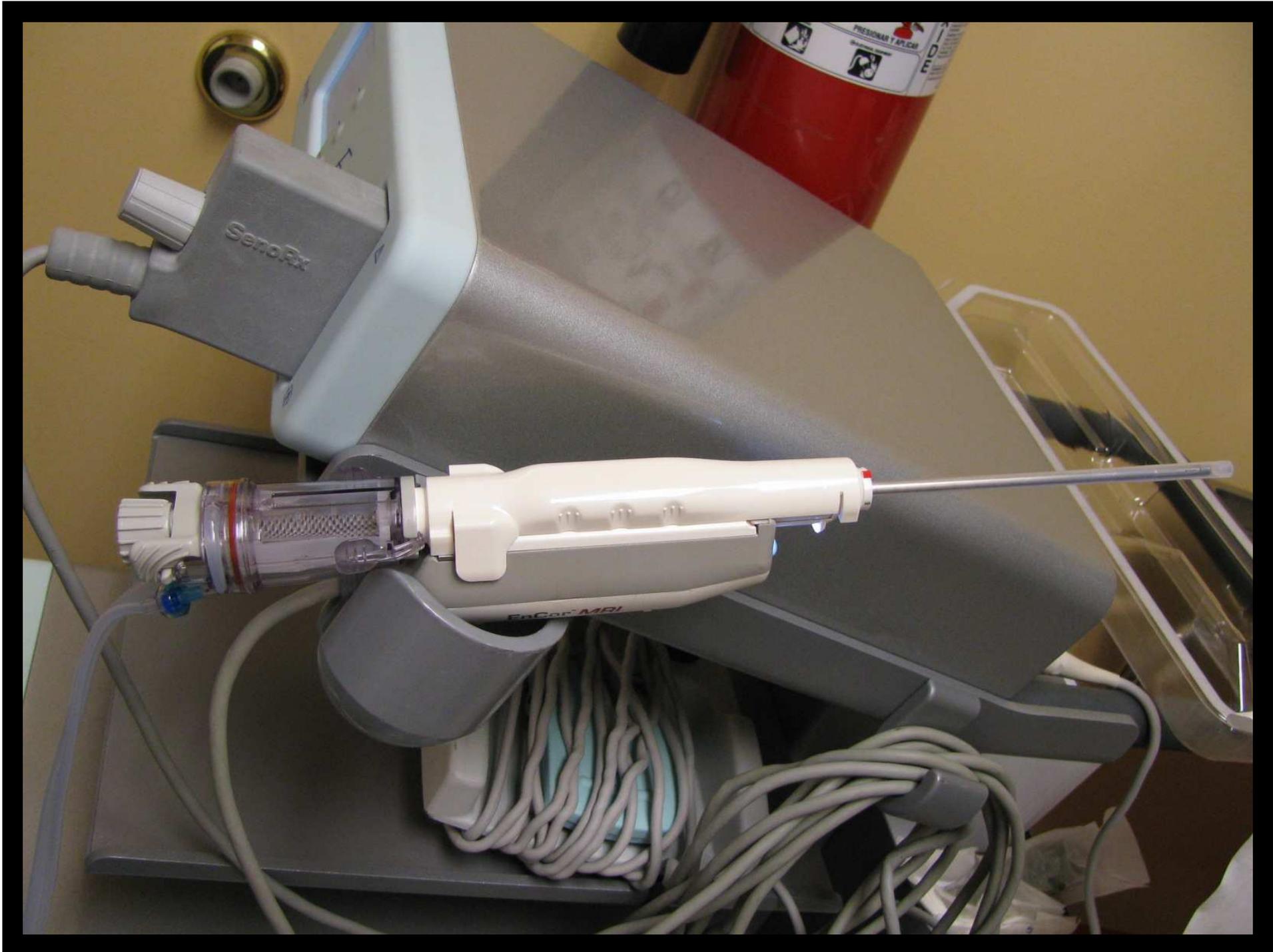


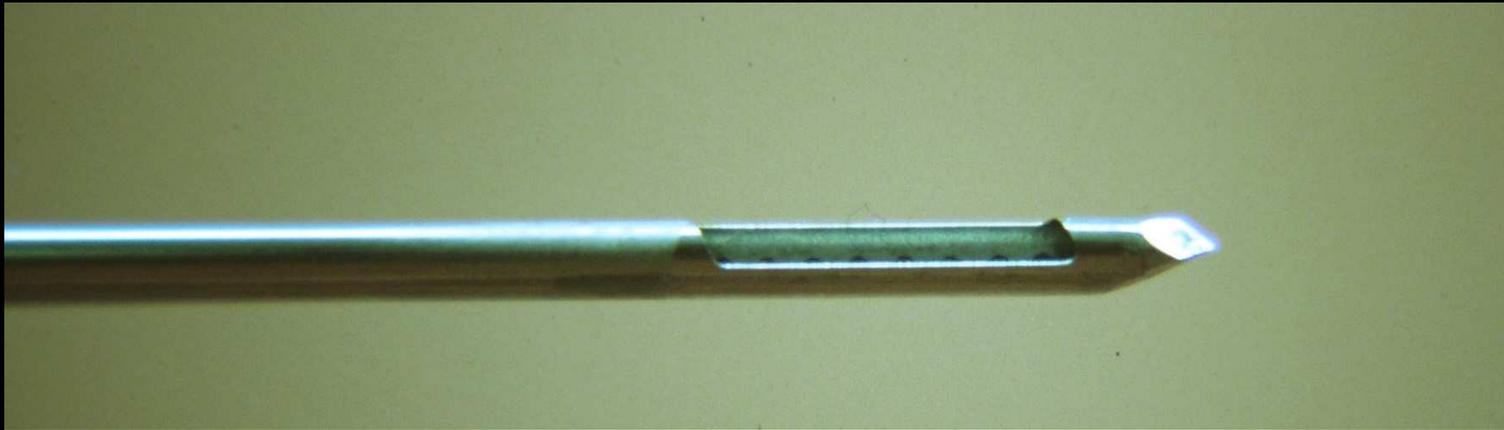
14g automated tru-cut type needle

Choice of Needle/Gun Automated Needle

- **14g needle**
 - short and long throw (ideal)
- **Less expensive**
- **Smaller core for same size needle**
- **Less bleeding/discomfort**
- **Requires multiple passes**
- **Choice for masses with US guidance**







**Sampling trough of a
vacuum assisted probe**

Vacuum Assisted Biopsy Probes

- **Can be used on prone table or upright stereotactic units, ultrasound and MRI**
- **Faster sampling time**
- **8g or 11g sampling is ideal for larger cores and clip insertion through the probe**
- **Requires breast compressed thickness of at least 25 mm for stereotaxis and MRI**

Directional Vacuum Assisted Biopsy Device

- **Single pass with suction/rotations for multiple cores**
- **More expensive**
- **Larger cores**
- **More bleeding/discomfort**
- **Improves diagnostic accuracy for calcifications**

Vacuum Assisted Needle

- **Microcalcifications**
- **Vague lesions**
- **Lesions where volume is critical for diagnosis**
- **Very small lesions**
- **MRI guided biopsies**

Tissue Sample Size Based on Sampling Technique

Author	Technique	Individual Sample Size (mg)
Berg	14g gun	17.7
	14g mammotome	36.8
	11g mammotome	94.4
Burbank	14g gun	17.2
	14g mammotome	43.3

Failure to Retrieve Microcalcifications

- **1511 women with core biopsy of microcalcifications**
- **No calcifications on specimen film in 16% with 14g core needle, 4% with 14g vacuum, and 1% with 11g vacuum probe**

Jackman et al , Radiology, 2006

Vacuum Assisted Biopsy: Effect of Needle Gauge on False Negative Rate

- 508 cancers diagnosed on core biopsy
- False negative rate was 4.4% in cases where a 14g vacuum assisted probe was used
- False negative rate was 0.45% in cases where an 11g probe was used

Jackman et al AJR, 2009

Underestimation of Lesions on Percutaneous Biopsy

- **DCIS underestimated to be ADH in 10-50% of cases**
- **Fewer cases of underestimation when an 11g or larger vacuum assisted probe is used**
- **Invasive carcinoma underestimated as DCIS in 20-25% of cases**

Underestimation of Invasive Carcinoma on CNB

- **63 cancers biopsied stereotactically (CNB)**
- **Core biopsy accurately predicted presence or absence of invasion in 92% (58/63 cases)**

Liberman, Radiology 194:379, 1992

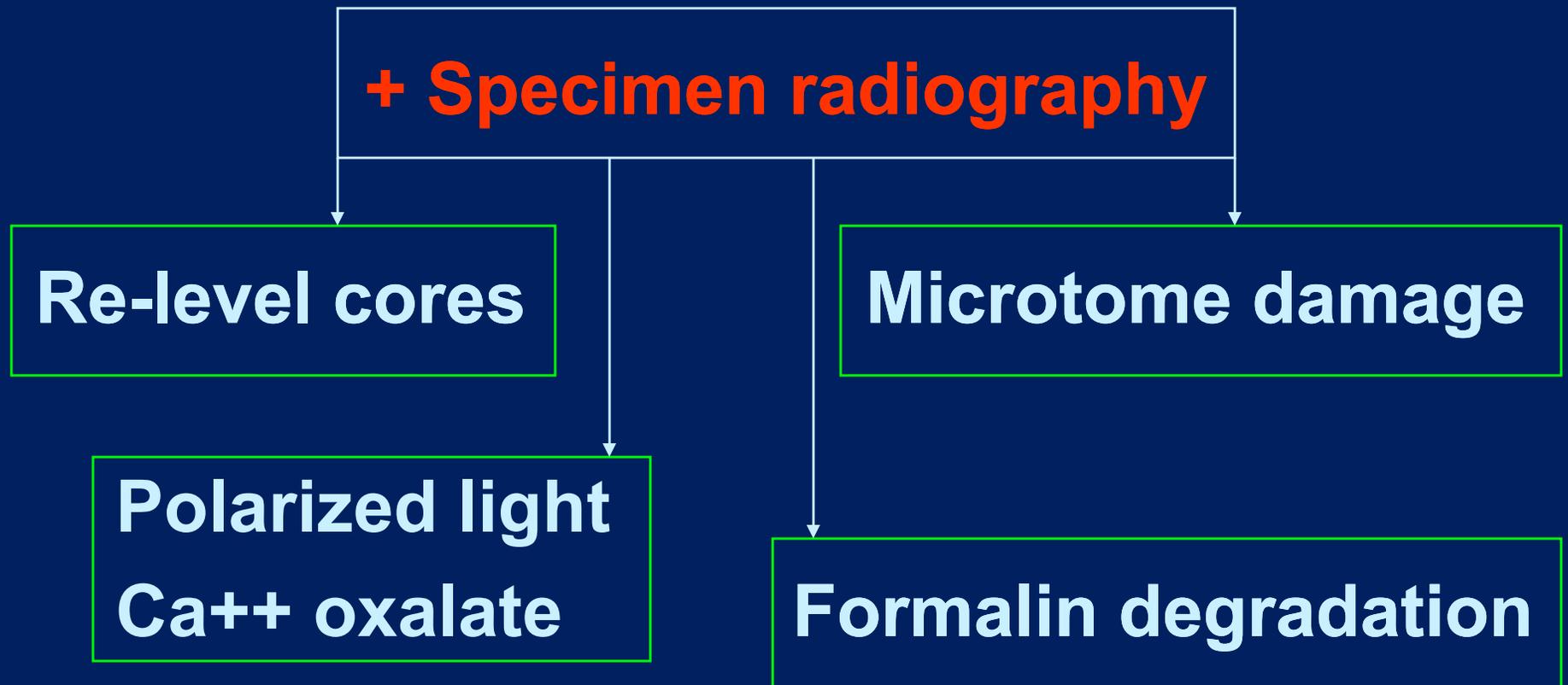
Clip Placement

- **To mark biopsy site for future reference**
- **Necessary for biopsy of very small lesions where entire mammographic abnormality may be removed**
- **Post procedure mammogram helps to confirm accurate sampling**
- **When pathology indicates need for excision ie ADH, ALH, carcinoma, clip is the reference point for localization**

Components of Percutaneous Biopsy

- Proper case selection
- Procedure performance
- Review of pathology report
- Recommendation for management
- Communication of results to patient and referring MD
- Medical audit

Considerations When No Calcifications Found at Histology



Causes for Excision Post Core Biopsy

- **Atypical ductal hyperplasia**
- **Atypical lobular hyperplasia**
- **Lobular carcinoma in situ**
- **Carcinoma (if lumpectomy is the planned method of treatment)**

Causes for Excision Post Core Biopsy

- Inadequate specimen for diagnosis
- “Fibroadenoma vs phylloides tumor”
- Radial scar
- Papillary lesion
- Nonconcordant finding

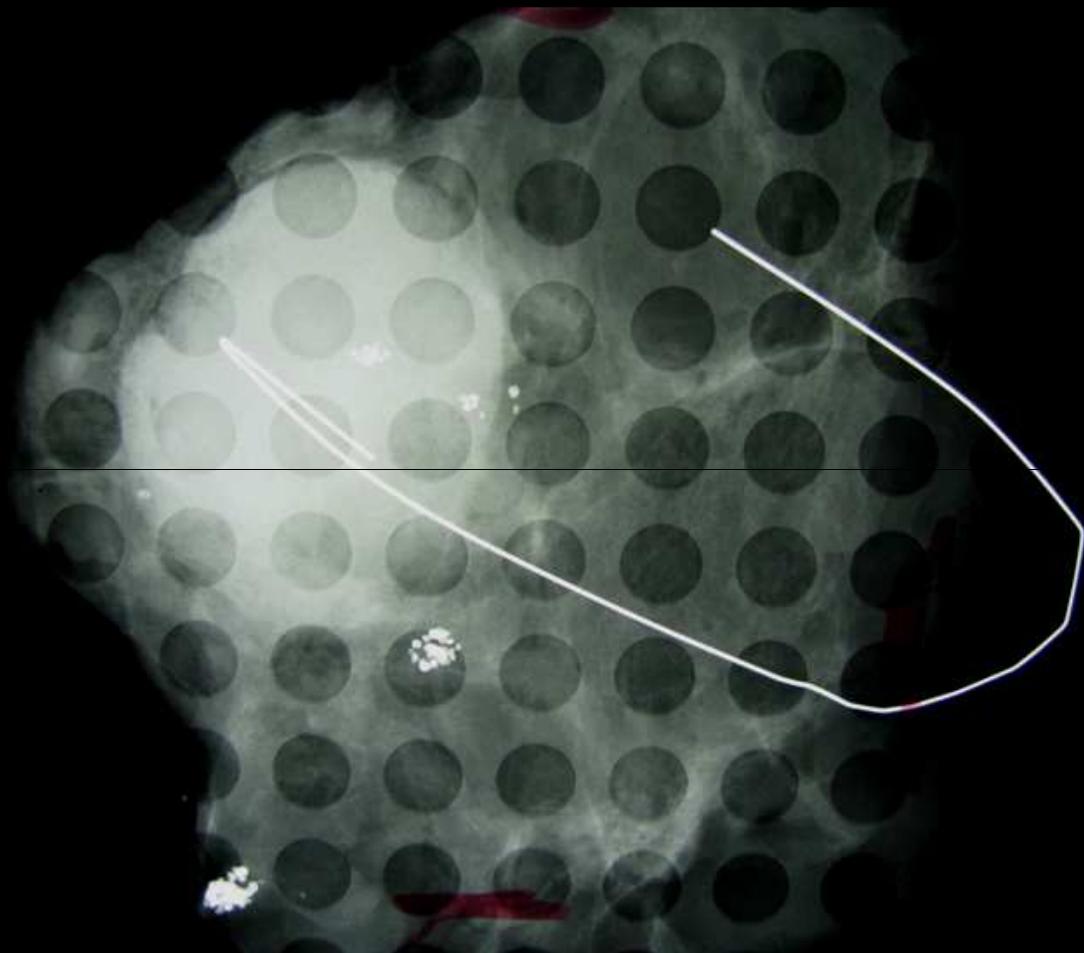
Case 5a

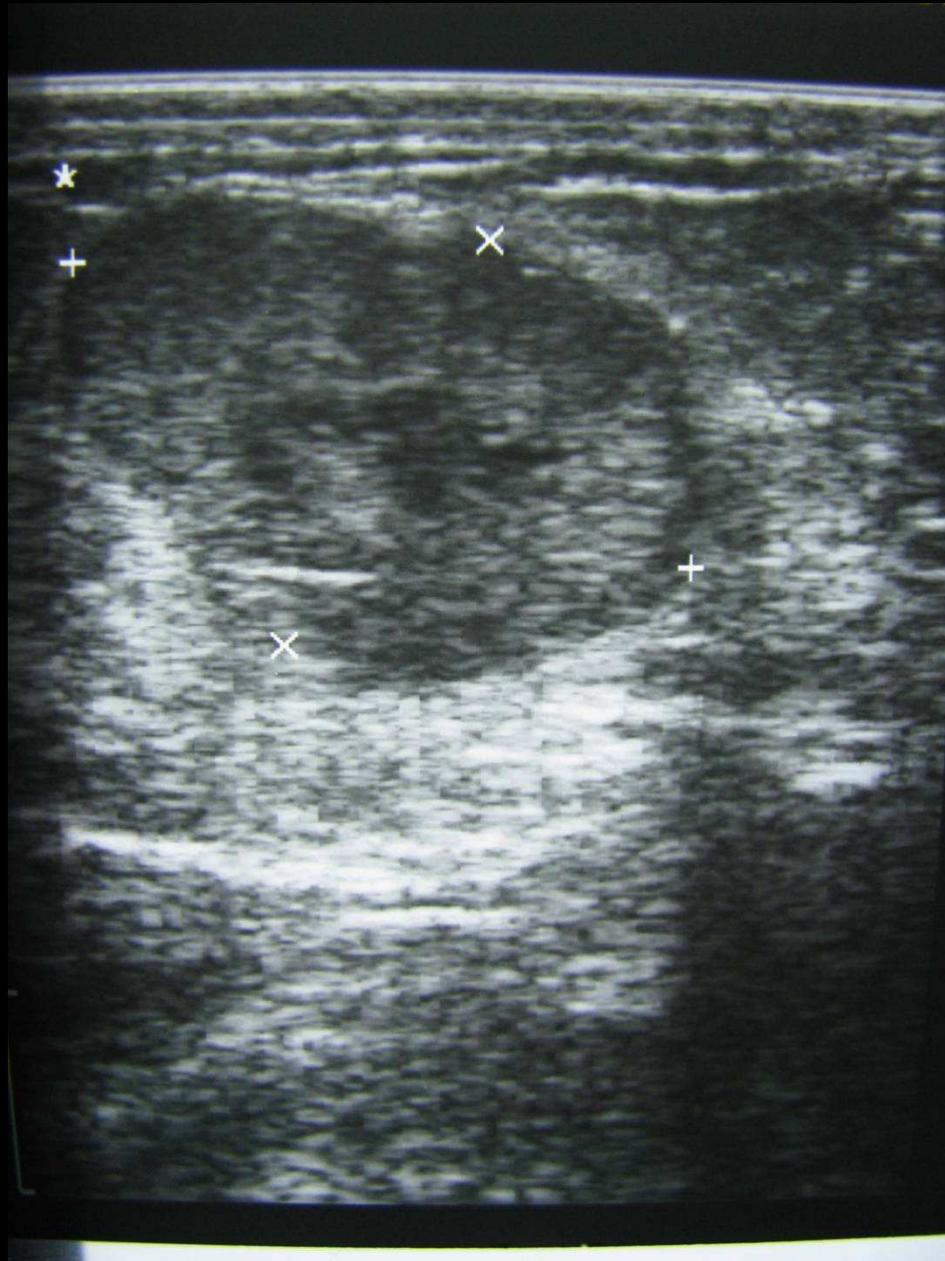
History: 57-year-old woman with breast mass

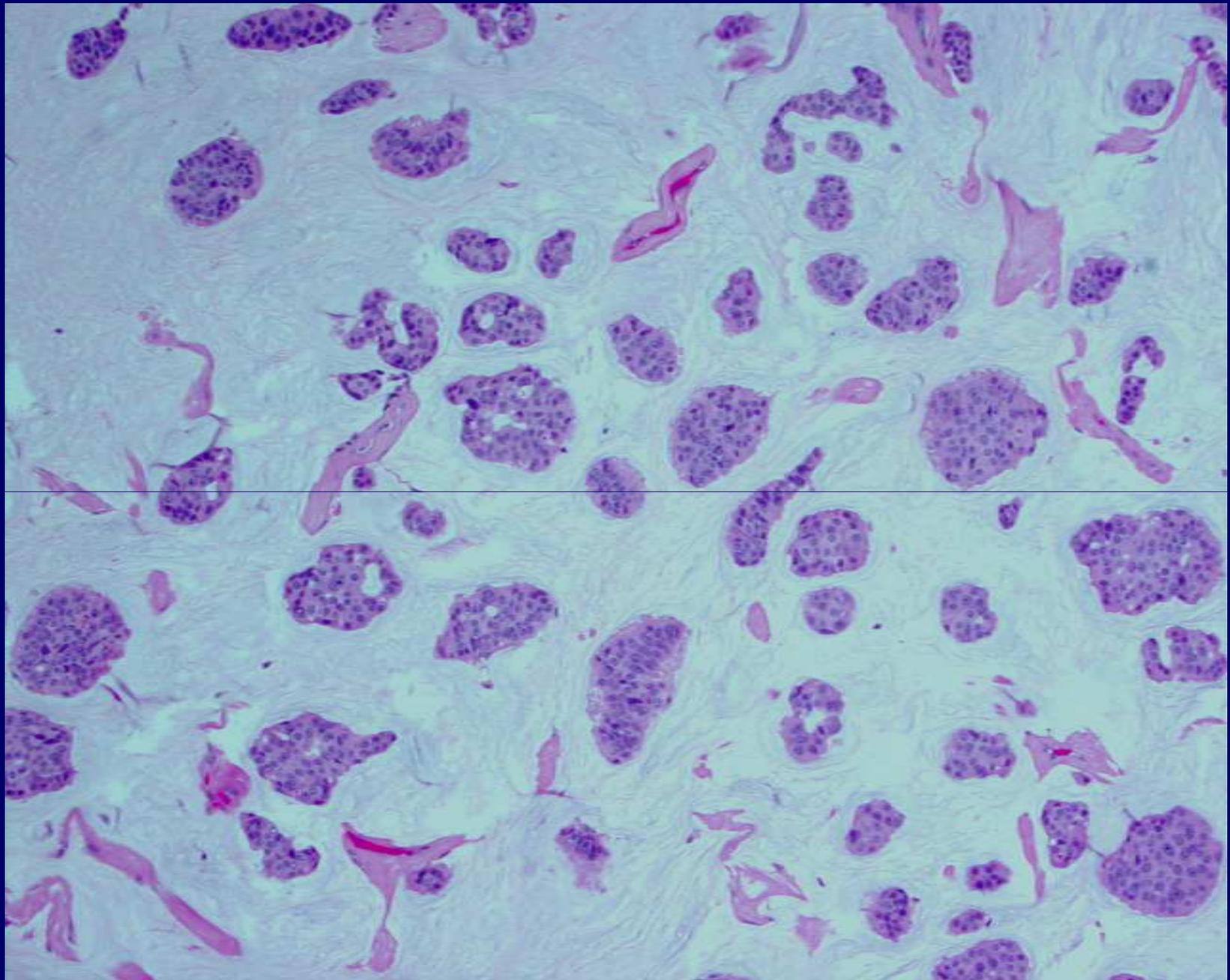
Mass: circumscribed, indistinct margins

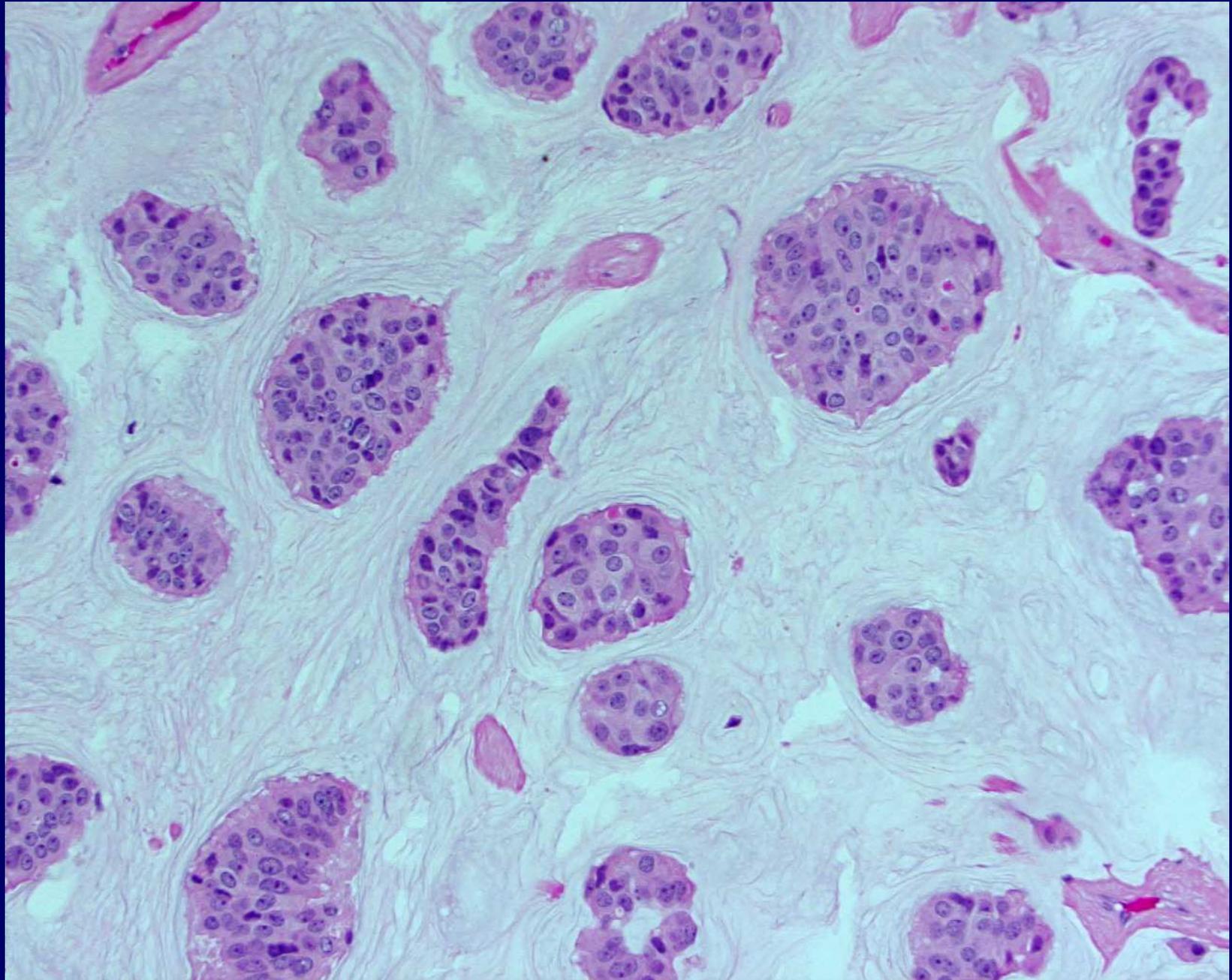
BP











Round well-circumscribed breast lesion on imaging may be seen in:

- **High-grade carcinoma**
- **Mucinous carcinoma**
- **Fibroadenoma-Phyllodes**
- **Cyst, distinguished on ultrasound**

Case 5B

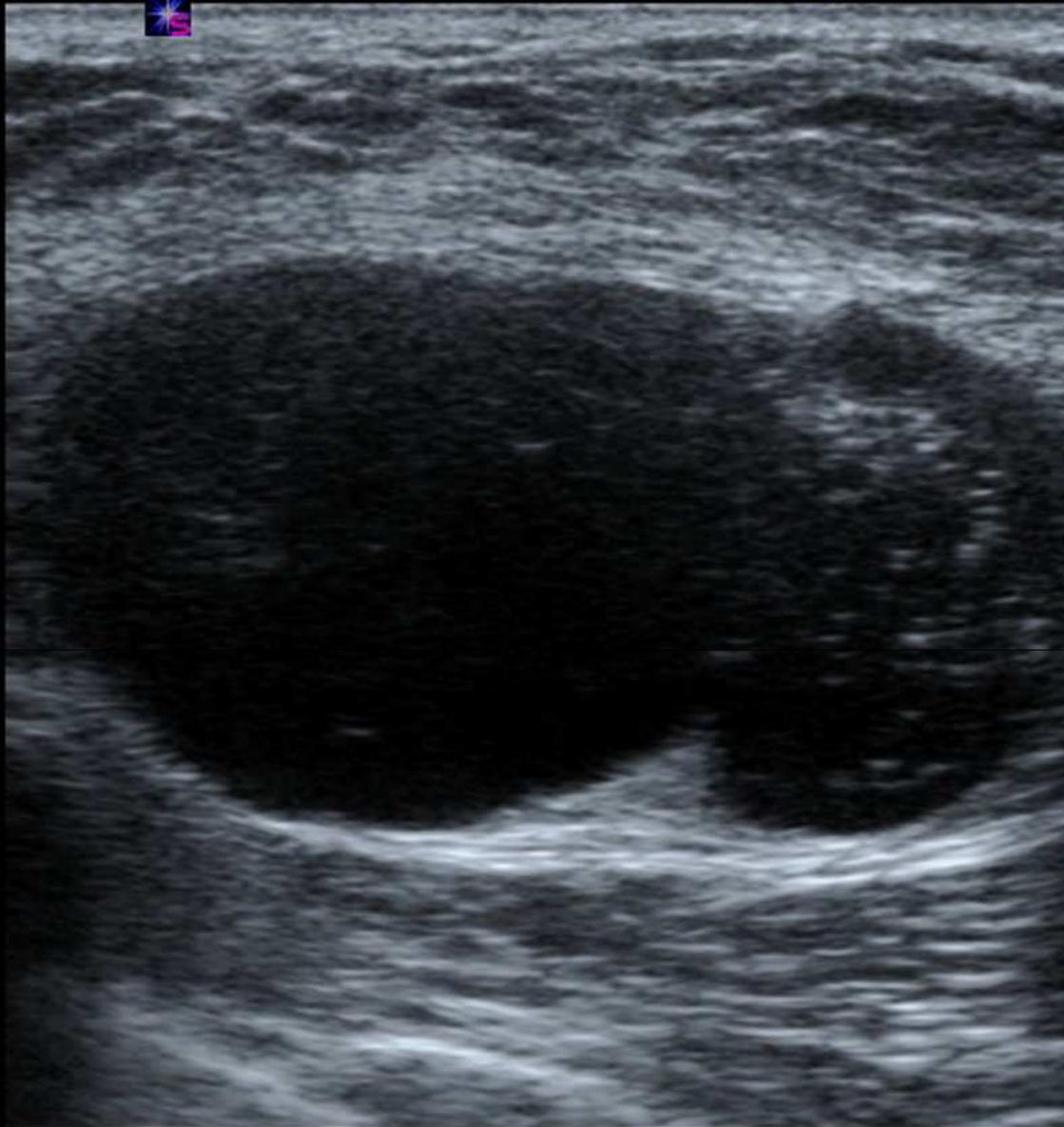
History: 73-year-old female,
Mass in left axilla

Mammogram: Multiple lymph nodes with
circumscribed margins

Ultrasound: Multiple lymph nodes with
thickened cortex, compressed hilum

MRI: Oval 4.3 cm mass in UOQ of left
breast characterized by rapid initial wash-in
and wash-out kinetic curves

