Apocrine Lesions of the Breast

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Basic features of apocrine cells

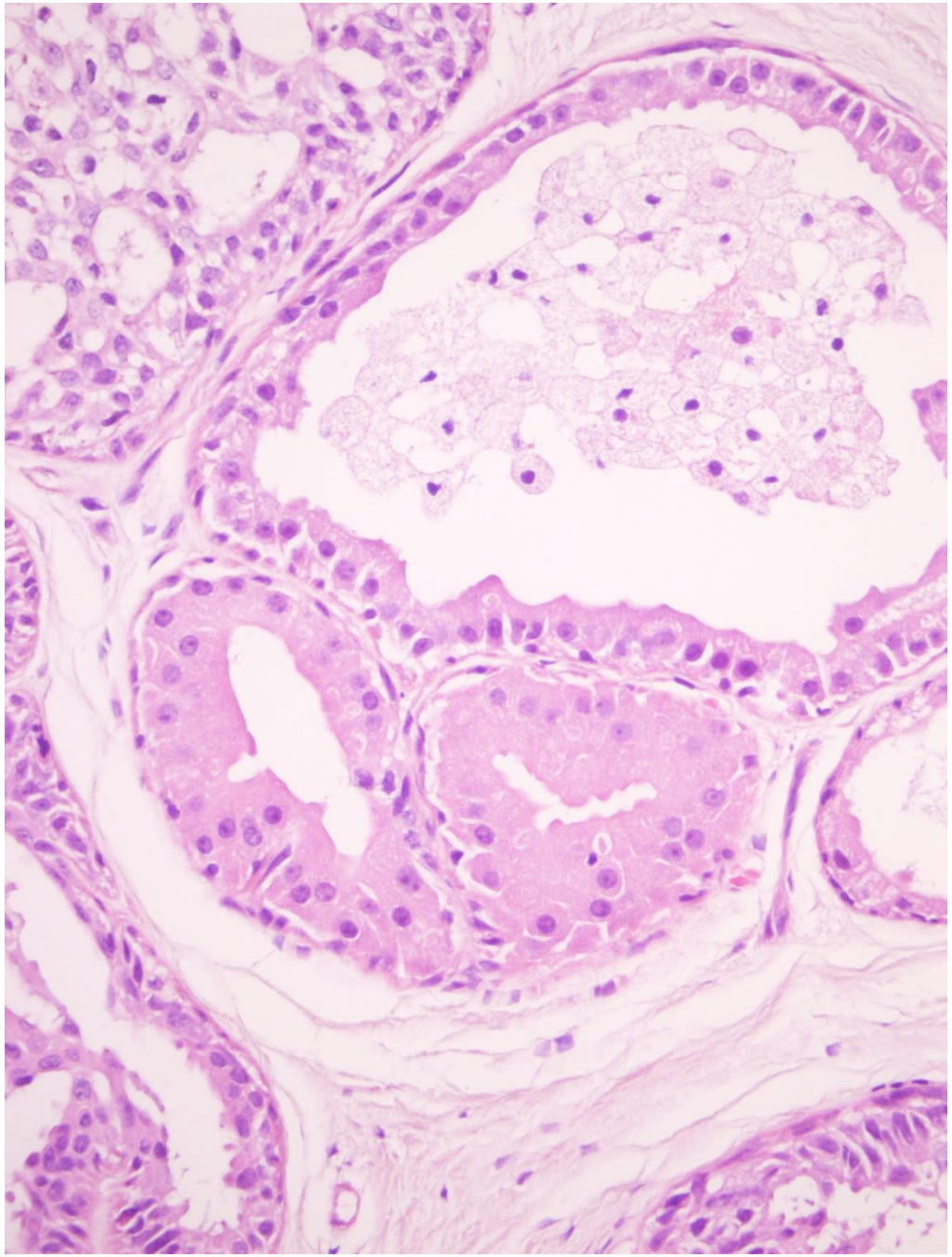
- Tall columnar, cuboidal, or flattened
- **Type A:**
  - **Cytoplasm:** Abundant eosinophilic granular cytoplasm; supranuclear vacuoles (may contain pigment)
  - **Nucleus:** Round to oval, basally located; 1–2 prominent nucleoli
  - **Cystic spaces:** Hyperchromatic, flattened to cuboidal nuclei

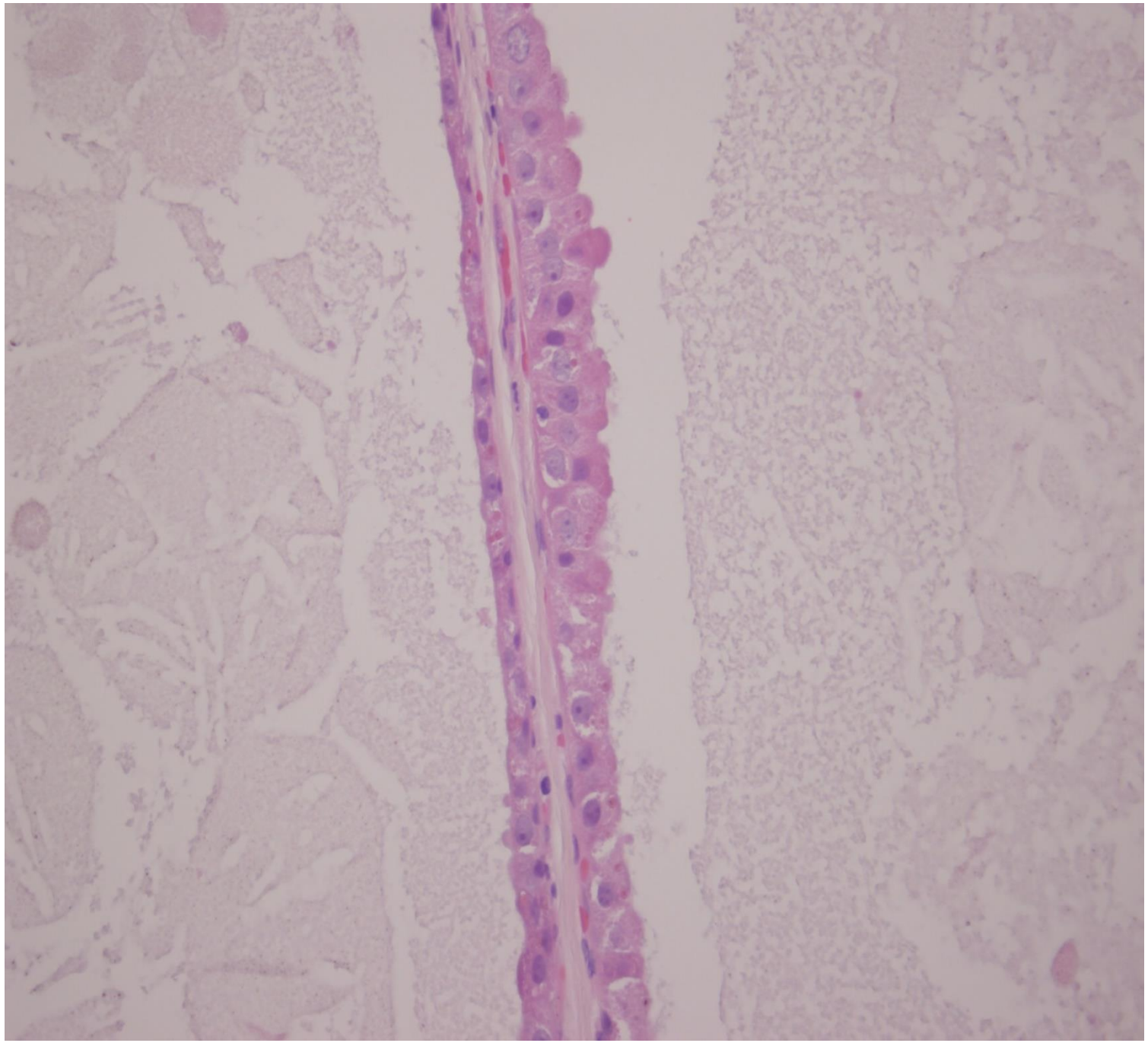
Ultrastructure:

- Electron-dense granules near luminal surface
- Short, scattered microvilli

In apocrine metaplasia:

- Mitotic figures rare
- No atypical mitoses





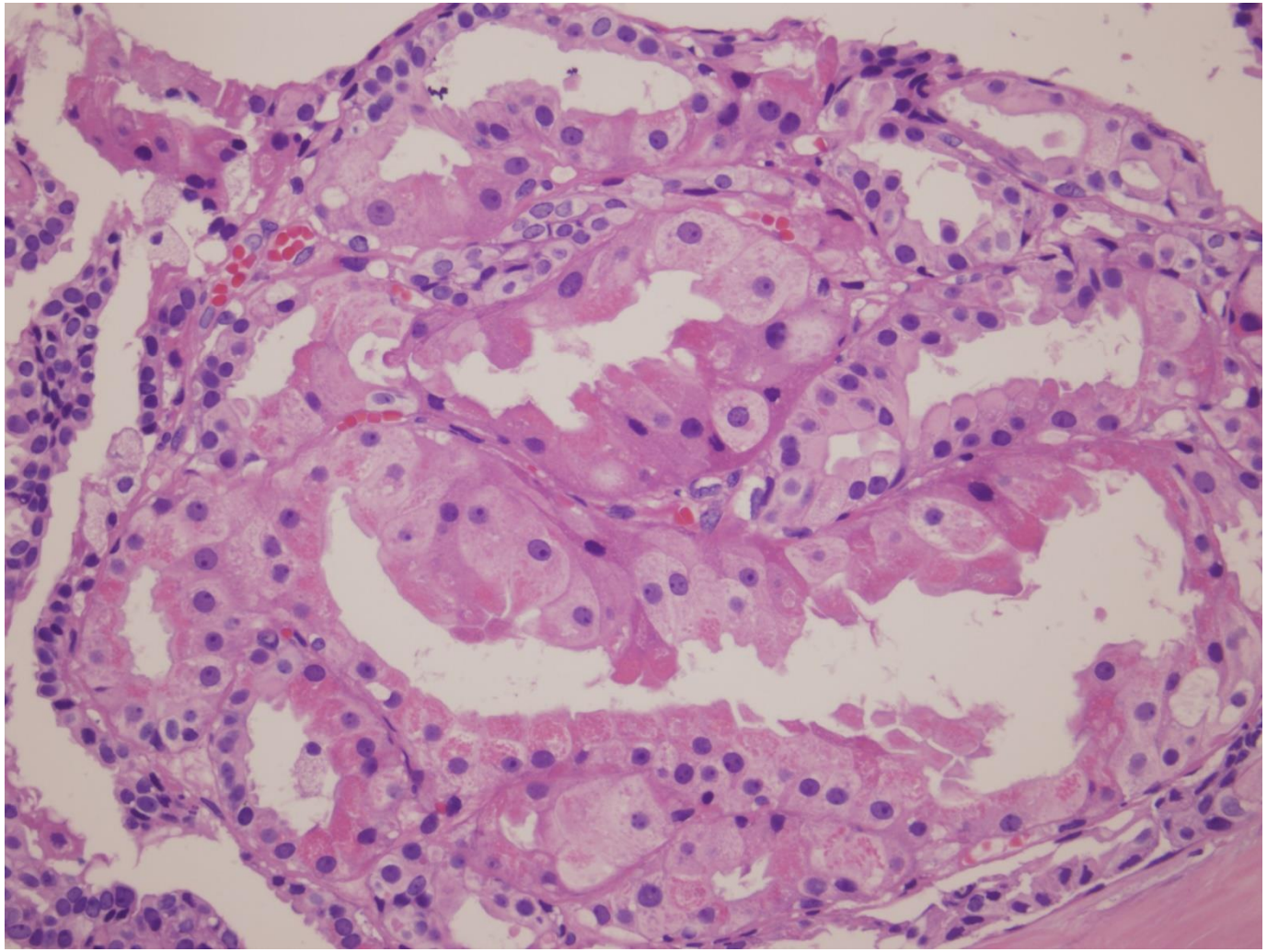
- Uniform cuboidal to columnar cells in a single cohesive layer
- Basal nuclei with luminal cytoplasmic accumulation (apical blebs or snouts)
- Eosinophilic homogeneous cytoplasm and supranuclear vacuoles
- No significant necrosis or mitotic activity

- **Type B:**

➢Cytoplasm: Pale, clear, foamy, with small vacuoles (lipofuscin pigment).

➢Nuclei: Identical to those of Type A cells.

Ultrastructure: the small vacuoles correspond to empty vesicles



Immunohistochemical characteristics of apocrine cells

- Diastase-digested PAS (+)
- IHC:

  ER (-), PR (-), AR (+)

  EMA (+) ,CK8/18 (+)

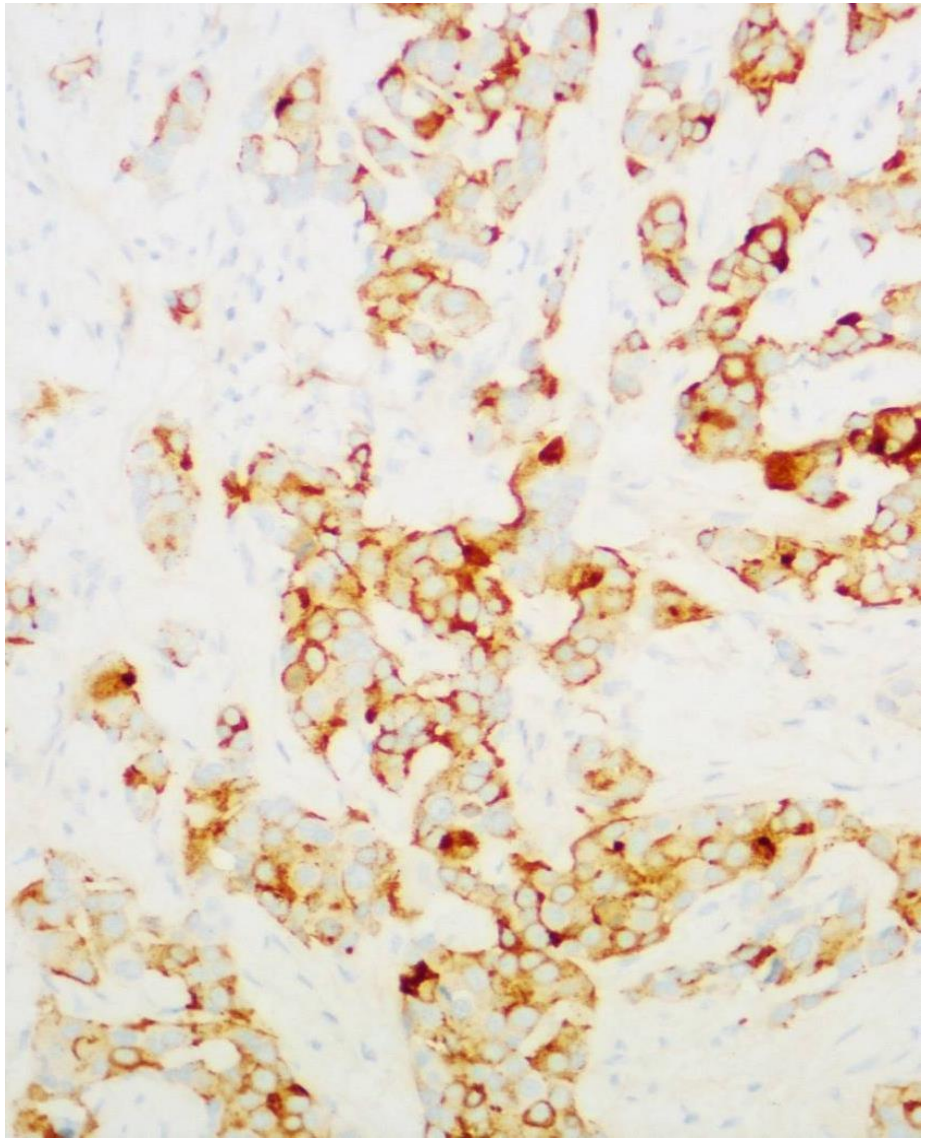
  GCDFP15 (+)

  CK5/6(-), CK14(-)

ADH vs. Low-grade DCIS:
differentiation using ER and HMWCK

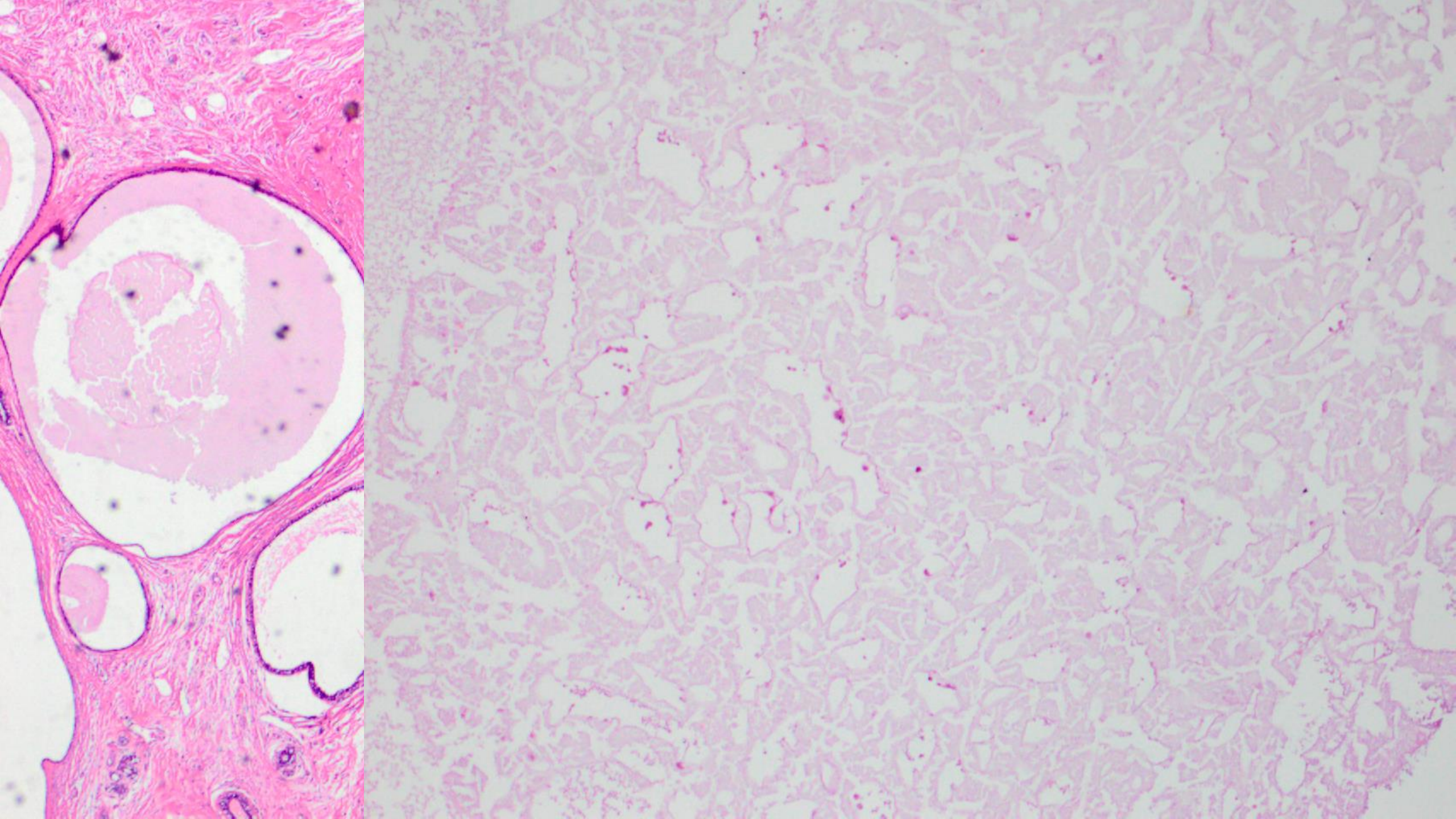
Not applicable to apocrine lesions

GCDFP15 (Gross Cystic Disease Fluid Protein-15)



- Cytoplasmic staining localization.
- Positive expression is not restricted to breast apocrine glands.
- Apocrine cells from various sites (e.g., axilla, vulva, eyelid, external auditory canal).
- Non-apocrine glands (e.g., salivary glands, bronchial submucosal glands).
- Other sites: ovary, endometrium, pancreas, ampulla of Vater, prostate.

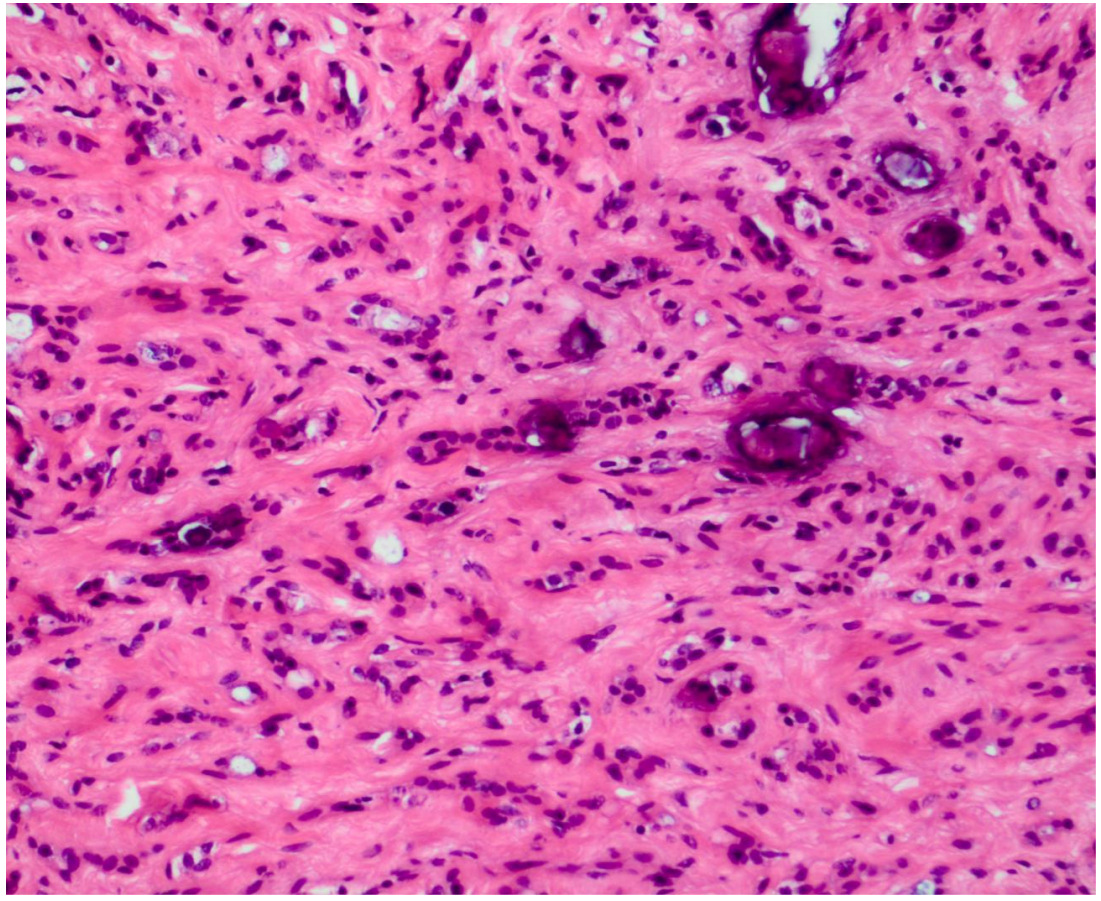
Not only positive in invasive breast cancer with apocrine differentiation, other invasive breast carcinomas can also be positive (50-74%).

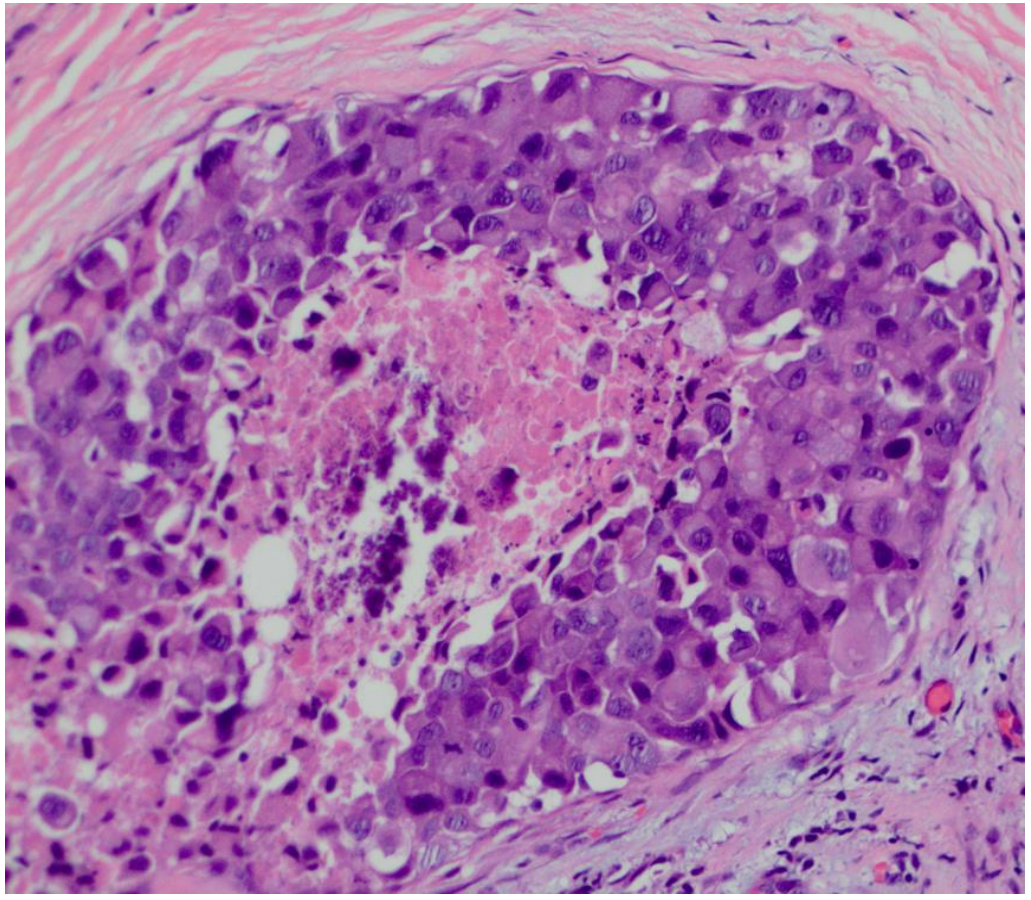


Breast calcifications are divided into two primary categories defined by their biochemical composition.