MI: 0.6



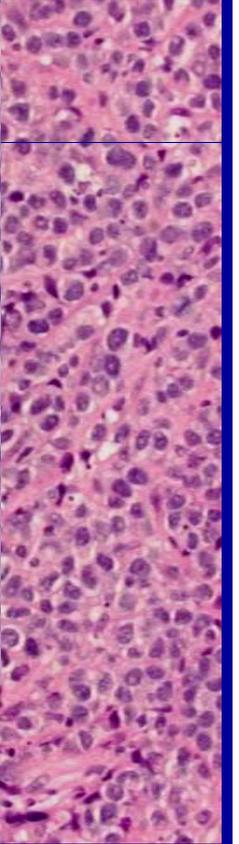
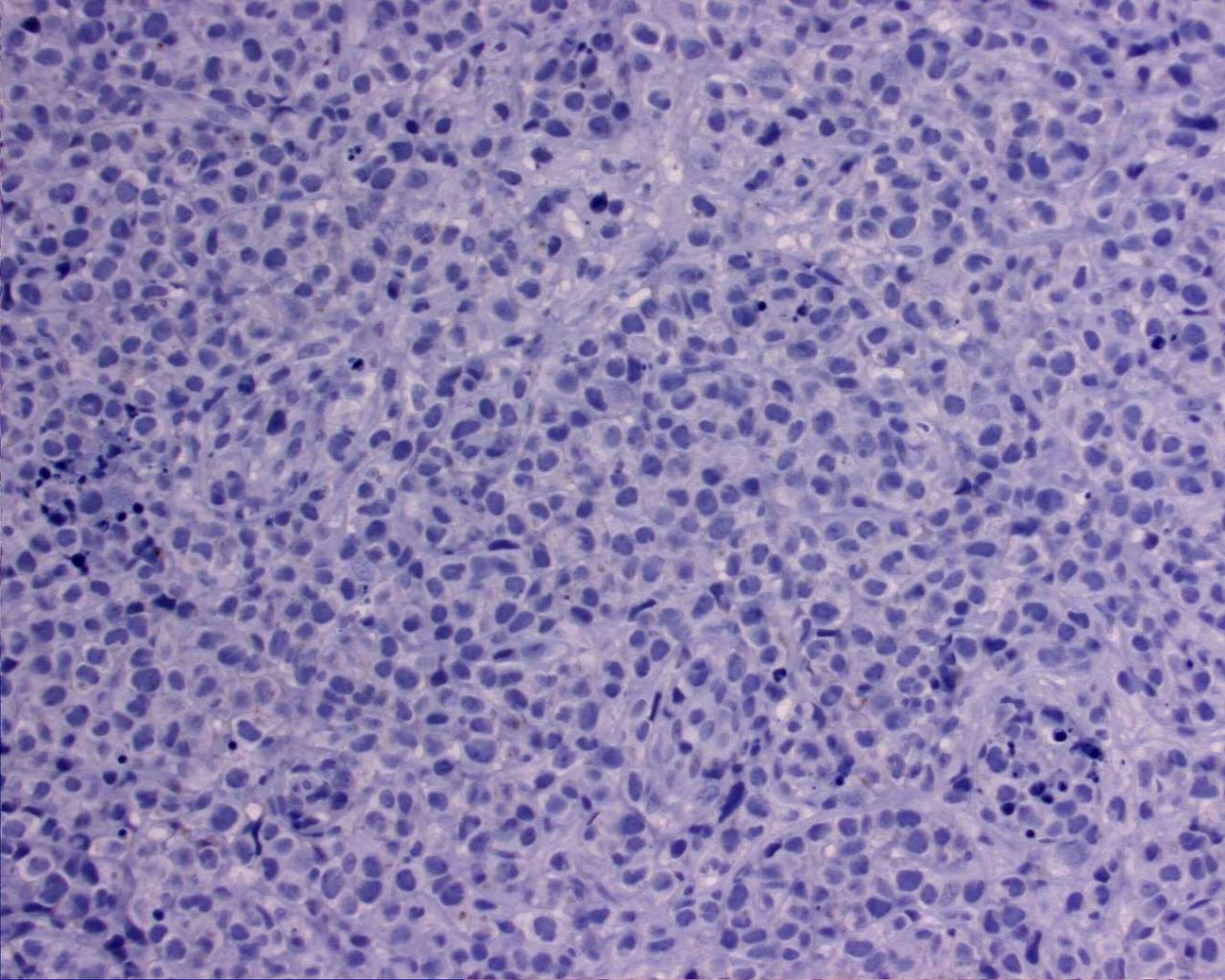
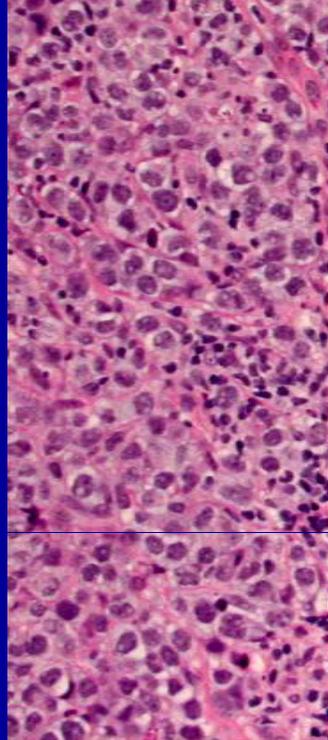
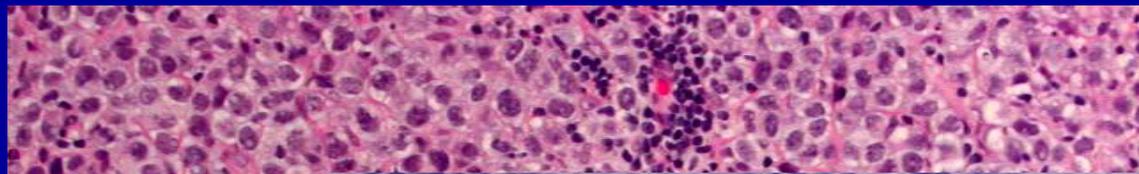
LEFT AXILLA PALP ARAD_

4ci
13i

LYMPH NODE WITH COMPRESSED HILUM ON U/S



ENHANCING MASS ON MRI



Audience Response

Diagnosis of Infiltrating lobular carcinoma versus metastatic lobular carcinoma?

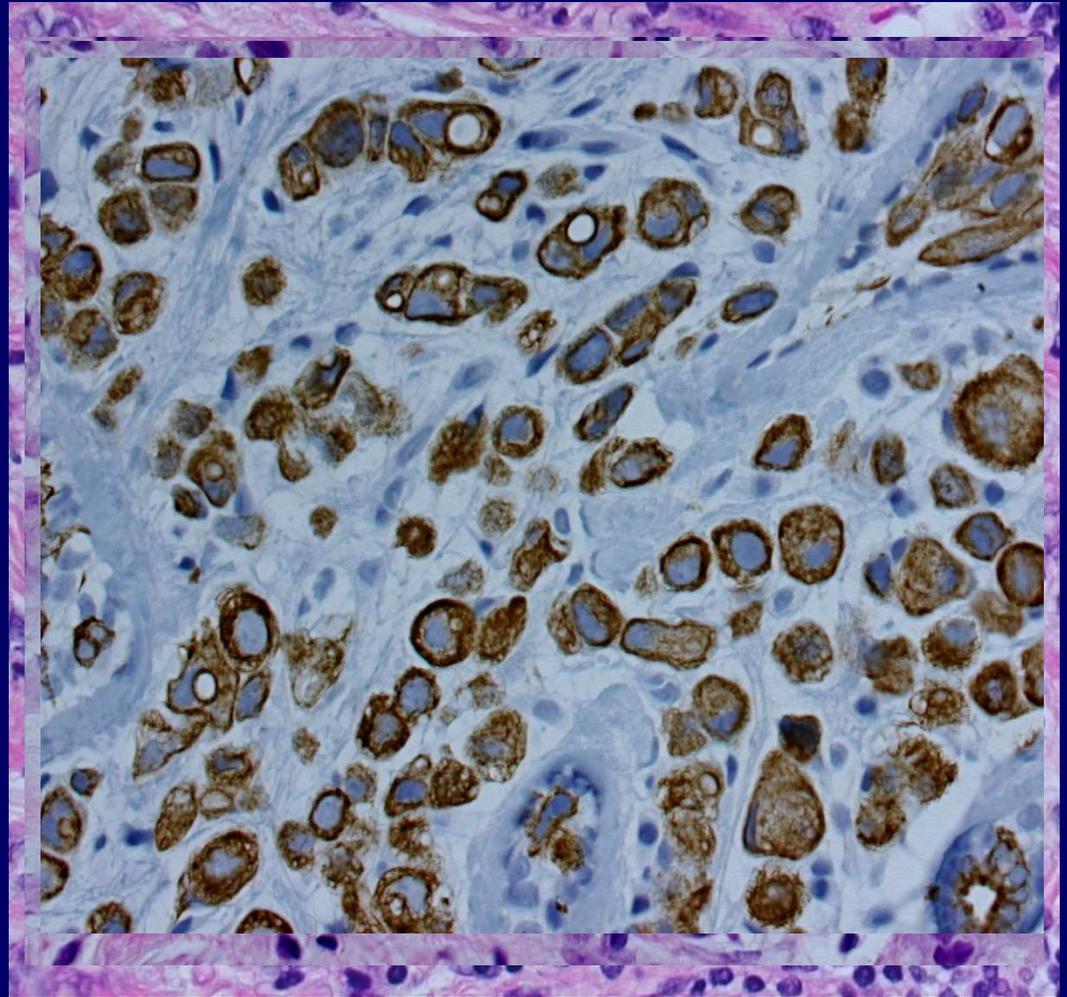
A. Yes

B. No

C. Not Sure

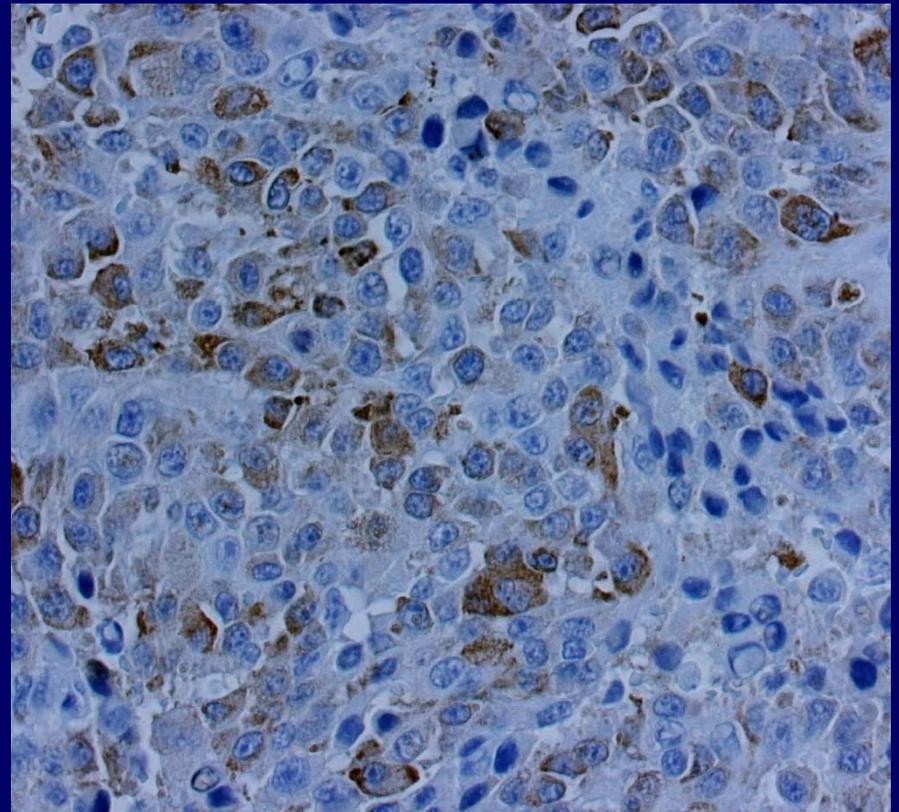
Lobular carcinoma

- **Classical**
- **Solid**
- **Pleomorphic**



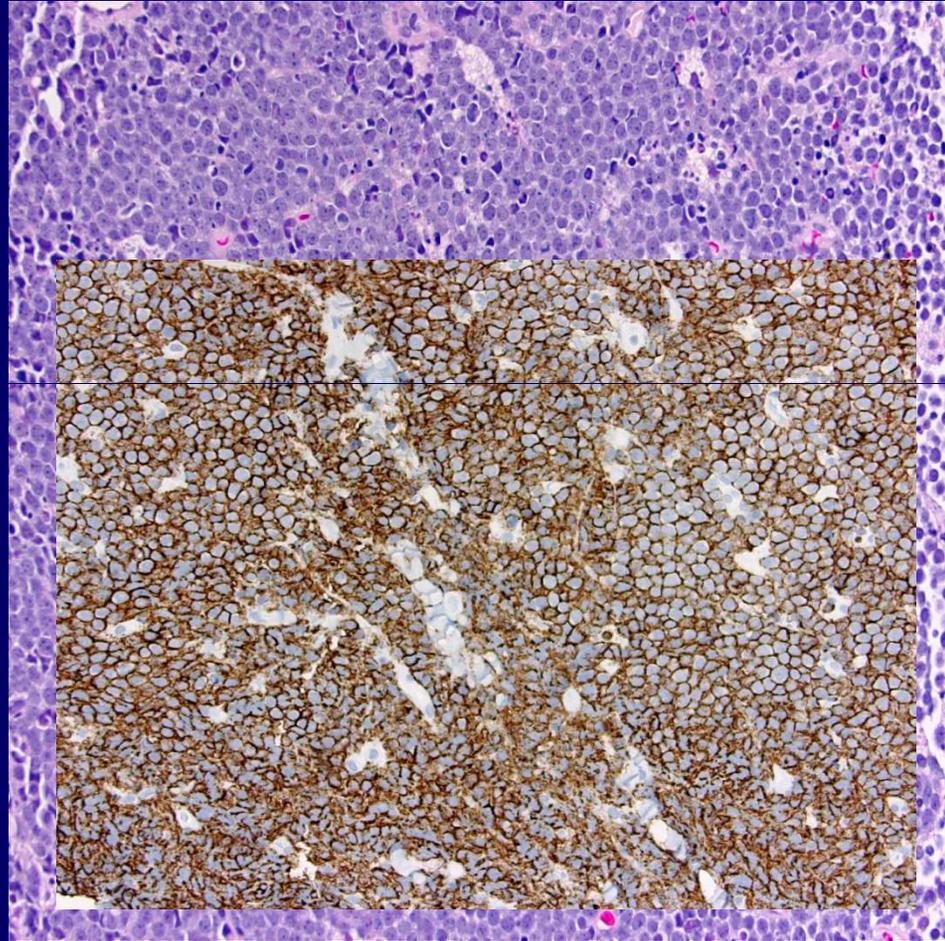
Melanoma

- Great mimicker



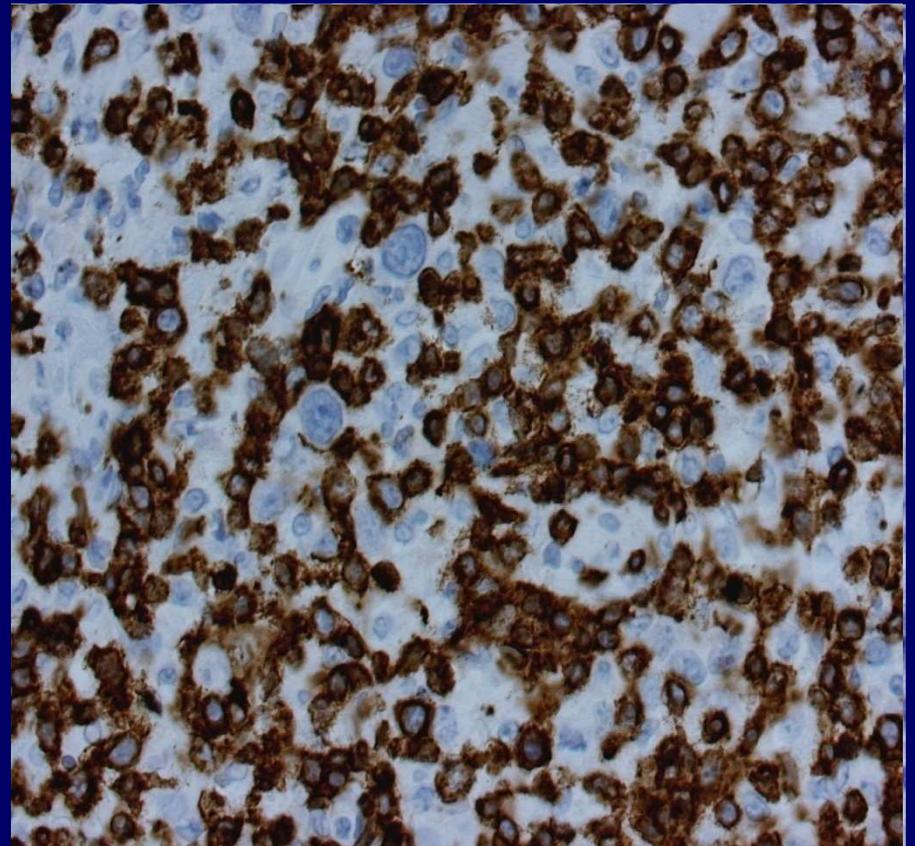
Non-Hogkin Lymphoma

- DLBCL



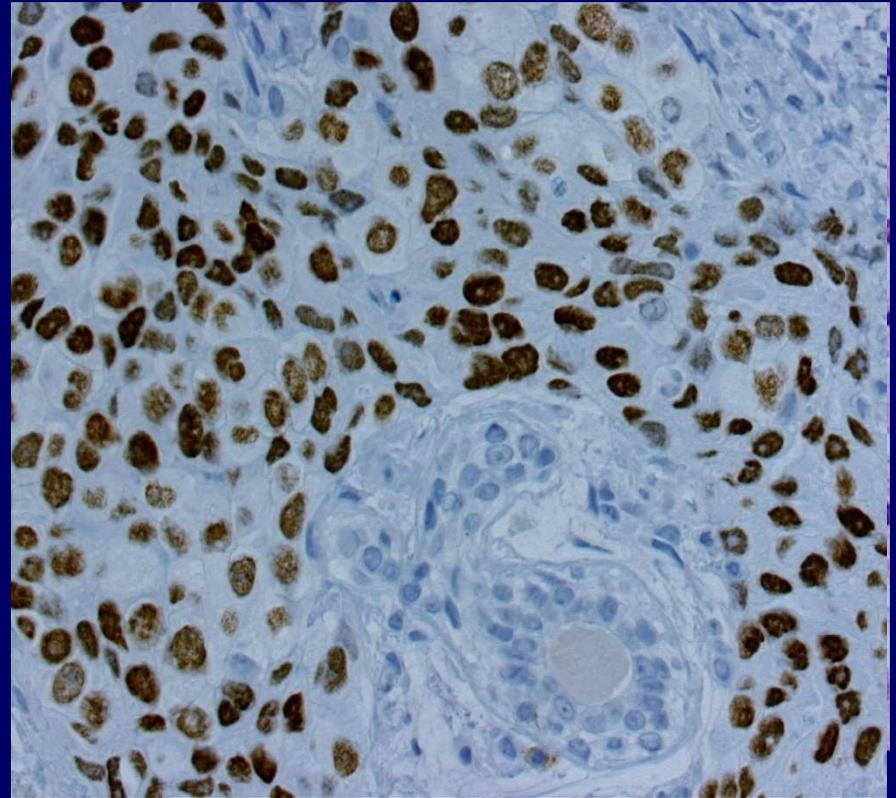
Hodgkin Lymphoma

- **Mixed inflammatory cells**

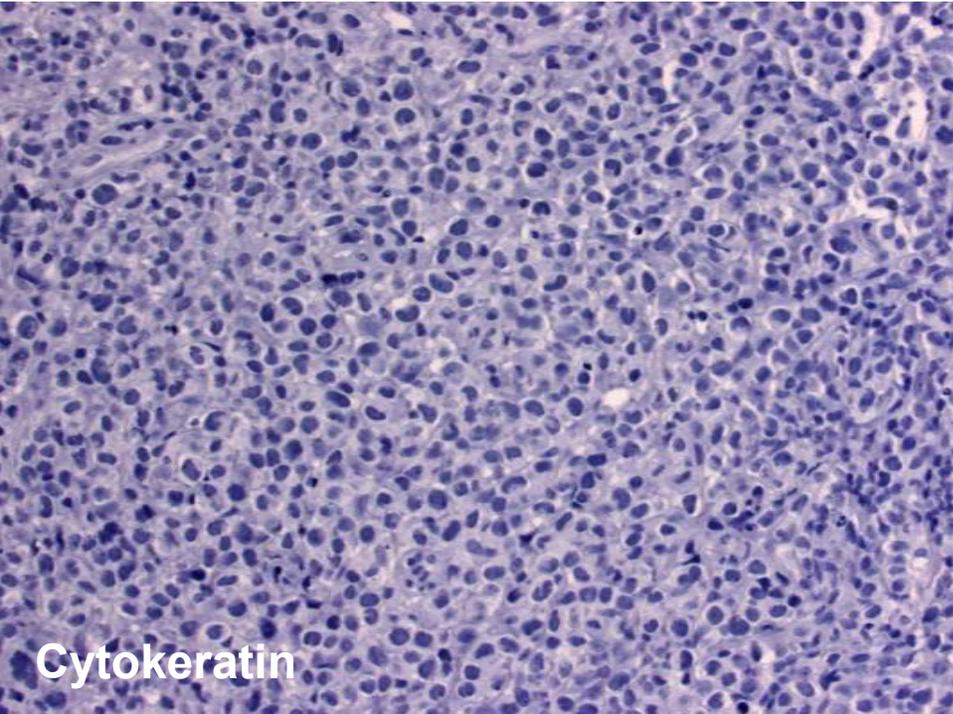
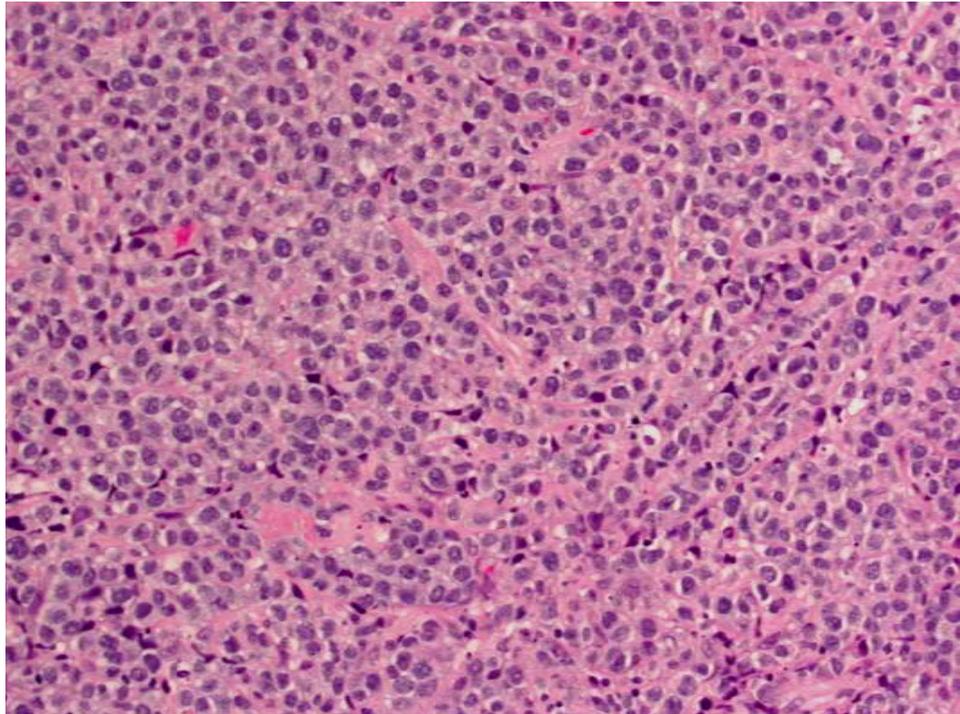


Metastatic carcinoma, non-breast

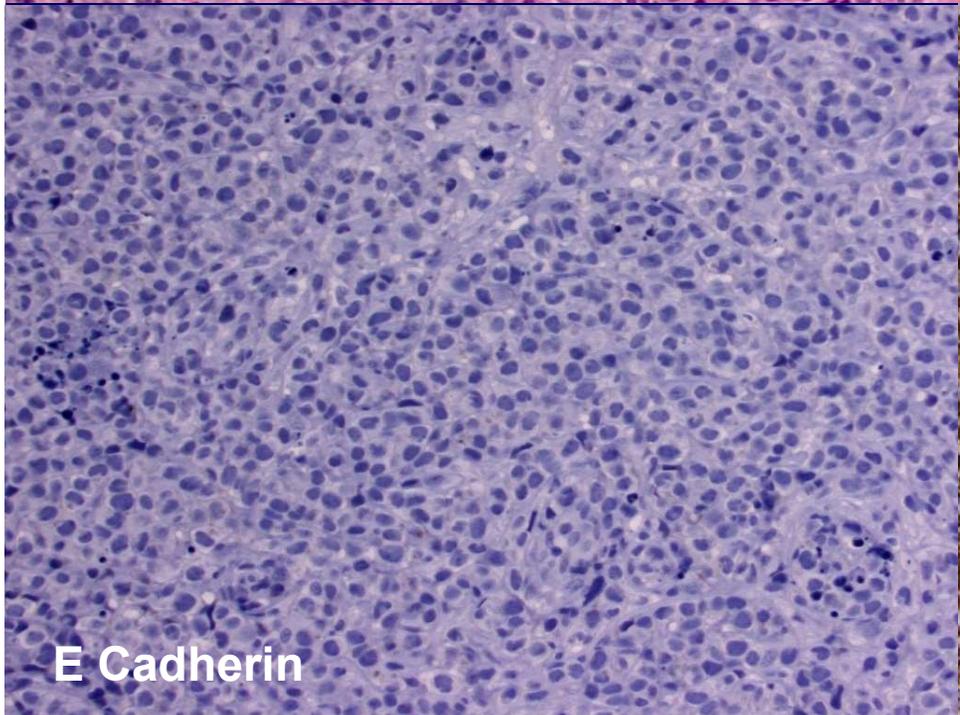
Other tumor can metastasize, e.g. lung



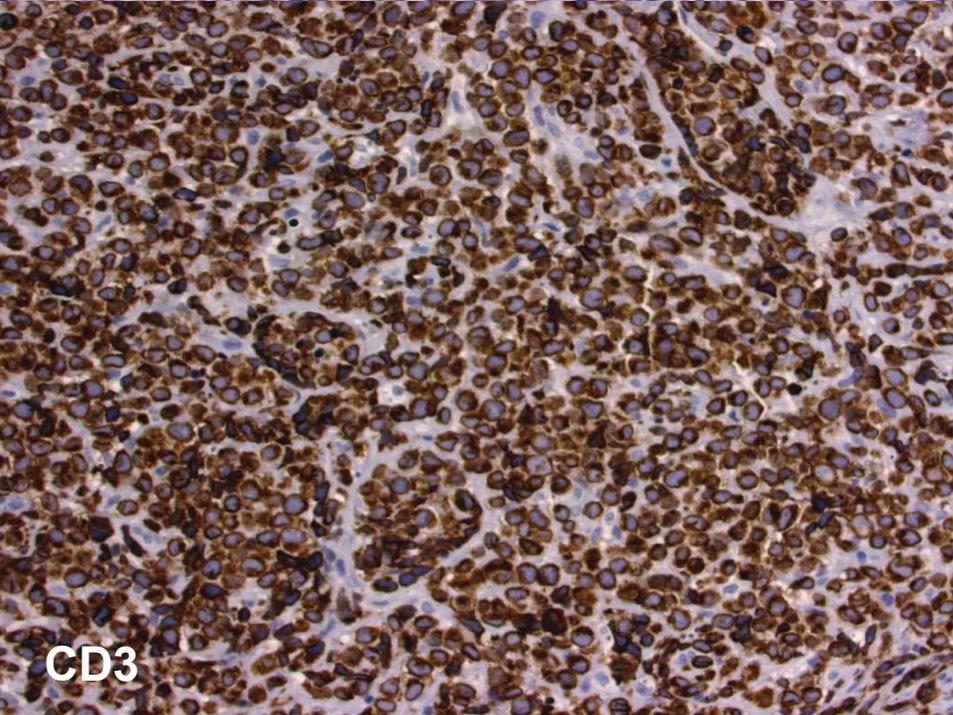
**Back to the breast mass and
axillary masses in case 3B**



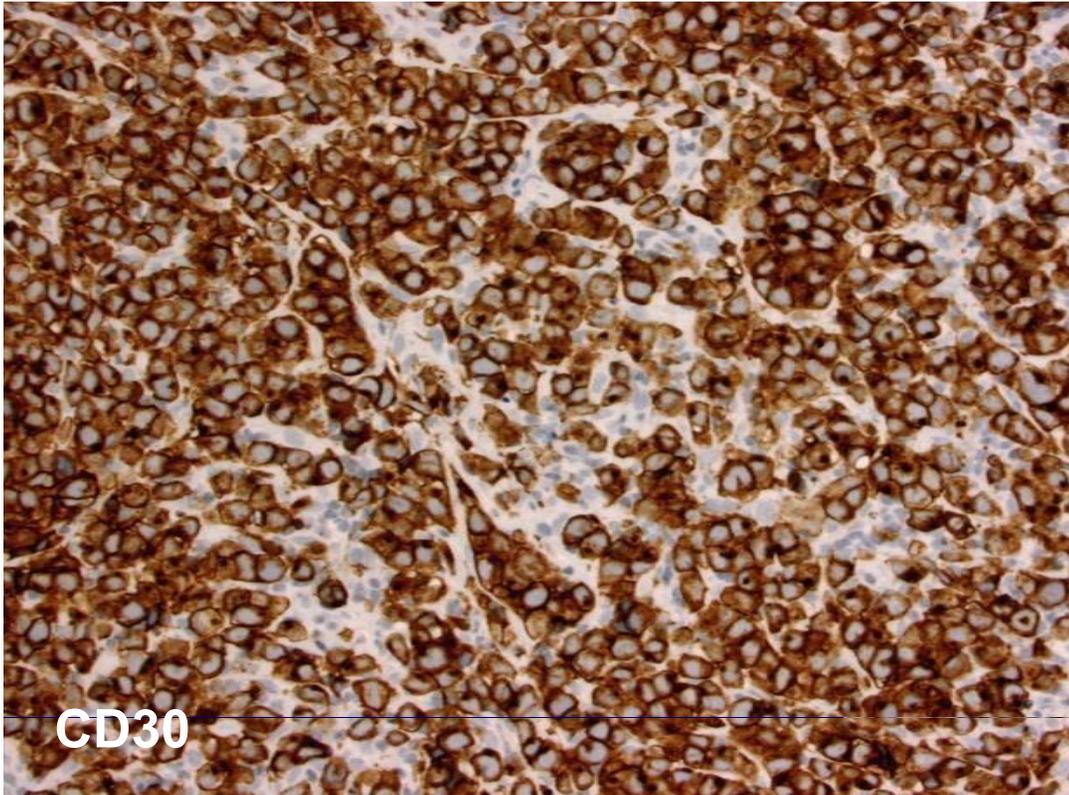
Cytokeratin



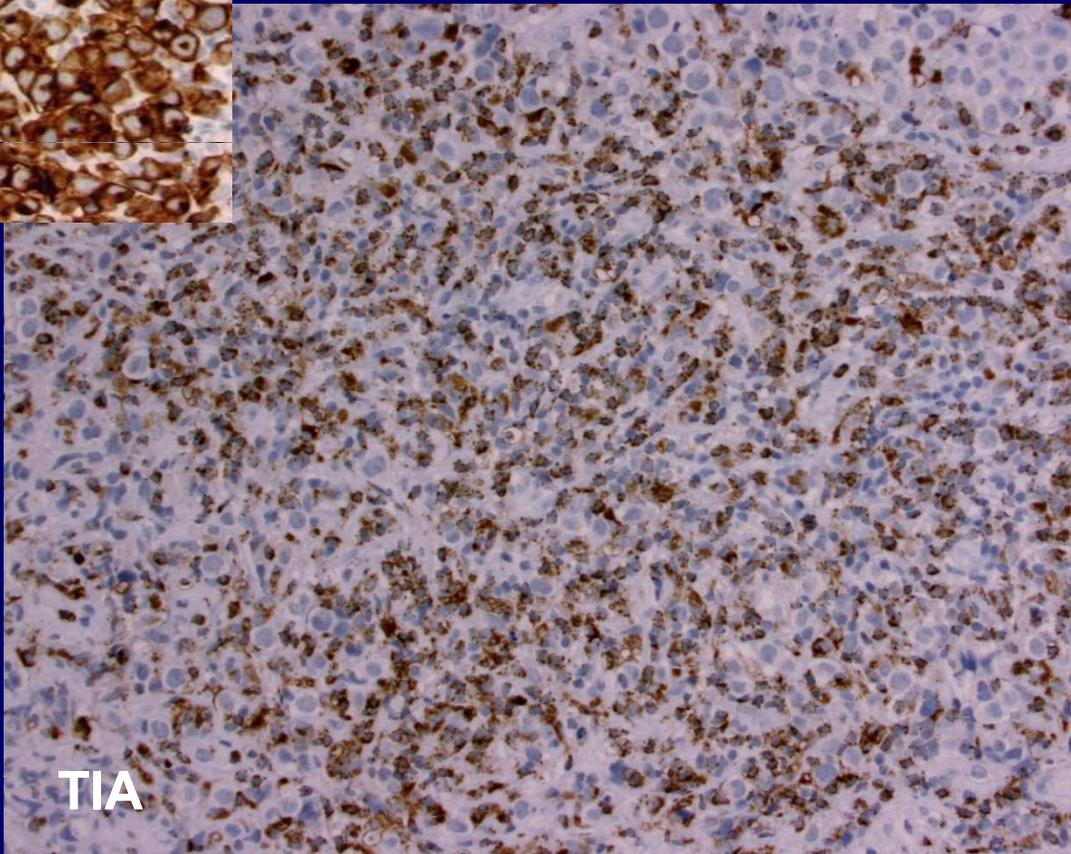
E Cadherin



CD3



CD30



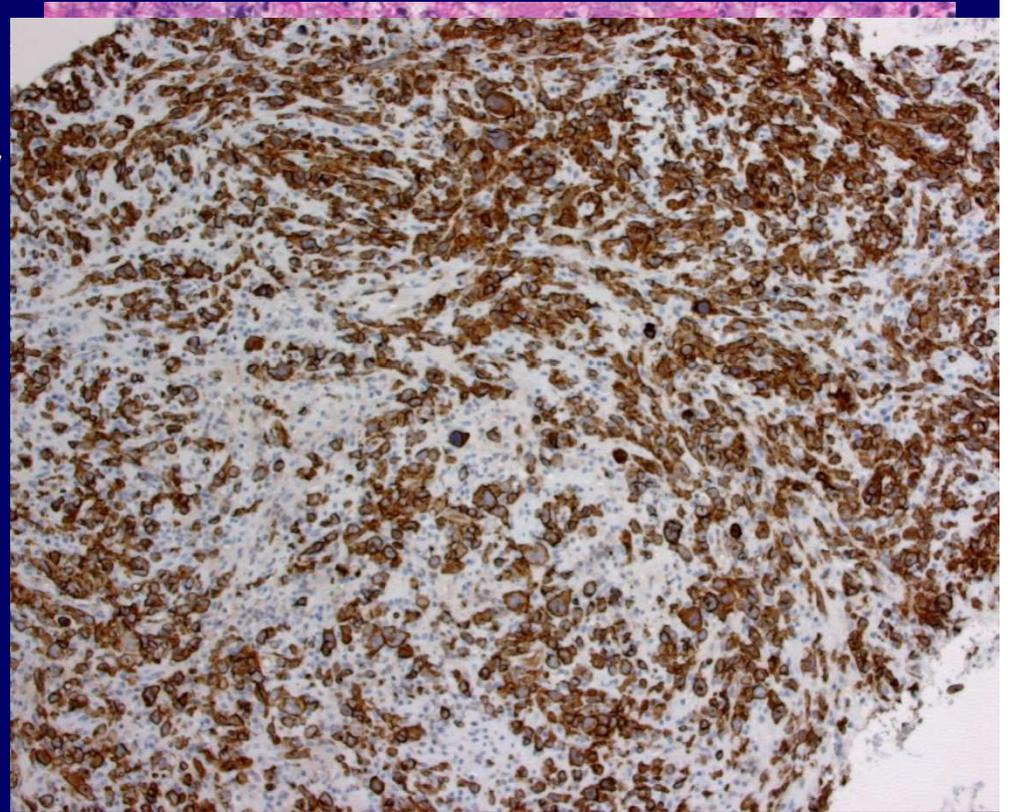
TIA

Anaplastic Large Cell Lymphoma

- The name aptly describes the classic variant (most common 70-80%)
- There are other variants, cells neither large or anaplastic
 - Lymphohistiocytic
 - Small cell
 - Sarcomatoid