Calcium Phosphate Microcalcifications

- Common
- Non-refractile and non-birefringent
- Stain blue-purple with hematoxylin
- Typically originate from cellular degeneration or necrosis
- Can be present in both benign and malignant lesions



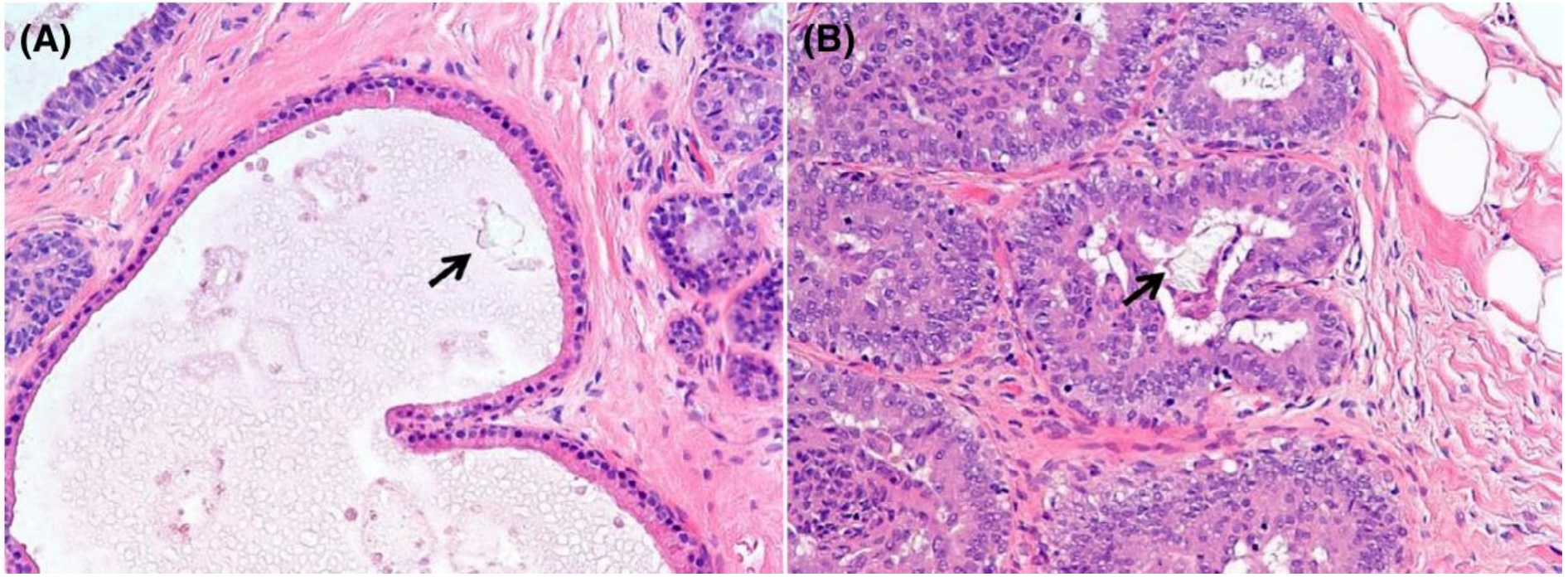


Calcium Oxalate Microcalcifications

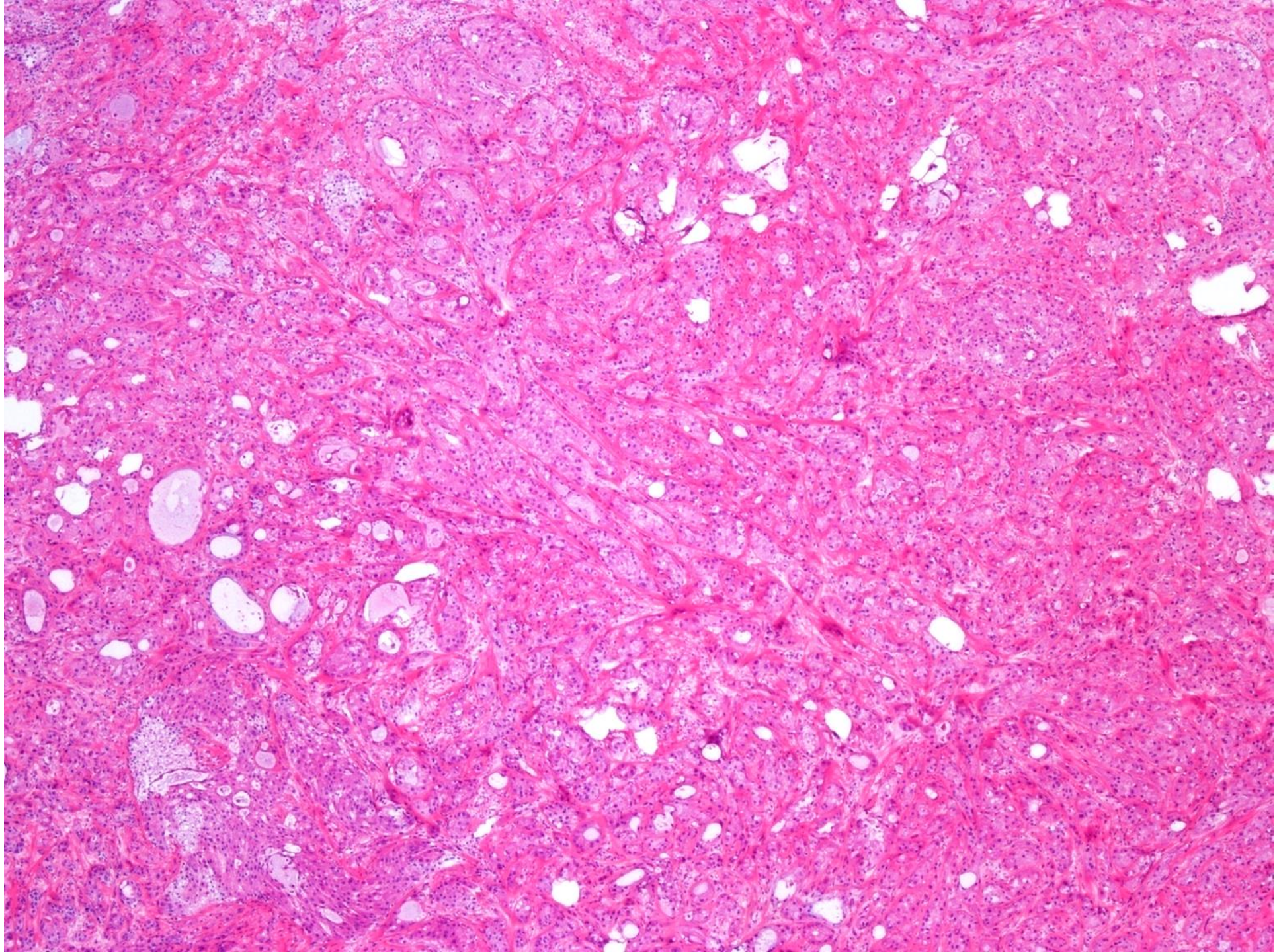
- Refractile and birefringent.
- Difficult to identify under non-polarized light microscopy.
- Associated with apocrine cysts.
- May originate from secretory products.

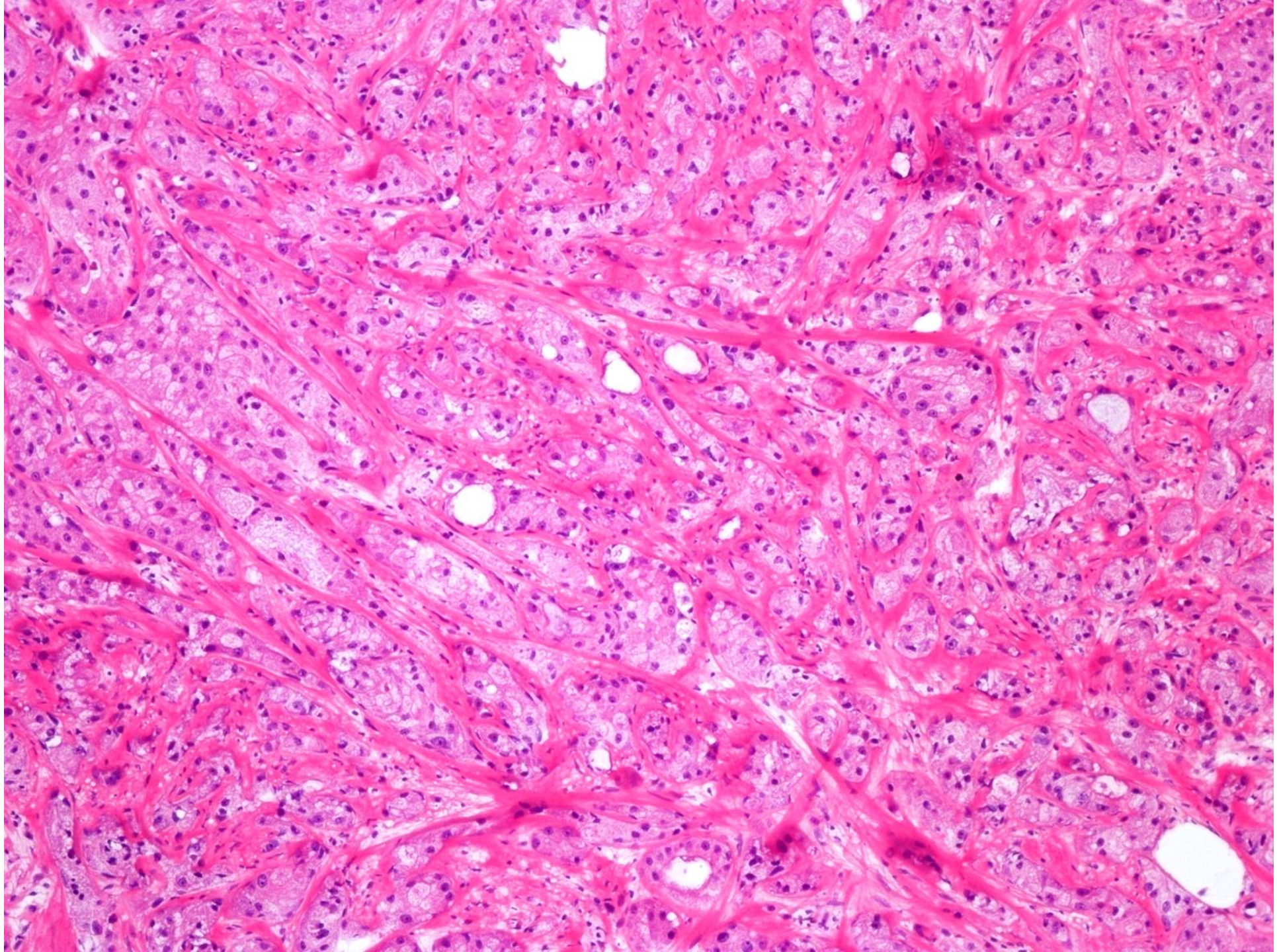
Occurrence

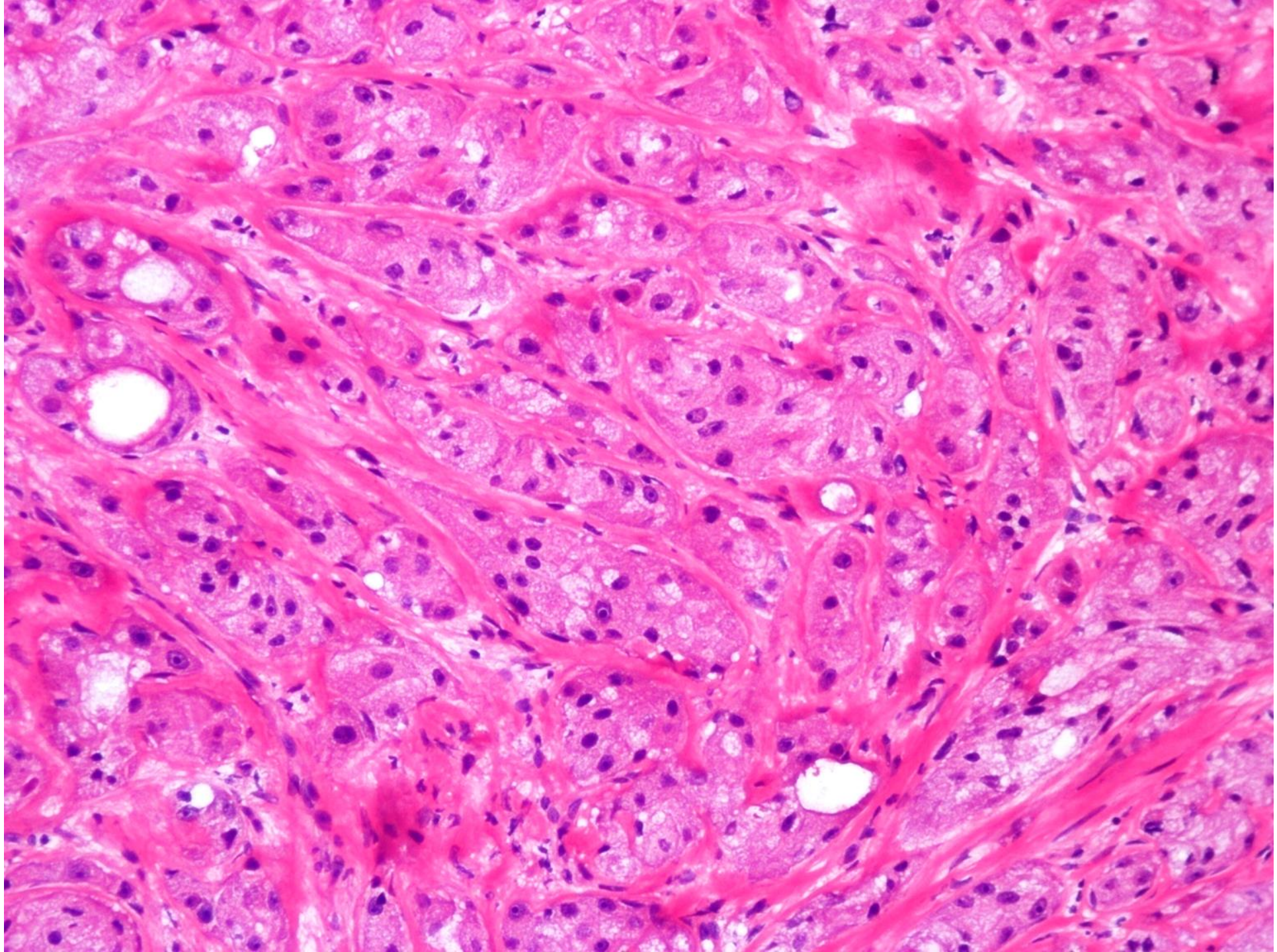
- Typically in non-proliferative lesions: cysts, apocrine lesions, benign ducts
- Among proliferative lesions: only in usual ductal hyperplasia (UDH)
- Rare: chronic granulomatous inflammation, intraductal papilloma, columnar cell change, stromal tissue