Anaplastic Large Cell Lymphoma

- Pleomorphic and cohesive tumor cells arranged in sheets or in clusters
- Abundant basophilic or amphophilic cytoplasm
- Round, lobulated or bizarre shaped nuclei



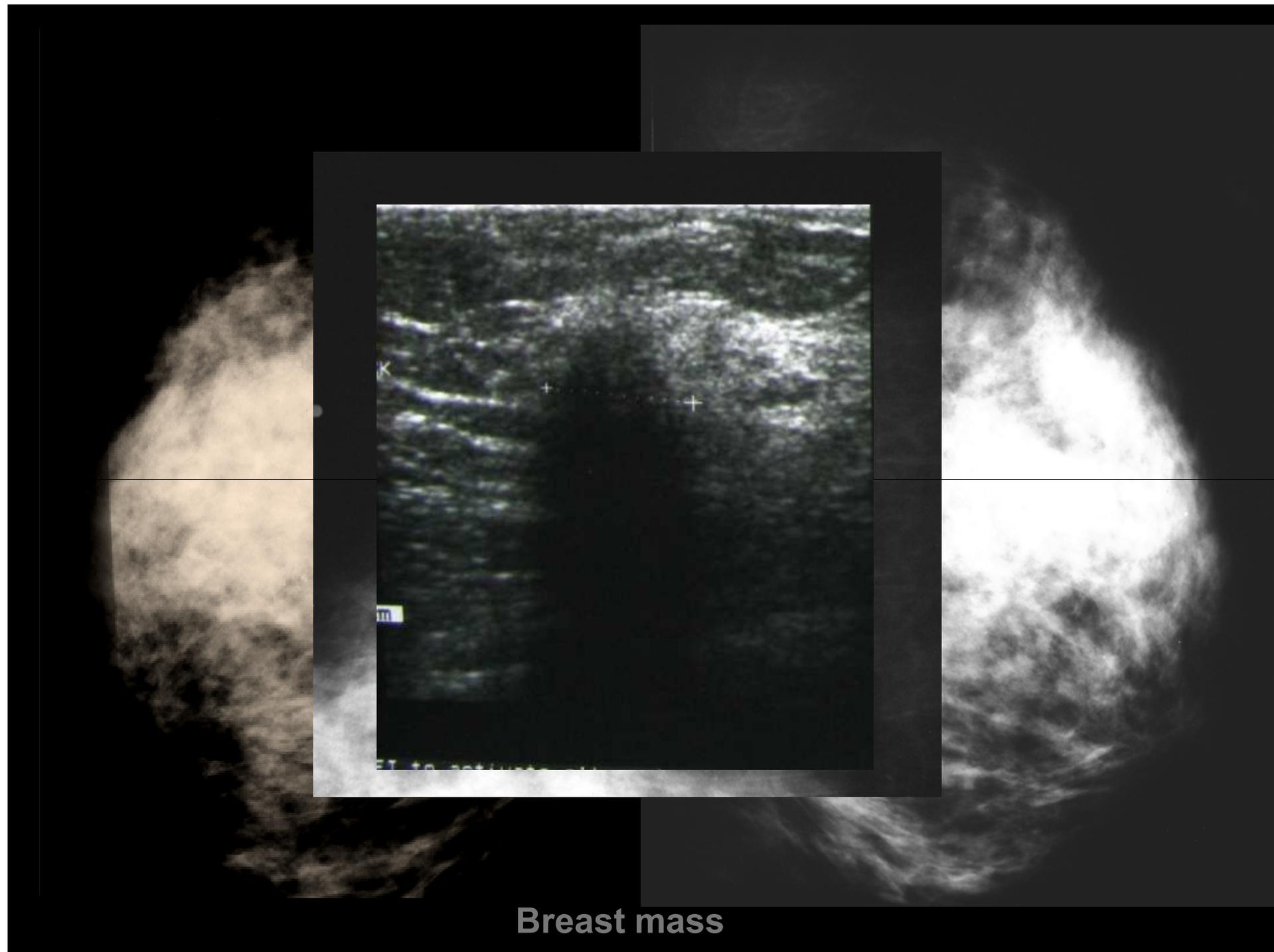
Anaplastic Large Cell Lymphoma

- Identification of hallmark cells or bizarre cells should raise the possibility
- Monomorphic variant may mimic diffuse large cell lymphoma or infiltrating lobular carcinoma
 - Classic pattern often present, but may be focal
- May be ALK-negative
- CD3 and CD5 may be negative
- CD2, CD4, CD7 and CD43 are often expressed
- Requires a high index of suspicion

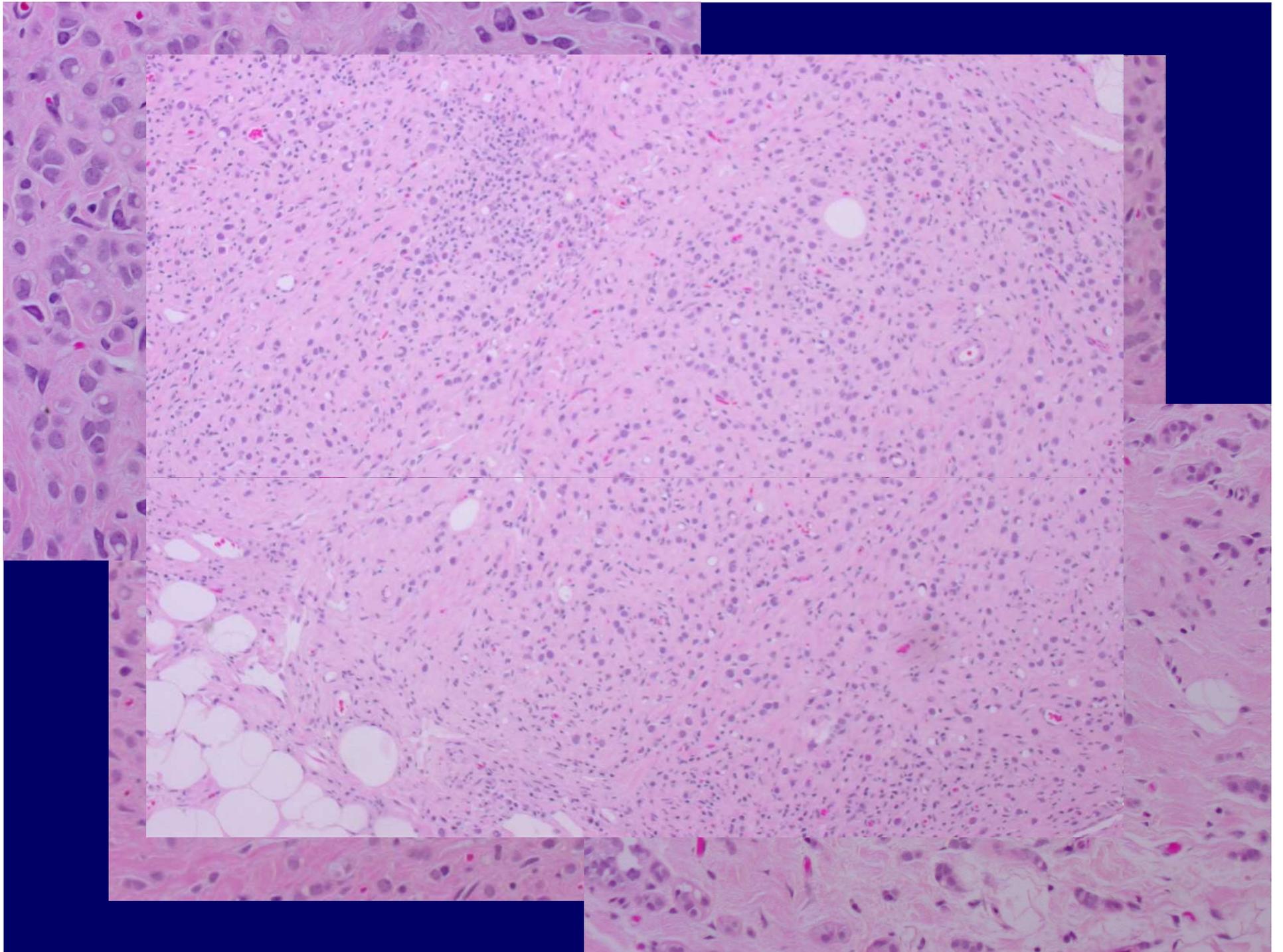
Case 5C

History:

Left breast mass



Breast mass



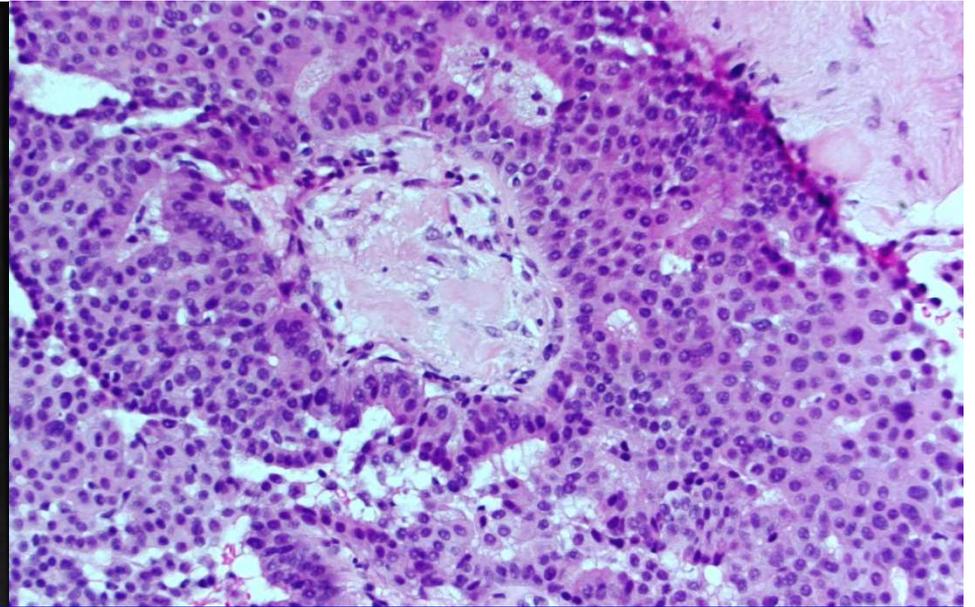
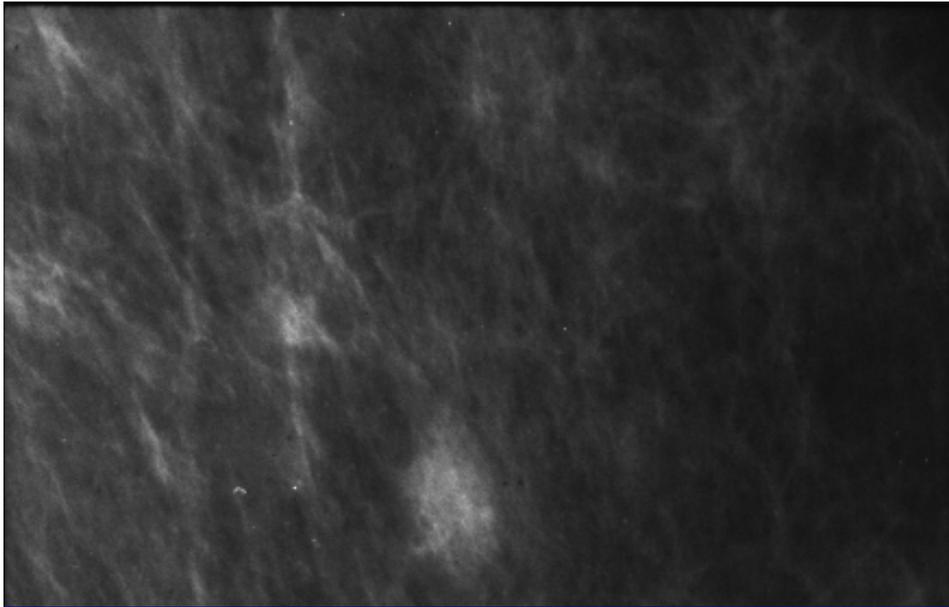
Diagnosis: Infiltrating lobular carcinoma.
Correlates with the radiological findings

Variants of Infiltrating Lobular Carcinoma

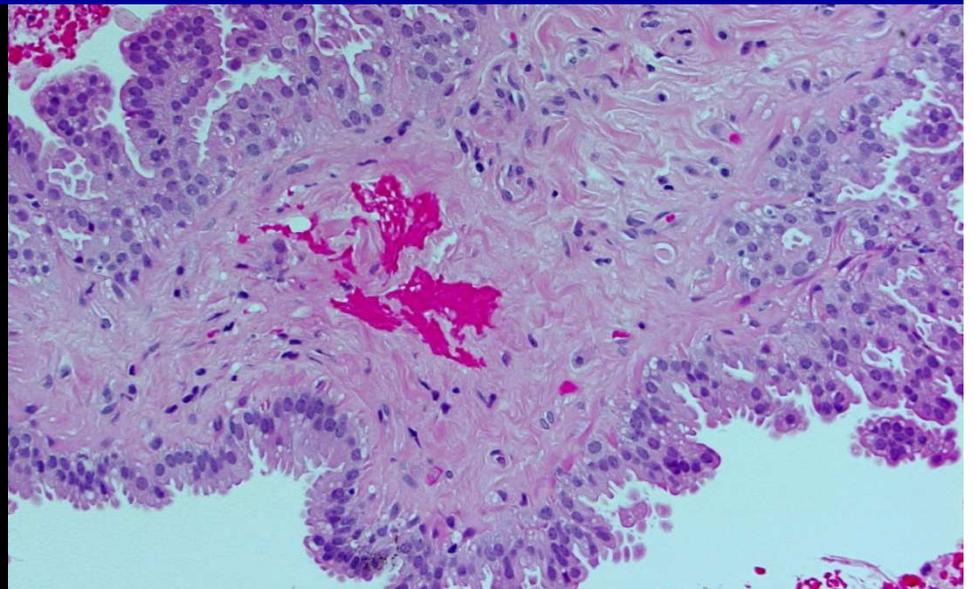
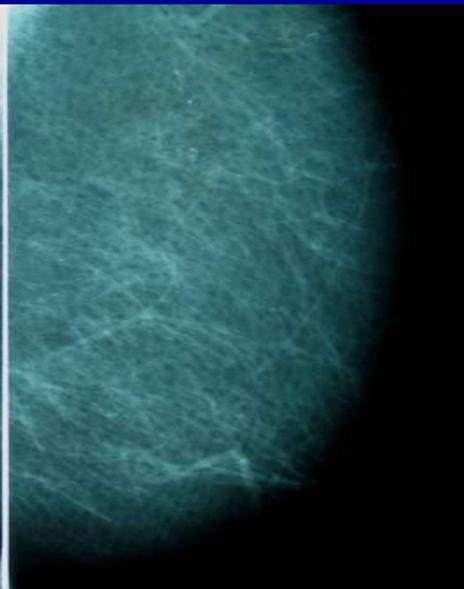
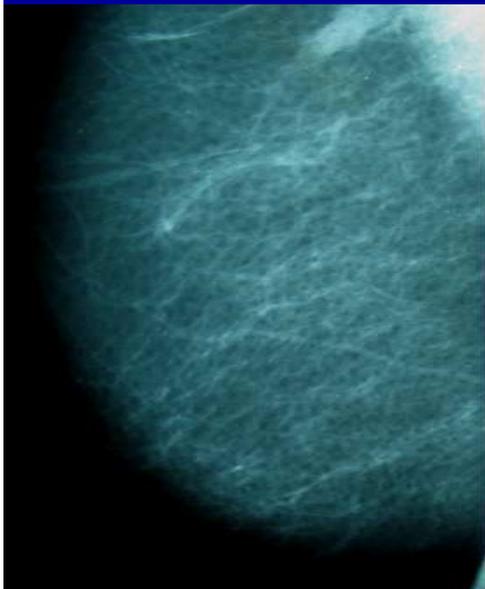
- **Classic, most common**
- **Solid**
- **Trabecular**
- **Alveolar**
- **Tubulolobular**
- **Pleomorphic/histiocytoid**
- **There may rarely be prominent lymphocytic response**

Infiltrating lobular carcinoma

- **May resemble lymphocytes or lymphoproliferative disorder**
- **Cytokeratin useful in differentiation**
- **Higher frequency of metastasis to visceral organs, e.g. gastrointestinal and gynecologic system**



Radiology Unhelpful in Evaluating Papillary Lesions



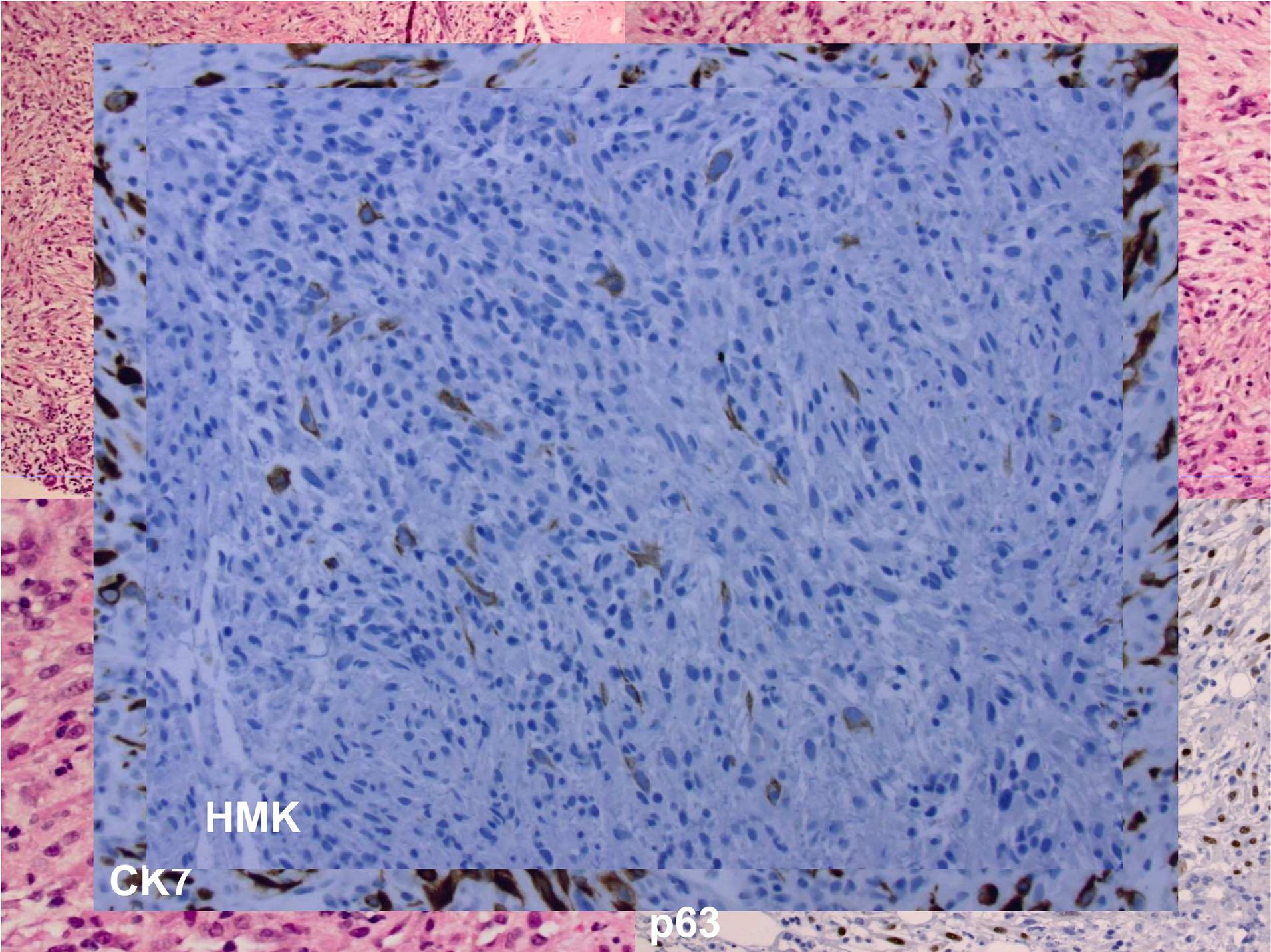
Case 6

History: 57 year old. mass in right UOQ

Mammogram: Mass with lobulated, ill-defined margins

Ultrasound: *Hypoechoic vertically oriented mass with poorly-defined margins*

MRI: Lobulated mass with irregular rim enhancement and central areas of high signals intensity on T2-weighted images



HMK

CK7

p63

Metaplastic carcinoma

- Positive for p63, CK7 and other keratins including pan-cytokeratin, HMWCK: K903, 34BE12
- Negative for pan-melanoma, actin, desmin, ALK-1

Differential Diagnosis

- MPNST
- Fibromatosis
- Spindle cell melanoma
- Inflammatory myofibroblastic tumor

Metaplastic Breast Tumors with a Dominant Fibromatosis-Like Phenotype Have a High Risk of Local Recurrence

Helenice Gobbi, M.D., Ph.D.^{1,2}

Jean F. Simpson, M.D.¹

Alexander Borowsky, M.D.¹

Roy A. Jensen, M.D.¹

David L. Page, M.D.¹

¹ Department of Pathology, Division of Anatomic Pathology, Vanderbilt University Medical Center, Nashville, Tennessee.

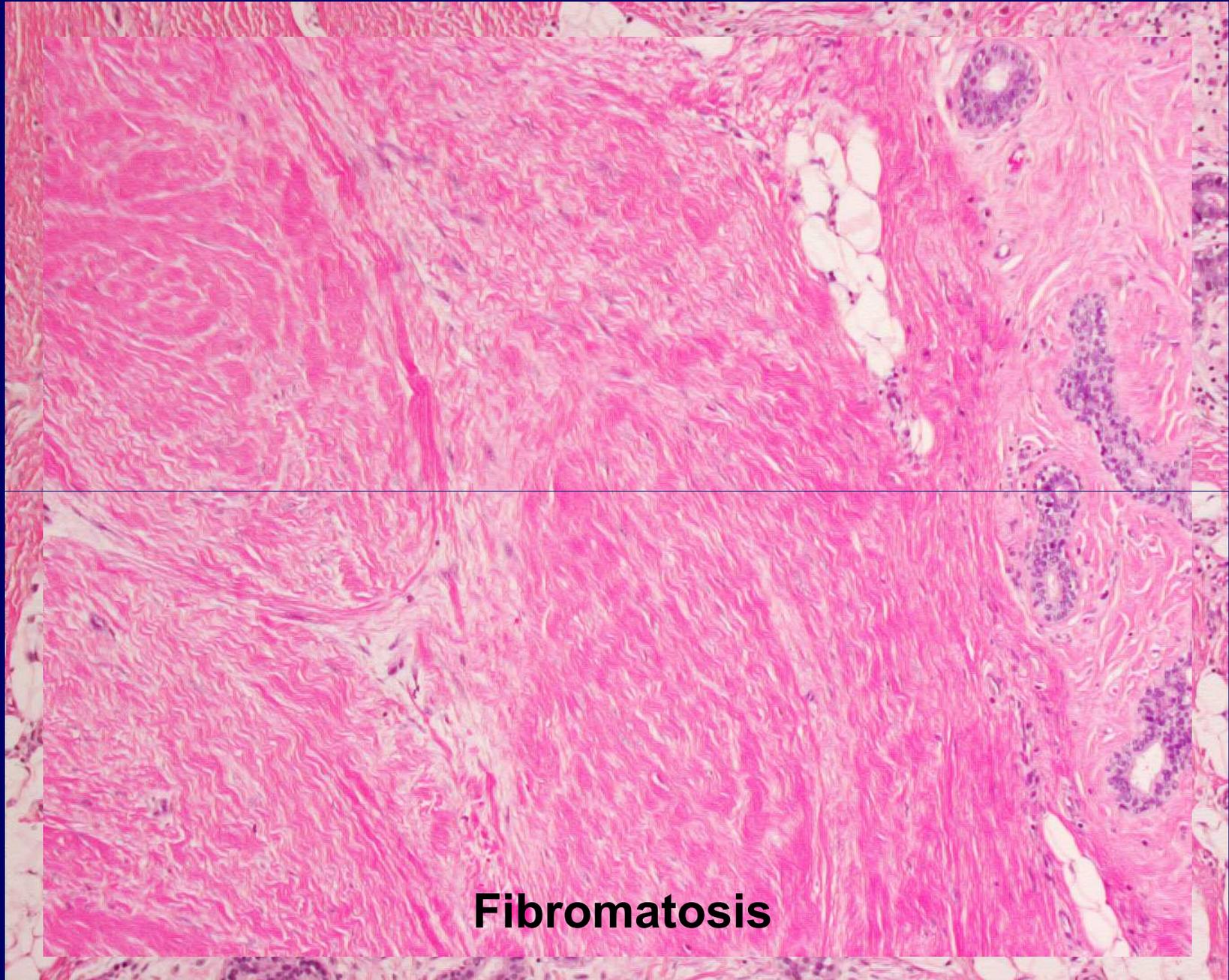
² Department of Anatomic Pathology, Federal University of Minas Gerais, Belo Horizonte, Brazil.

BACKGROUND. In the current study the authors describe the clinicopathologic characteristics of a low grade variant of spindle cell metaplastic tumors of the breast. Previously these tumors have been considered within a larger group recognized as metaplastic carcinoma, including cases with higher grade features.

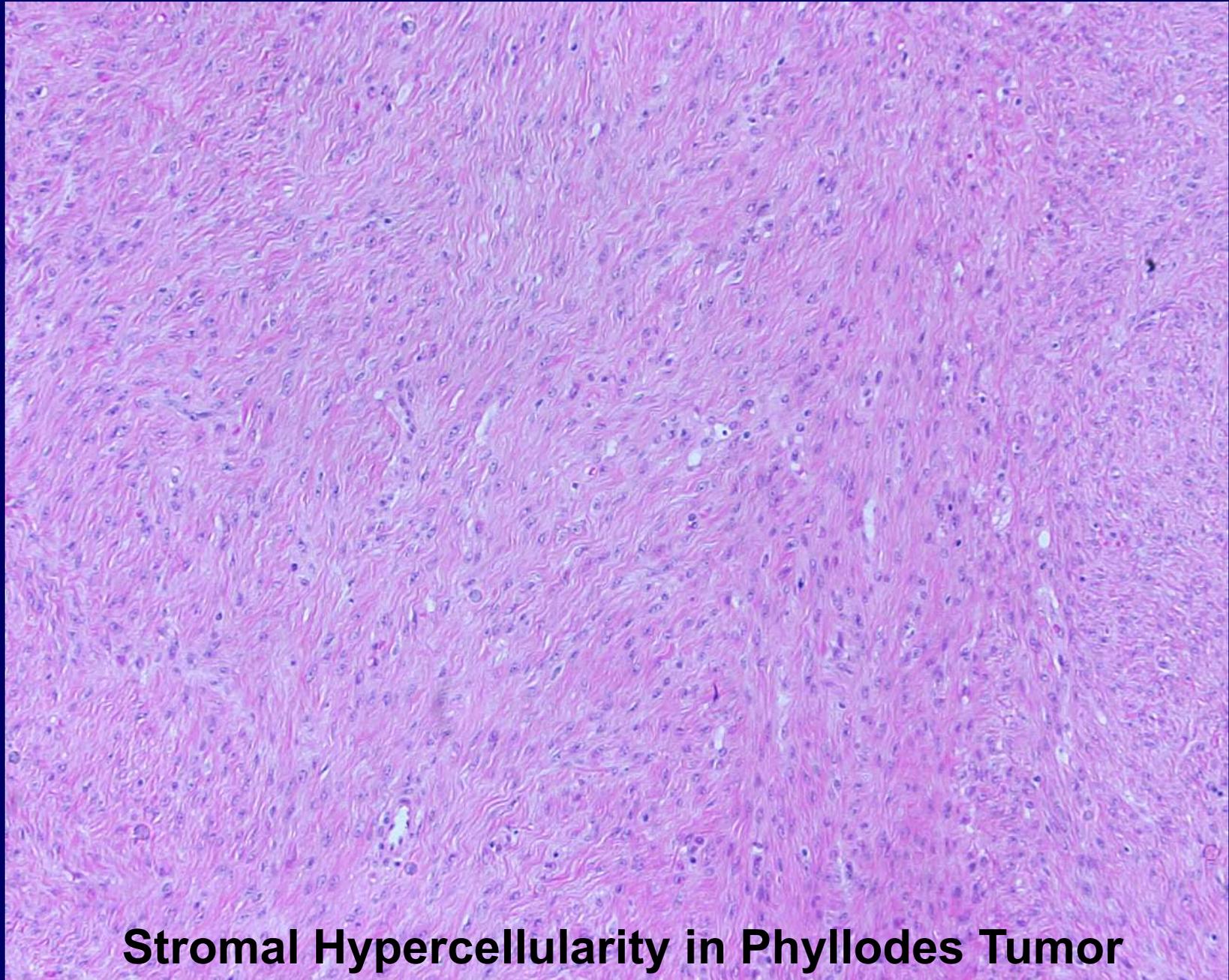
METHODS. Breast tumors comprised predominantly of low grade spindle cells, with sparse low grade epithelial elements, were selected. Clinical features as well as macroscopic, microscopic, and immunohistochemical findings were reviewed with emphasis on the biologic behavior and the differential diagnosis from other spindle cell lesions.

RESULTS. Of 30 tumors fulfilling strict criteria, 20 contained squamous or glandular elements associated with the spindle cells. Ten tumors were comprised entirely of low grade spindle cells with limited clustered epithelioid cells. At the periphery, all tumors showed a proliferation of bland spindle cells infiltrating the adjacent parenchyma and mimicking fibromatosis. The epithelioid cells and some spindle cells expressed both vimentin and one or more cytokeratins. Seven of eight patients treated by excisional biopsy developed local recurrence, whereas only one of ten patients treated with wide excisional biopsy developed a local recurrence. No distant or regional metastases occurred.