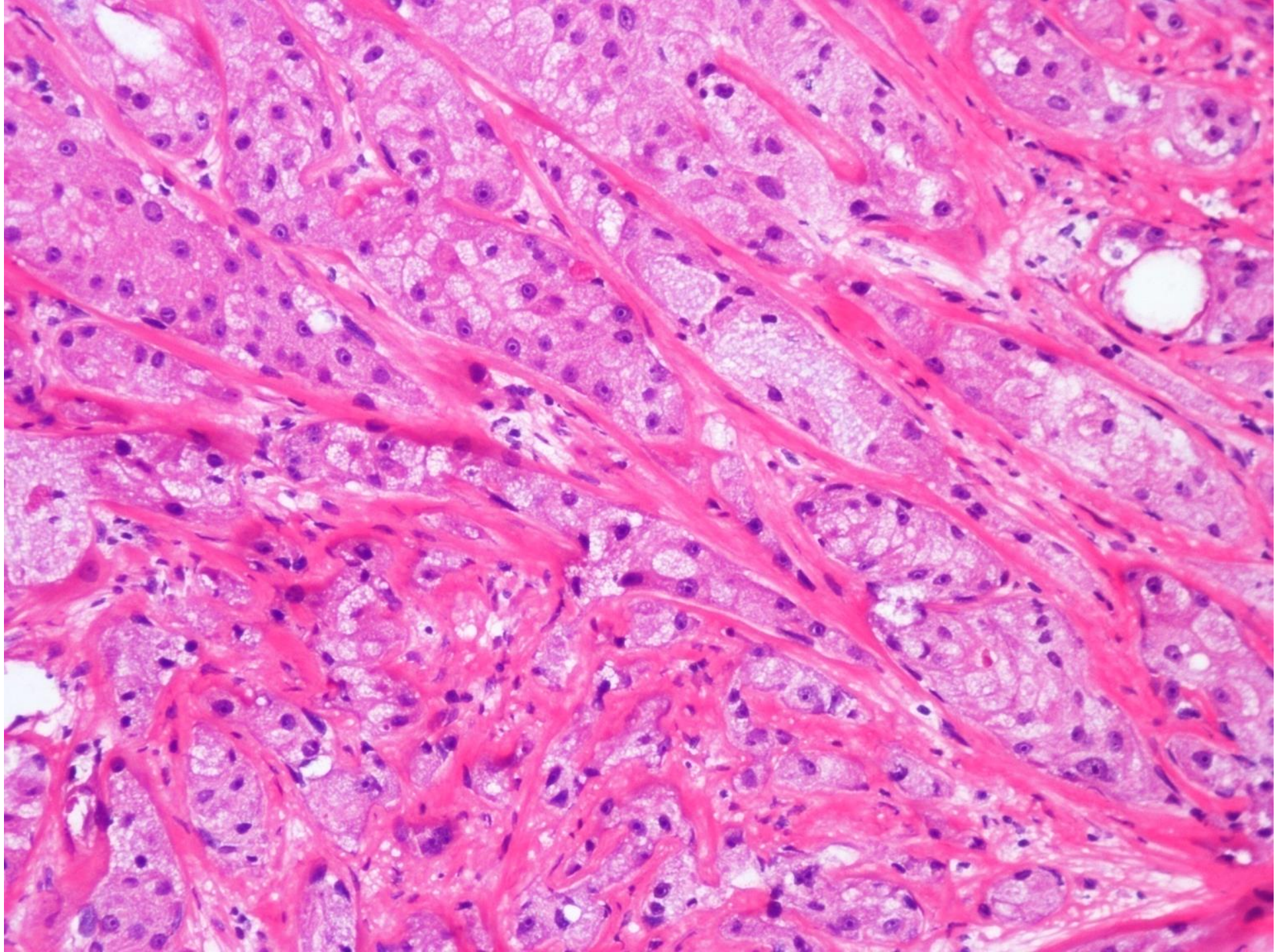


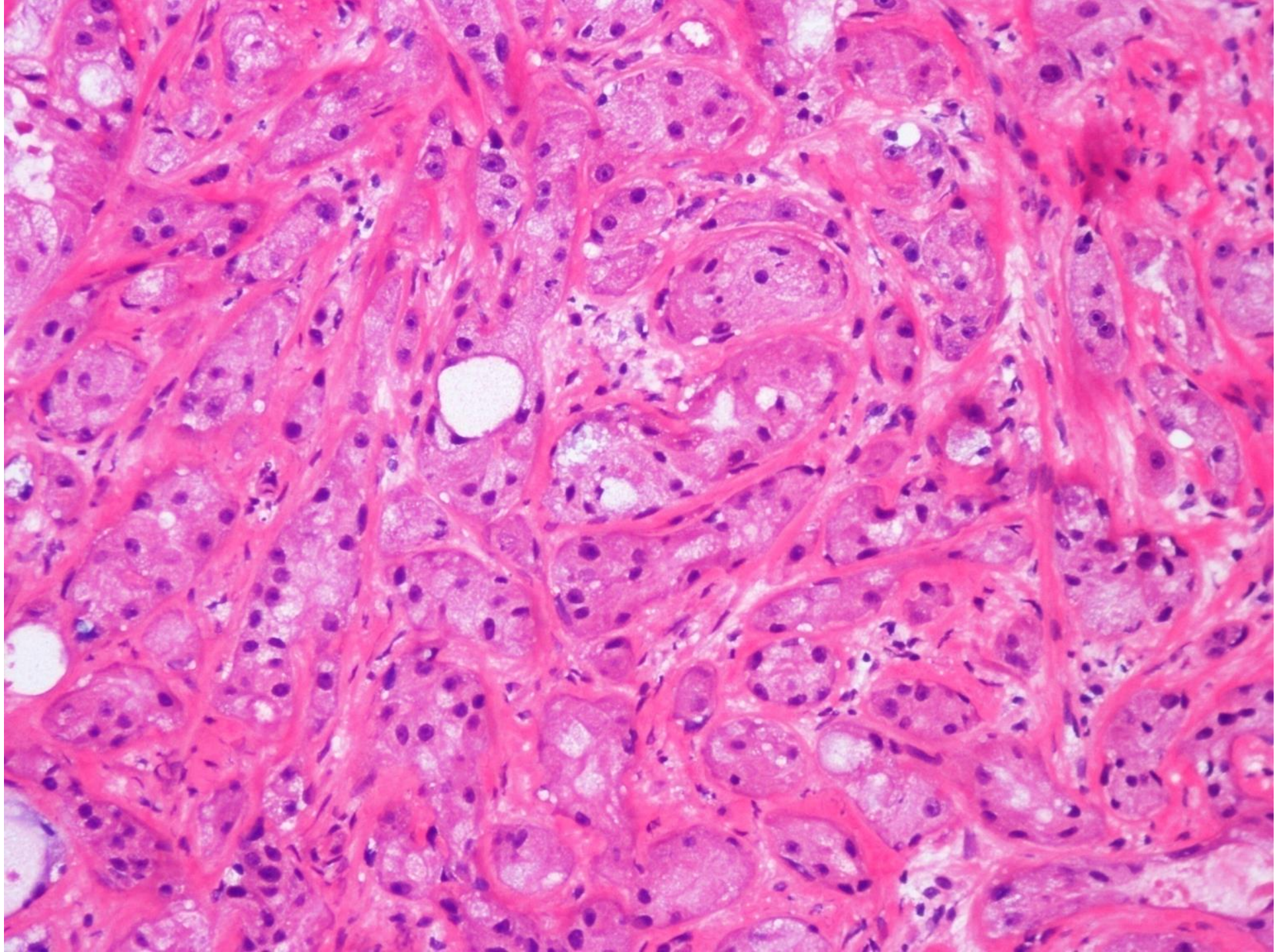
2020;26(9):1736-1741



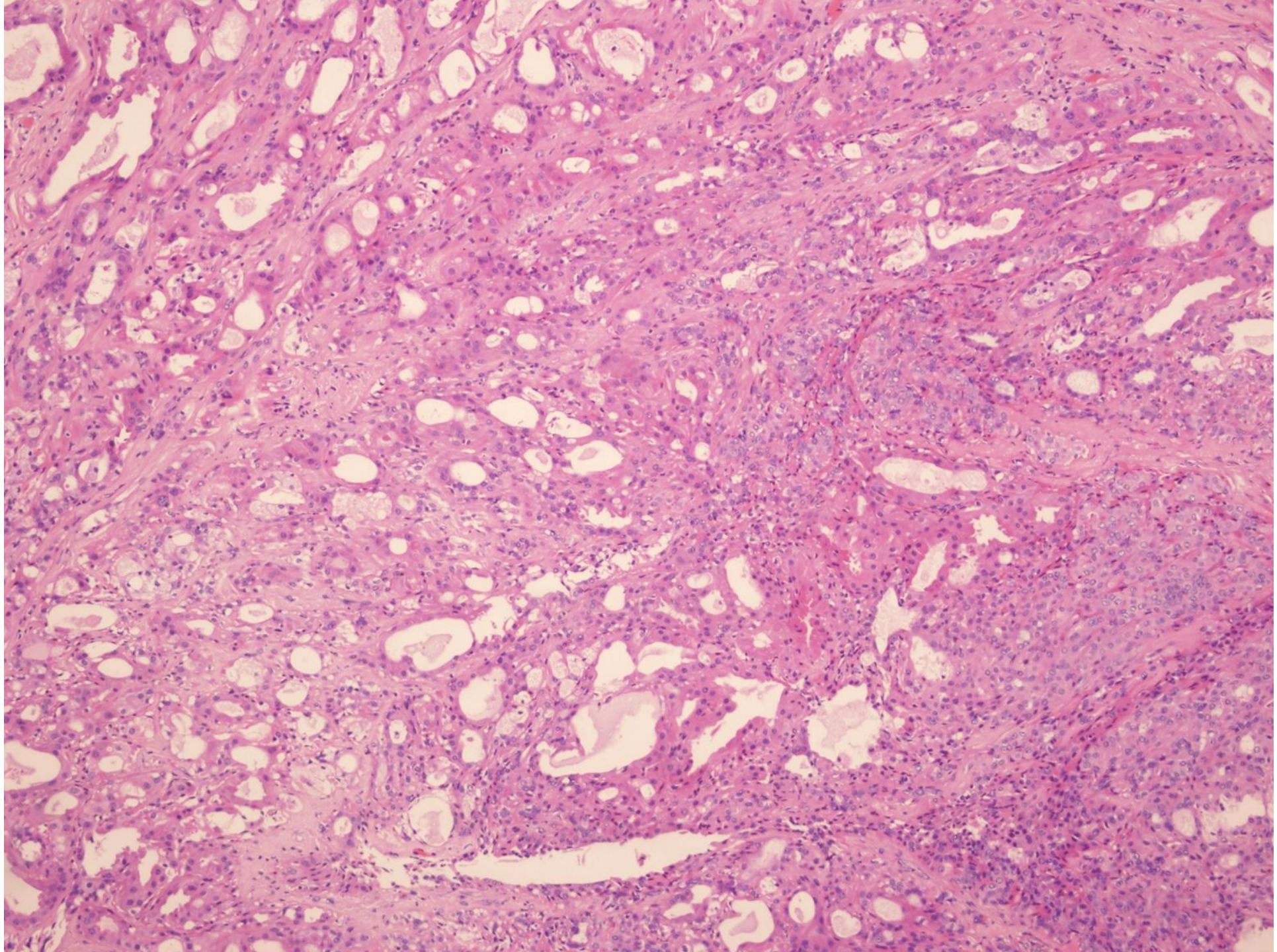


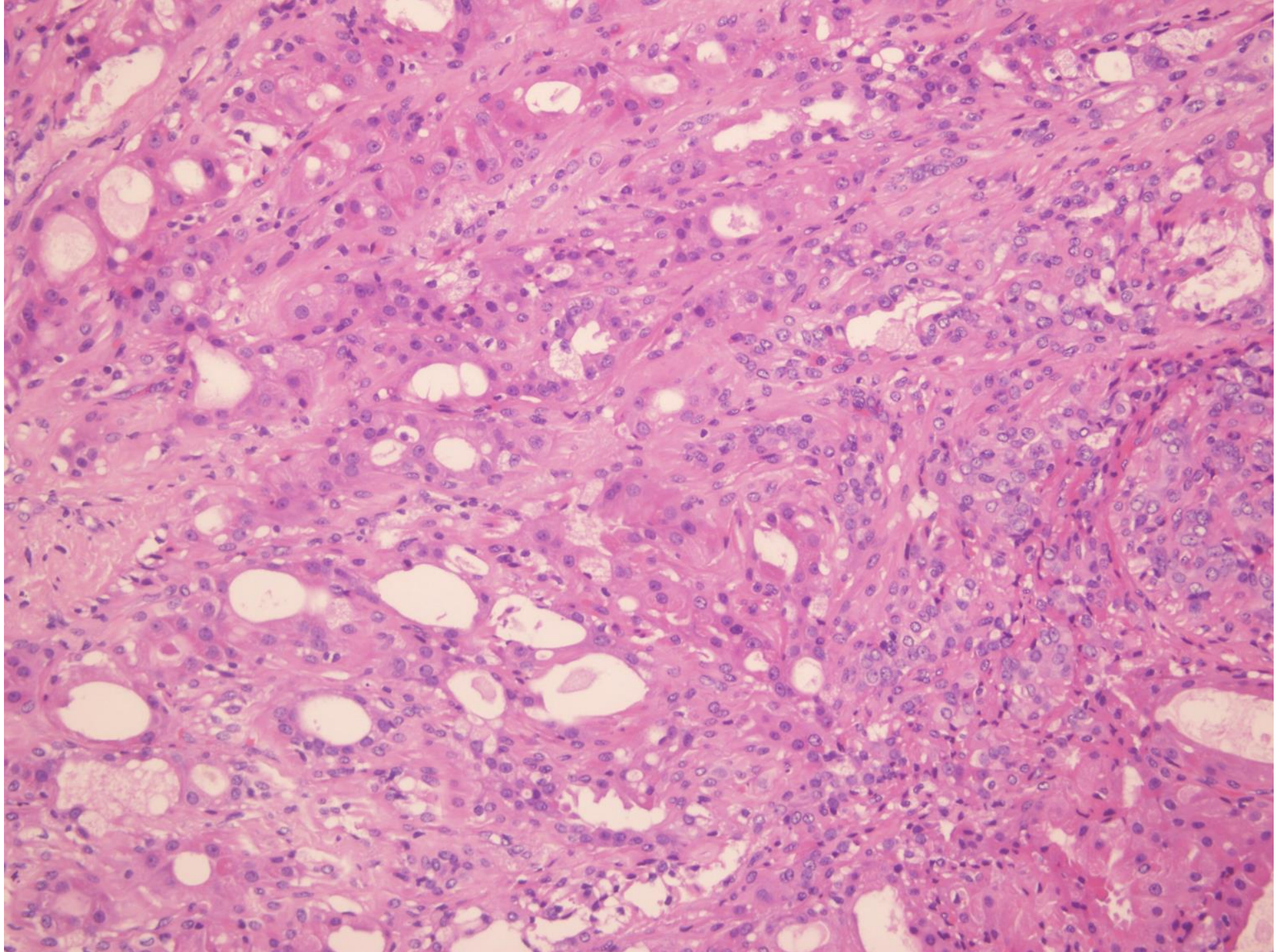


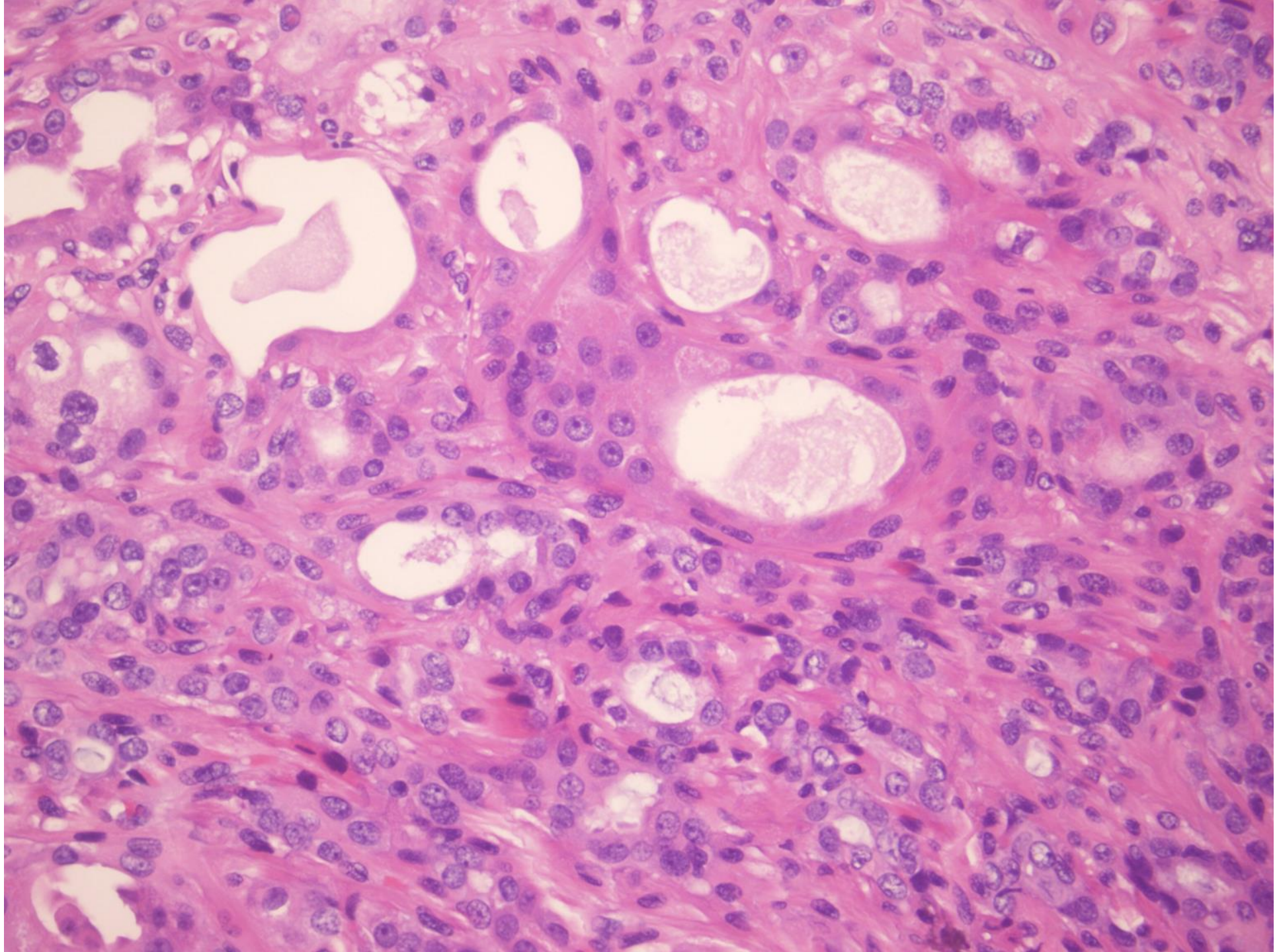


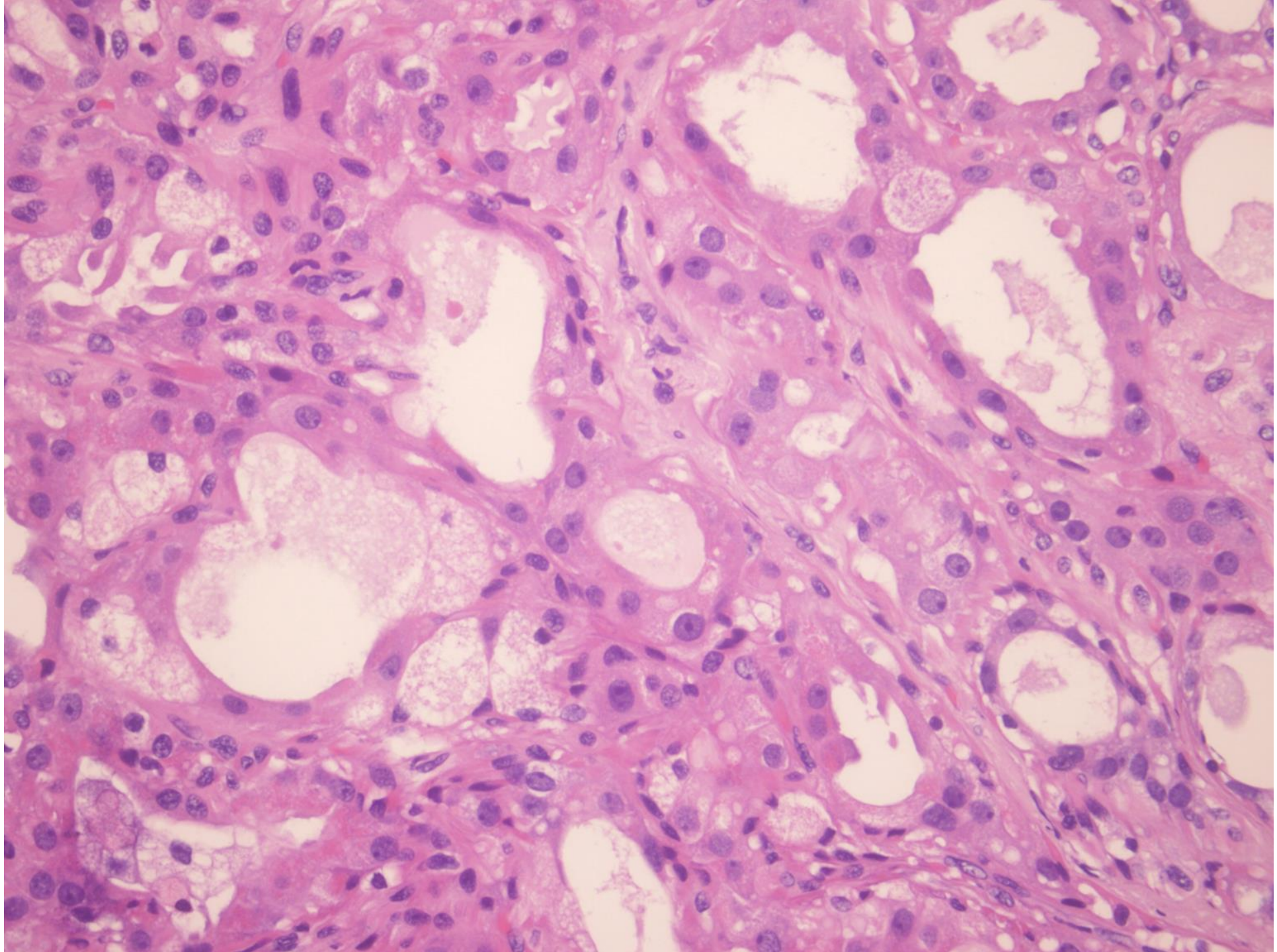


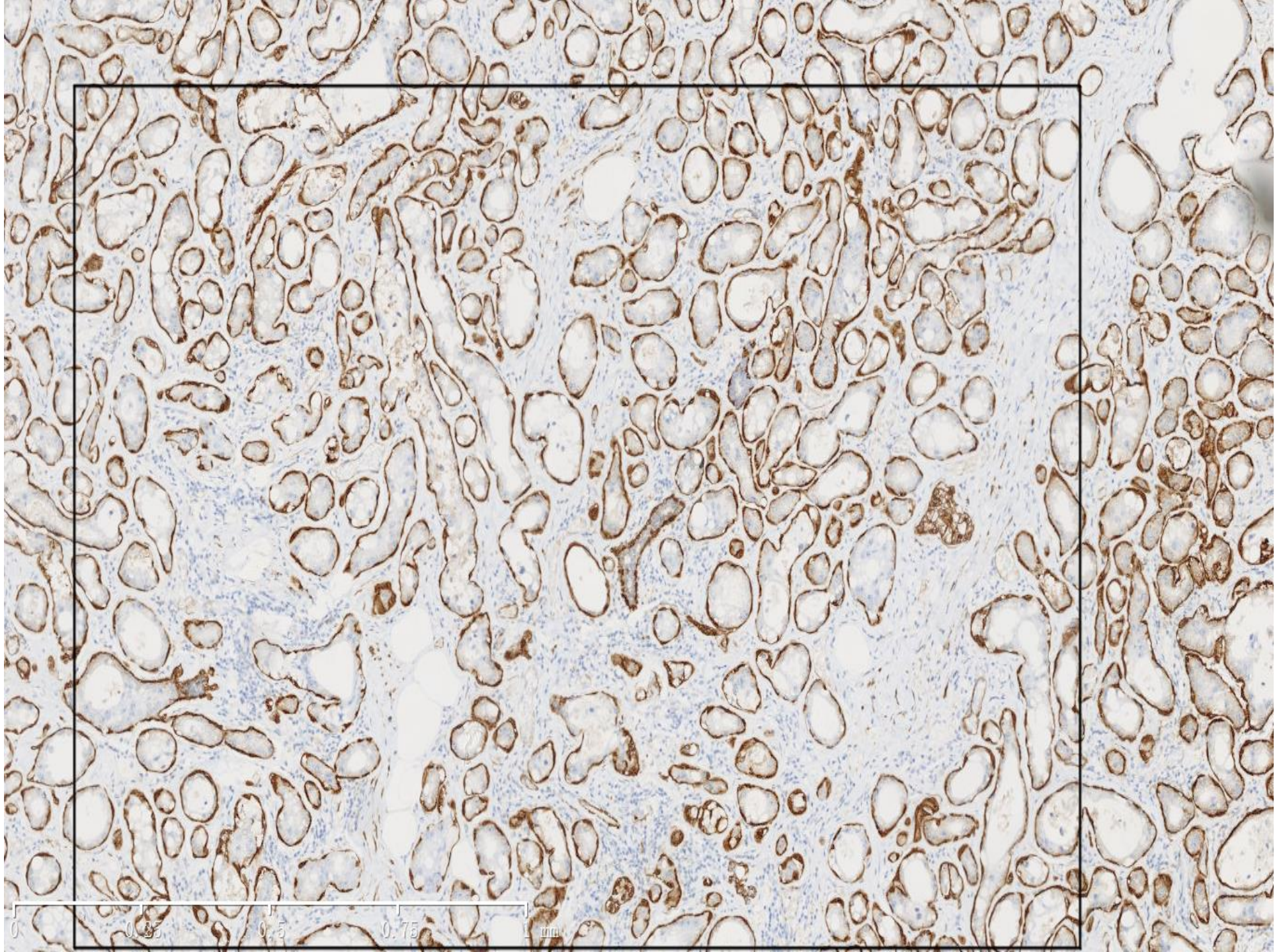
Paraffin Slides

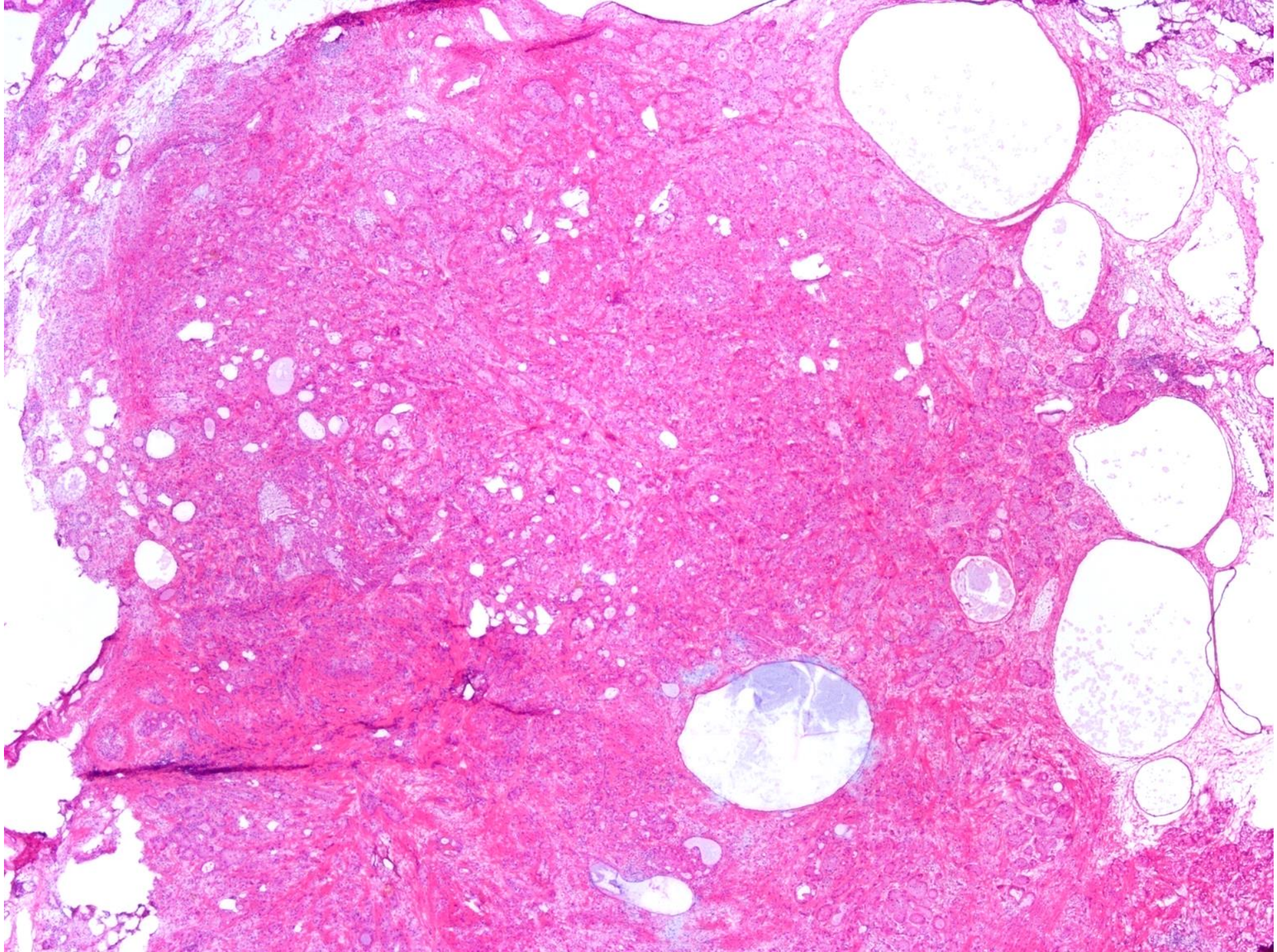




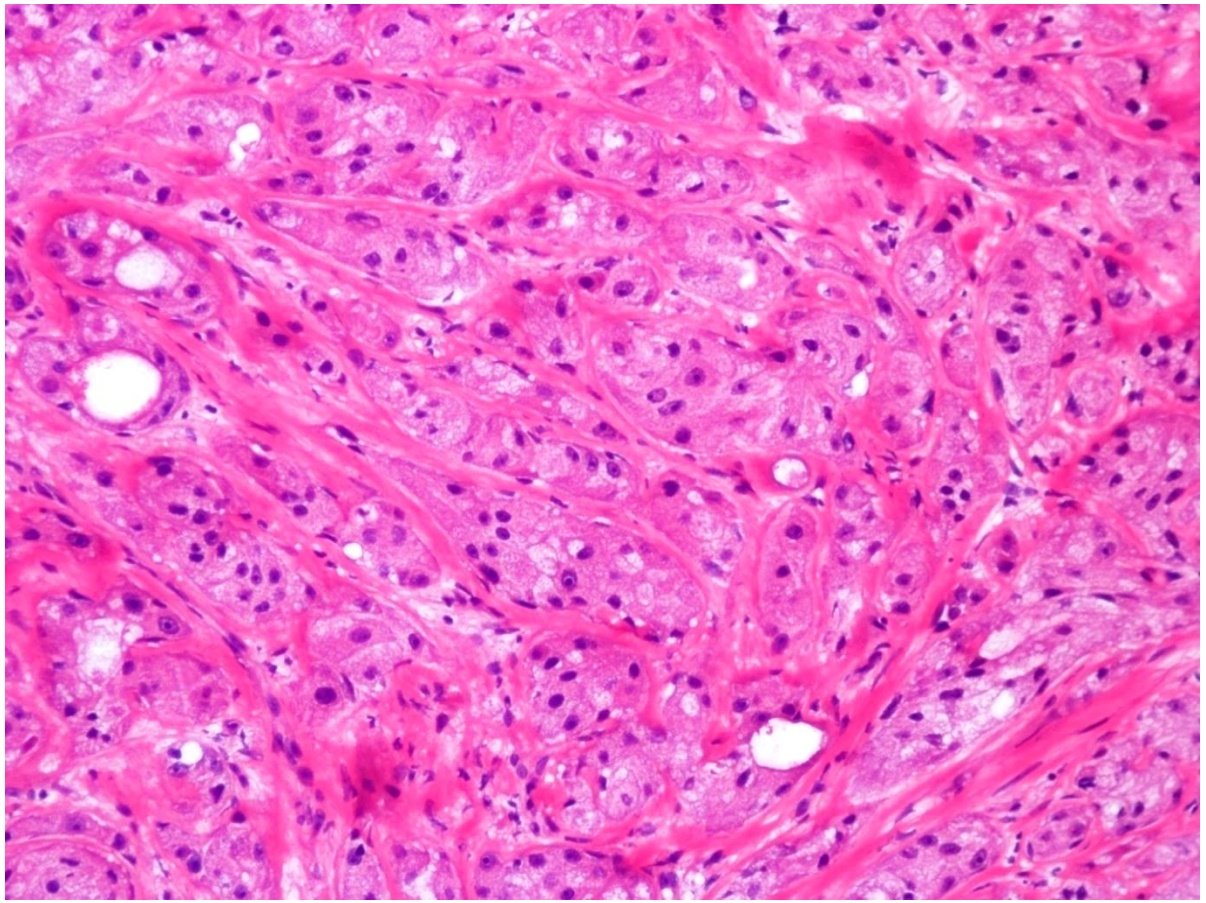





0
0.25
0.5
0.75
1 mm

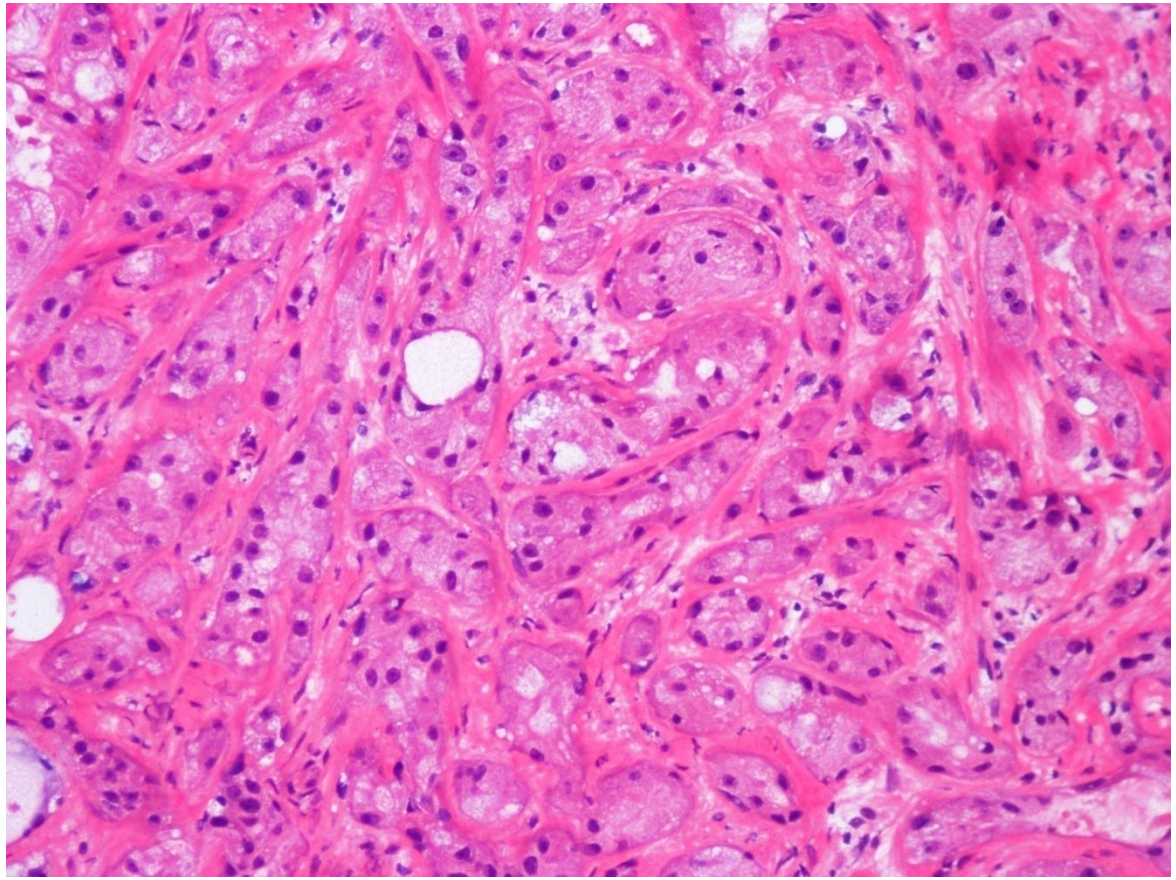


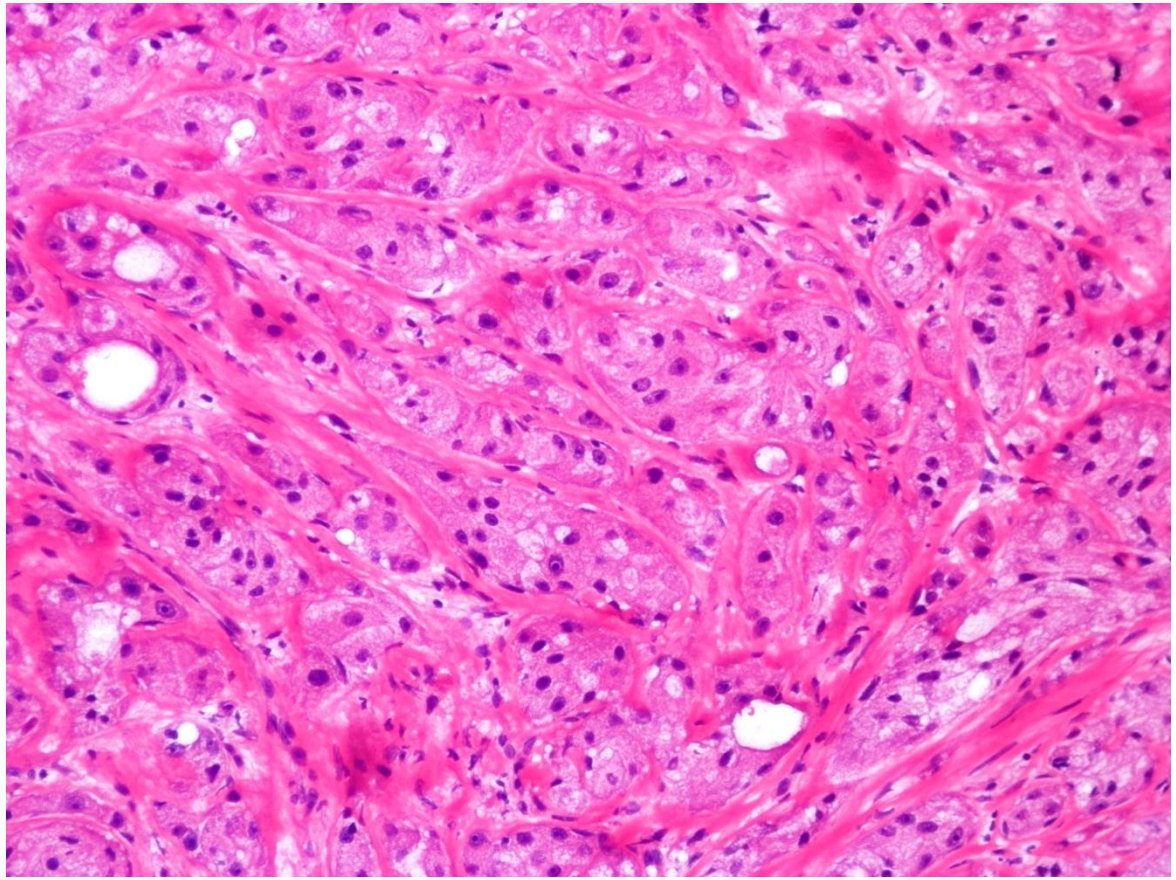
Apocrine adenosis



- sclerosing adenosis, radial scar or complex sclerosing lesion, with prominent apocrine metaplasia
- may present as a distinct mass
- Nuclear/nucleolar features may mimic atypia
- Compressed, distorted and architecturally disordered
- The myoepithelial cell layer may be attenuated and difficult to visualize

---- misdiagnosed as invasive carcinoma





- Low power: lobulo-centric configuration, background of sclerosing adenosis
- Lesion with apocrine metaplasia, architectural disorder
- Lack significant cytologic atypia and mitotic activity
- Epithelial-myoepithelial bilayer (basement membrane-like material)

high caution on frozen section and await paraffin sections

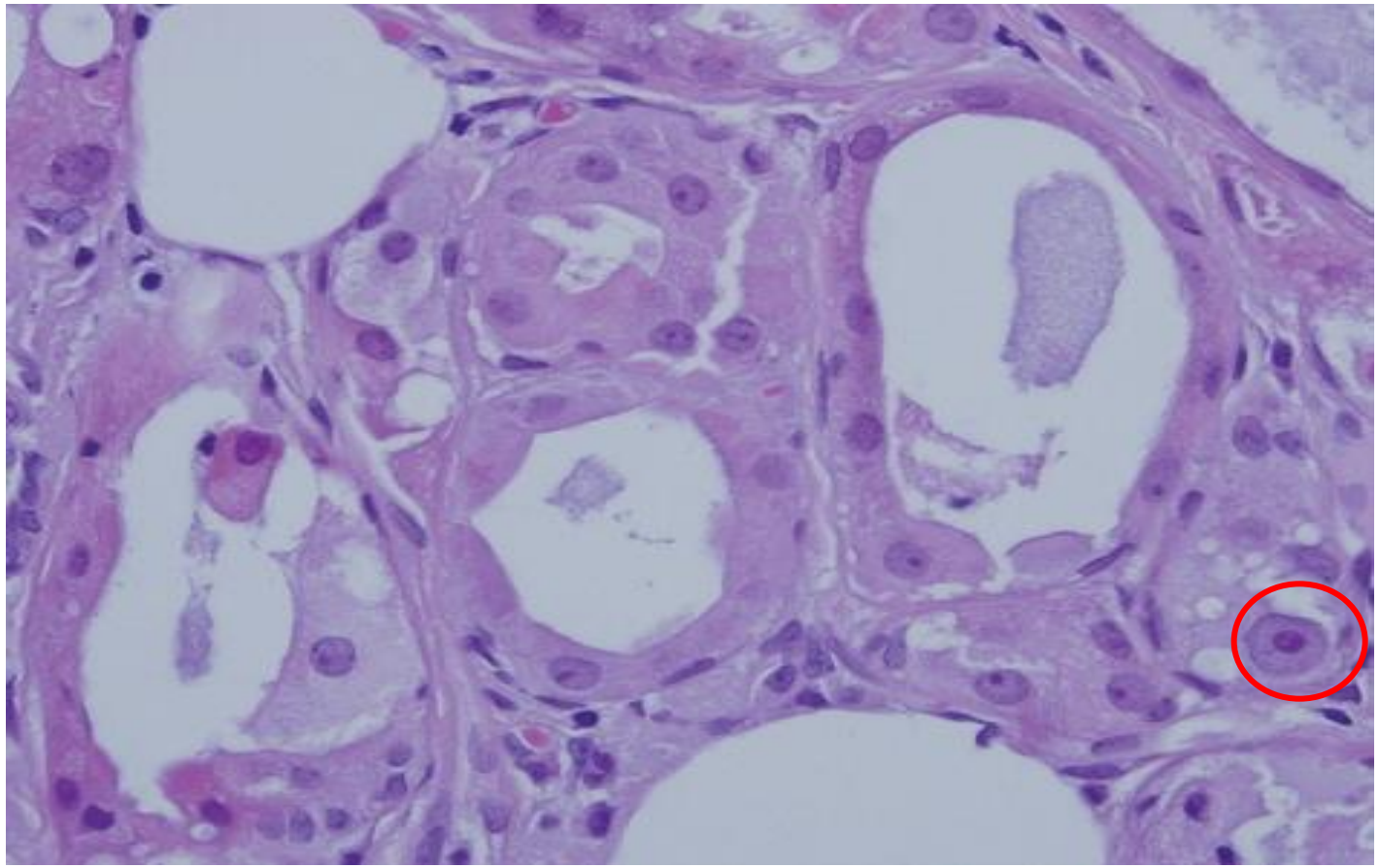
Atypical Apocrine Adenosis

- **sclerosing adenosis with apocrine change(apocrine adenosis) with superimposed atypia**
- Crowded ducts without epithelial hyperplasia/stratification, lacking cribriform or micropapillary patterns (architectural atypia and necrosis are not features of this entity)
- Marked nuclear size variation (≥3-fold variation)

- **Distinction from apocrine ductal carcinoma in situ (DCIS) can be extremely difficult.**
- **In cases of diagnostic uncertainty, a diagnosis of atypical apocrine adenosis should be rendered.**