CONCLUSIONS. The presence of limited clusters of epithelioid cells along with a dominant fibromatosis-like pattern may be unique in the breast. The biologic potential of the fibromatosis-like, spindle cell, metaplastic breast tumors most likely is defined by their major histologic phenotype; they are capable of local recurrence with no demonstrated distant spread or regional metastases, as in pure fibromatosis of the breast. *Cancer* 1999;85:2170–82.



Fibromatosis



Stromal Hypercellularity in Phyllodes Tumor

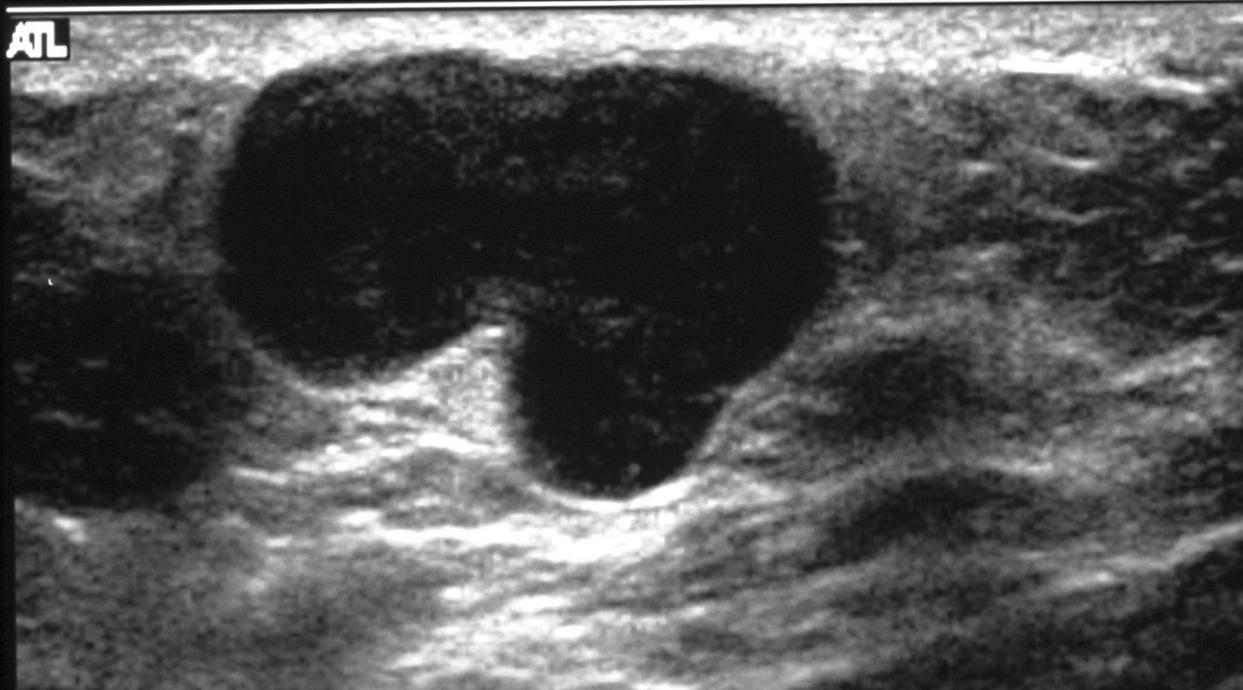
Case 6B

History: 46-year-old female, enlarging mass

Mammogram: Mass with lobulated but well circumscribed margins

U/S: A 2.1 x 1.3 x 1.0 cm hypoechoic mass with circumscribed margins. Multiple other hypoechoic dermal lesions are identified scattered in inner quadrants of right breast

MRI: Areas of mass-like enhancement are noted bilaterally



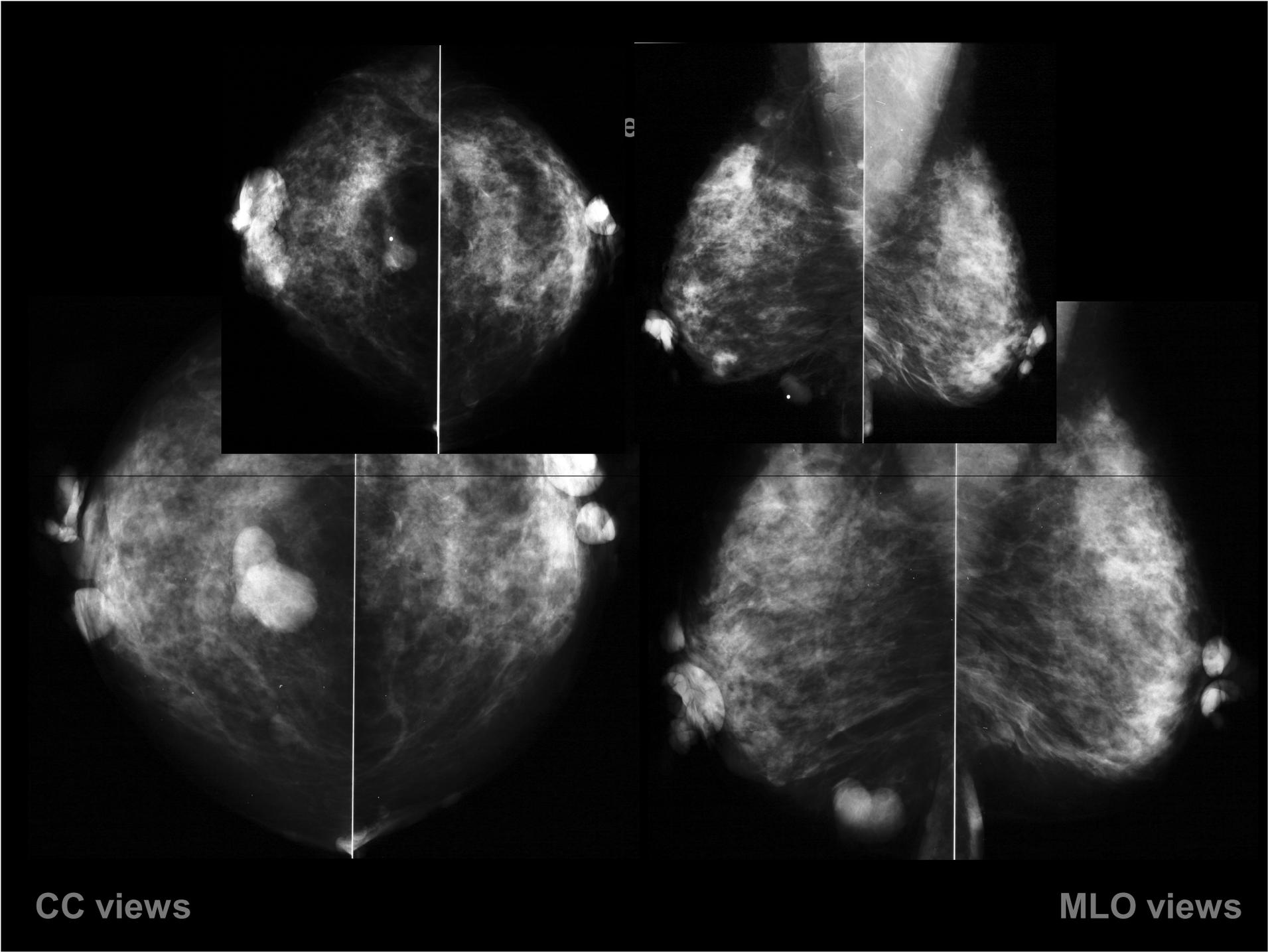
RIGHT BREAST 5:00 5 CM PALP

TRV

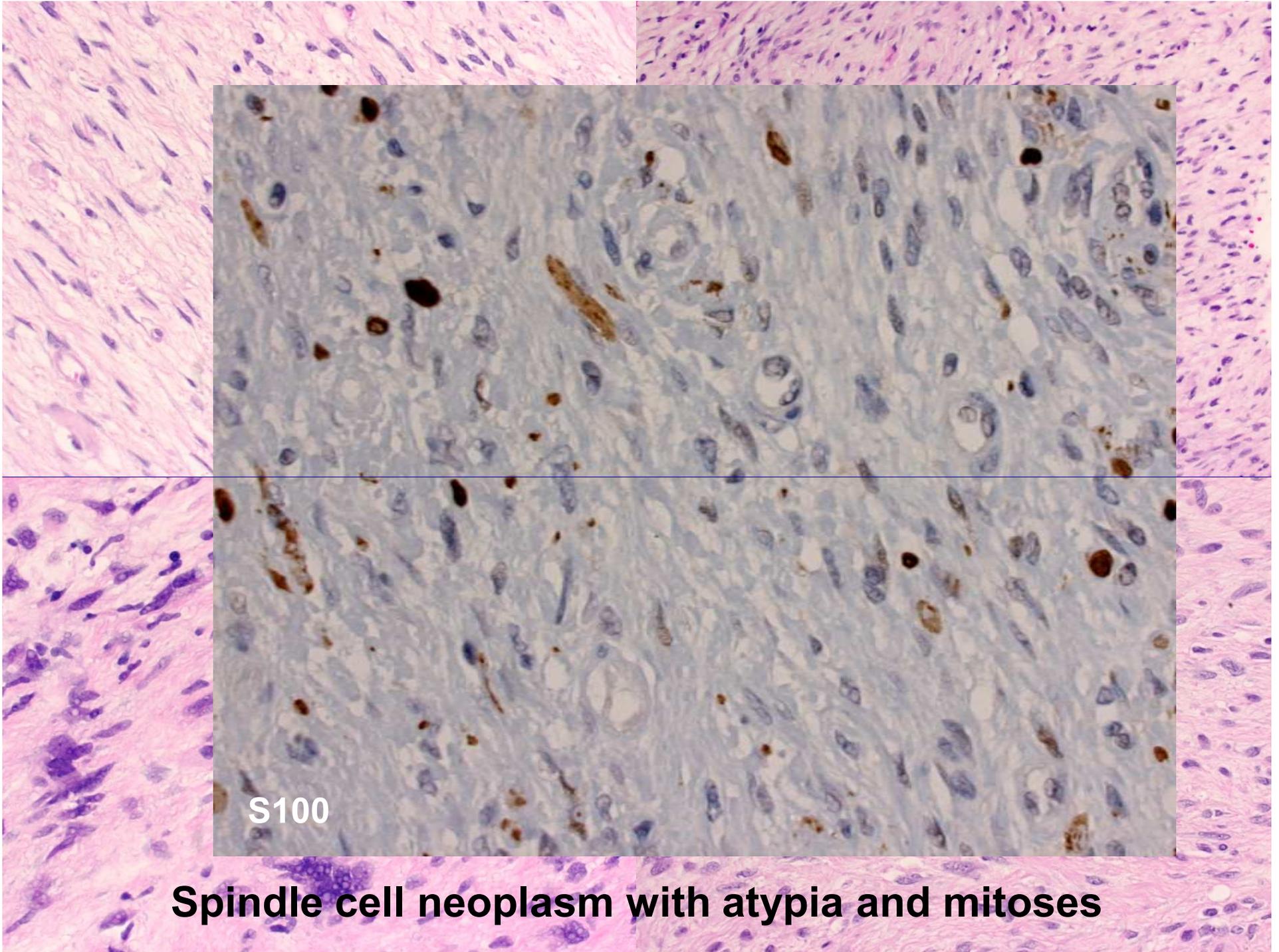
2

CC views

MLO views







Spindle cell neoplasm with atypia and mitoses

Spindle cell neoplasm

- **Patient with history of neurofibromatosis**
- **Spindle cell neoplasm with moderate cellularity and focal significant nuclear atypia, with diffuse mitotic activity. Necrosis is not present. S-100 immunohistochemical stain indicates patchy positivity**

Interpretation: atypical neurofibroma versus MPNST

Case 7a

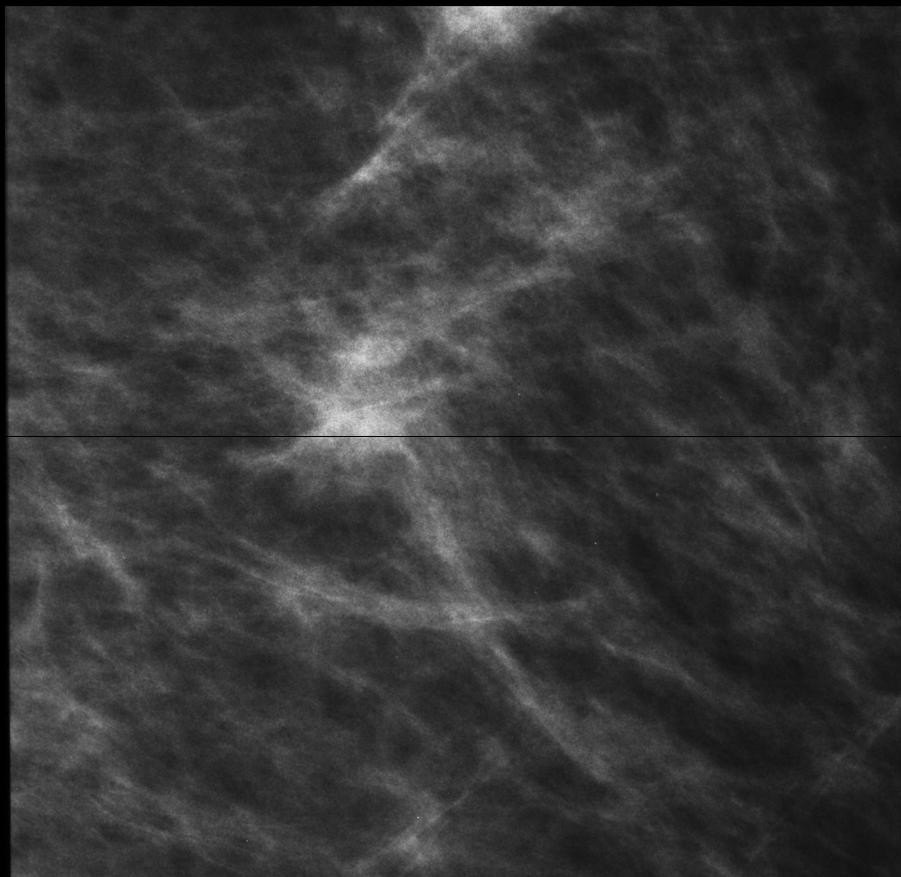
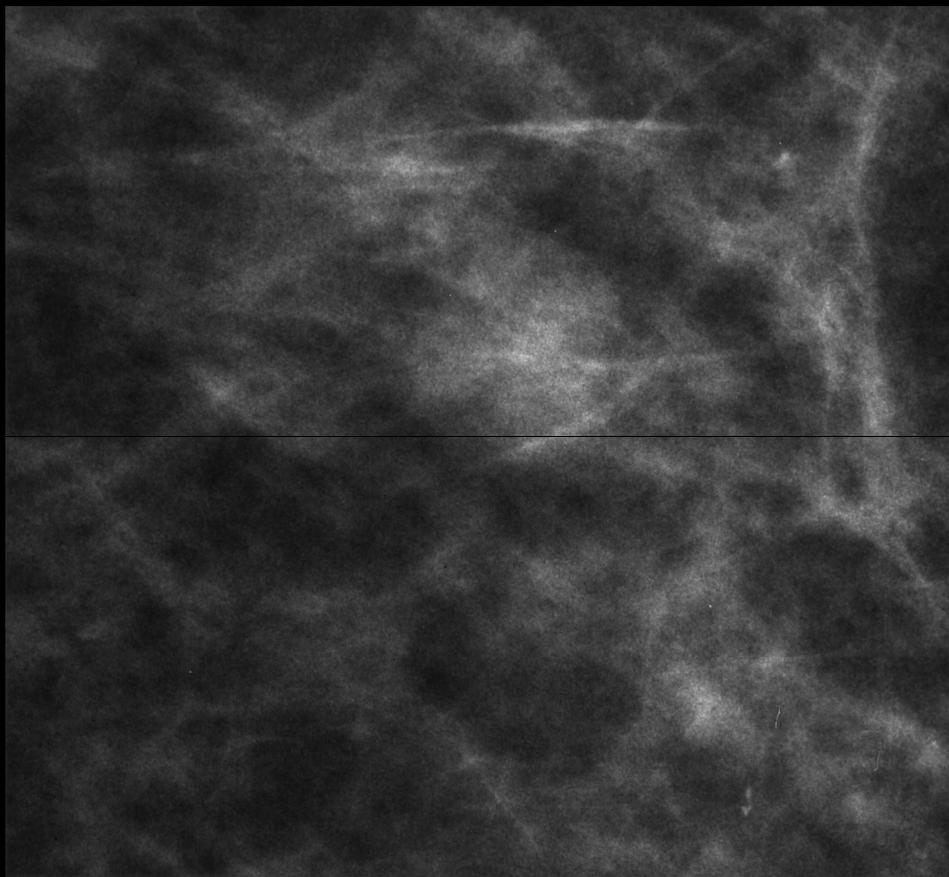
History: 60-year-old
Spiculated mass in left breast

Mammogram: Spiculated mass measuring 0.8 x 0.6 x 0.5 cm centrally in the breast

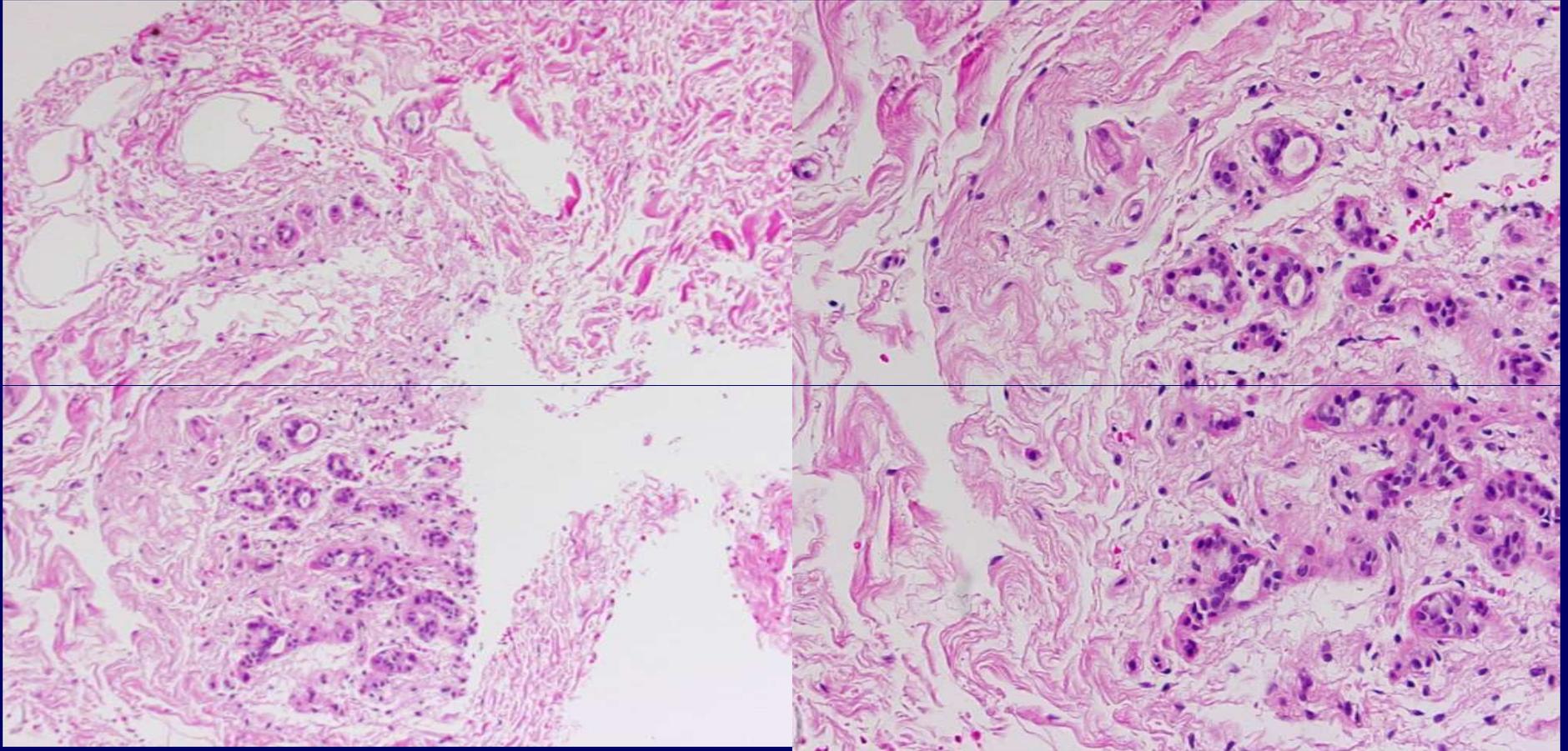
Ultrasound: Hypoechoic area disrupting tissue planes, measuring 0.5 x 0.4 x 0.4 cm

Right

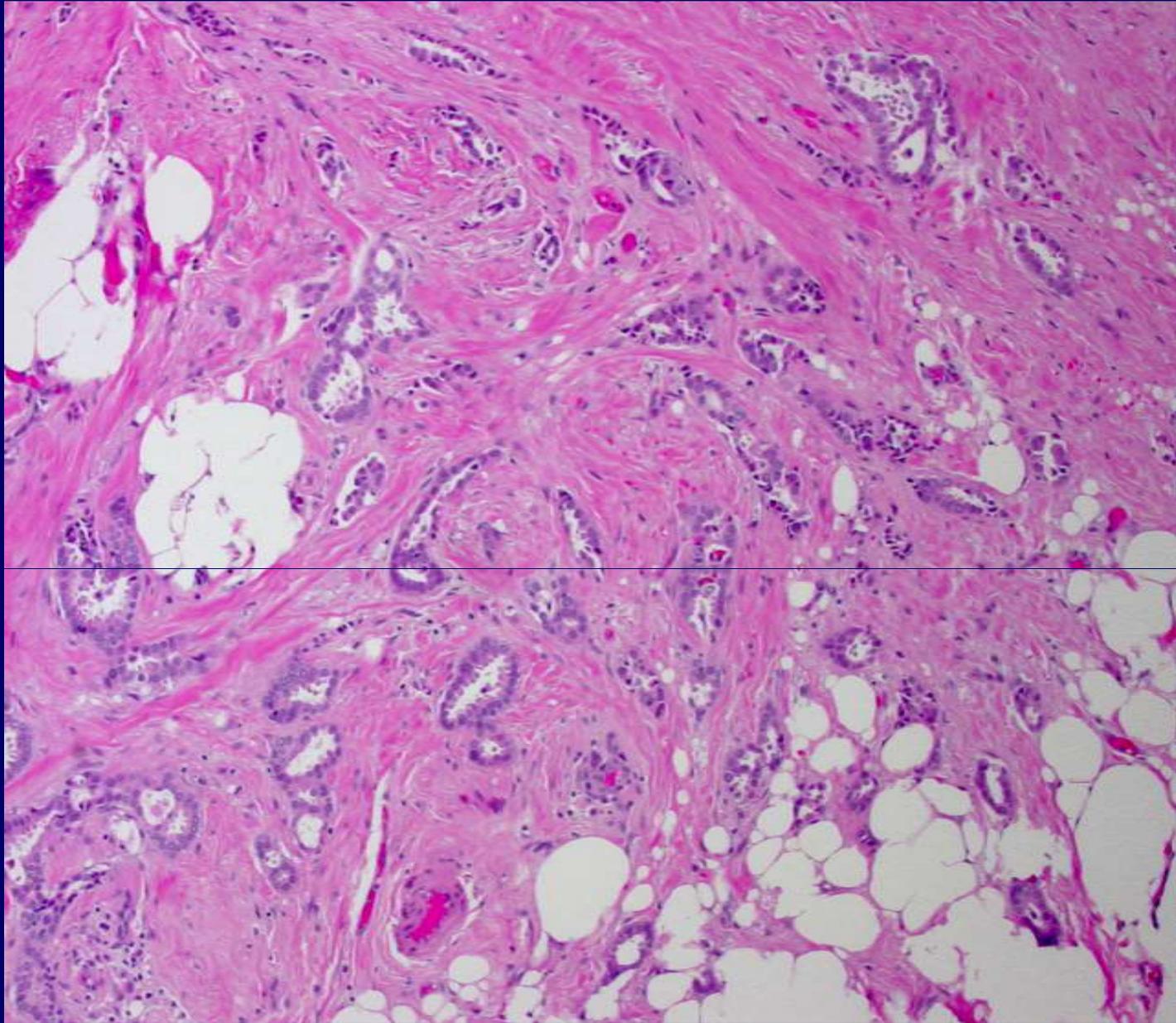
Left



Spot Compression Views



Initial Biopsy



Excision

Infiltrating Ductal Carcinoma



T1 pre contrast



T1 post contrast

MRI shows additional enhancing contralateral mass

Discussion

Spiculated Mass

- IDC
- IDC
- IDC
- Rarely fat necrosis
- Radial scar

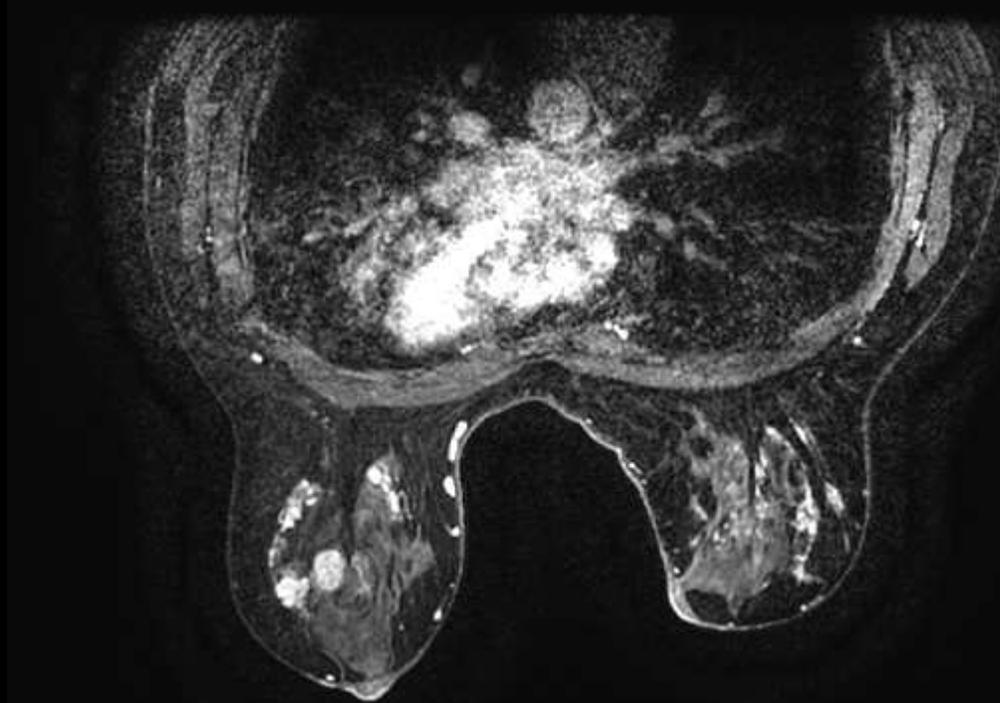
Case 7b

History: 50-year-old with left mass

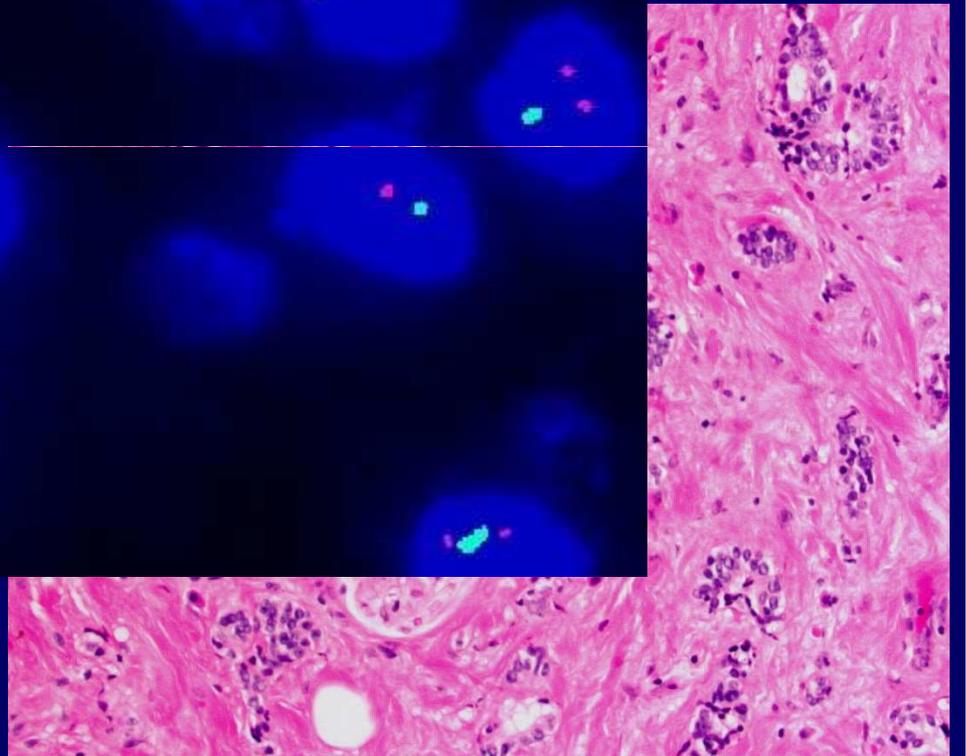
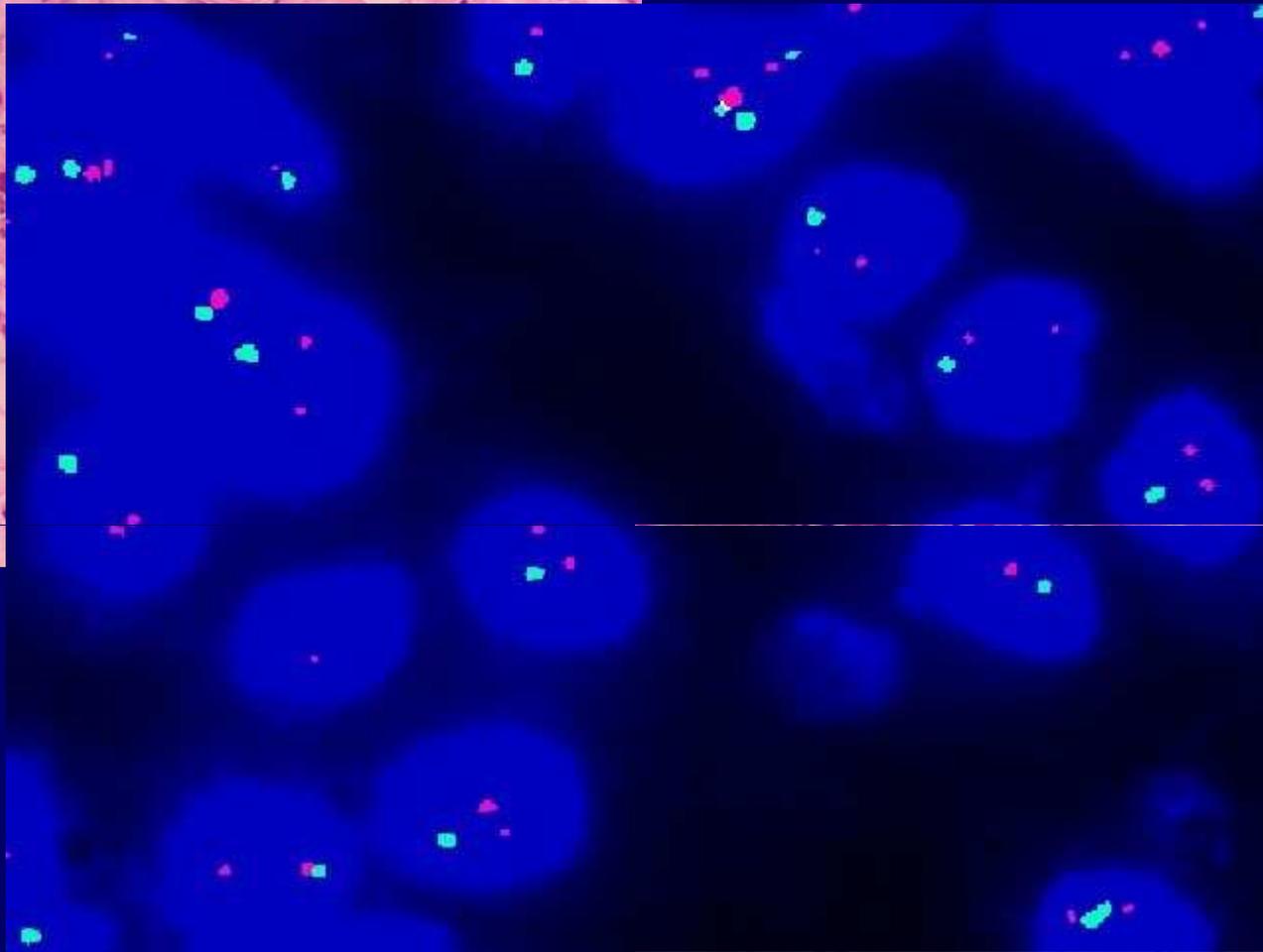
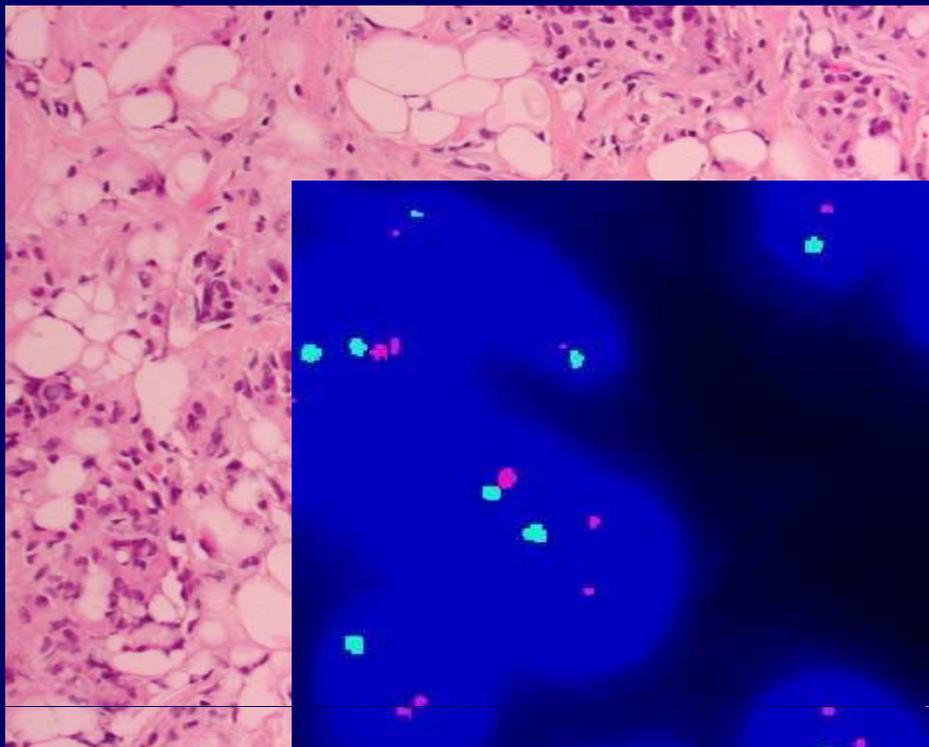
Mammogram: Area of distortion and a mass with indistinct margins.