Variation in Nuclear Size

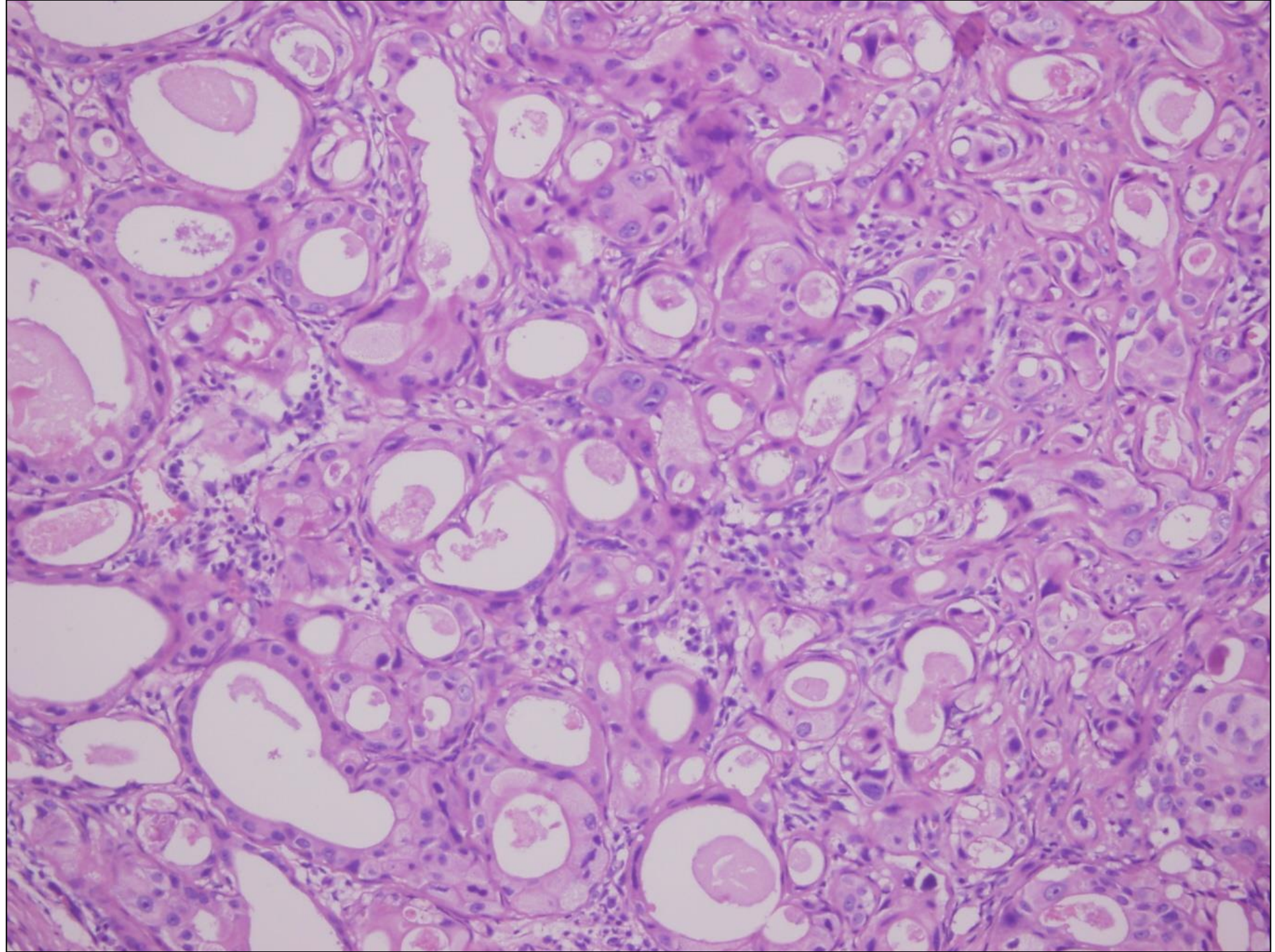
- Refers to the two-dimensional nuclear area.
- The "3-fold variation rule": A 3-fold difference in nuclear size (vs normal apocrine cells) ---- a 1.73-fold difference in diameter.

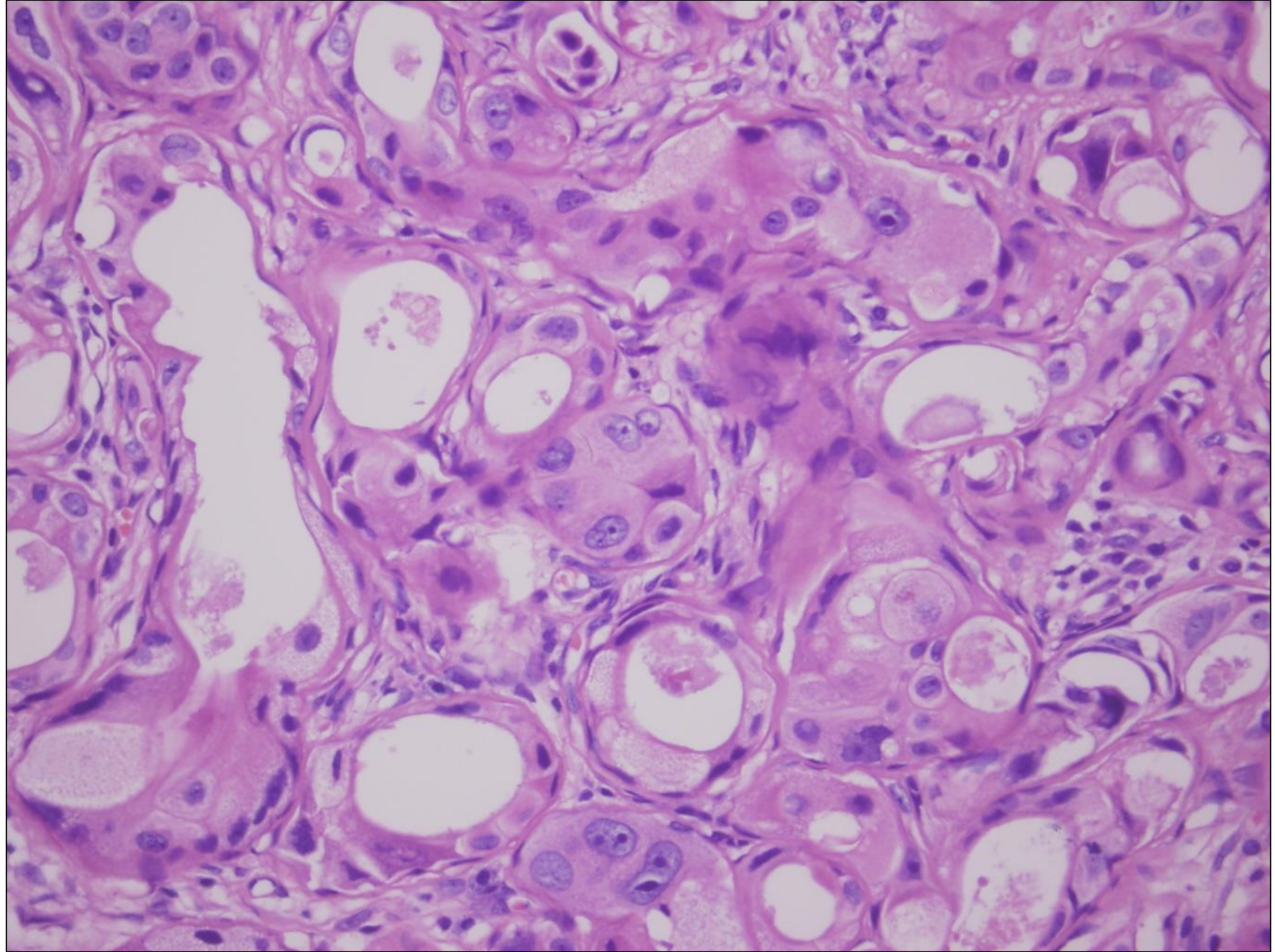


(*Arch Pathol Lab Med.* 2009;133:1817–1821)

Prominent nucleoli

- Apocrine metaplasia: typically features small, well-defined nucleoli.
- This finding is common and lacks diagnostic significance.
- Nuclear enlargement is a more relevant feature.





Apocrine DCIS vs. Atypical apocrine adenosis

- Limited experience.
- Marked nuclear pleomorphism, prominent/multiple nucleoli, and necrosis

  ---- diagnosis is not difficult.
- Architectural features have limited value in the differential diagnosis.
- In difficult cases, favor a diagnosis of atypical apocrine adenosis.

However, the distinction from apocrine DCIS involving sclerosing adenosis is not clear-cut; this is especially problematic in cases in which there is apocrine DCIS elsewhere in the specimen.

In equivocal cases, a diagnosis of "atypical apocrine adenosis" or "atypical apocrine proliferation involving sclerosing adenosis" is preferable.

Atypical apocrine hyperplasia (AAH)

a proliferation of apocrine cells within a duct space or terminal duct lobular unit with atypical cytological features and/or architectural atypia but insufficient for a diagnosis of DCIS

- **Architectural Atypia:**

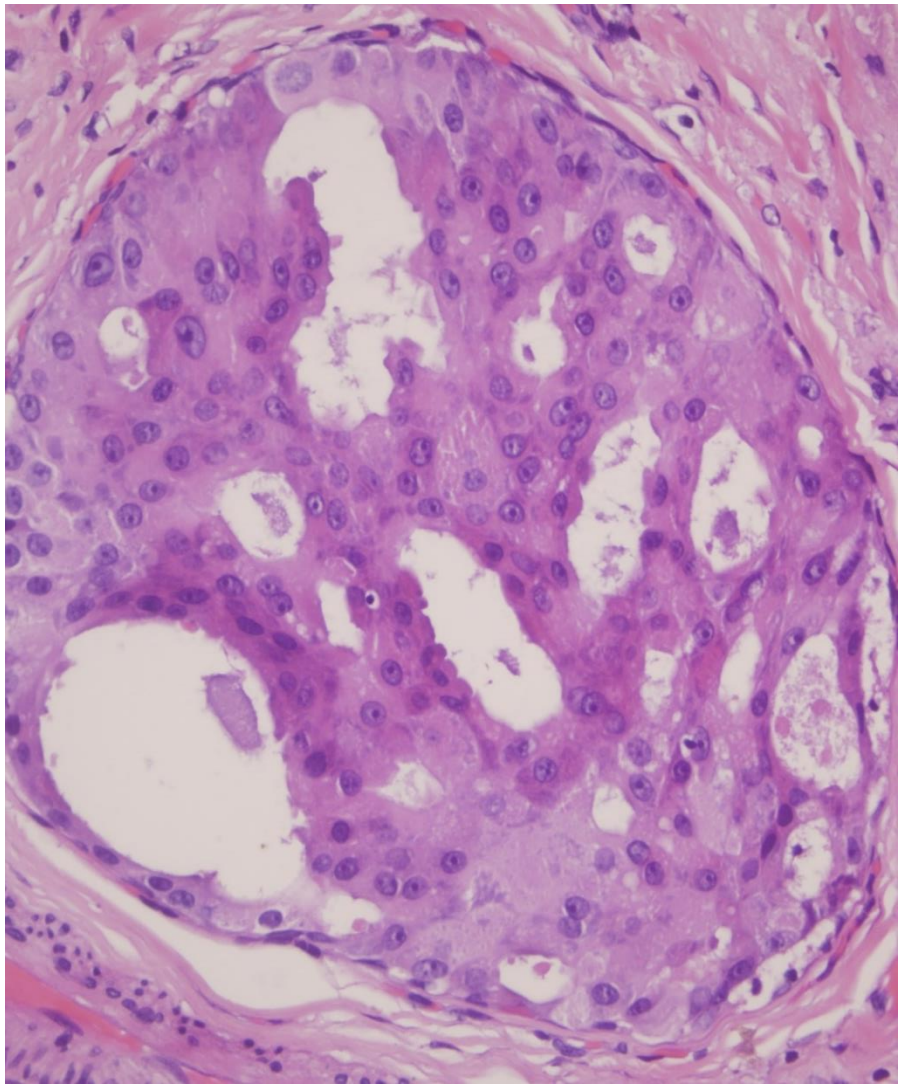
  Roman bridges, cribriform patterns, micropapillae.

- **Cytologic Atypia:**

  ≥3-fold nuclear size variation; prominent/enlarged nucleoli.

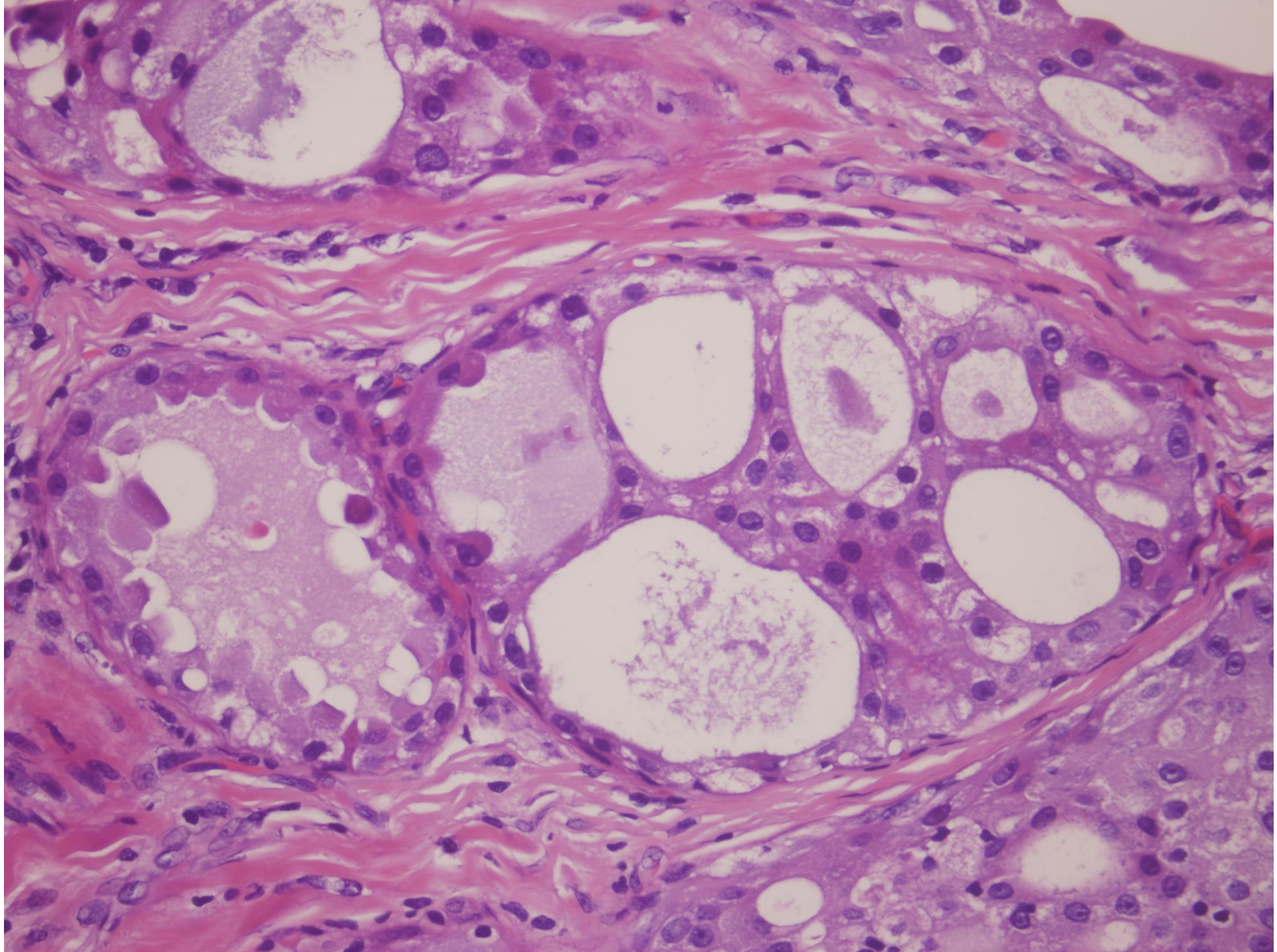
  Nuclear rounding, monotony, and uniformity (may not meet the 3-fold rule).

  Presence of mitotic figures. **HER2 staining might be helpful**



Tavassoli & Norris defined AAH by the following criteria:

- **Cytologic changes:** ≥3-fold nuclear size variation, prominent nucleoli, increased nuclear stratification
- **Architectural changes:** cribriform patterns or bridging; nuclear pleomorphism may be absent
- **Typically absent:** necrosis, atypical mitoses, periductal inflammation, fibrosis
- **Size criterion:** <2 mm focus



Low-grade Apocrine DCIS

- **Tavassoli and Norris**

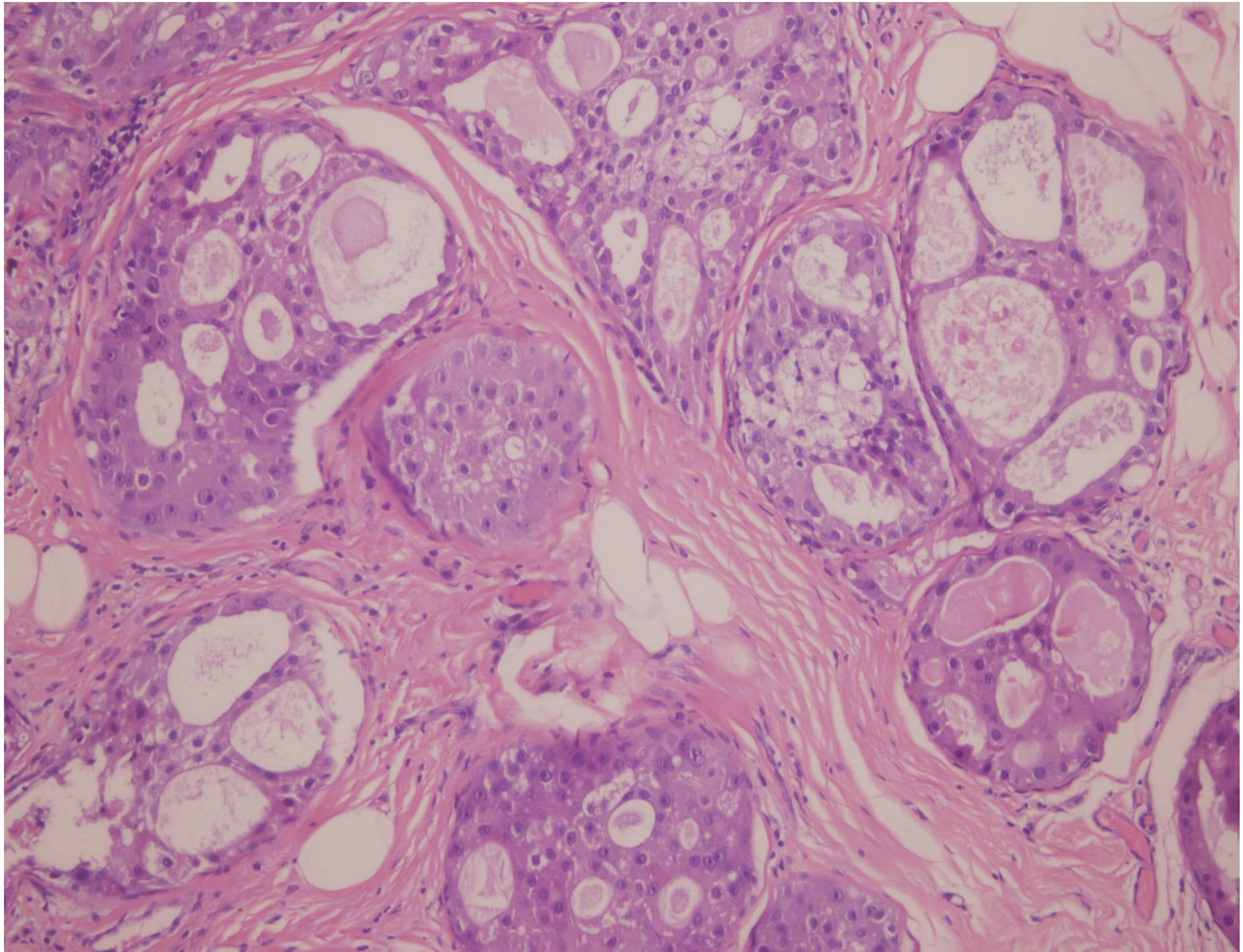
  Architecture (solid, cribriform, micropapillary)

  Nuclear features (Note: cells may not meet the 3-fold rule; can be monomorphic and uniform)

  2 mm criterion (involvement of the entire duct cross-section)

- **O'Malley**

  Relies primarily on extent of disease and nuclear features, not architectural pattern.

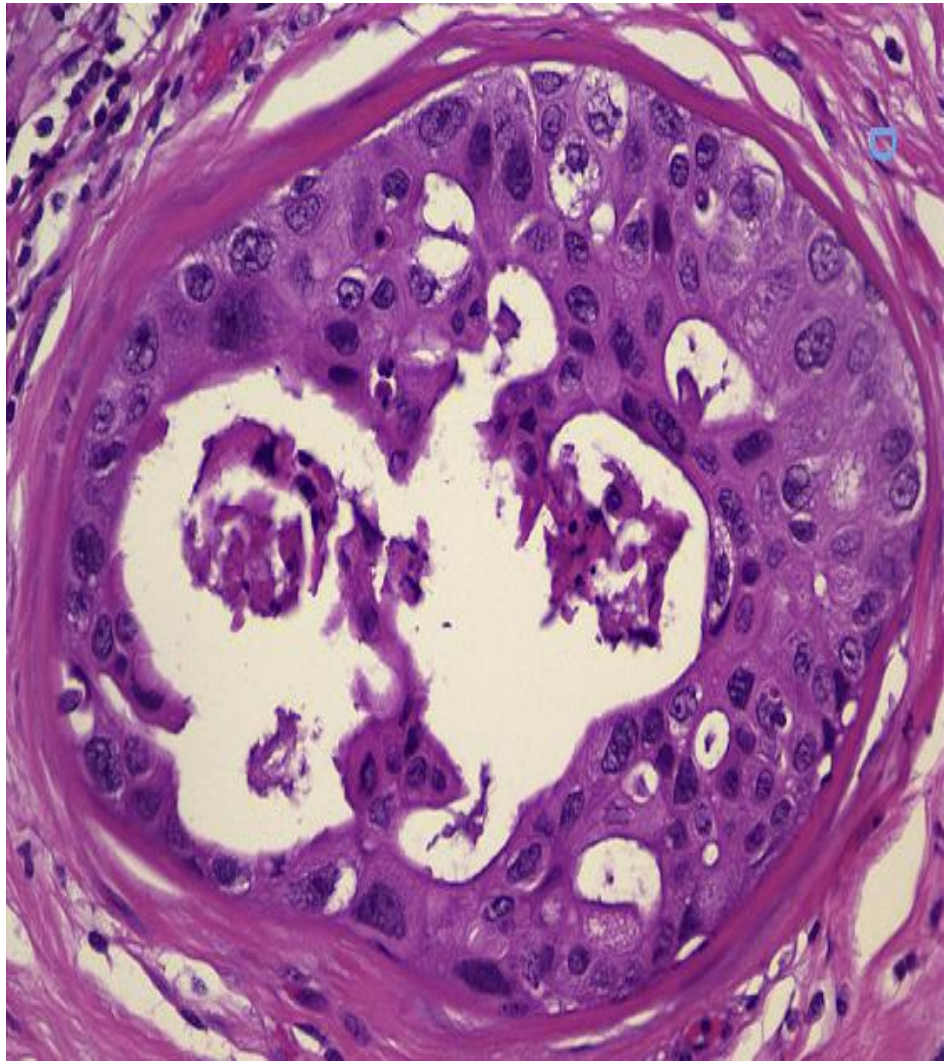


High-grade apocrine DCIS

- Cells exhibit marked atypia

  Nuclei show >3-fold variation, distinct nuclear membranes, and coarse chromatin.

  Prominently enlarged nucleoli.
- Mitotic figures
- Comedo necrosis
- Periductal fibrosis and inflammation may be present



Diagnosis of high-grade lesions is generally straightforward and does not require a size criterion.

Pathology – Research and Practice 205 (2009) 155–164

Apocrine Ductal Carcinoma In Situ of the Breast: Histologic Classification and Expression of Biologic Markers

Apocrine DCIS requires a distinct grading system from conventional DCIS, due to its unique cytologic features.

Nuclear Grading

	Nuclear size	Pleomorphism	Nucleoli
Grade 1	Small to moderate	Inconspicuous	Single, prominent
Grade 2	Small to moderate	Moderate	Multiple, prominent
Grade 3	Moderate to large	Marked	Multiple, prominent

- Nuclear size (vs. benign apocrine cells): Small: 1x-2x; Moderate: 3x-4x; Large: ≥5x
- With overall mild-moderate pleomorphism, the grade is 2, regardless of occasional large/multinucleated cells.

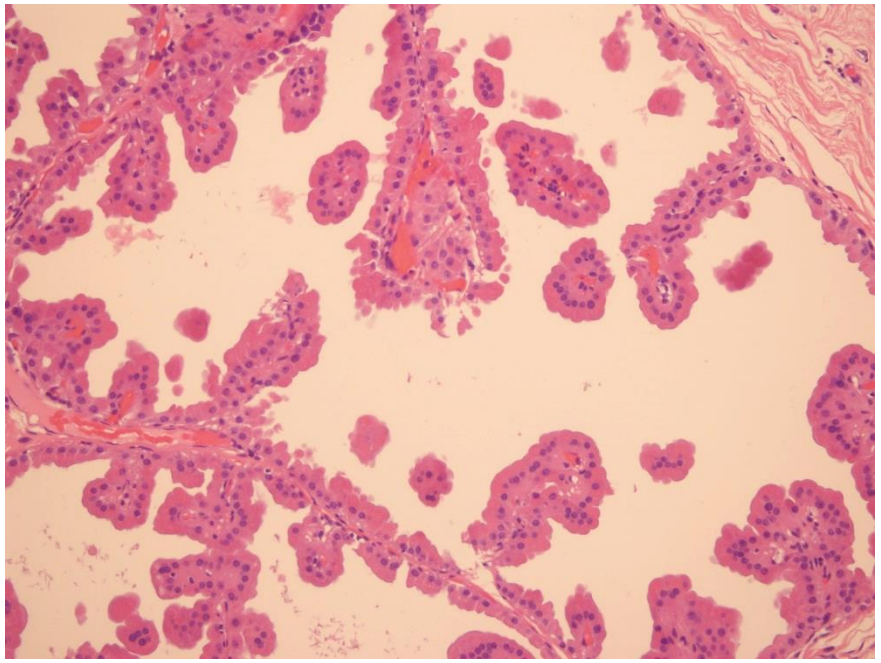
HUMAN PATHOLOGY Volume 32, No. 5 (May 2001)

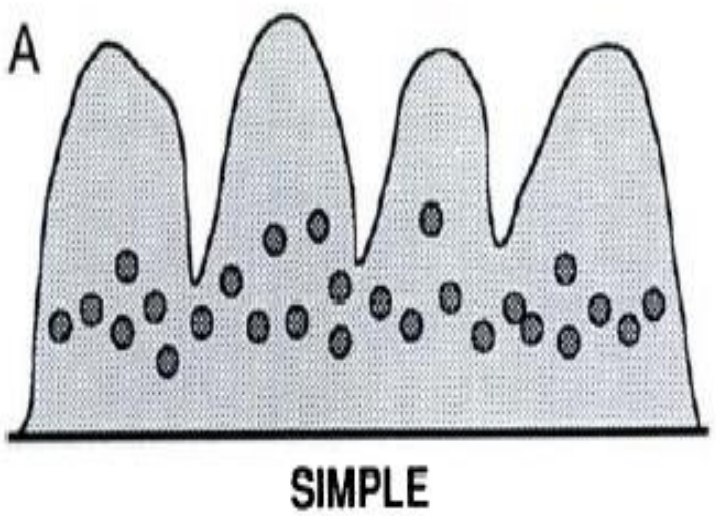
- **Low-grade Apocrine DCIS**: nuclear grade 1-2; no necrosis (In practice: mild-moderate cytologic atypia without necrosis.)
- **High-grade Apocrine DCIS**: nuclear grade 3; necrosis present
- **Intermediate-grade Apocrine DCIS**: intermediate between low and high-grade (Examples: moderate nuclear pleomorphism WITH necrosis, OR grade 3 nuclei WITHOUT necrosis)

- **Grade apocrine DCIS when possible**
- **Assess nuclear pleomorphism in most prominent atypical area**
- **Necrosis not required for diagnosis**

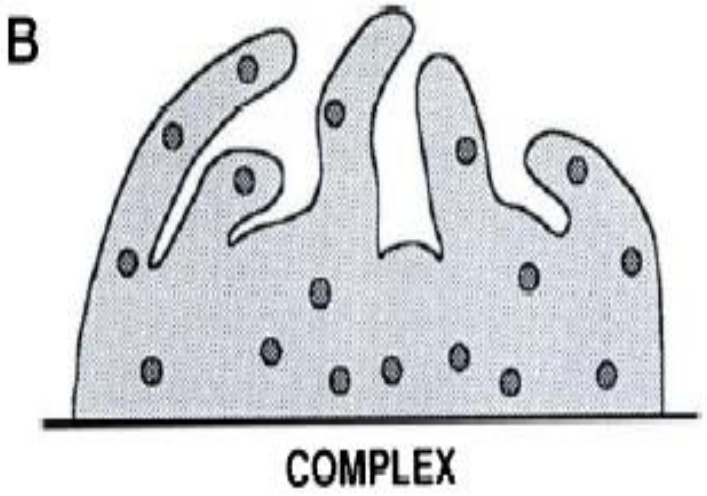
Papillary apocrine change

- Apocrine epithelium lining cysts may show varying degrees of micropapilla and papilla formation
- In a large series with extensive follow-up, Page et al. classified papillary apocrine change as simple, complex, highly complex

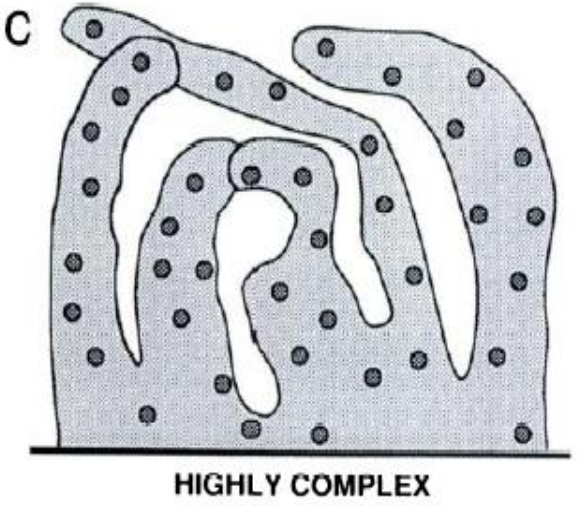




The projections show no tendency to fuse.



Taller, slender projections with a tendency to fuse



Projections extending to the lumen center (2-3 cells wide) with focal anastomosis (≥2 contact points)

Page DL, et al. Cancer Epidemiol Biomarkers Prev. 1996 Jan;5(1):29-32

Table 1 Prevalence of PAC and associ
biopsies

	All biopsies with
Simple	20.3% (n = 2,102)
Complex	6.5% (n = 673)
Highly complex	1.0% (n = 101)
All biopsies	100% (n = 10,357

[a] Atypical hyperplasia, lobular, or ductal pat

Highly complex lesions frequently
hyperplasia, requiring thorough sa

Table 2 Relative breast cancer risk of PAC[a]

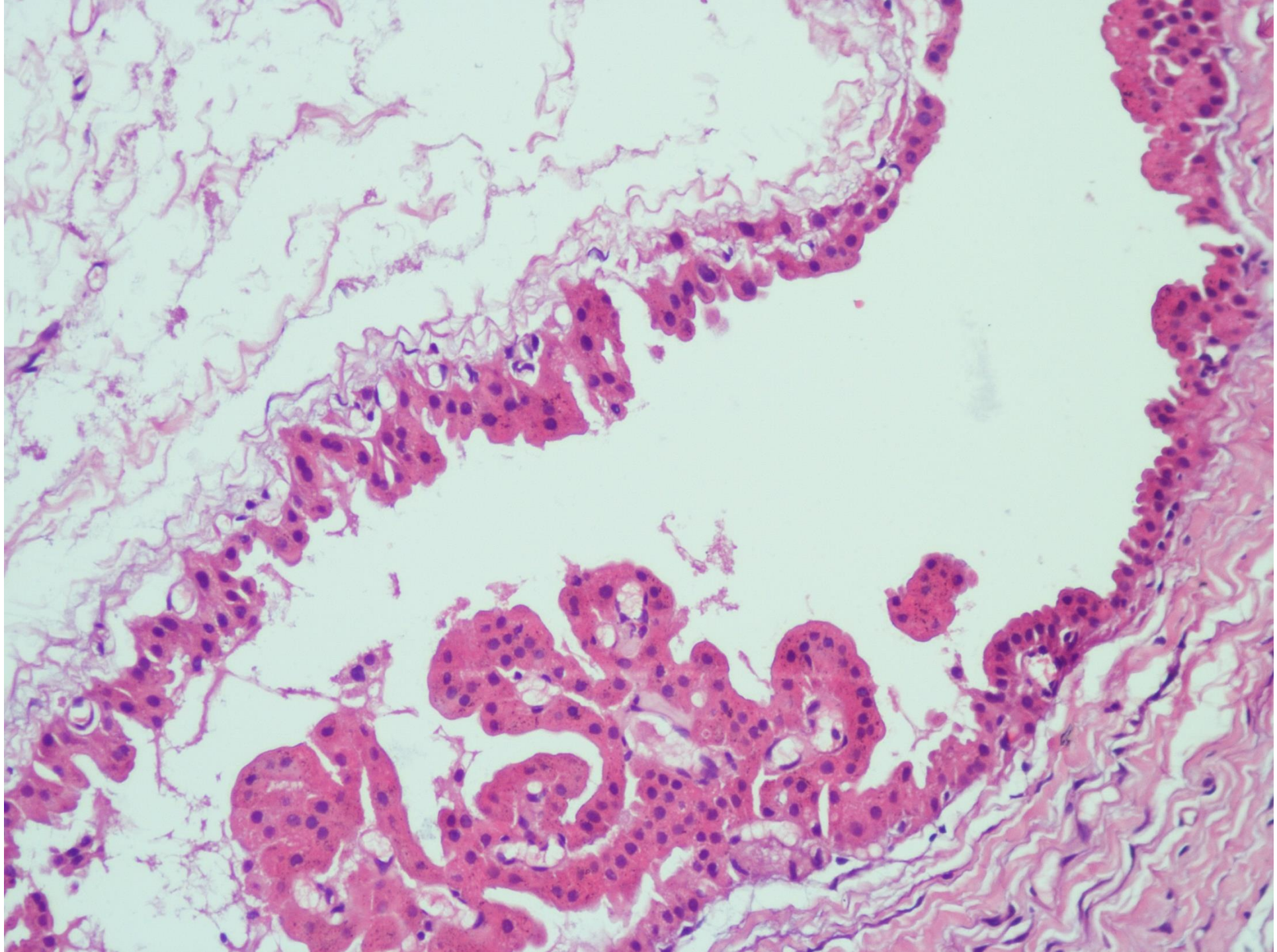
	All patients with PAC (95% CI)	All patients with PAC but without AH (95% CI)
Simple	1.39[b] (1.1–1.8) (n = 1,169)	1.29 (0.96–1.7) (n = 1,111)
Complex	1.30 (0.77–2.24) (n = 384)	0.90 (0.47–1.7) (n = 355)
Highly complex	3.14[c] (1.3–7.6) (n = 60)	2.0 (0.77–7.4) (n = 45)

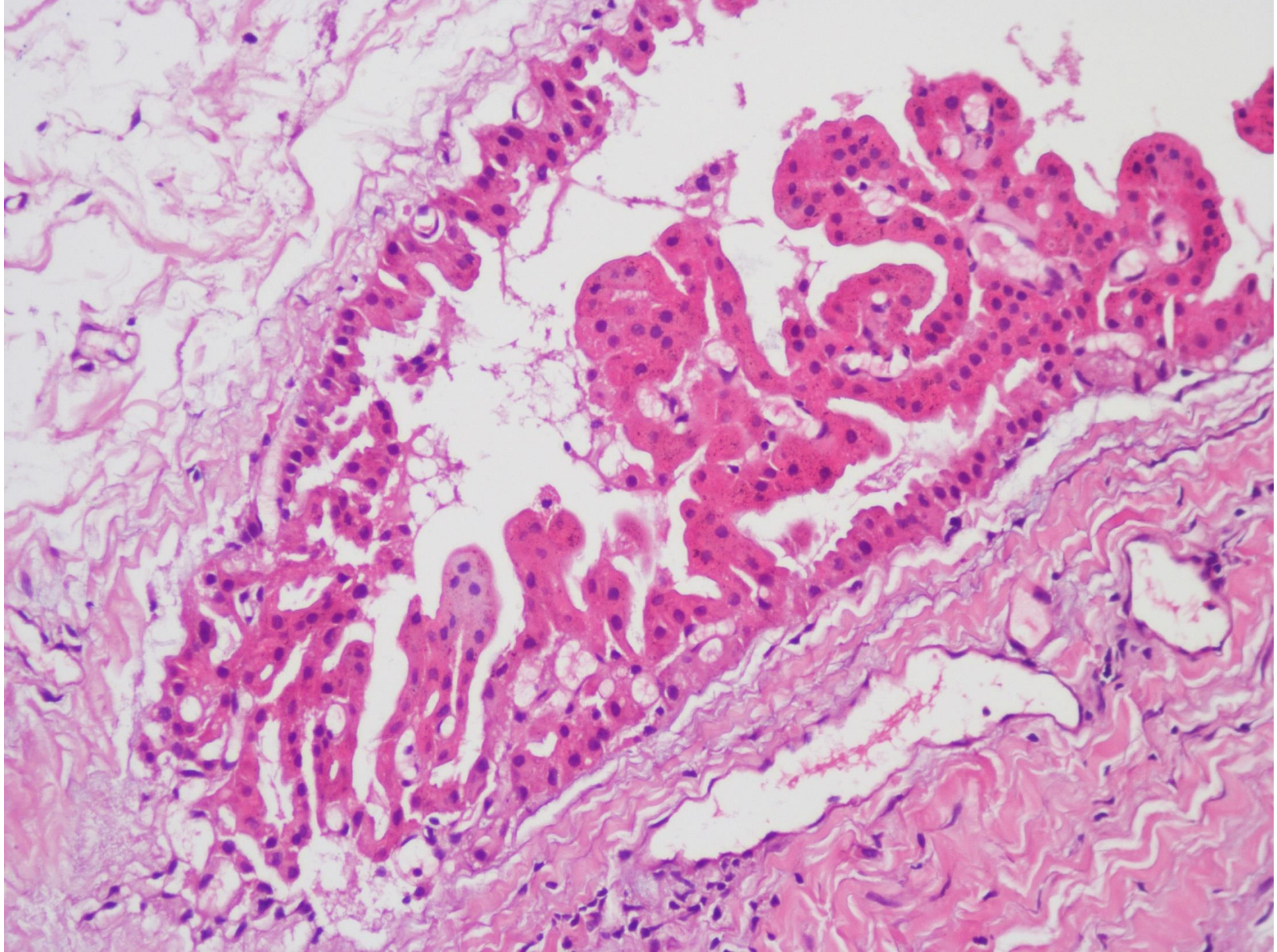
[a] Compared to analogous women from the Third National Cancer Survey.
[b] P = 0.02.
[c] P = 0.007.