Ultrasound: Irregular mass with distortion and shadowing measuring at least 1.7 x 1.3 x 1.2 cm

MRI: Two adjacent enhancing masses seen in central to lateral aspect of left breast

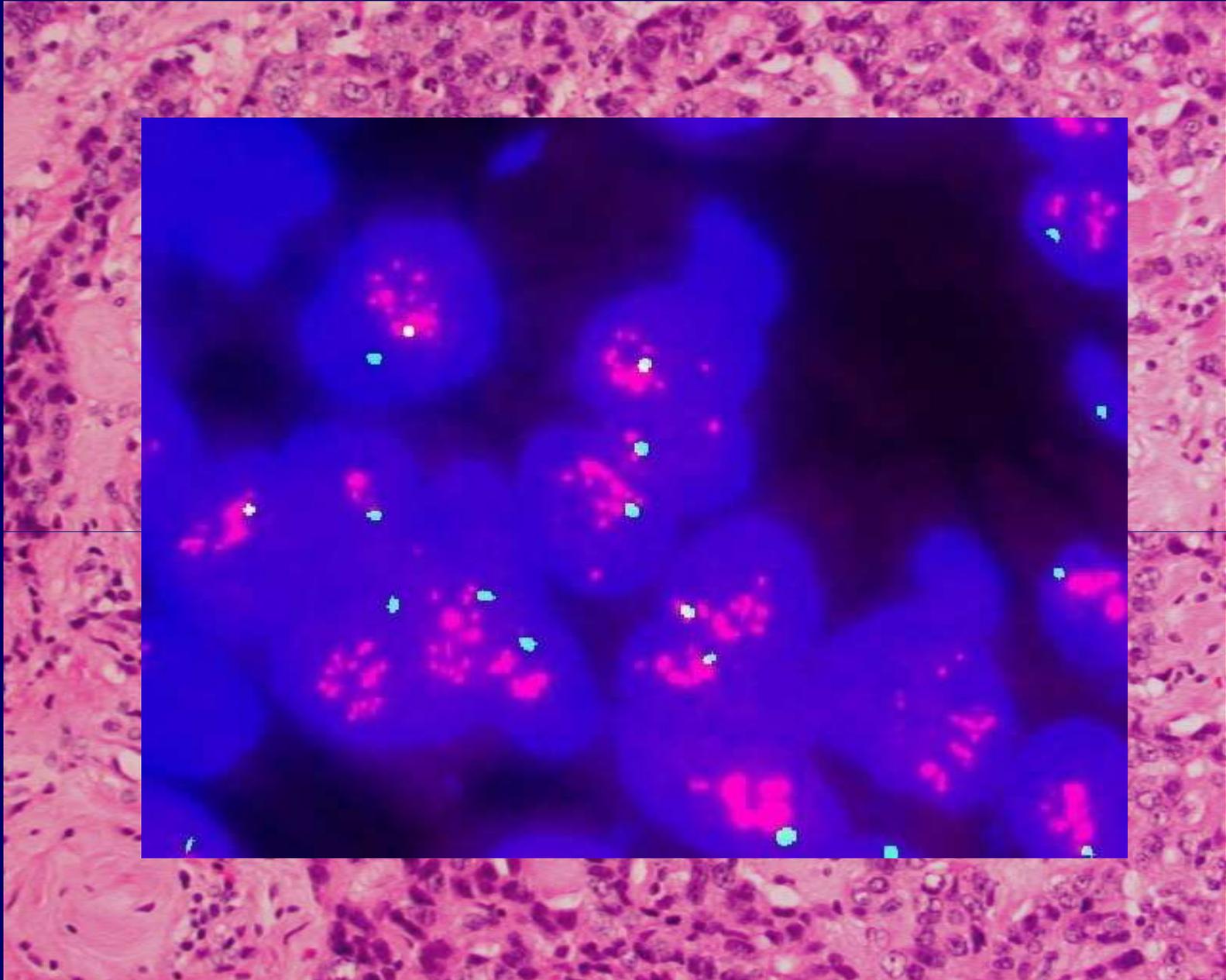


Two adjacent enhancing masses



Mass 1, H&E and HER2 FISH

Assumption is the mother of all foul-ups

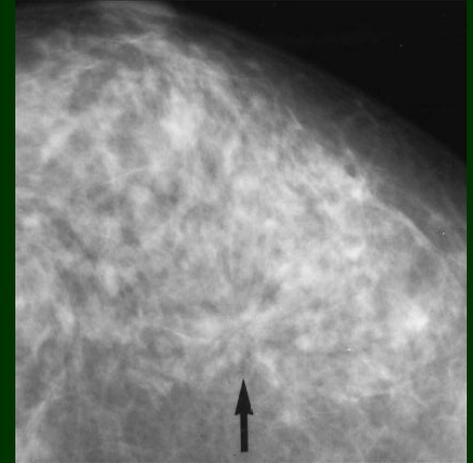


Mass 2, H&E and HER2 FISH

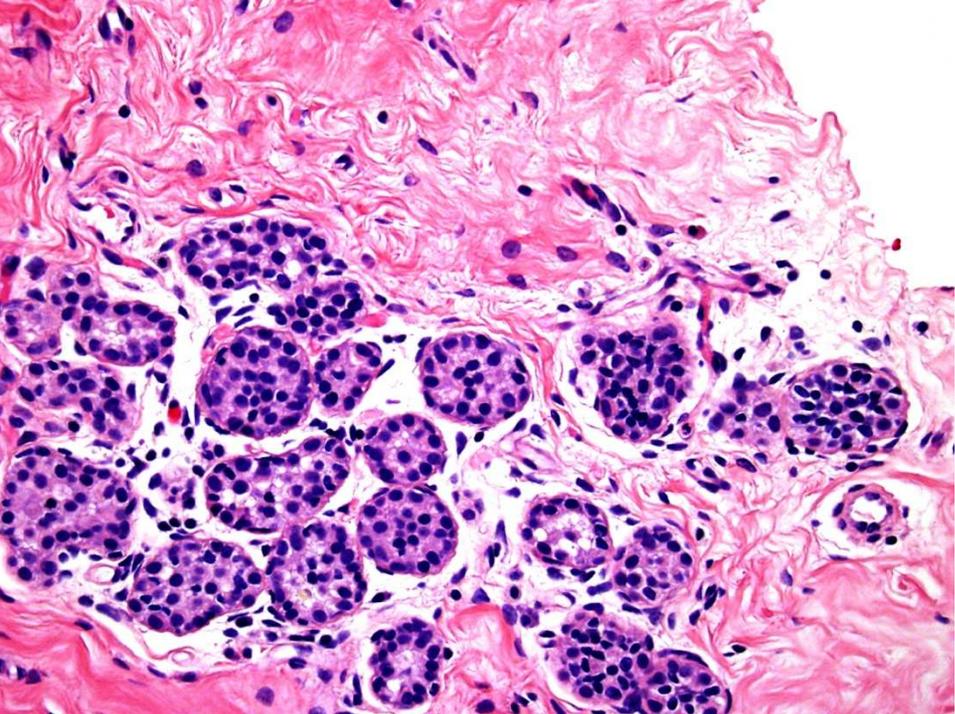
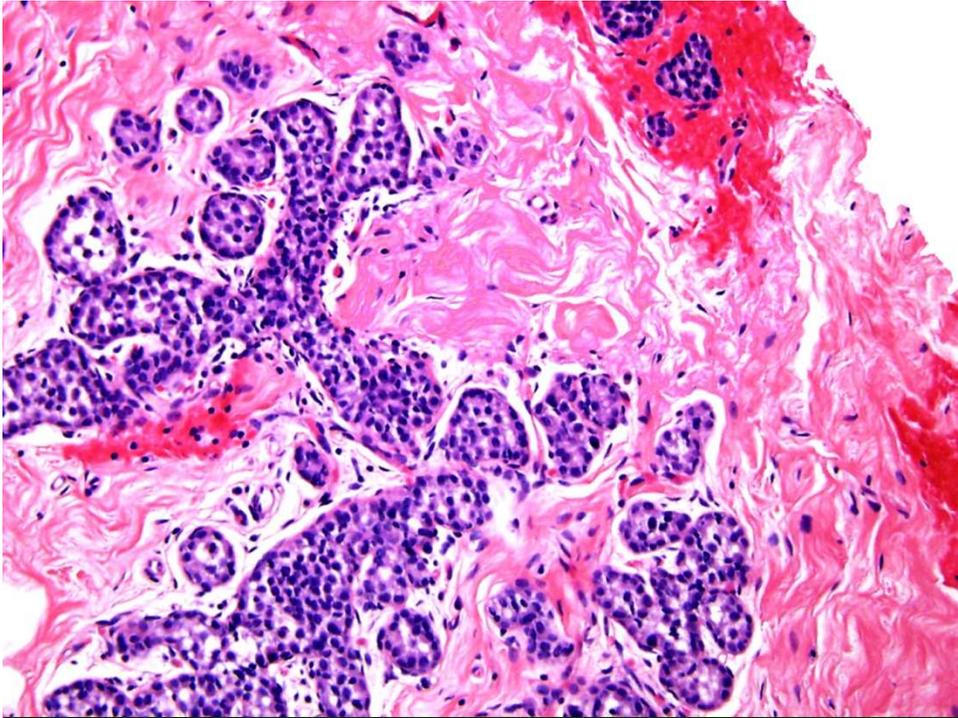
Discussion

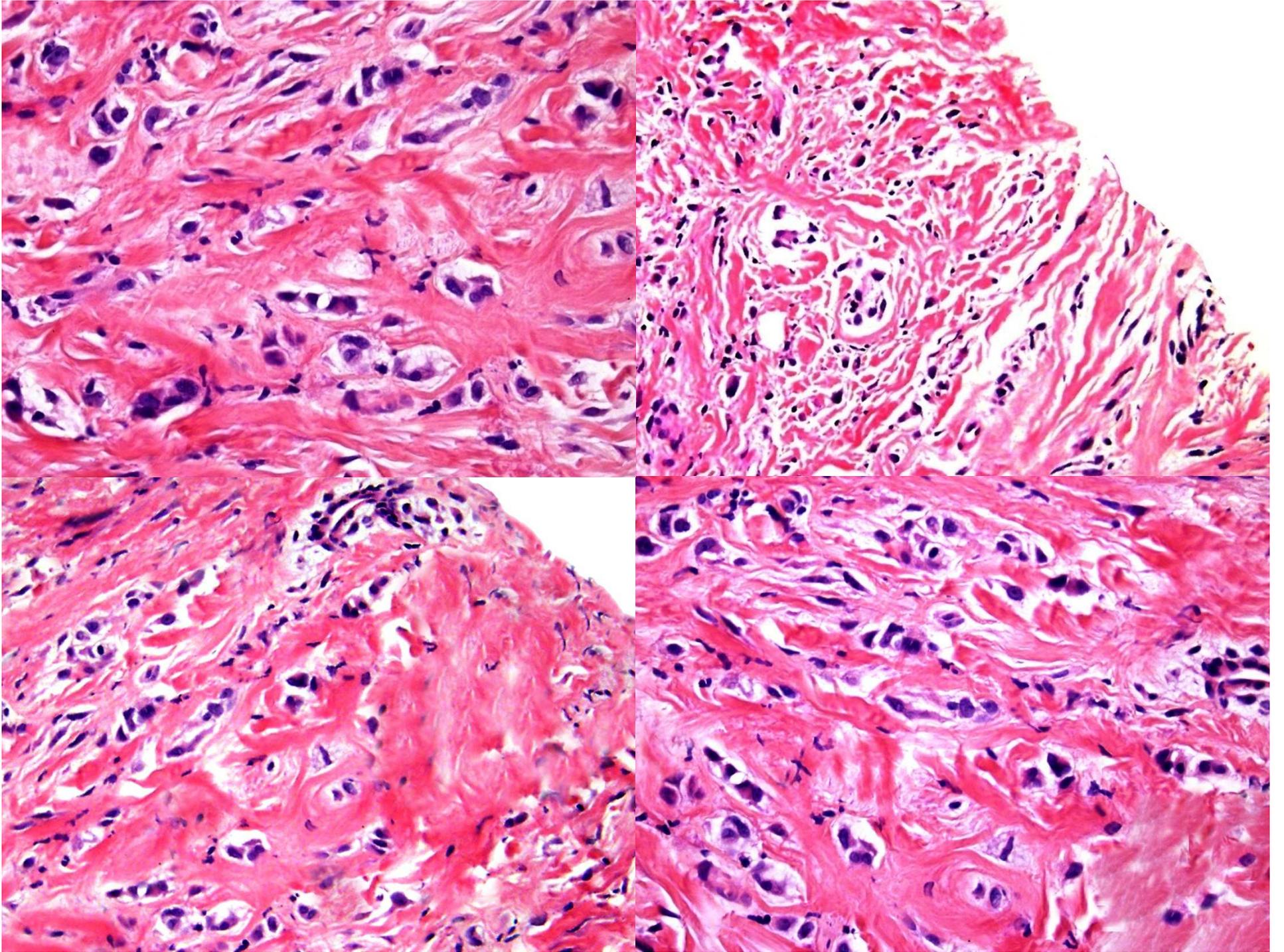
- **Important to review imaging report before grossing mastectomy specimens**
- **Tumor heterogeneity**
- **May affect adjuvant treatment, e.g. Herceptin**

8a

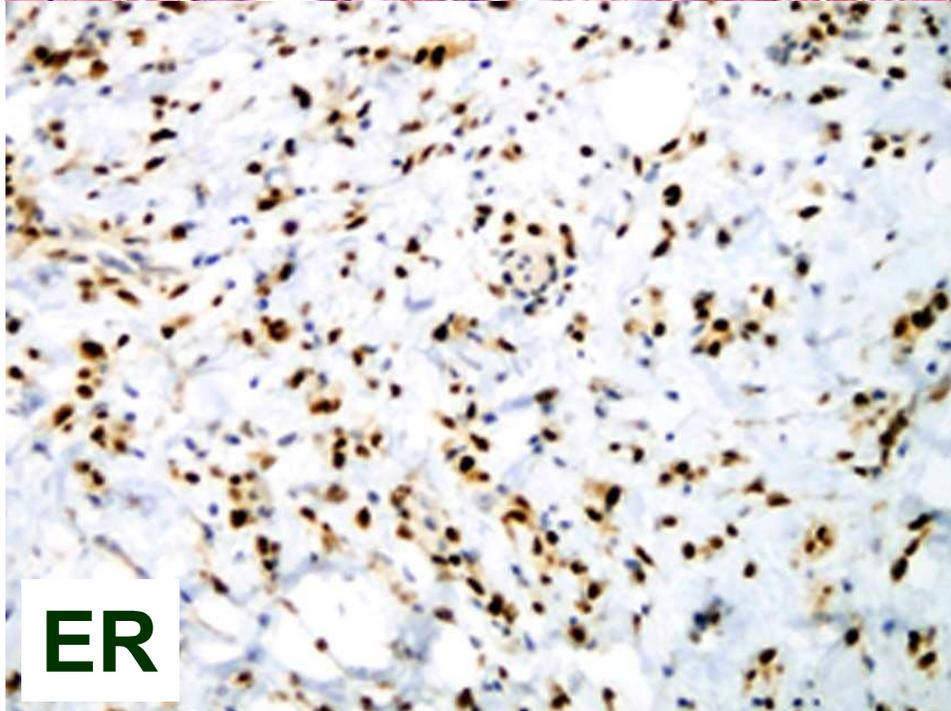
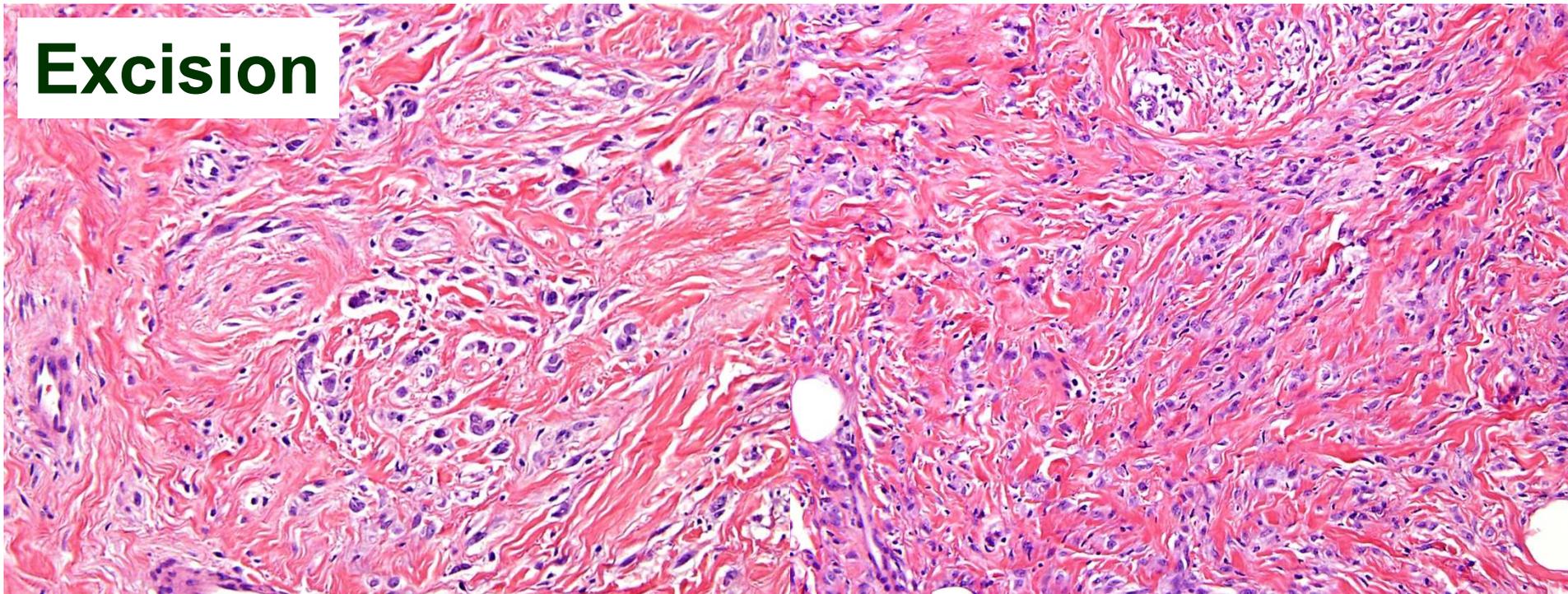


- **49-Year-Old Woman**
- **Spiculated Lesion on Mammogram**
- **Core Biopsy**

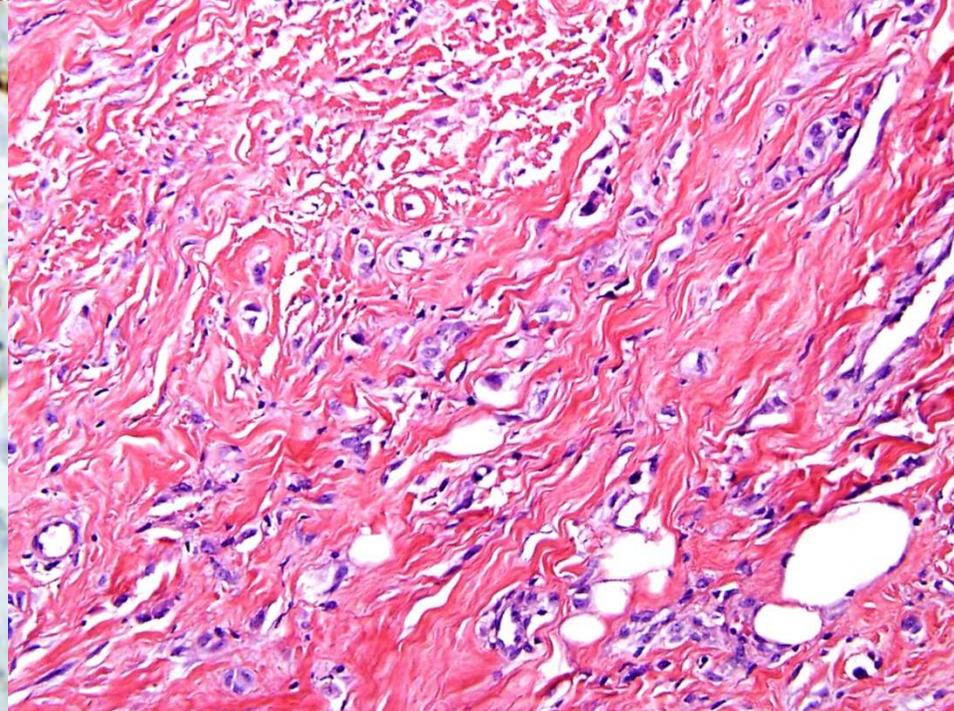


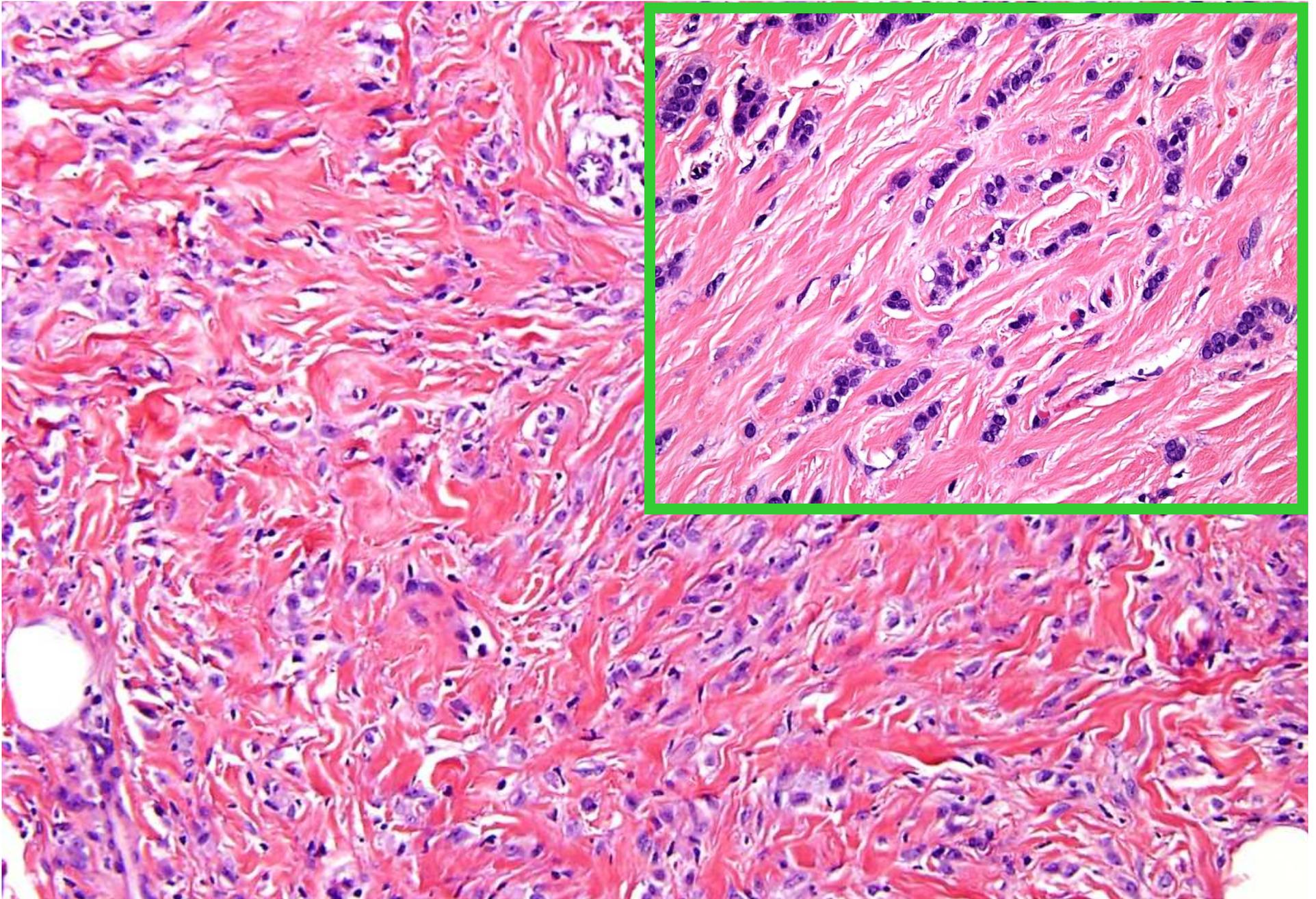


Excision



ER





Myofibroblastoma, Infiltrative & Epithelioid

Myofibroblastoma

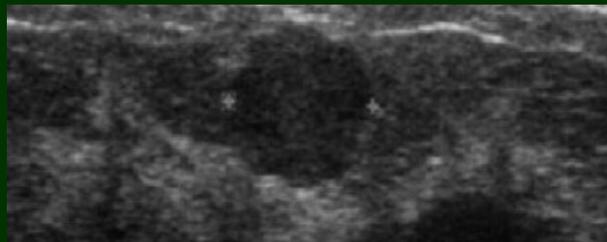
- **Benign Circumscribed Tumor**
- **Predominantly in Males**
- **Spindle Cell Proliferation, Rare Mitoses**
- **Vimentin+ Desmin+ CD34+ Actin+ ER+**
- **Rarely recurs**

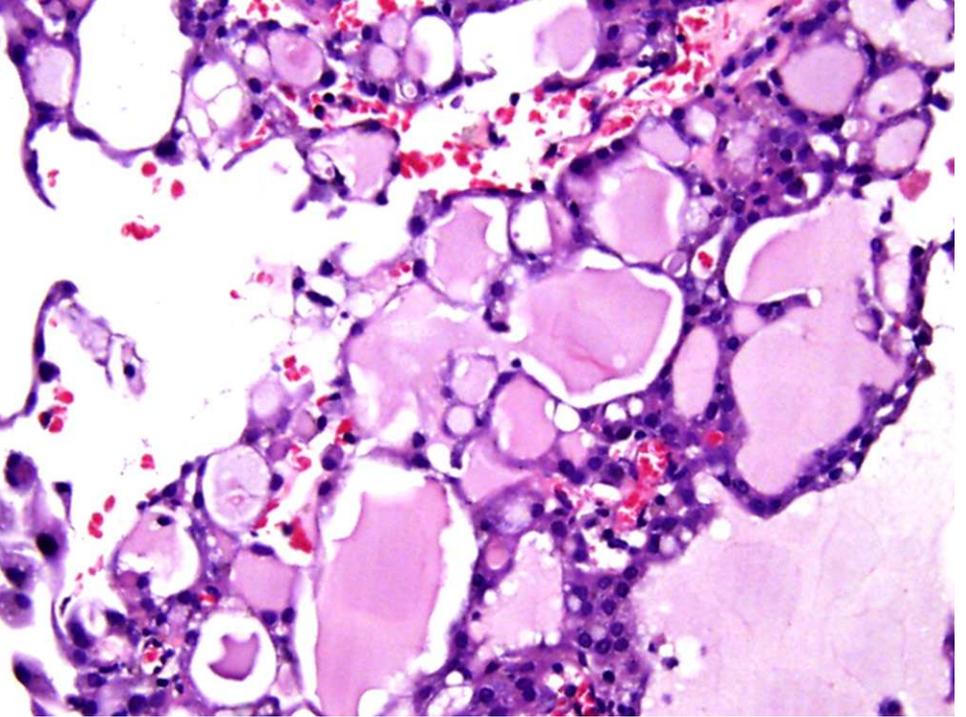
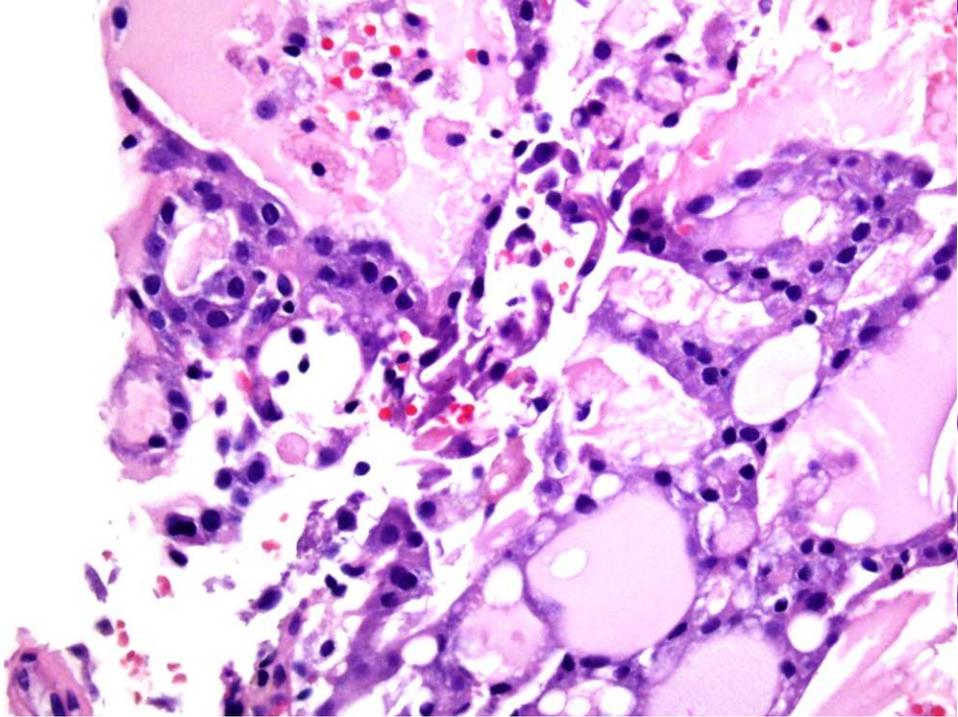
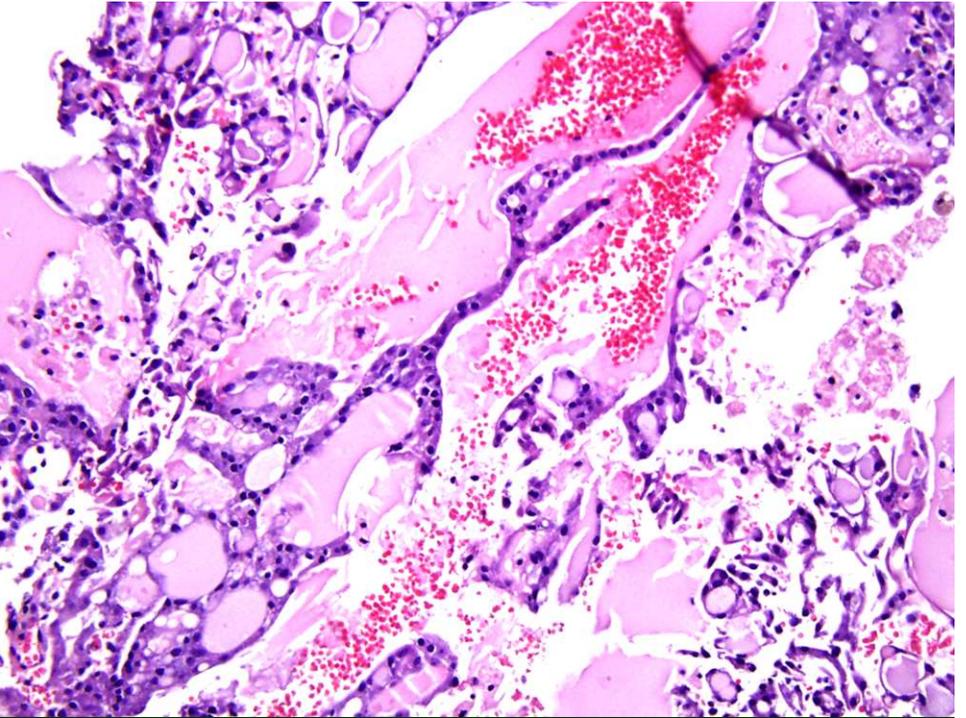
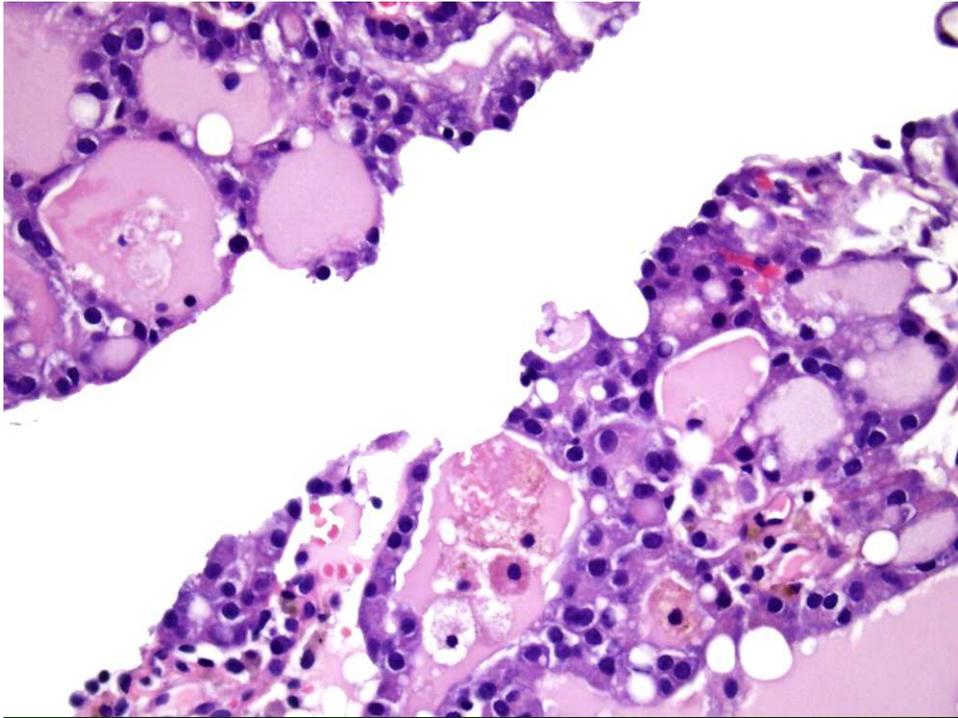


Look Out for Mimics of Invasive Carcinoma

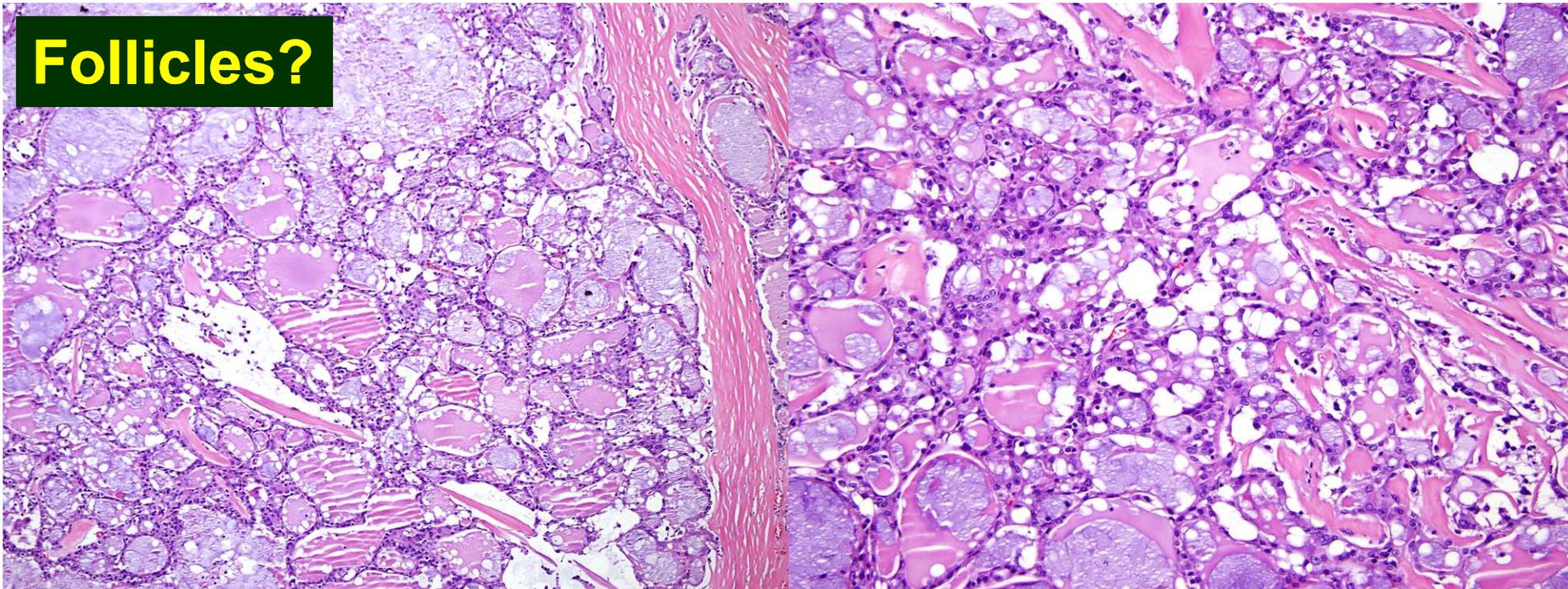
8b

-
- **19-Year-Old Woman**
 - **Lump**
 - **Core Biopsy**

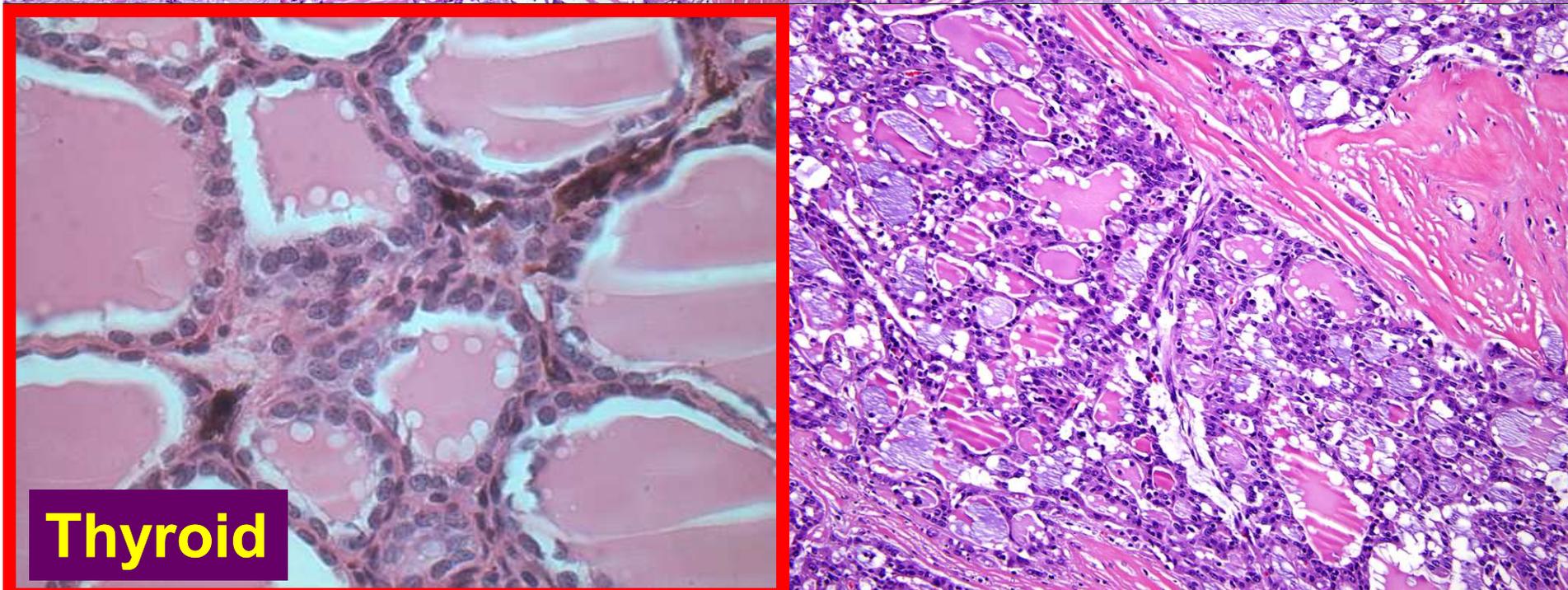




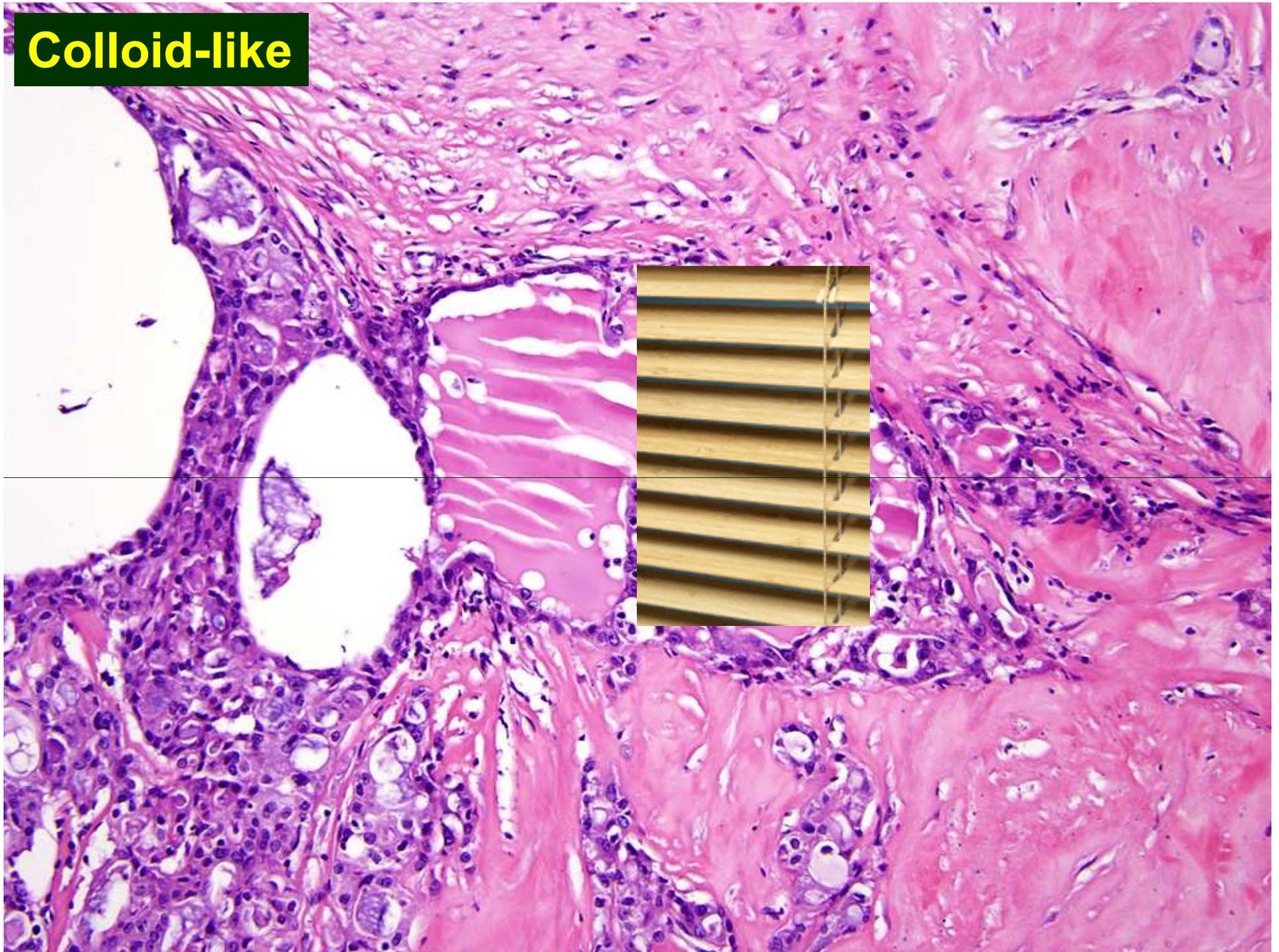
Follicles?



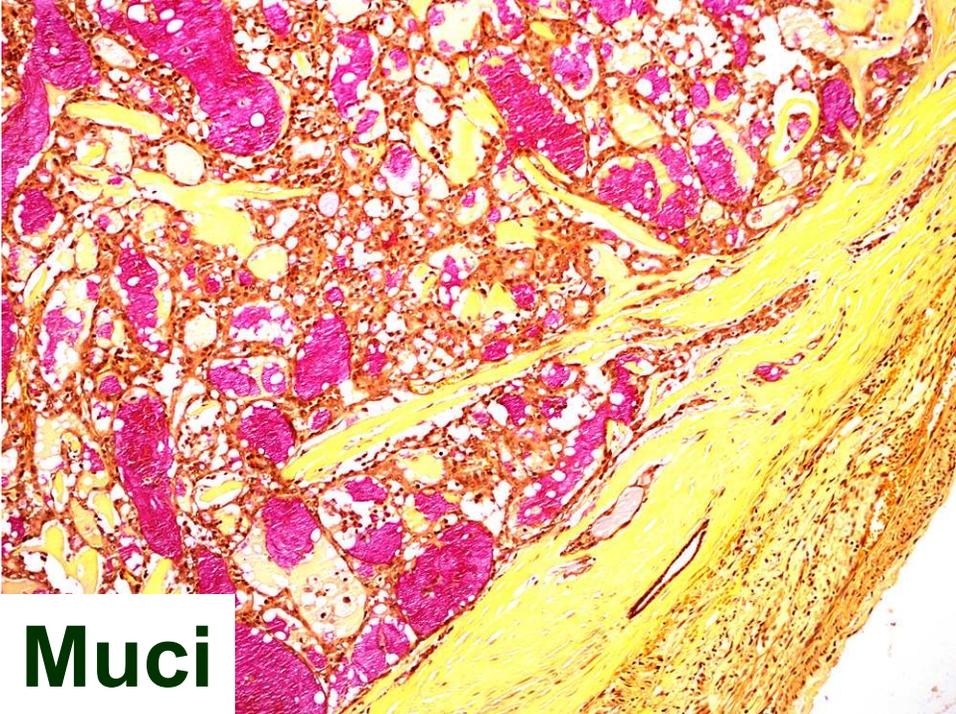
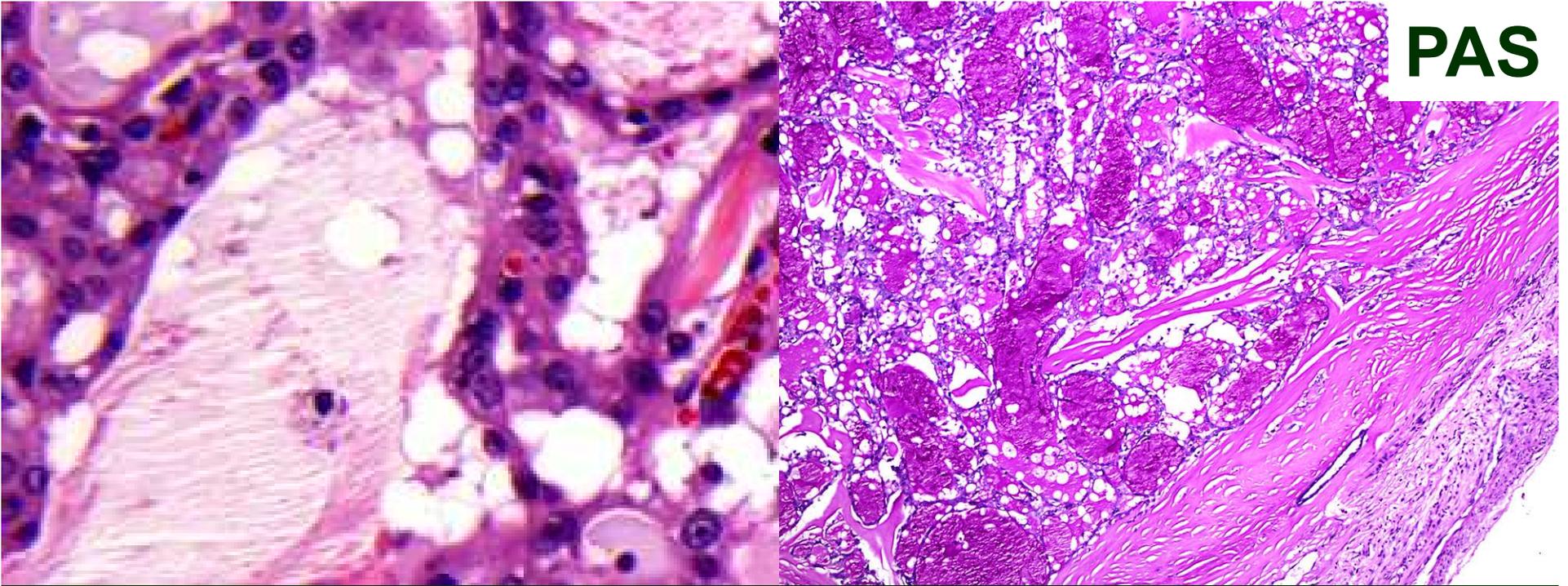
Thyroid



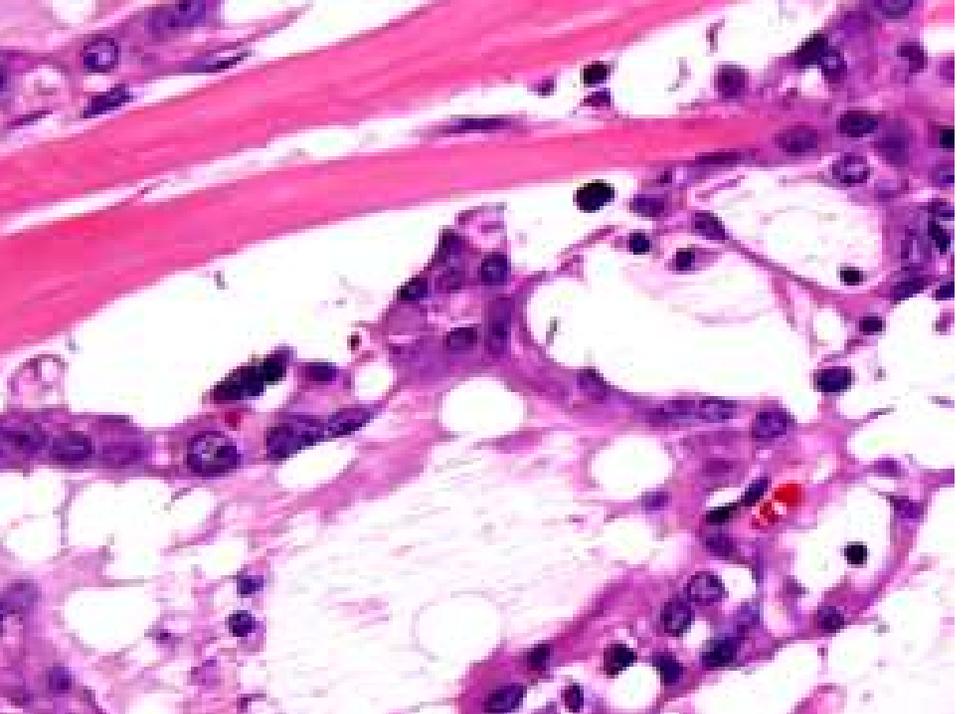
Colloid-like

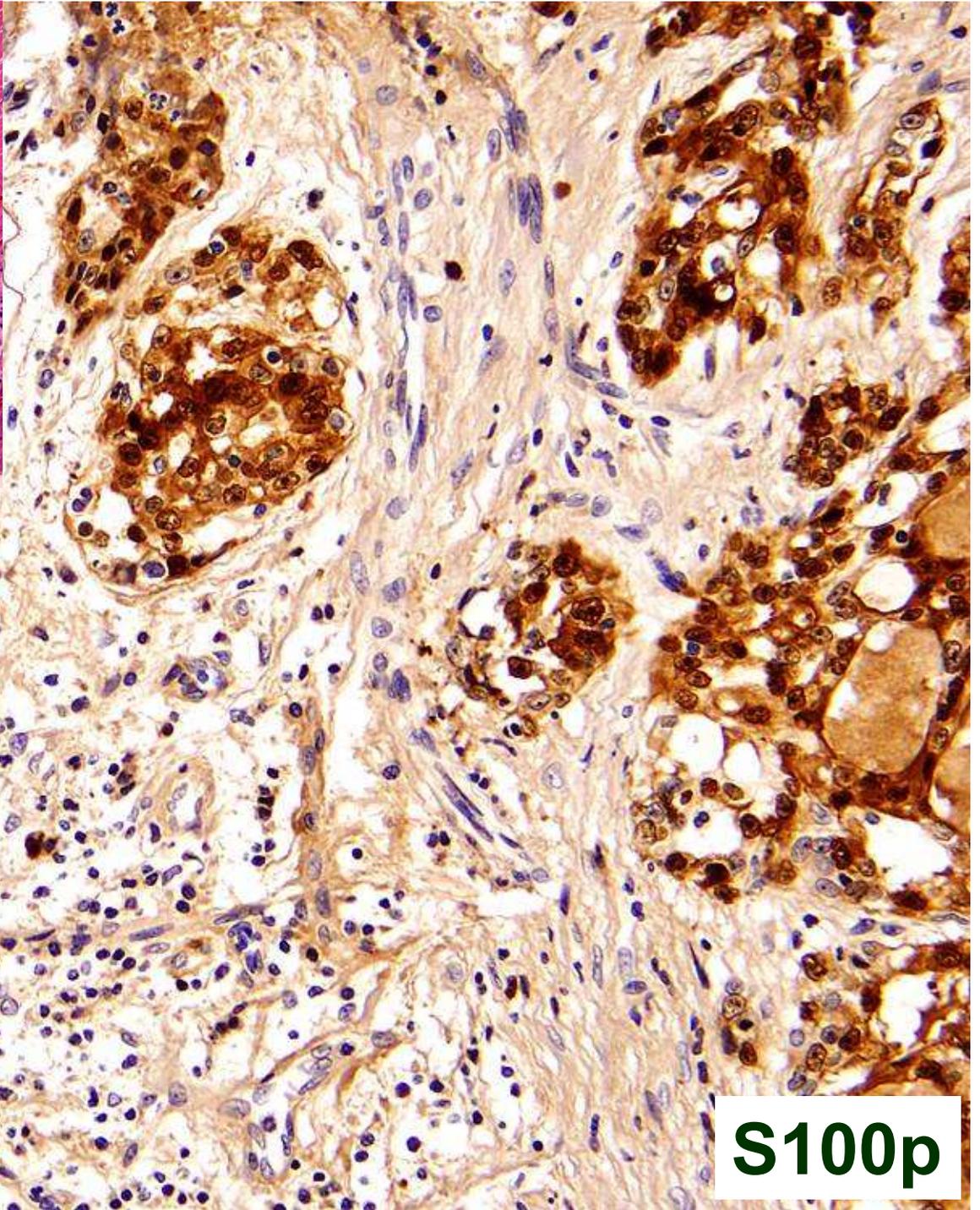
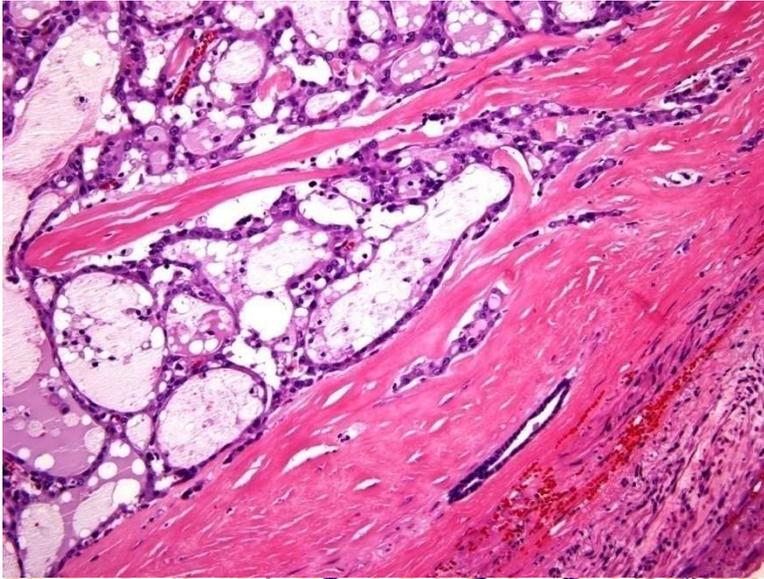


PAS

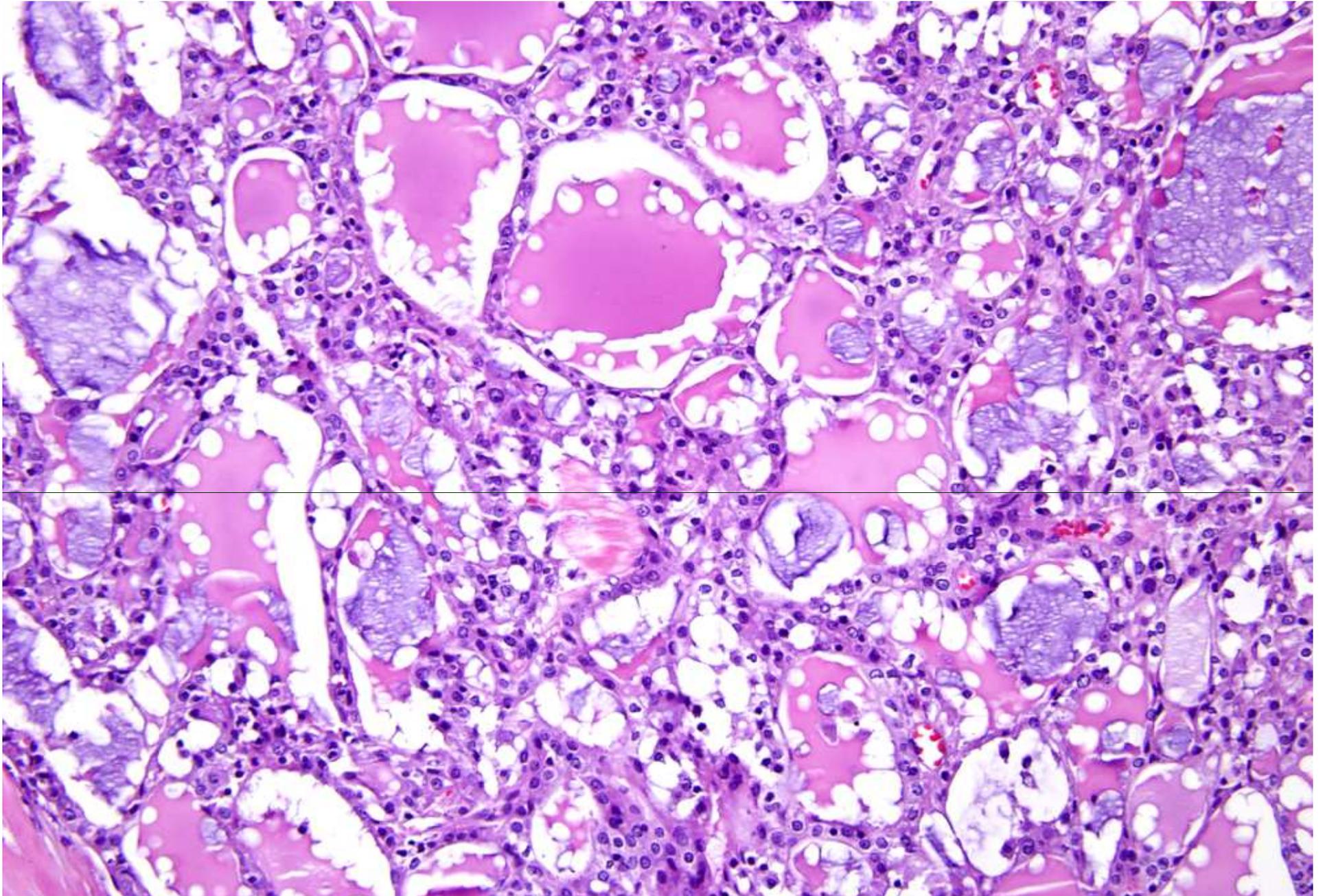


Muci

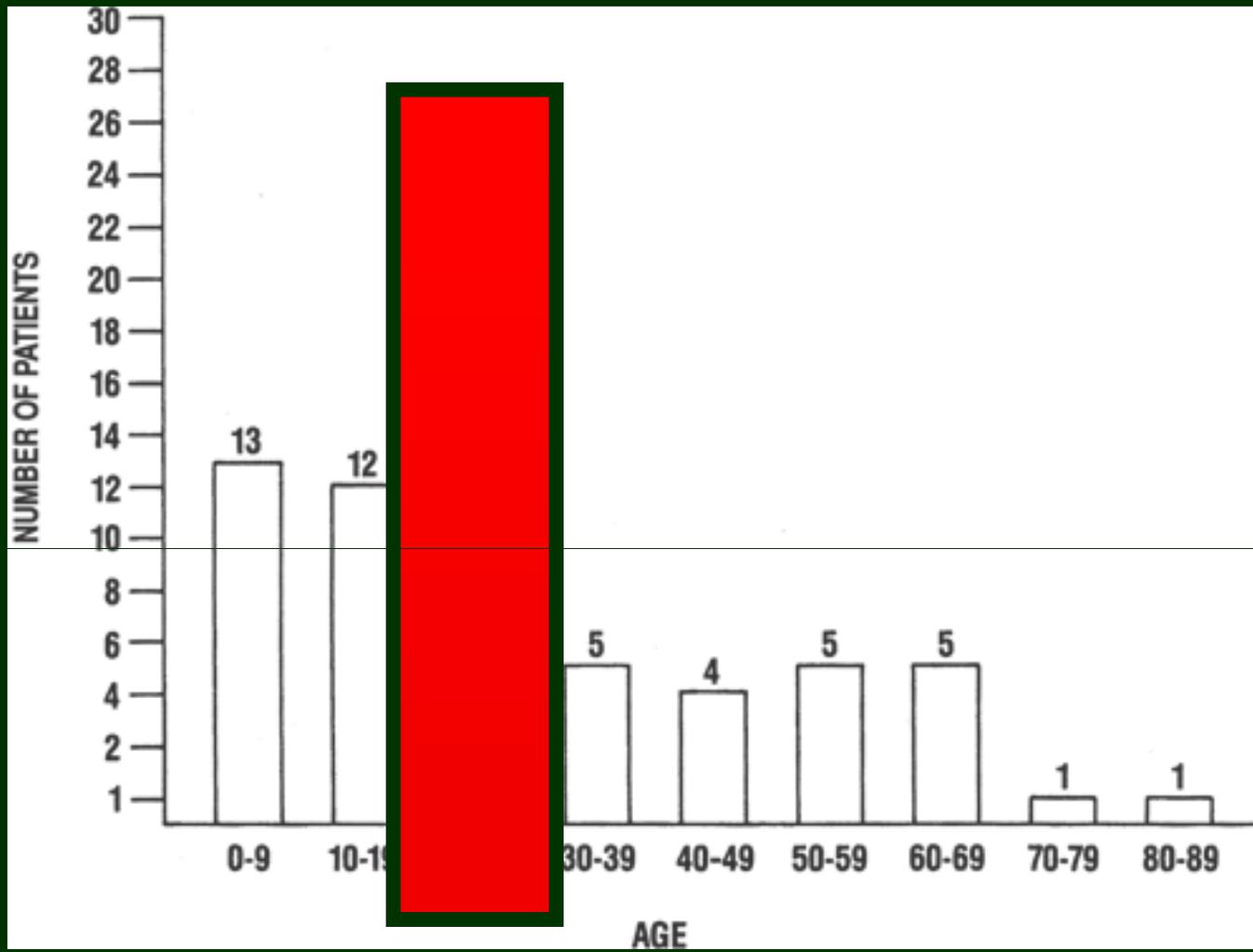




S100p



Secretory Carcinoma



Secretory Carcinoma of Breast

- **Rare Carcinoma, Mostly in <30**
- **Clear Vacuolated Cells in Sheets**
- **Secretions in Cells, Lumen, Stroma**
- **Recur, Rarely Metastasizes**