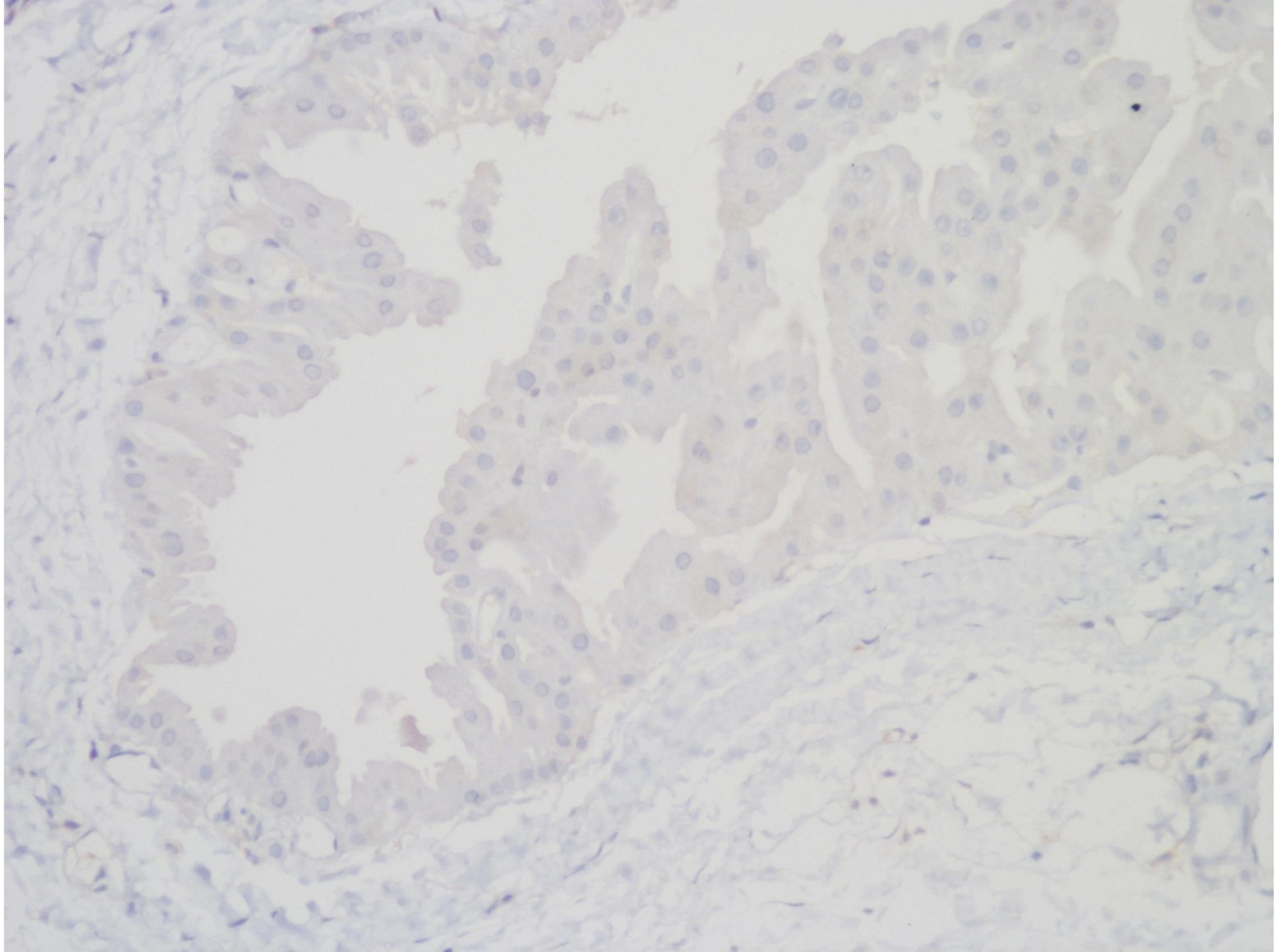
PAC does not increase the relative risk of breast cancer

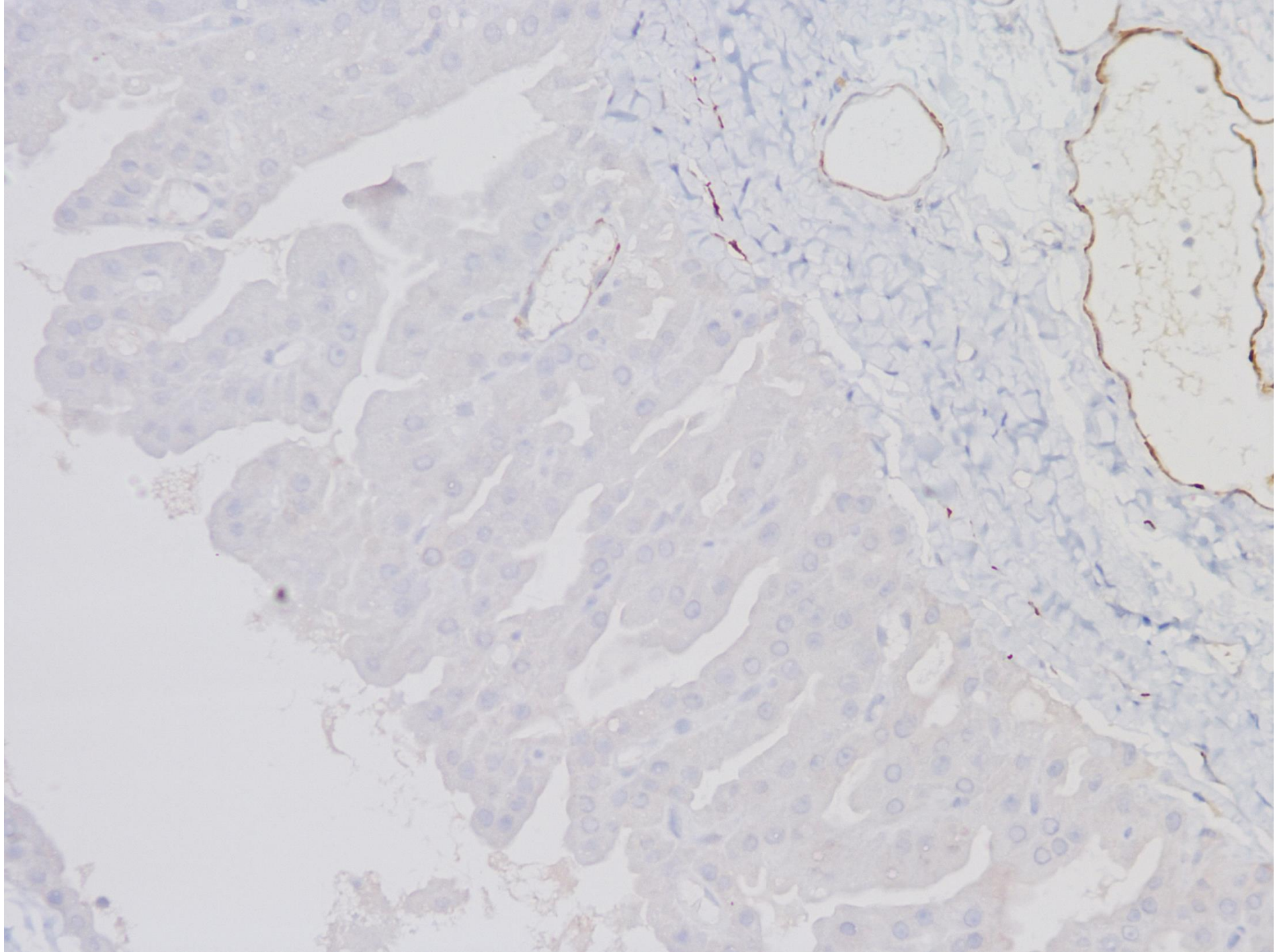
- no biological basis for distinguishing these variants of papillary change
- recognition of the highly complex variant is important to avoid misinterpretation as atypical or in situ change.

- **Received gray-red and gray-yellow tissue measuring 4×3×2 cm. Sectioning reveals a 1.5 cm cyst containing milky fluid.**



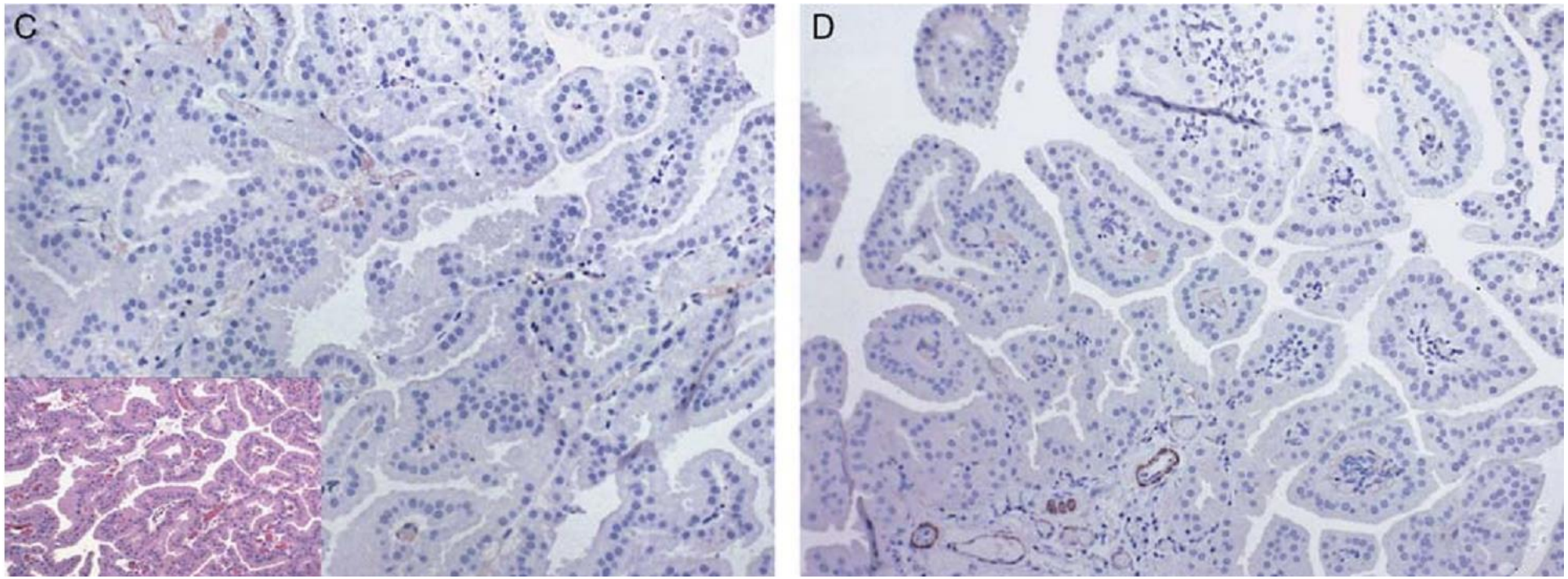






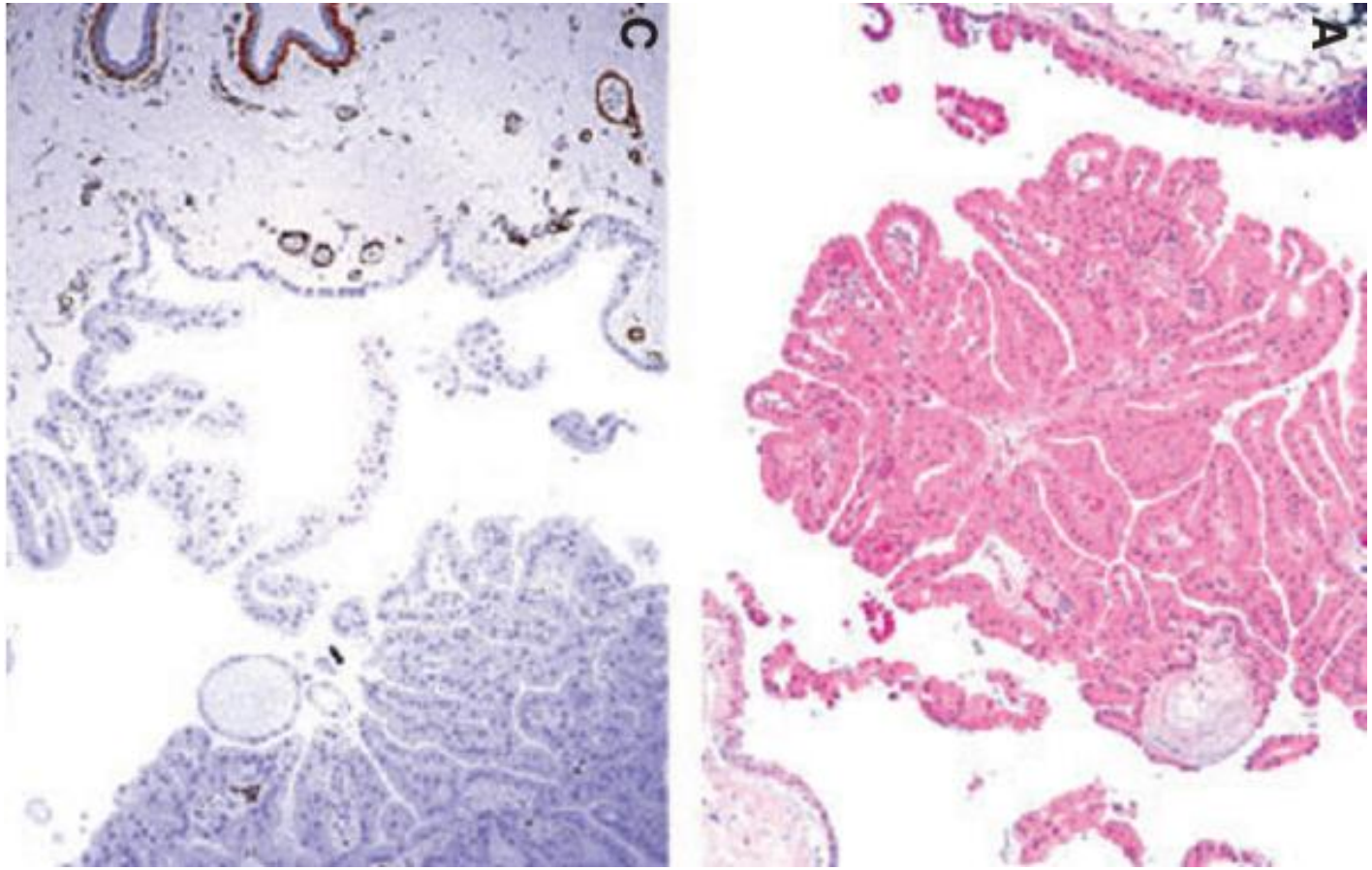
Diminished Number or Complete Loss of Myoepithelial Cells Associated With Metaplastic and Neoplastic Apocrine Lesions of the Breast

Trine Tramm, MD, Jee-Yeon Kim, MD,† and Fattaneh A. Tavassoli, MD‡*



Am J Surg Pathol. 2011 Feb;35(2):202-11.

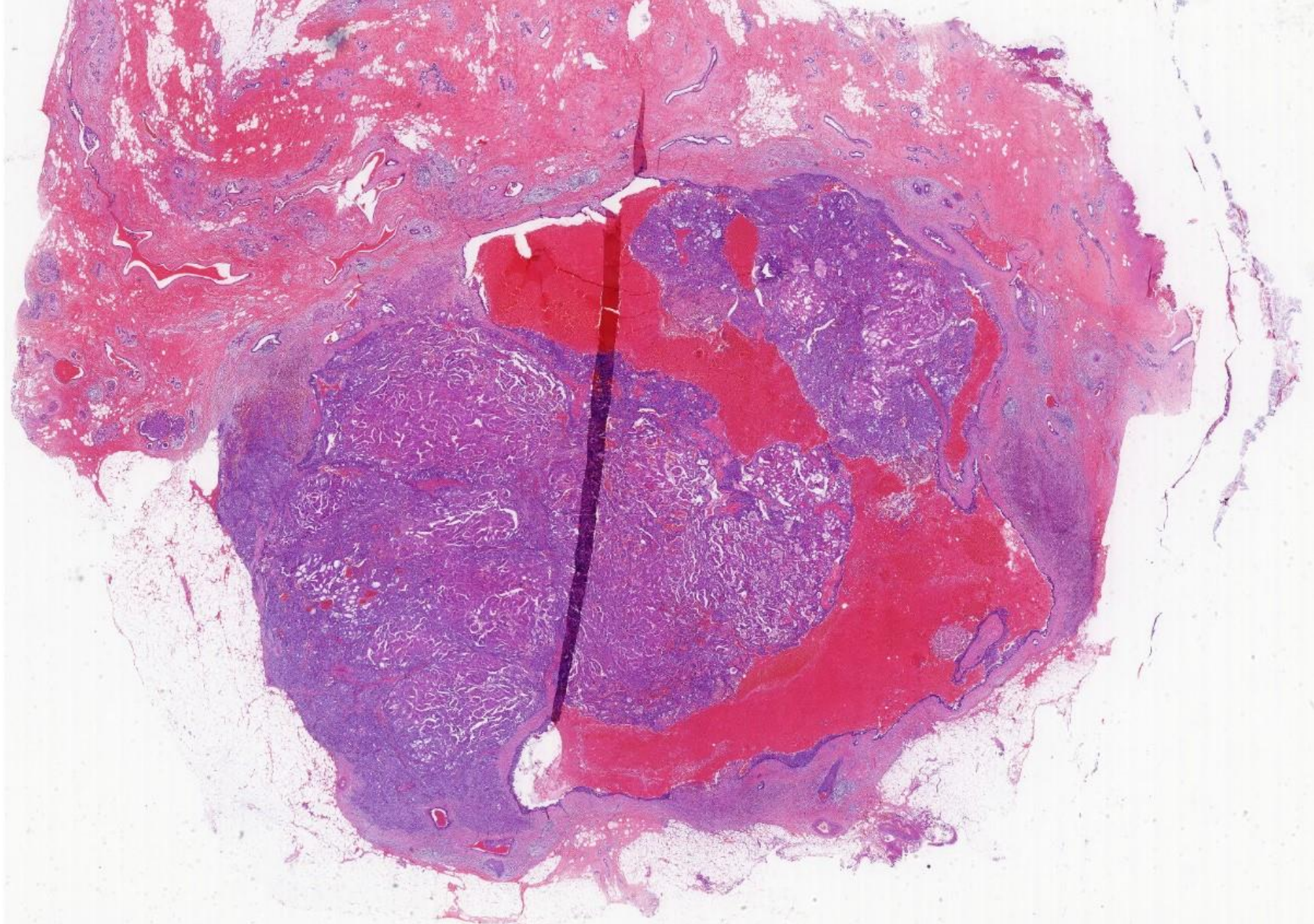
Benign apocrine papillary lesions of the breast lacking or virtually lacking myoepithelial cells—potential pitfalls in diagnosing malignancy

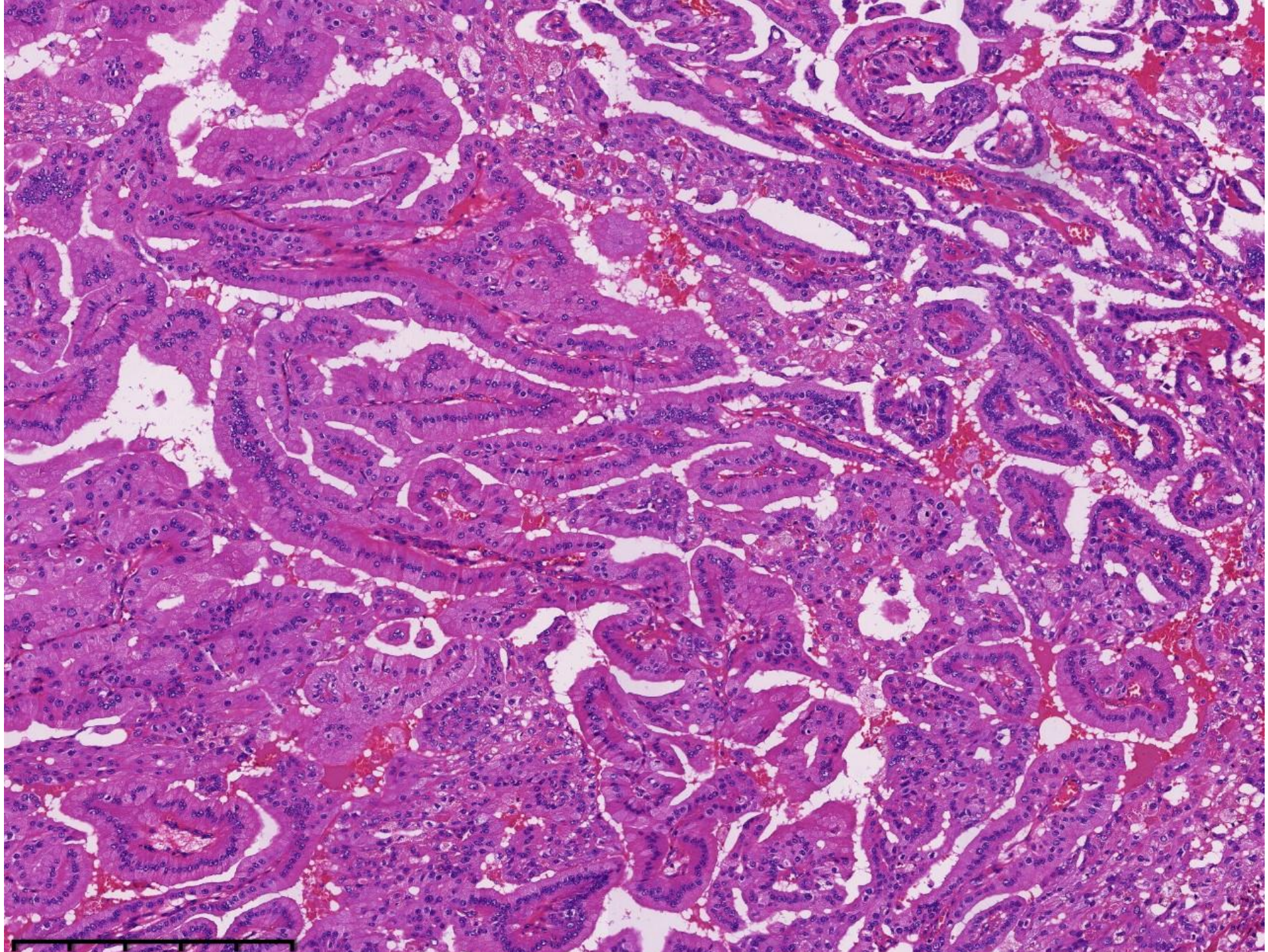


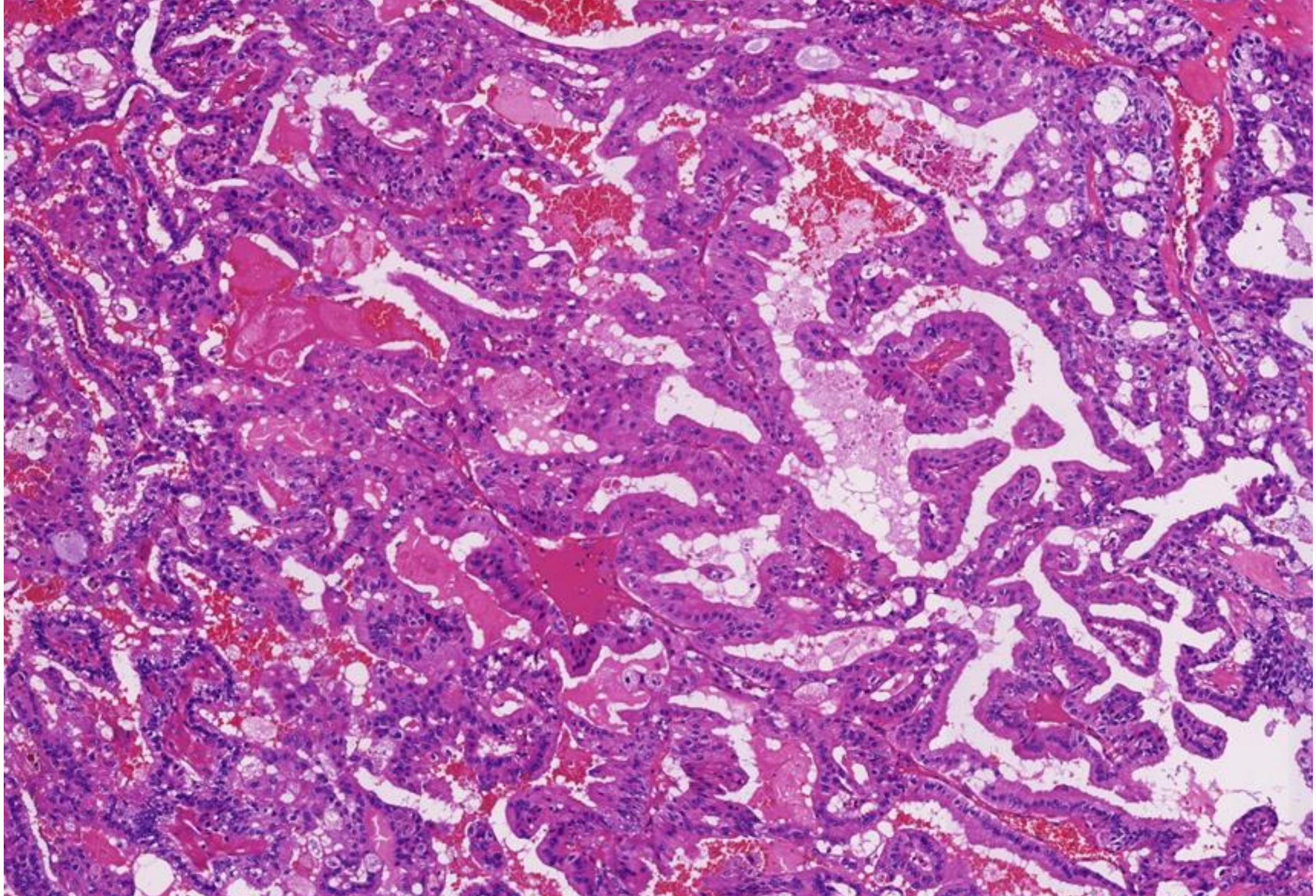
- Benign apocrine papillary lesions may show partial or complete loss of myoepithelial cells (within and around papillae)
- **Prerequisite: Benign cytologic and architectural features.**