Secretory Carcinoma of Breast

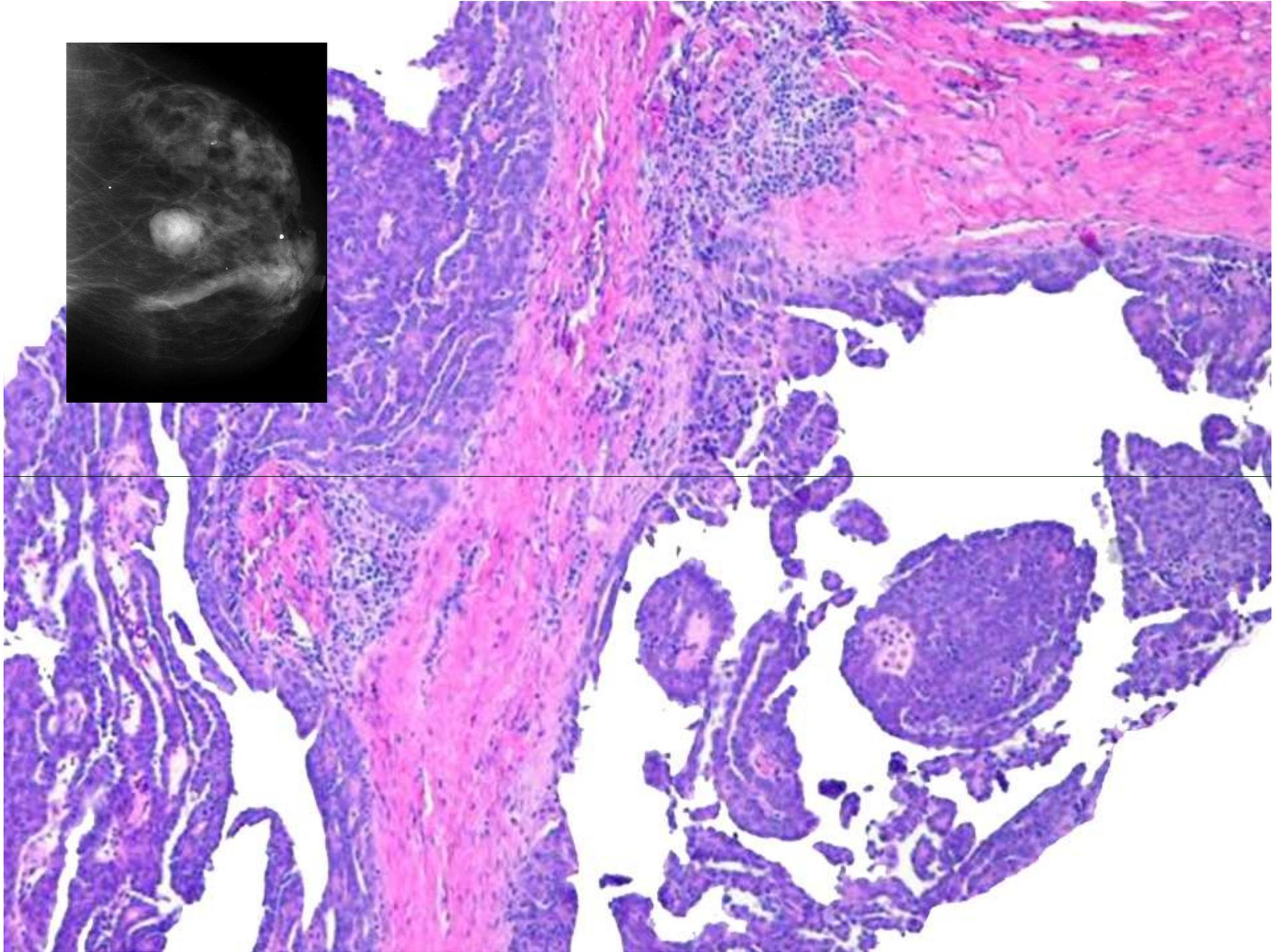
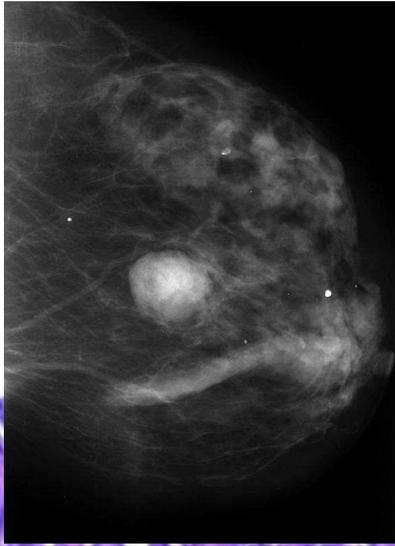
- **Low-Grade Nuclei**
- **ER, PR & HER2: Negative**

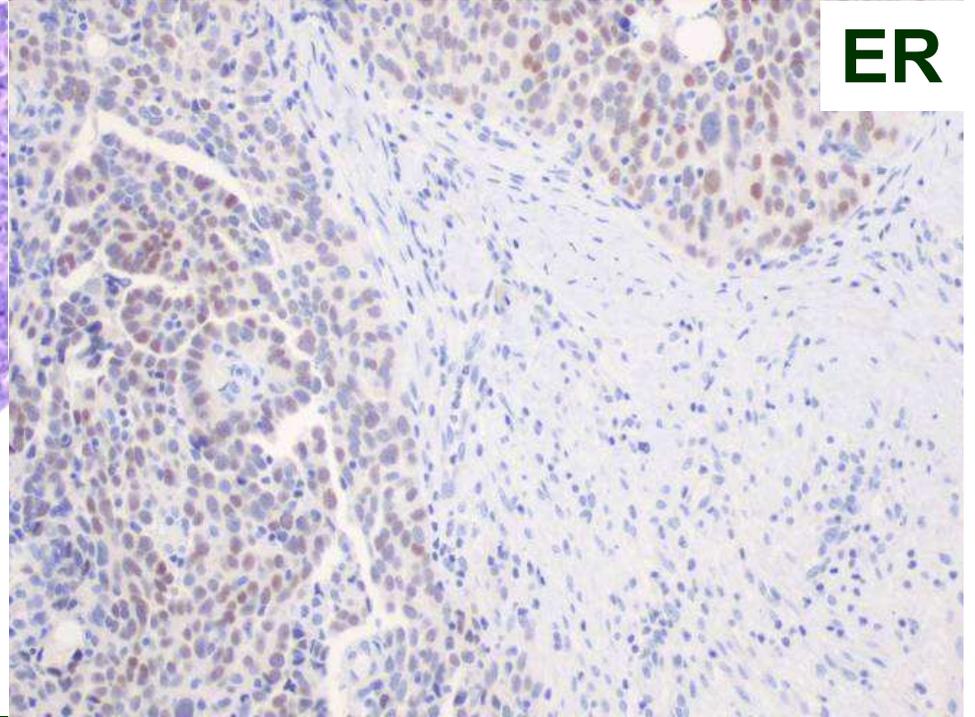
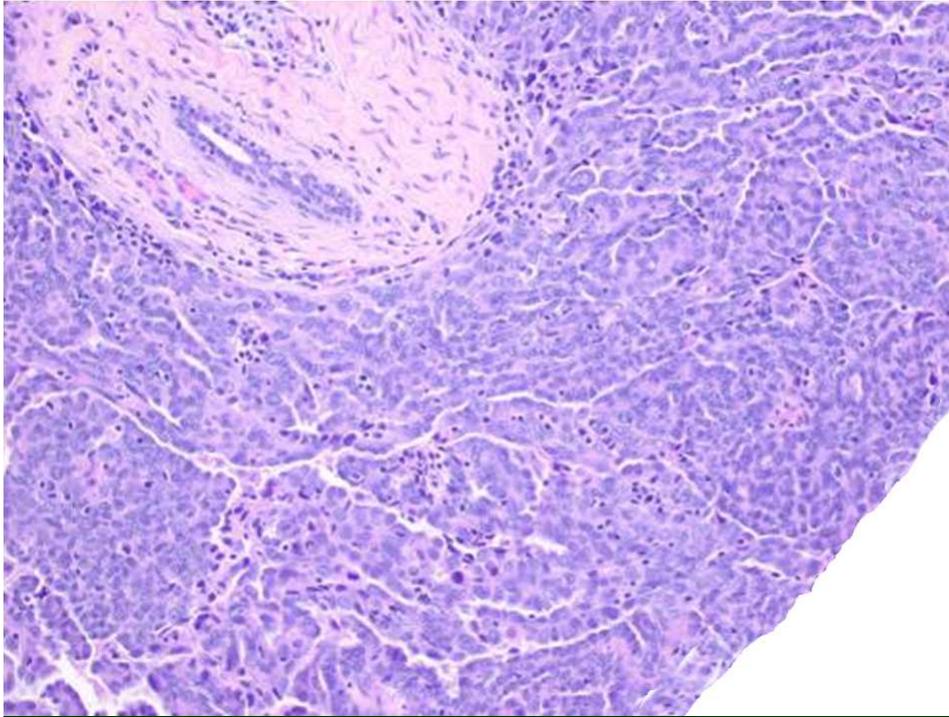


**Every Breast Lesion
Should be Taken Seriously**

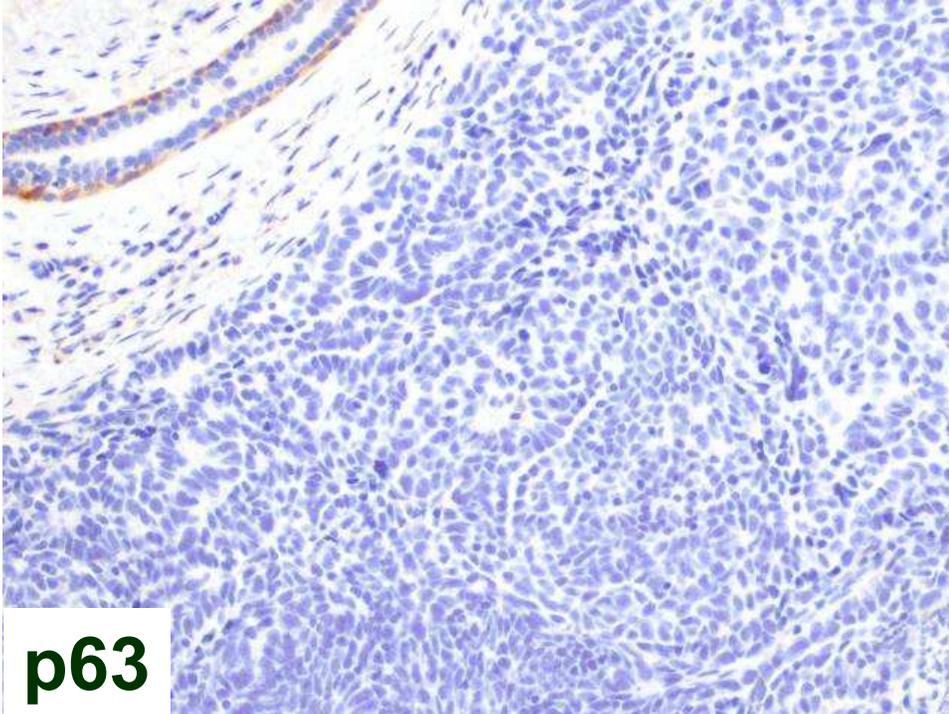
8c

- **63-Year-Old woman**
- **Mass**
- **Core Biopsy**

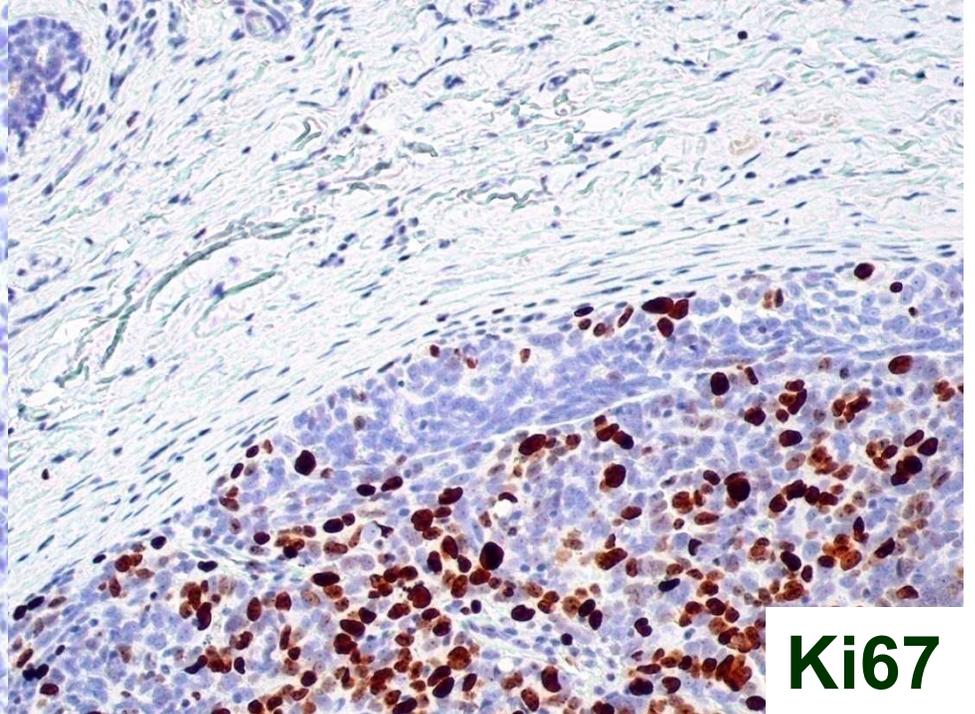




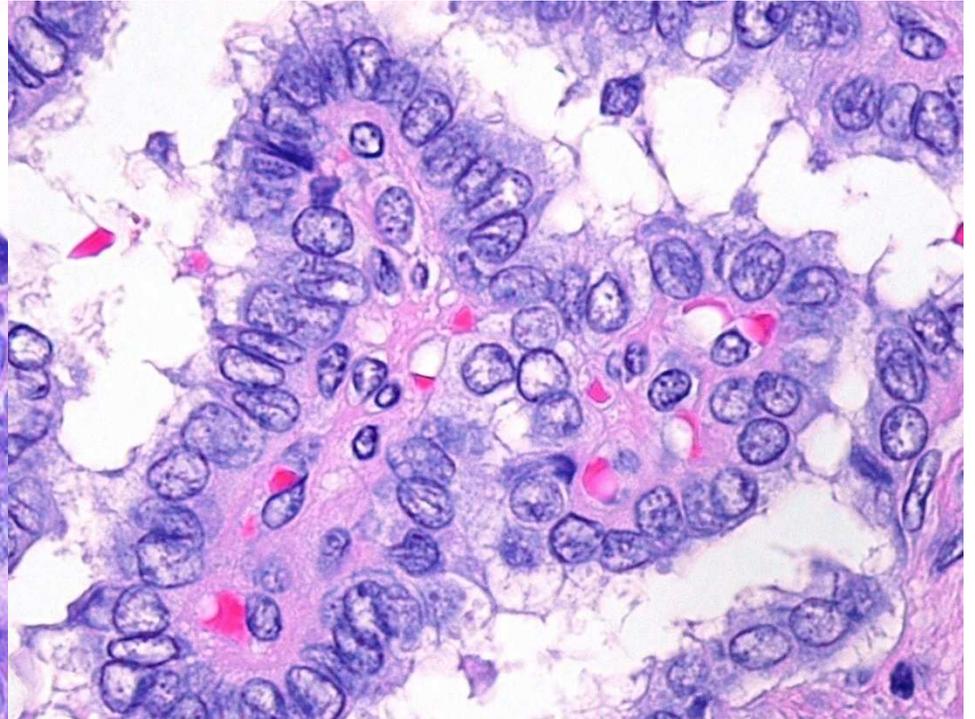
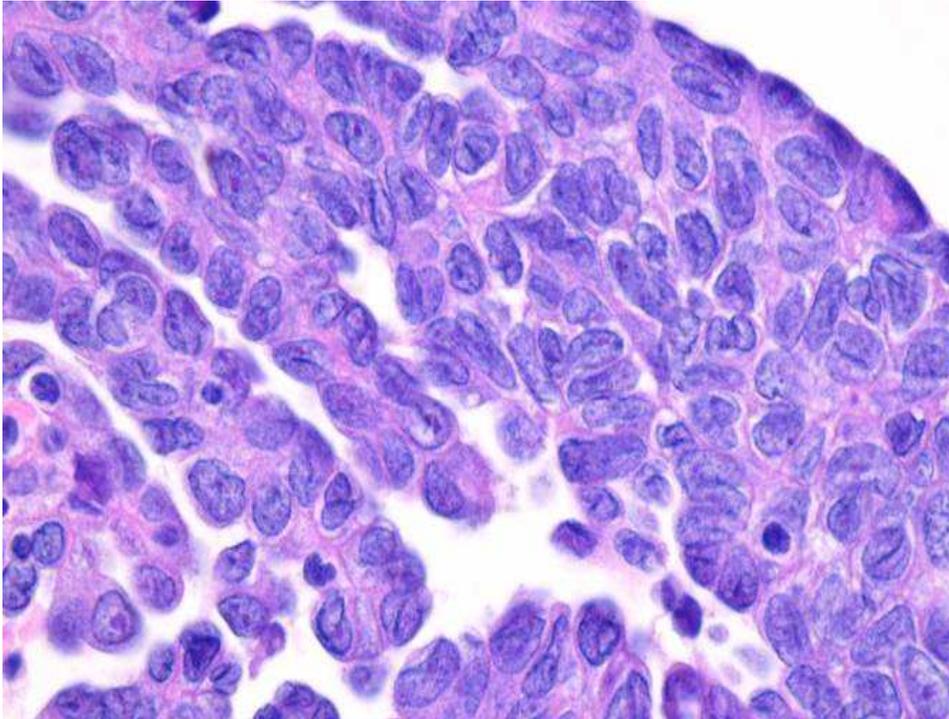
ER

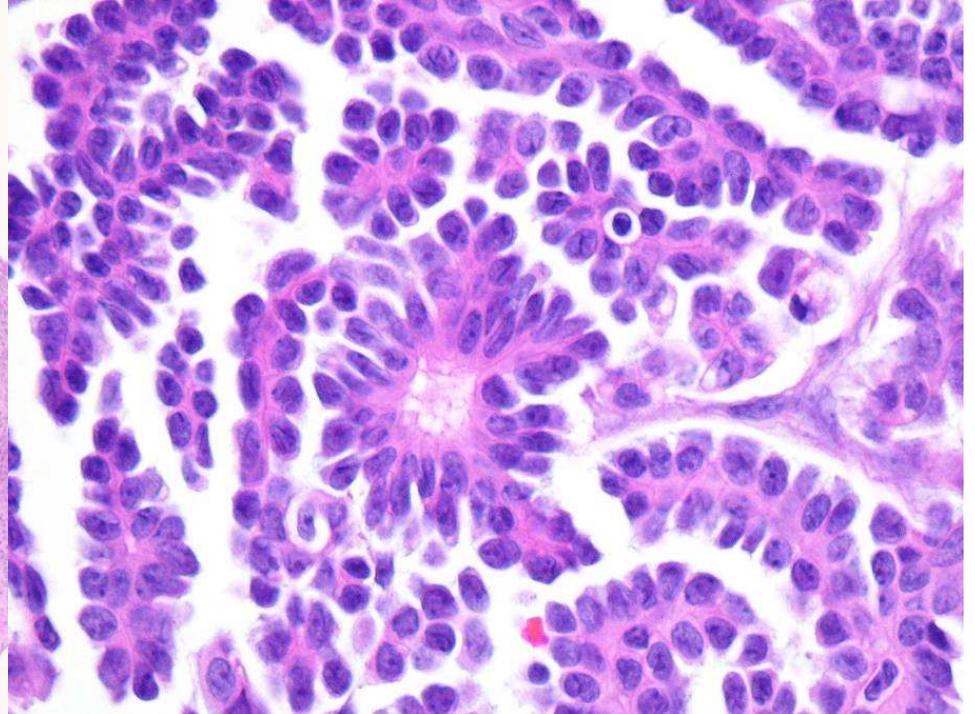
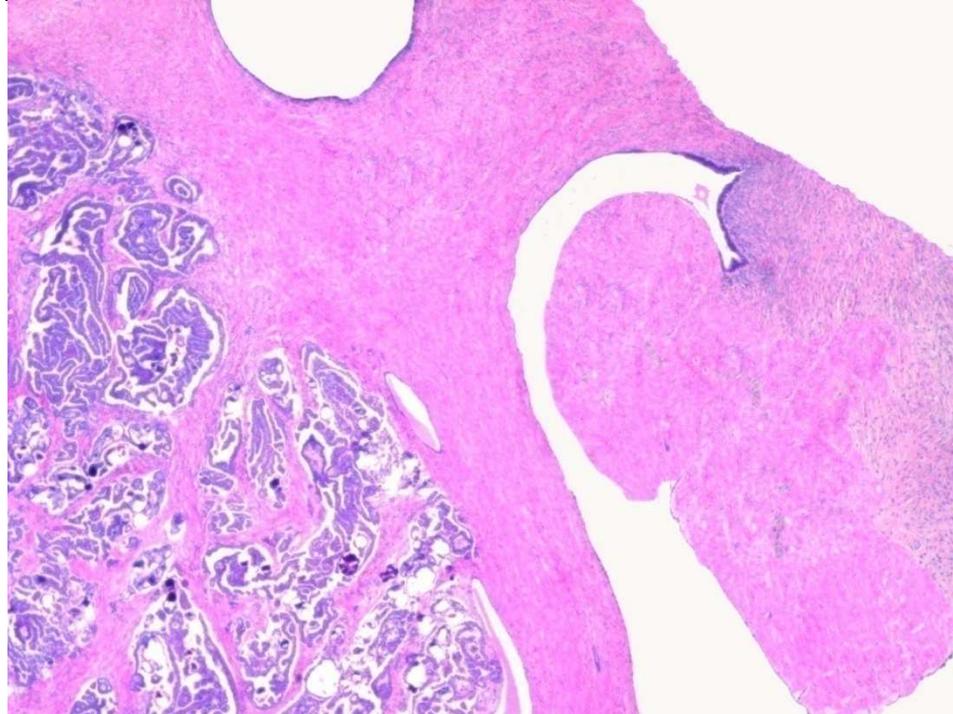
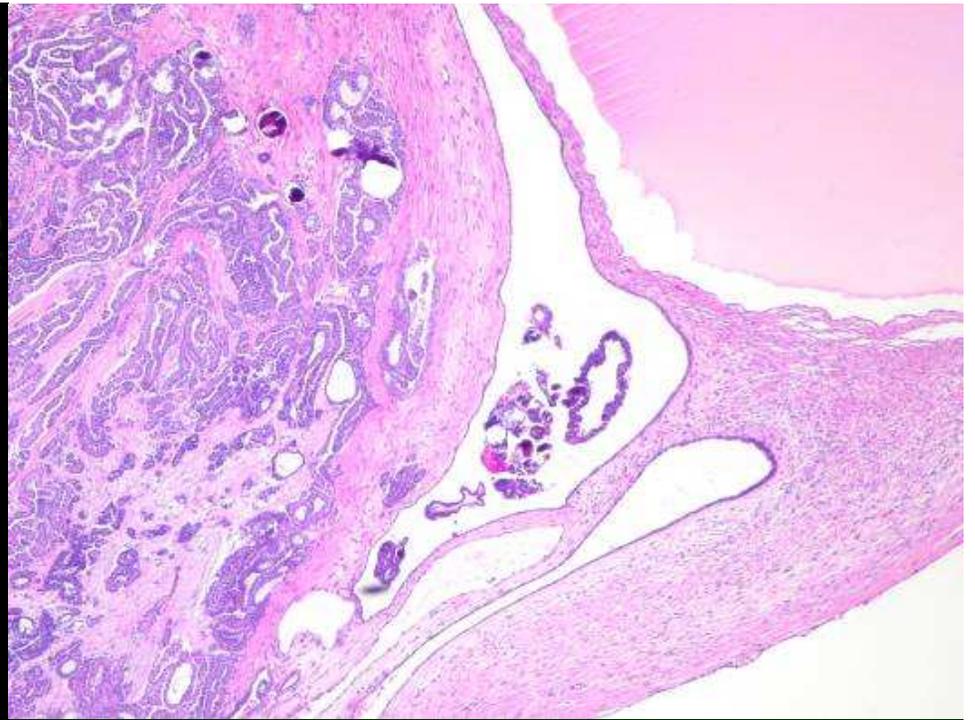


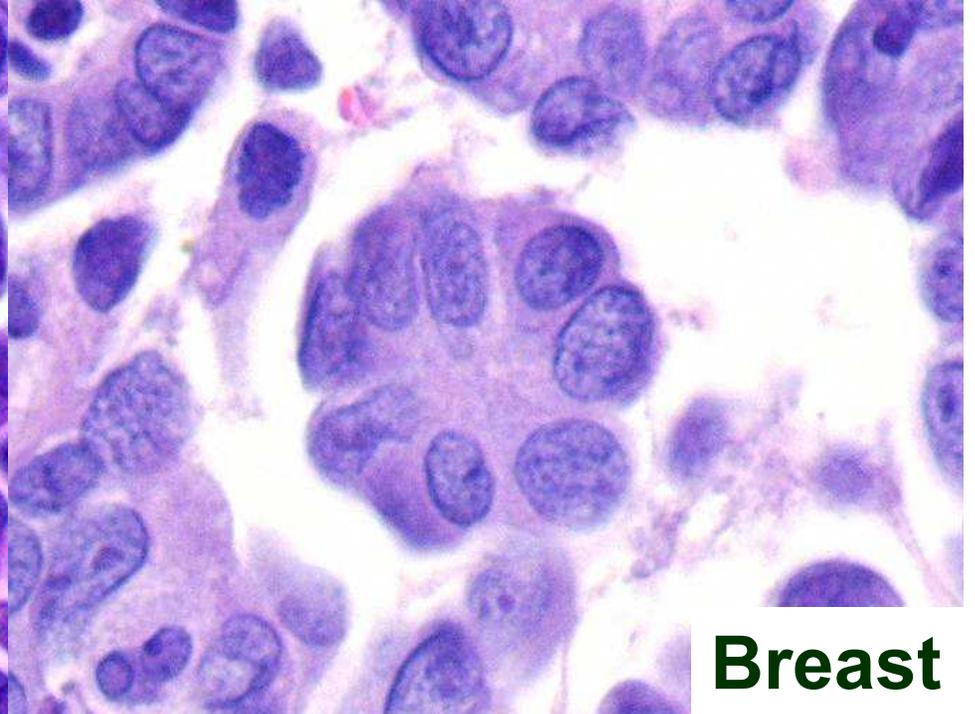
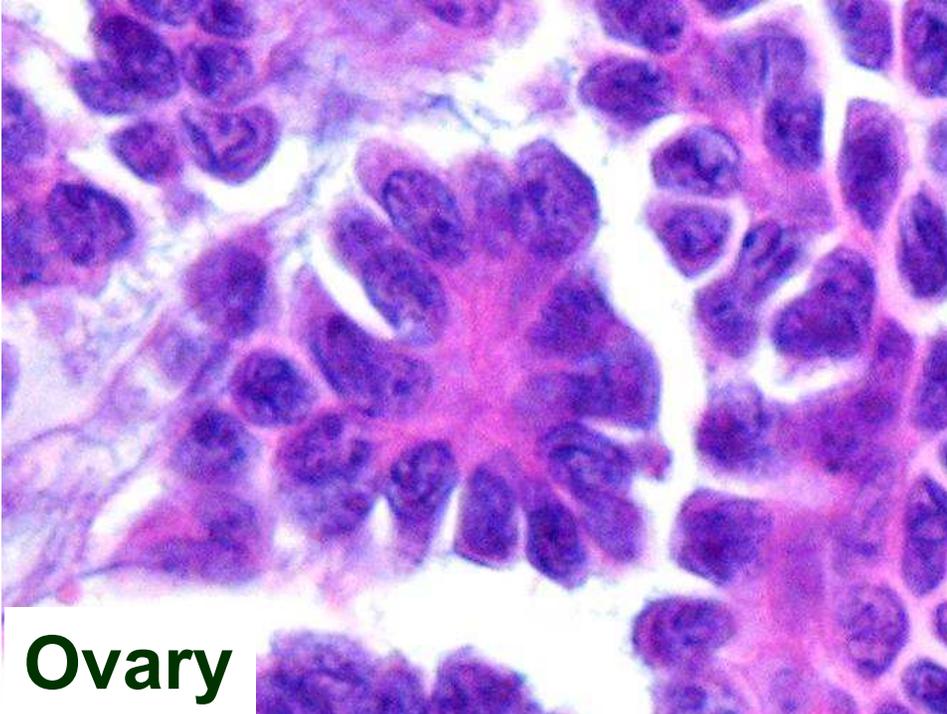
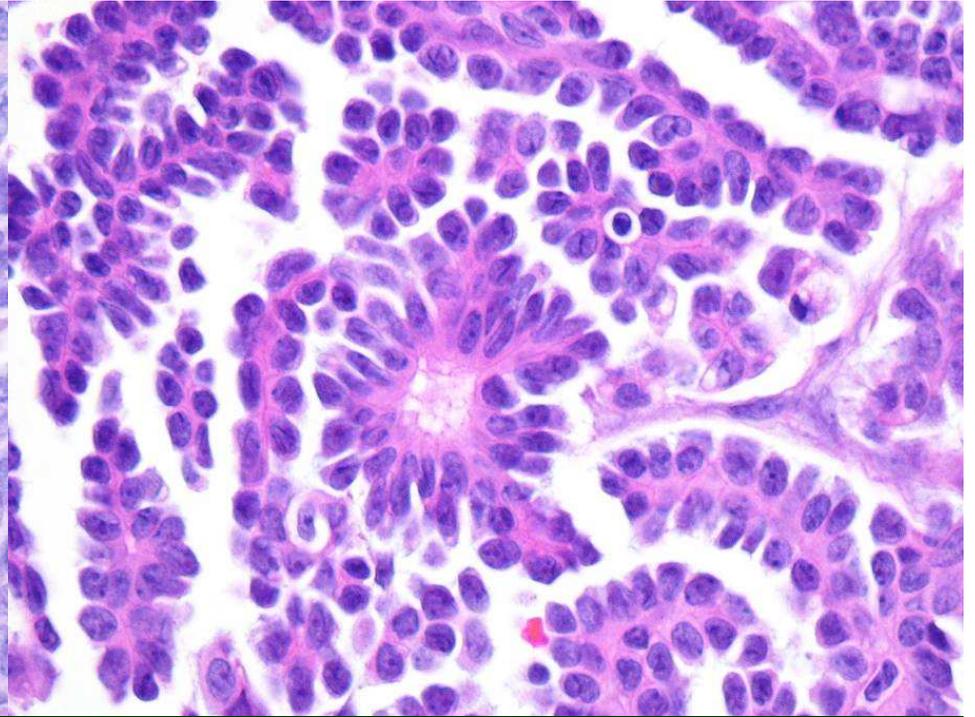
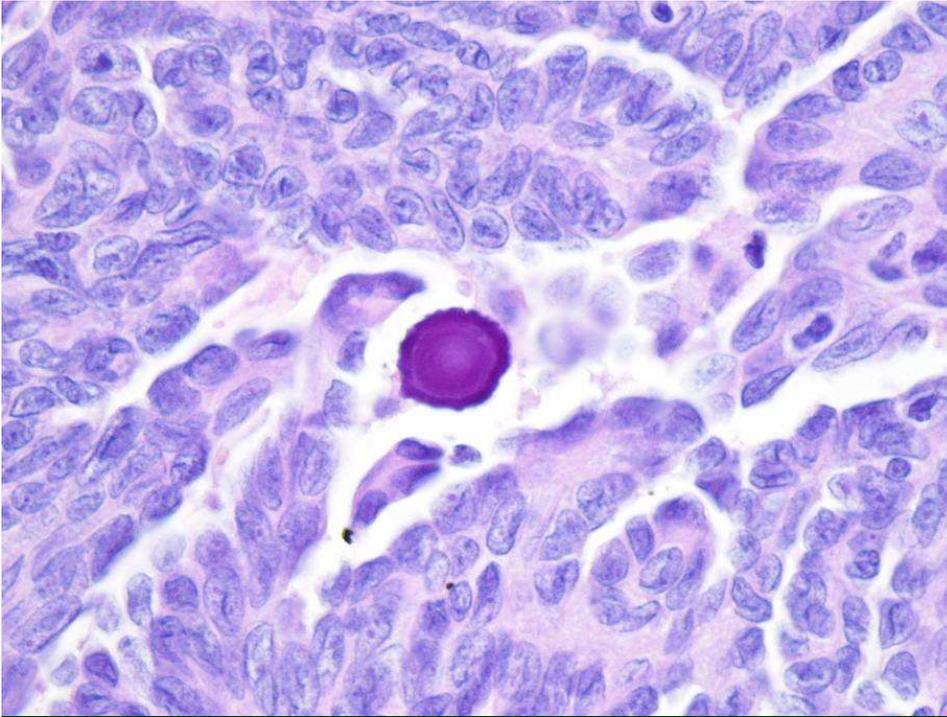
p63



Ki67



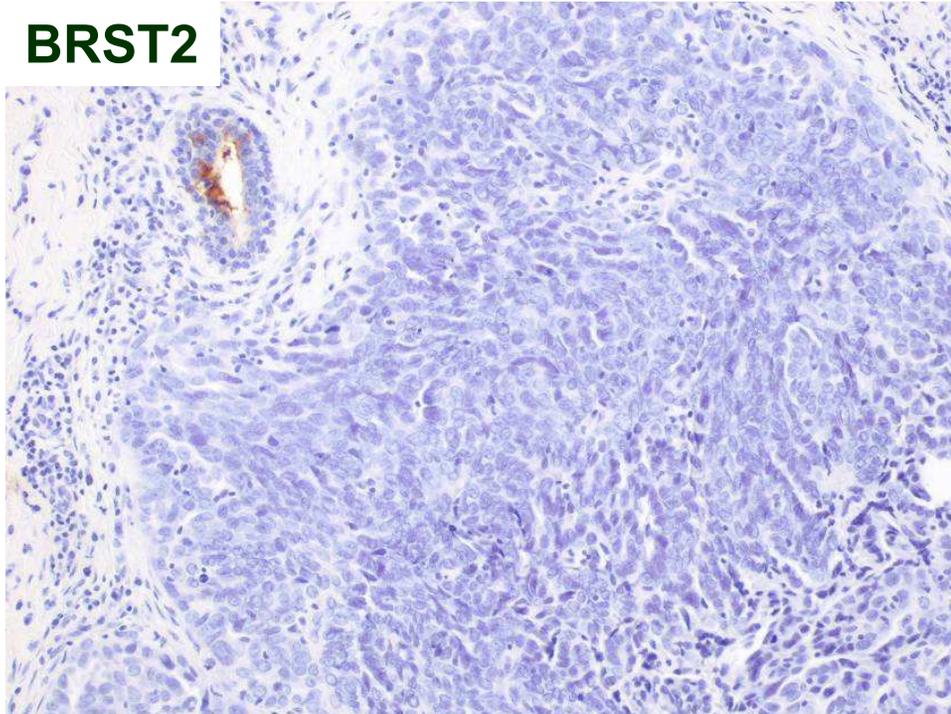




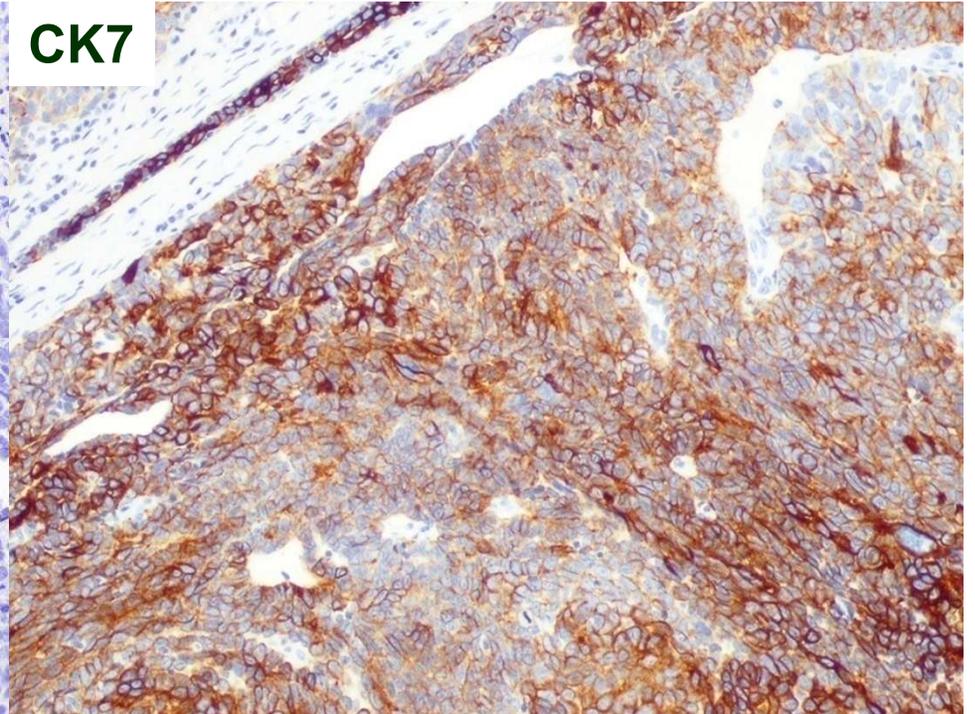
Ovary

Breast

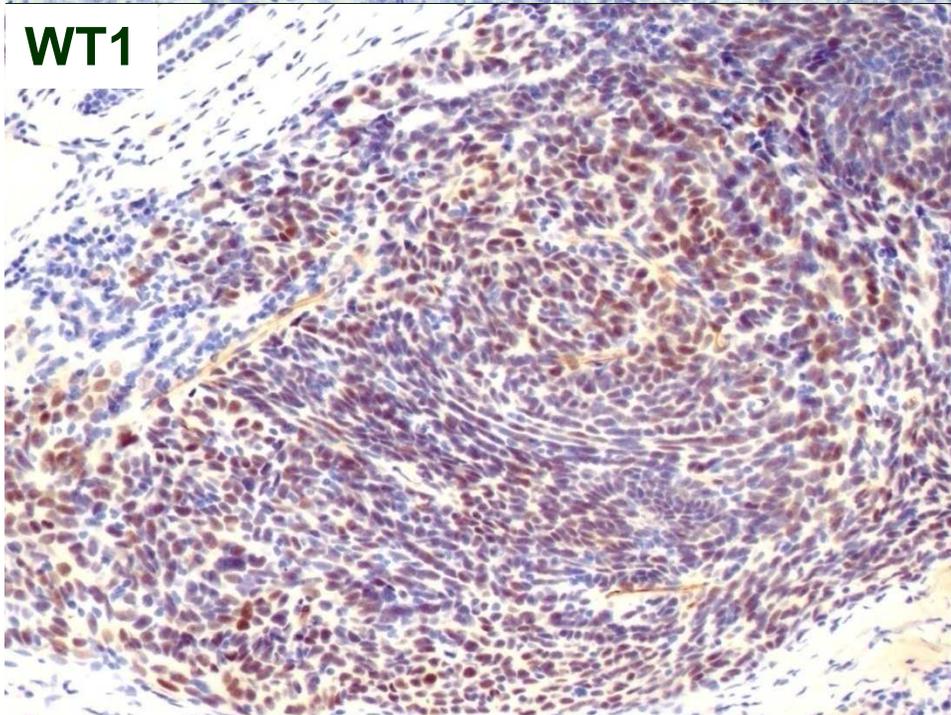
BRST2



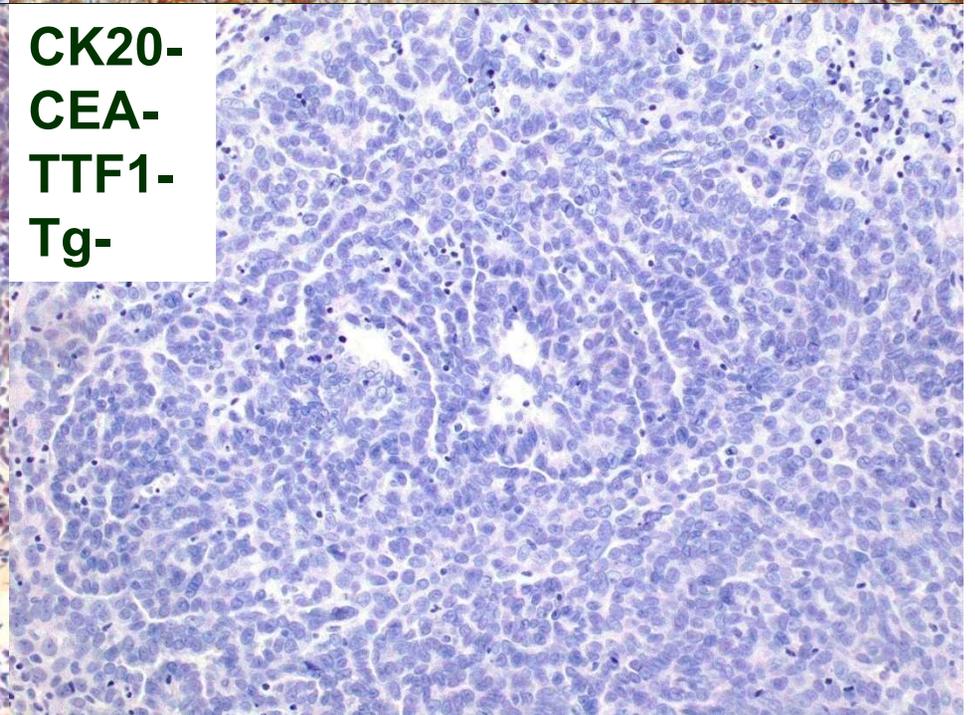
CK7

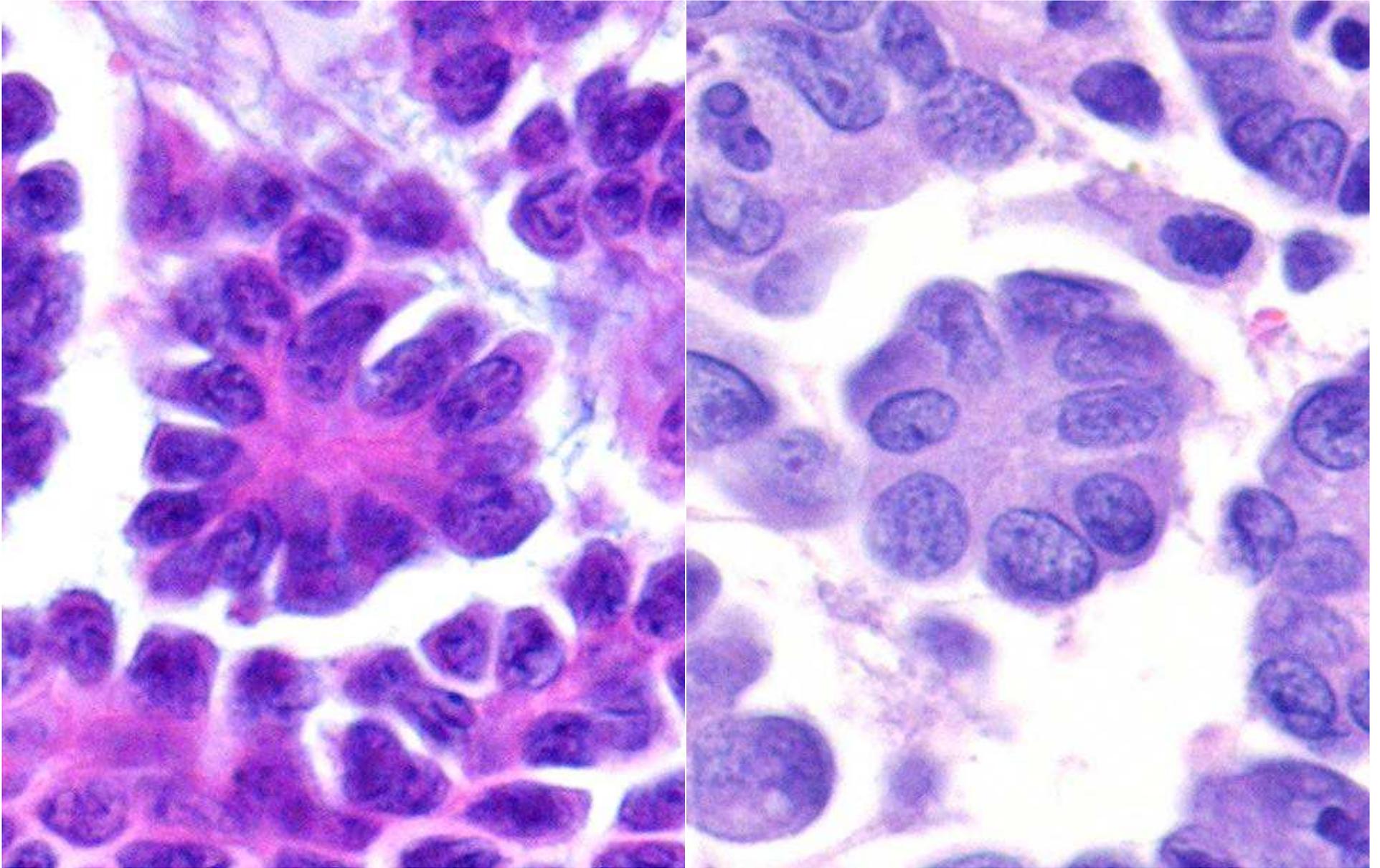


WT1



CK20-
CEA-
TTF1-
Tg-





Metastatic Ovary Ca to Breast

Metastatic Carcinoma to Breast

- **Rare Event**
- **Most Common: Melanoma, Lung, Ovary**
- **Ovarian Carcinoma Mimics Primary**
- **Axillary Lymph Nodes May Be Involved**
- **History & Immunostains Helpful**



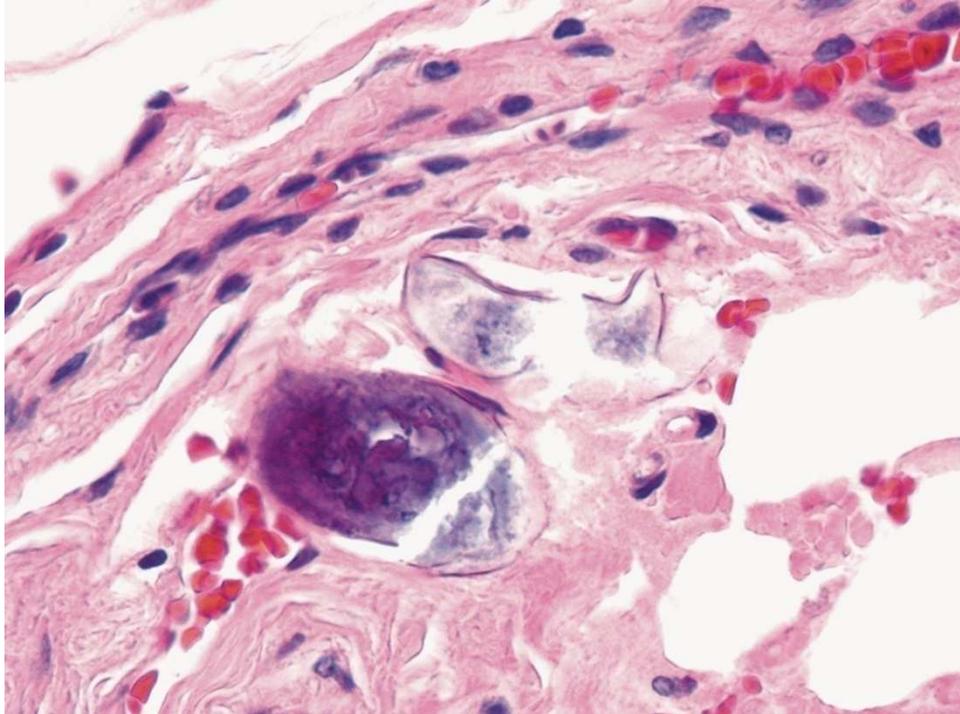
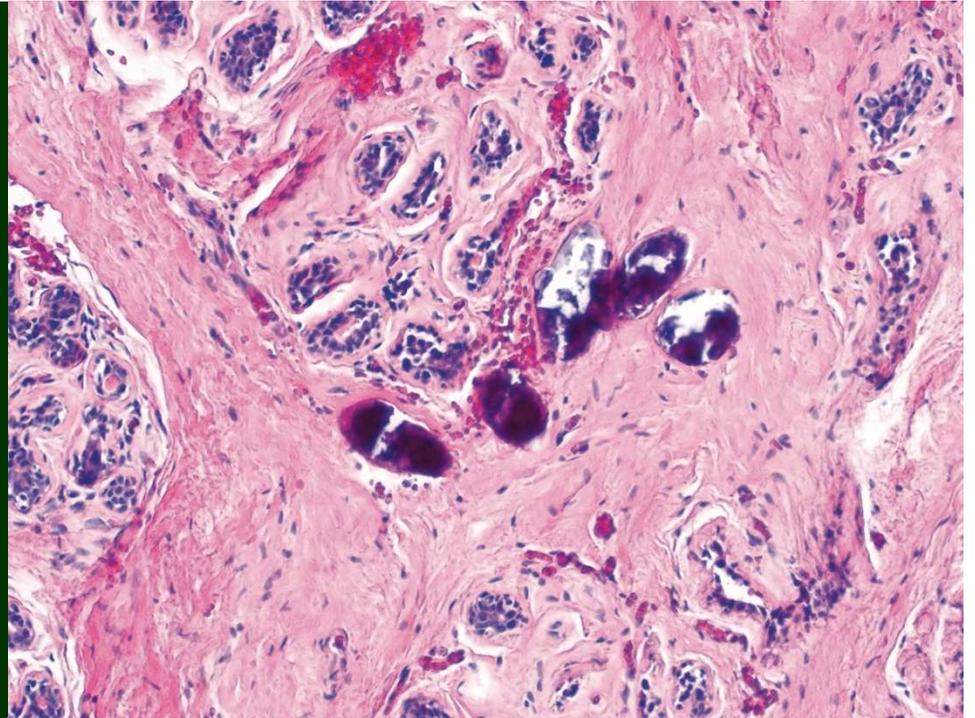
“Time is Often the Best Diagnostician”

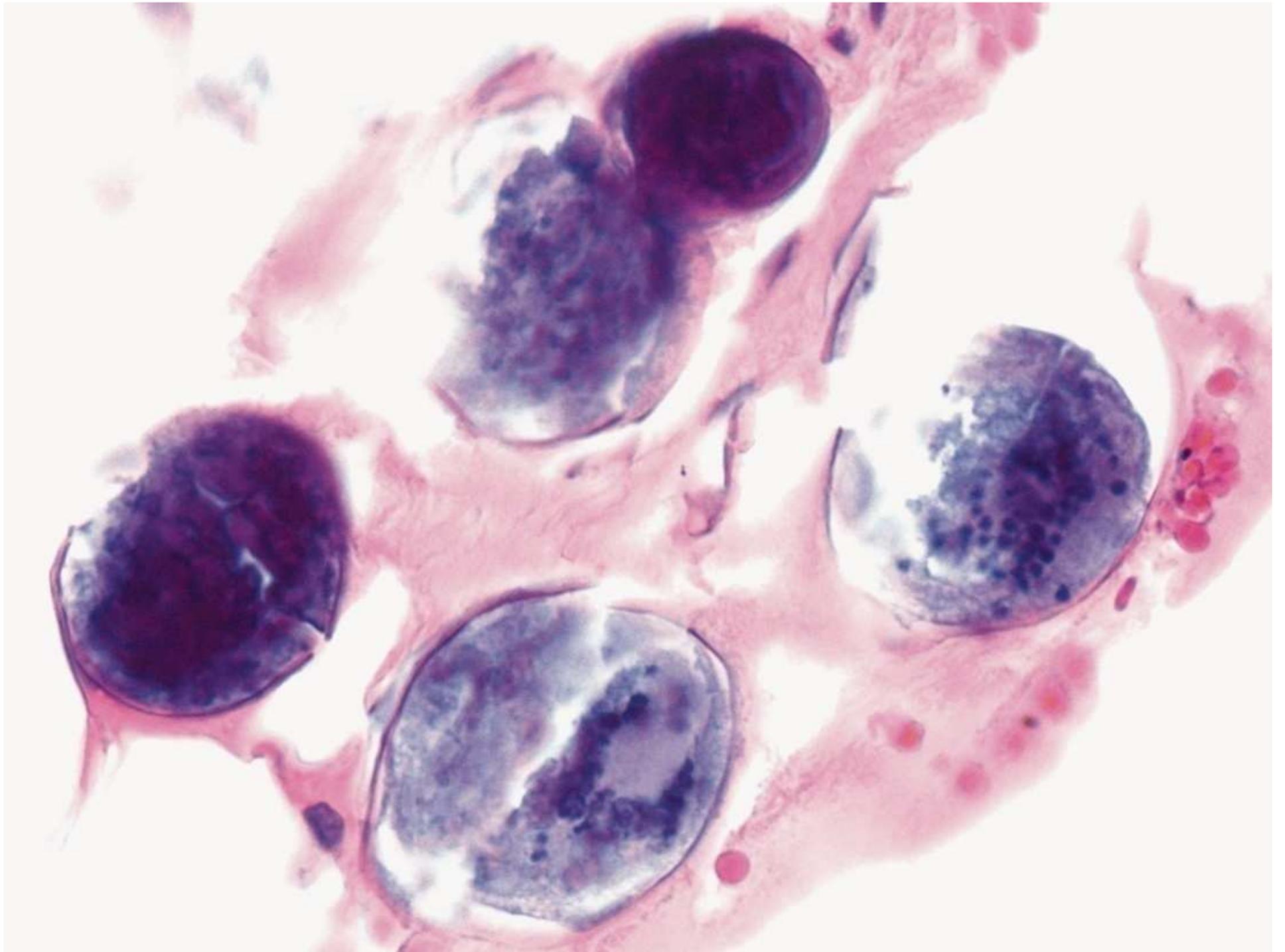
Juan Rosai

8d

63-Year-Old
Calcifications on First Mammogram

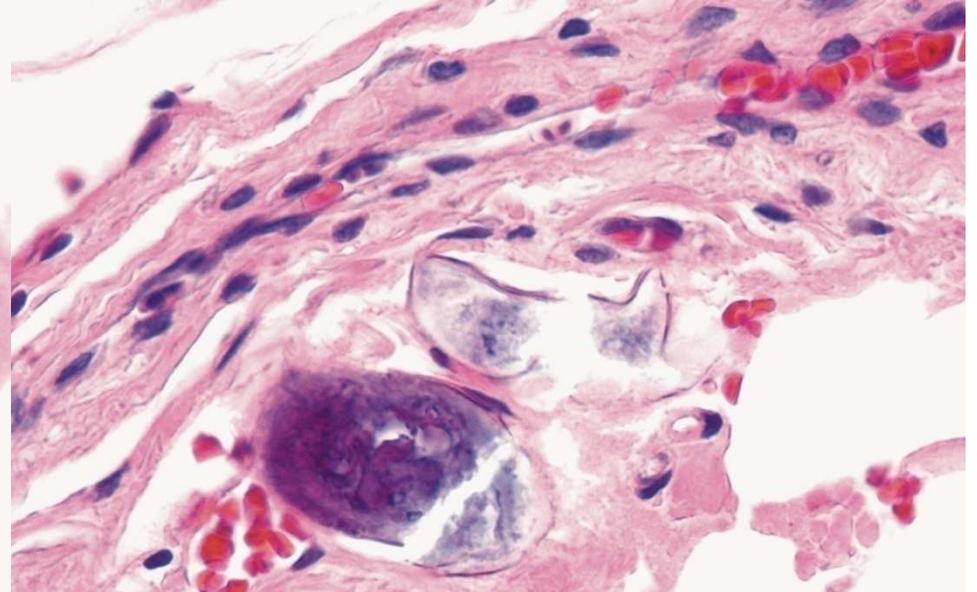
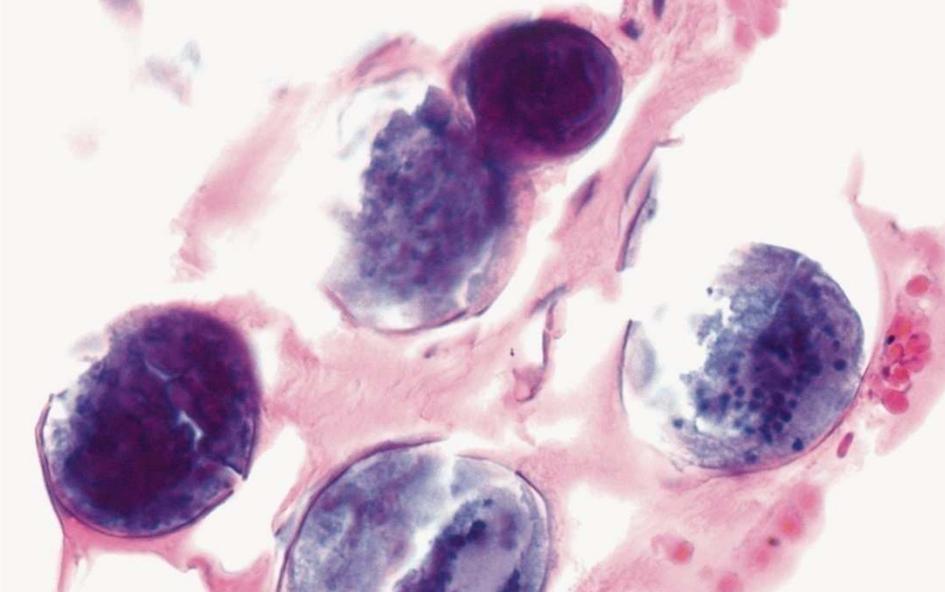
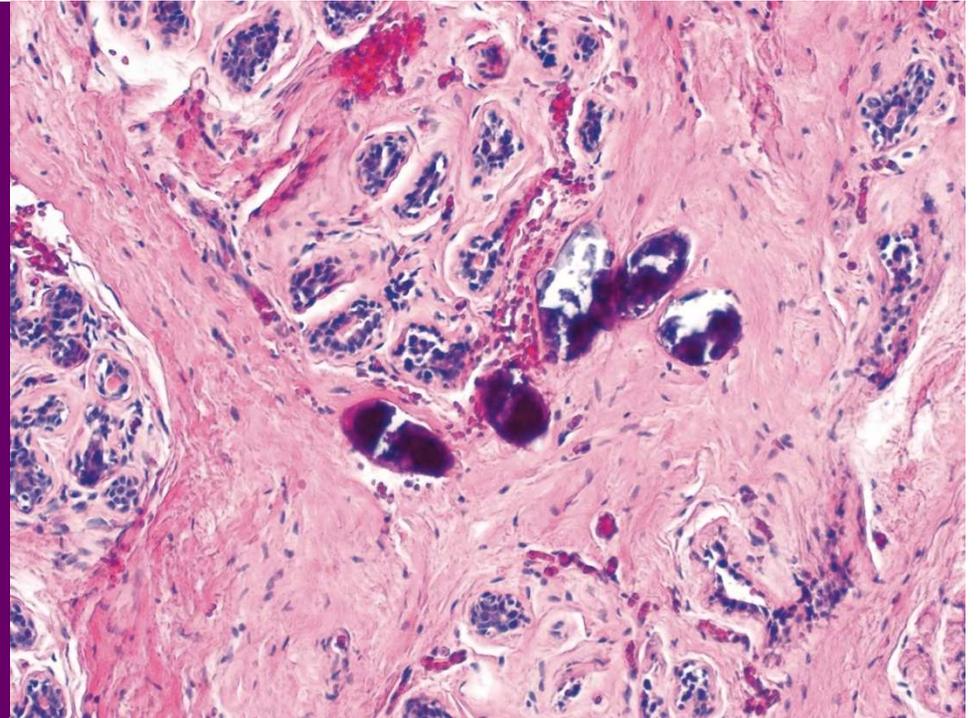
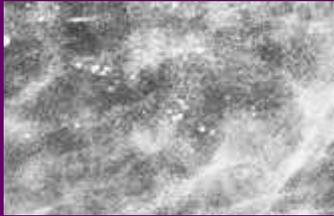






THE CARIBBEAN

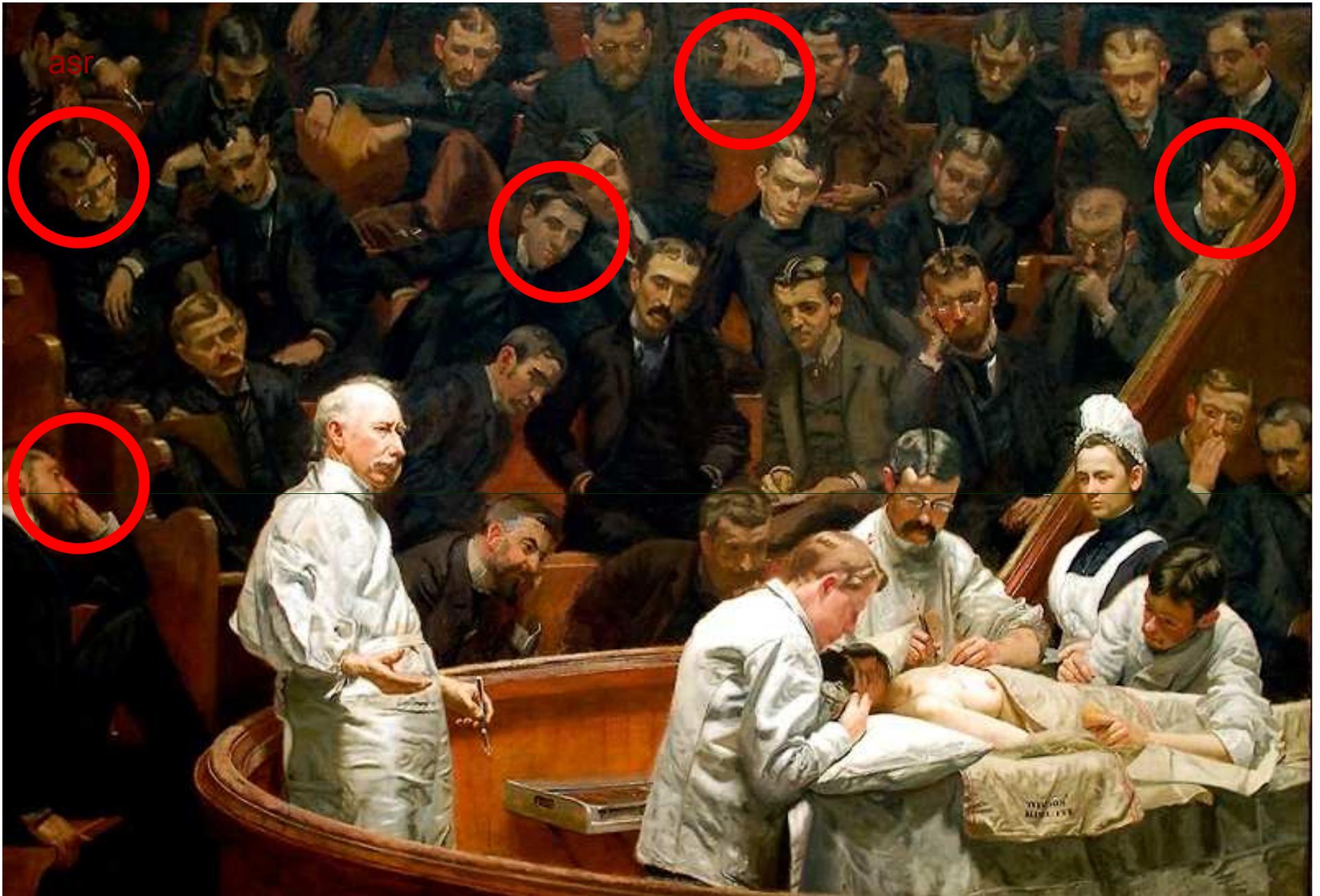




Schistosomiasis



Calcifications:
Occasionally Exotic Diagnosis



Eakins, The Agnew Clinic