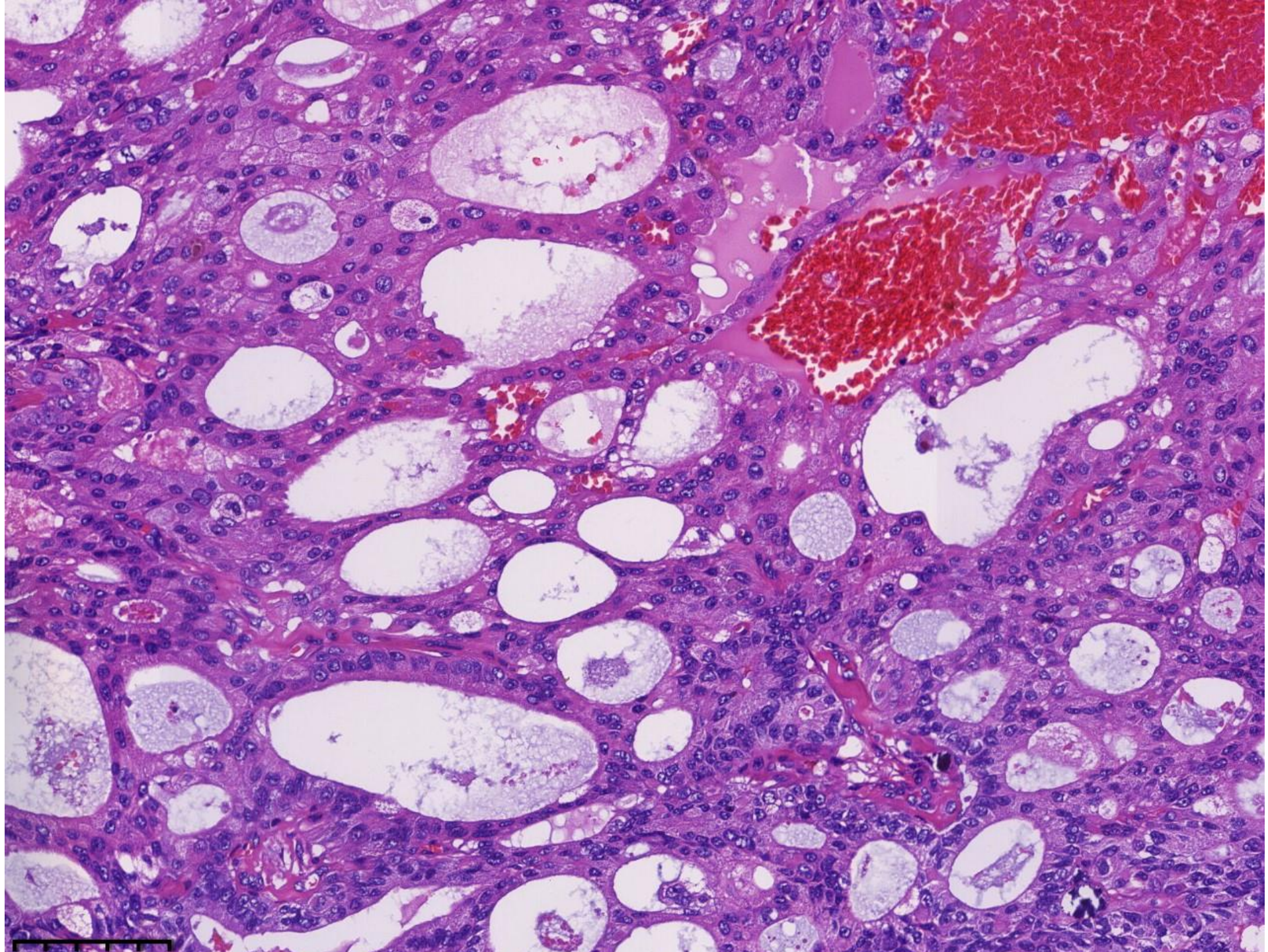
APMIS. 2012 Mar;120(3):249-52

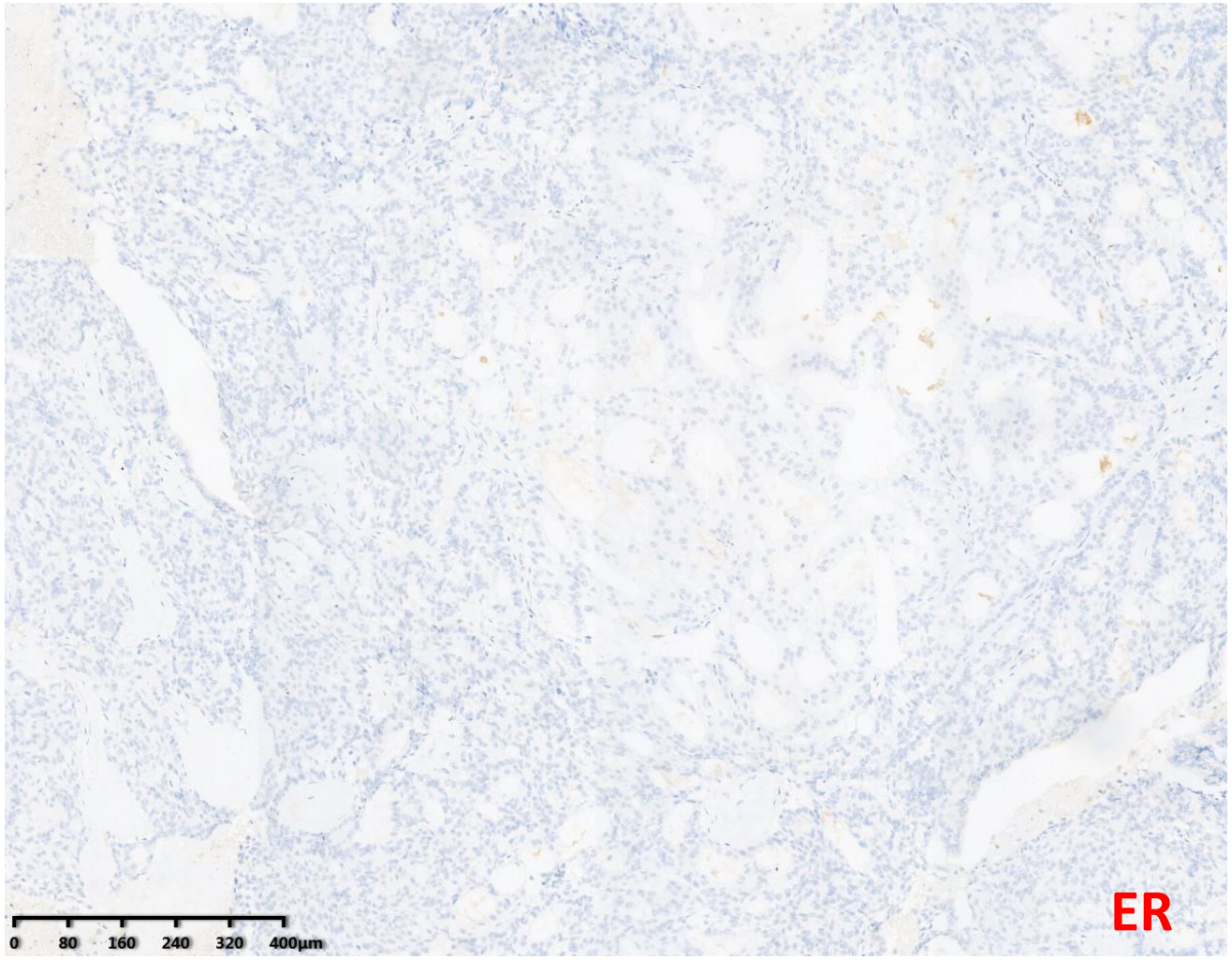
F/63, 4×3 cm mass in upper outer quadrant of left breast

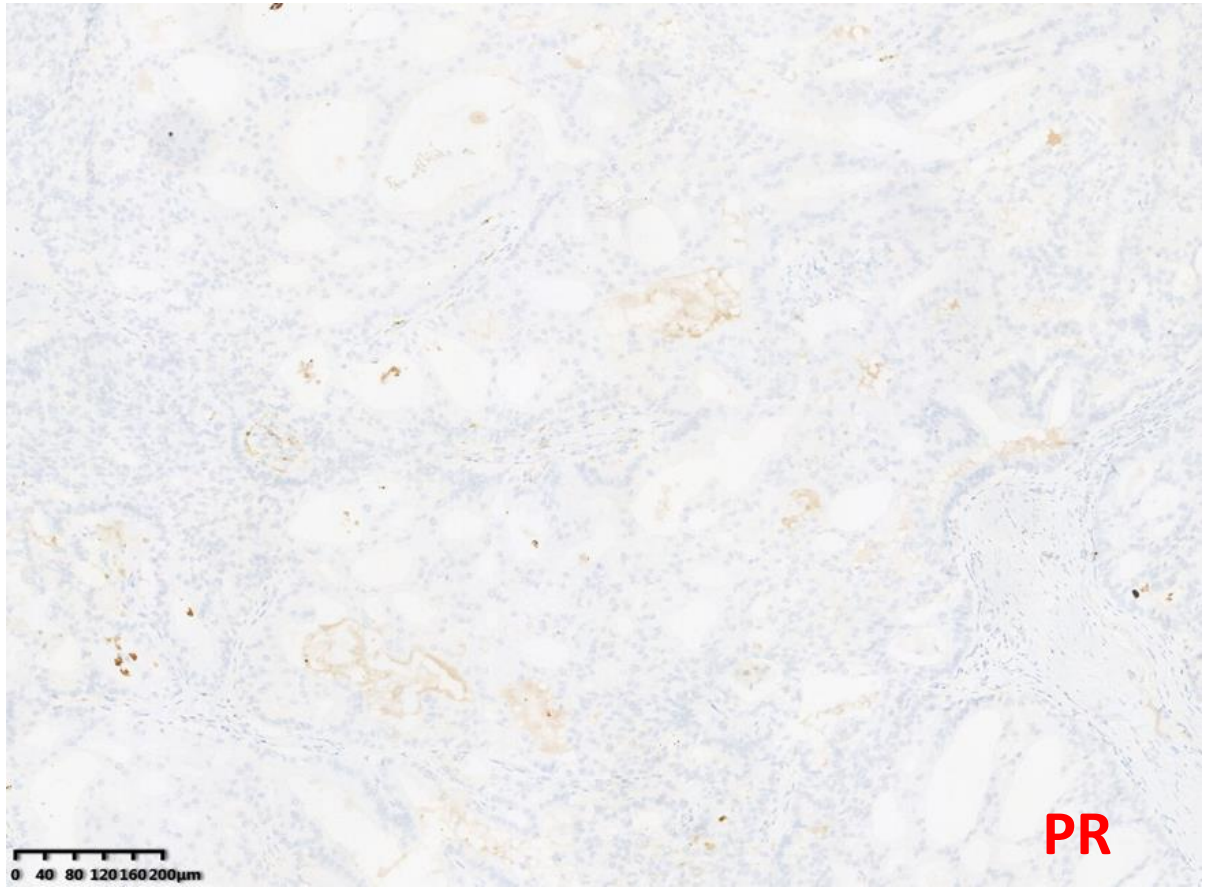


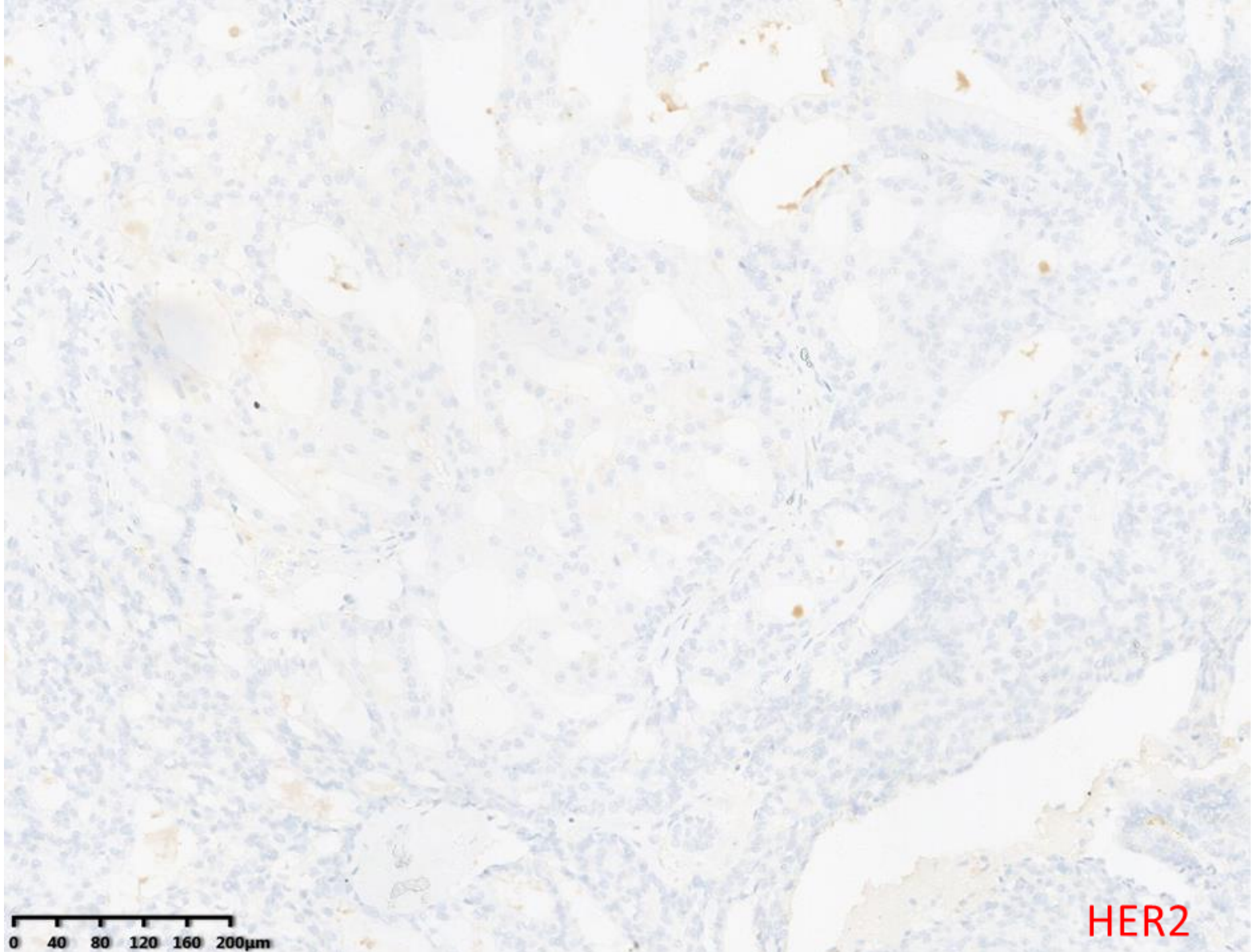


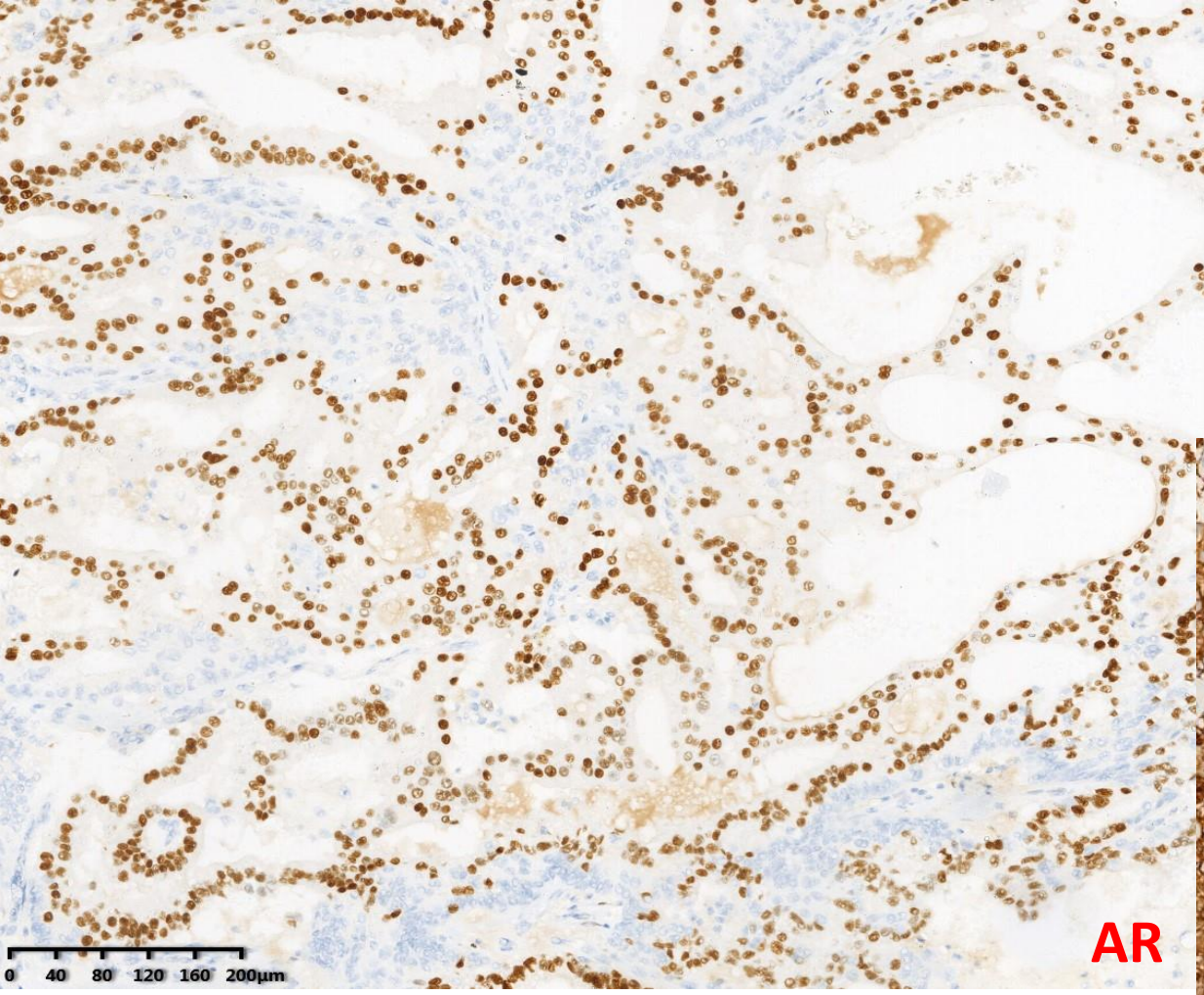


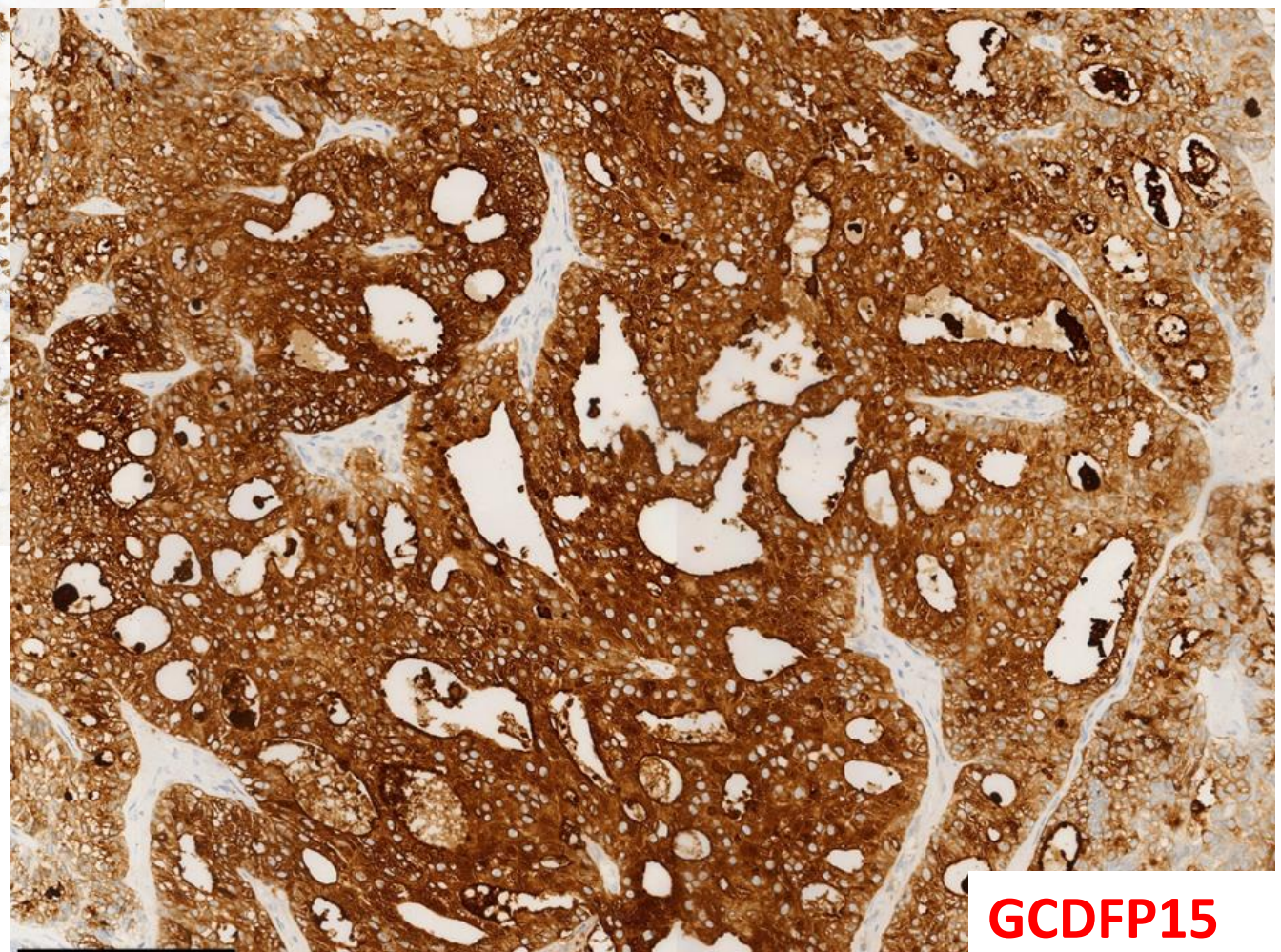


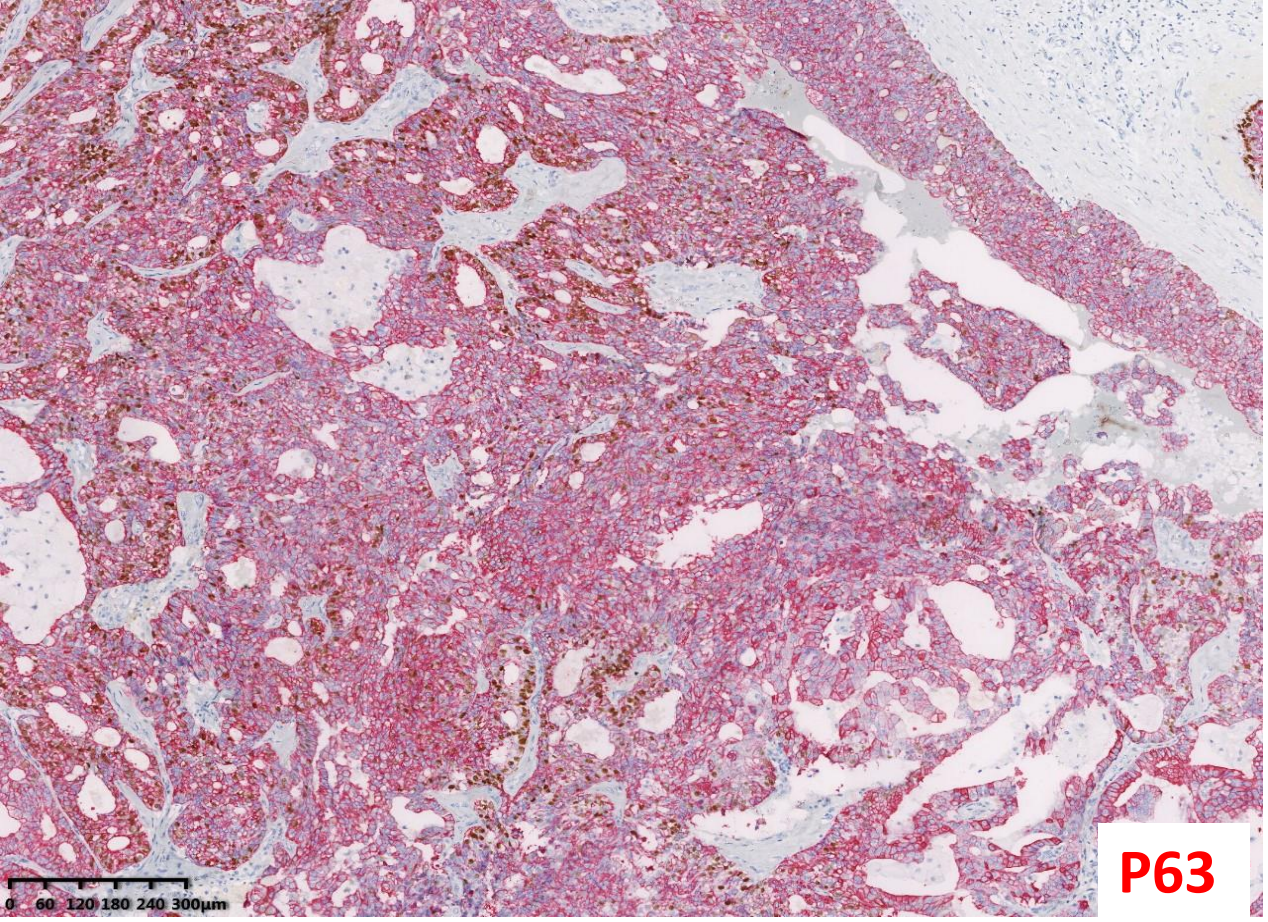

0 80 160 240 320 400µm
ER

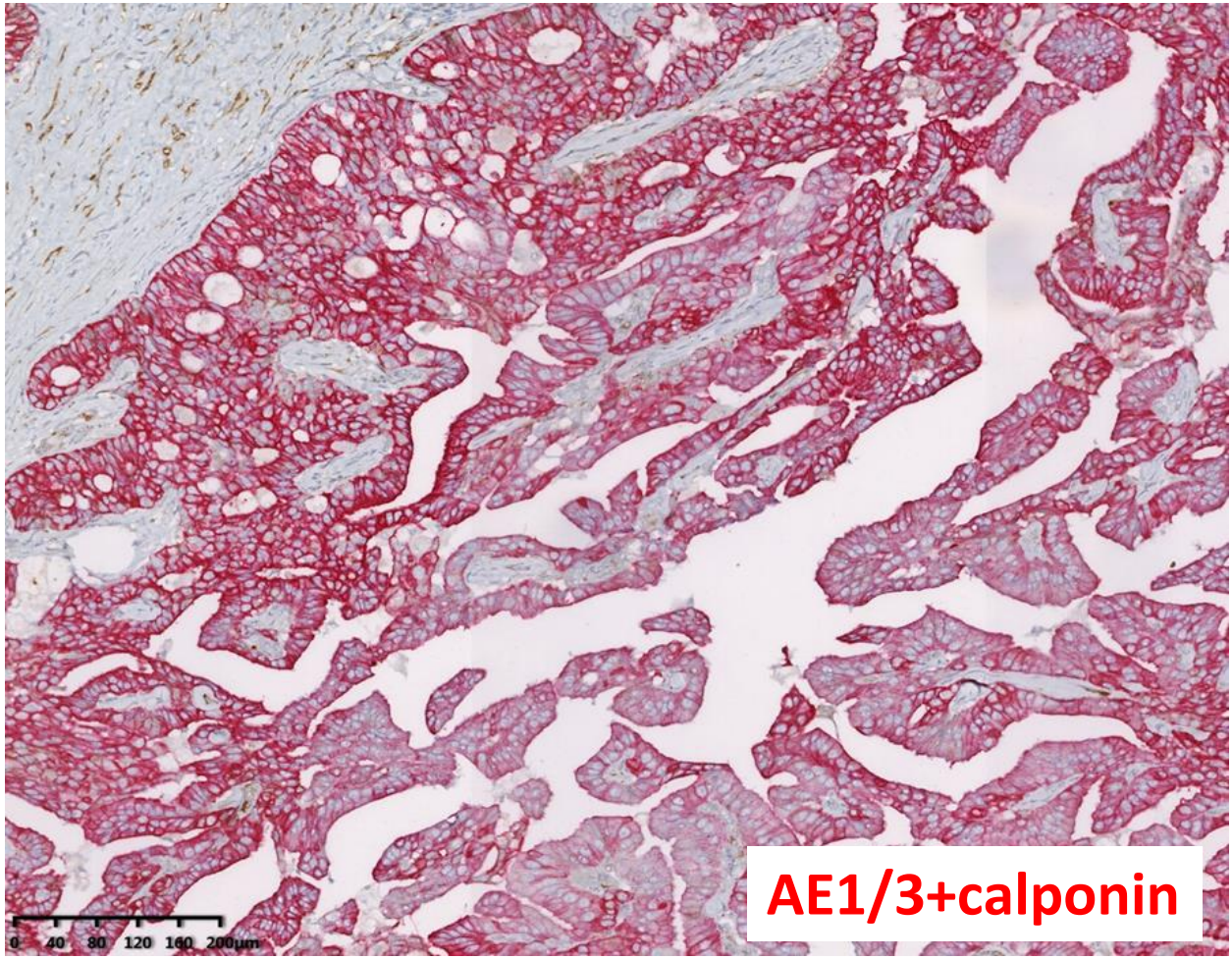

0 40 80 120 160 200µm
PR


0 40 80 120 160 200µm
HER2

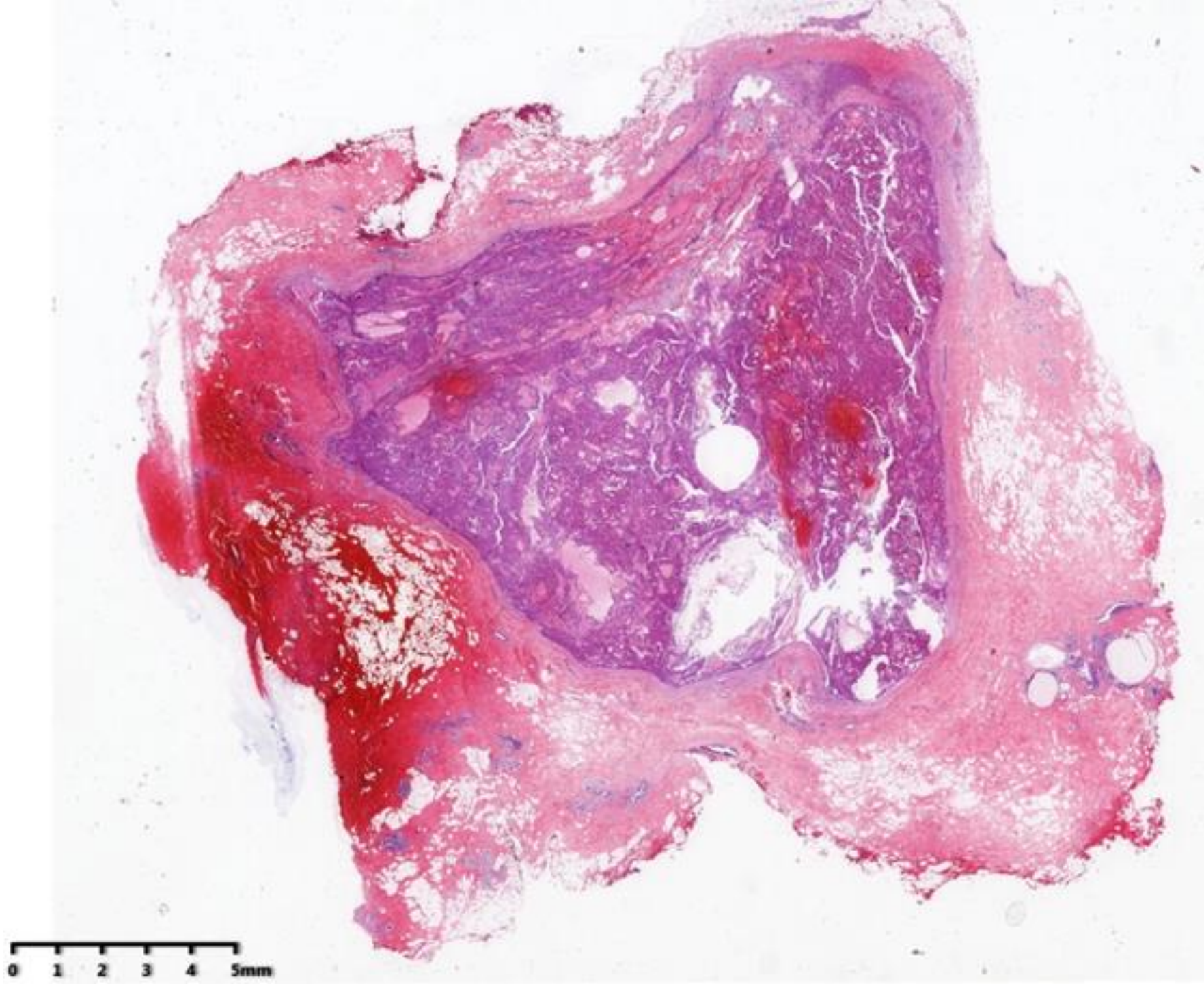

AR
0 40 80 120 160 200µm

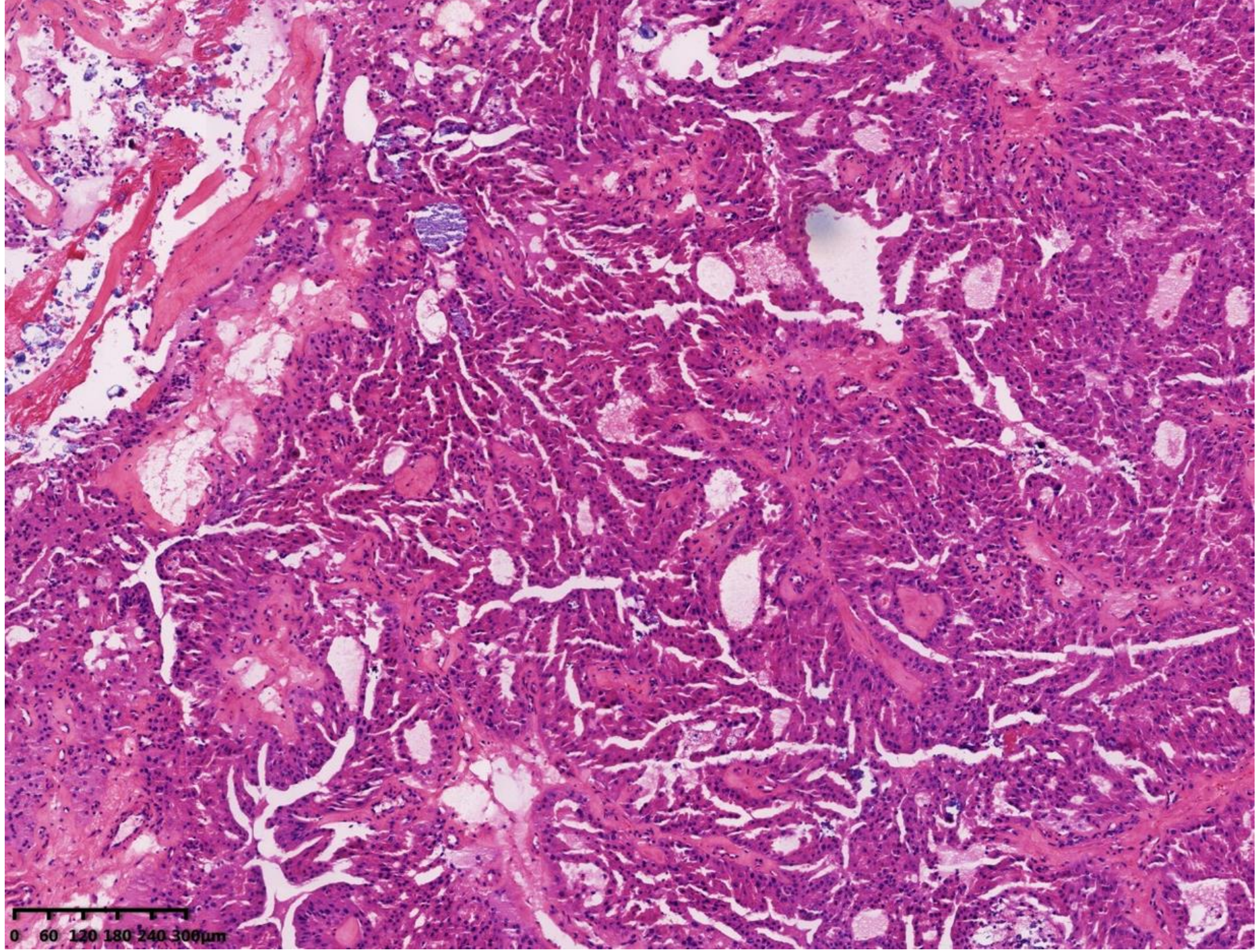

GCDFP15

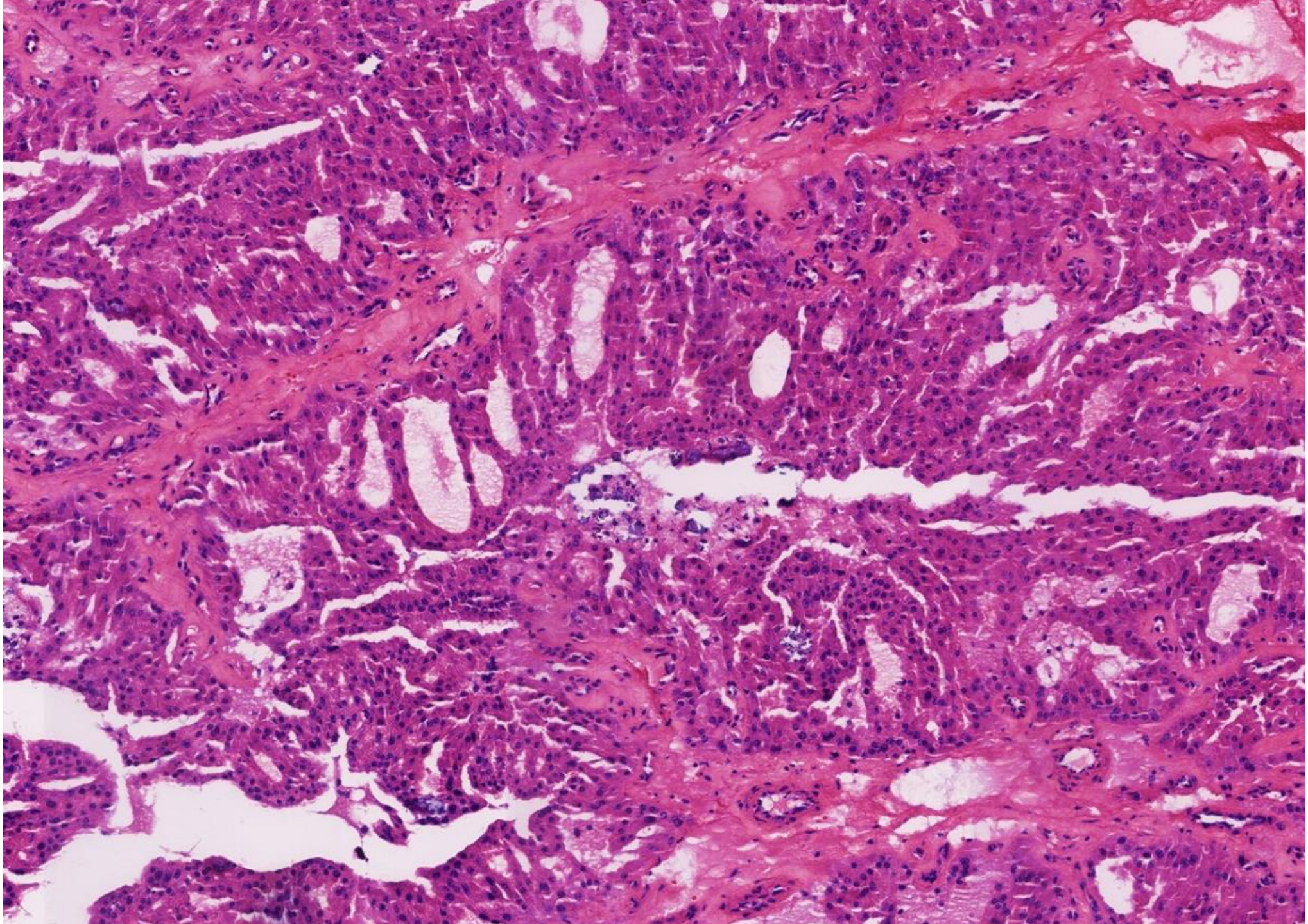

0 60 120 180 240 300µm
P63

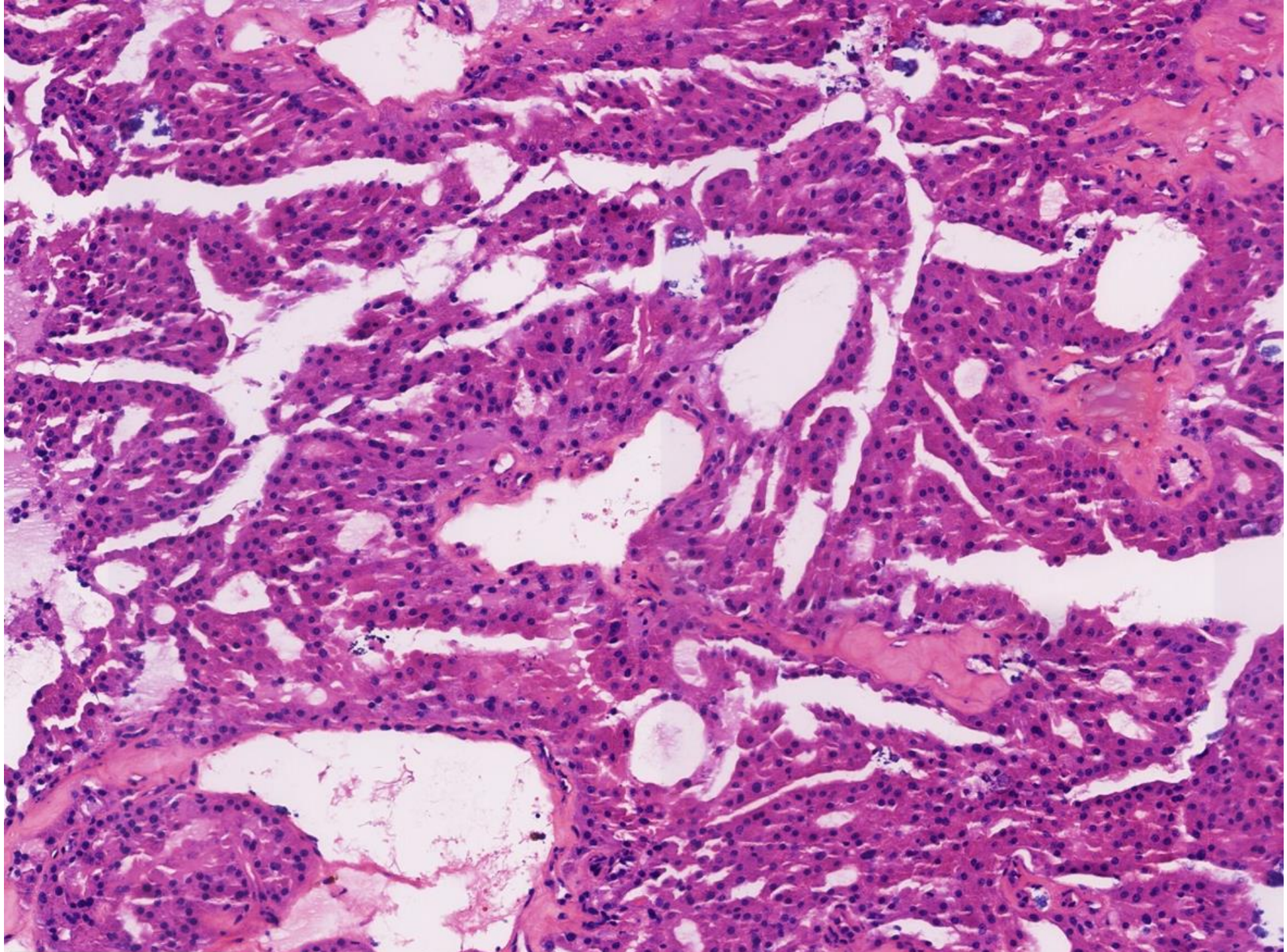

0 40 80 120 160 200µm
AE1/3+calponin

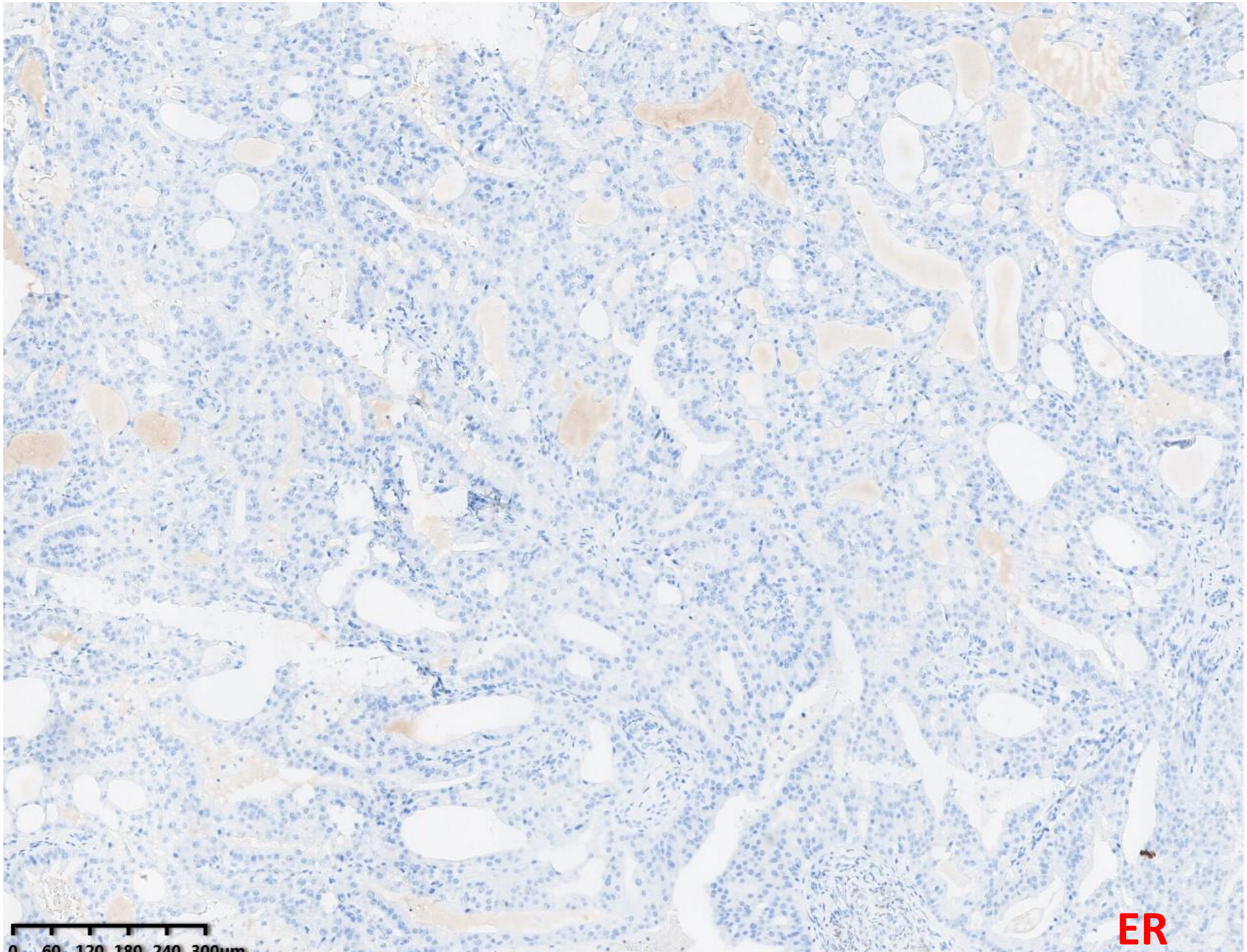
F/44, 3×3 cm left breast mass.

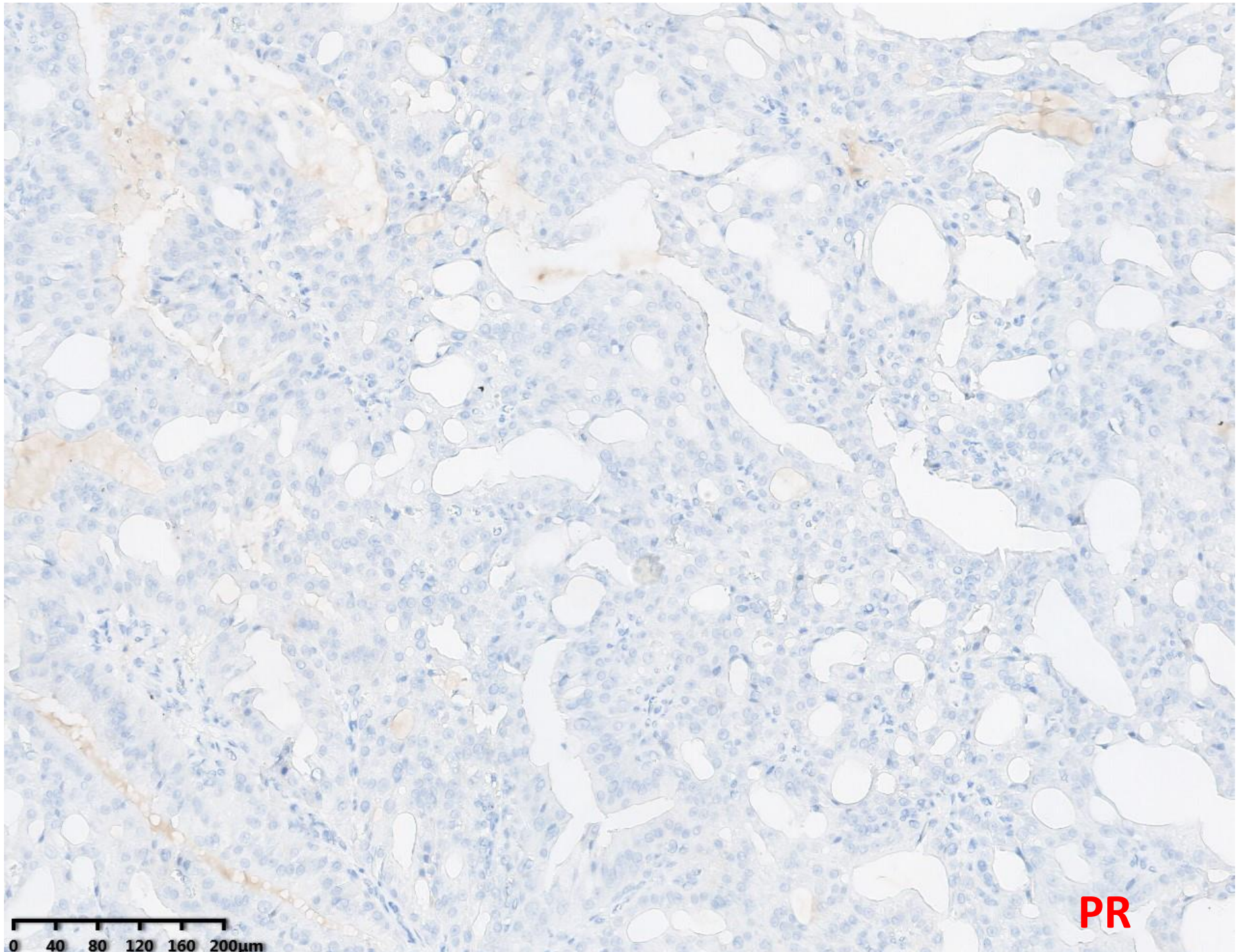

0 1 2 3 4 5mm

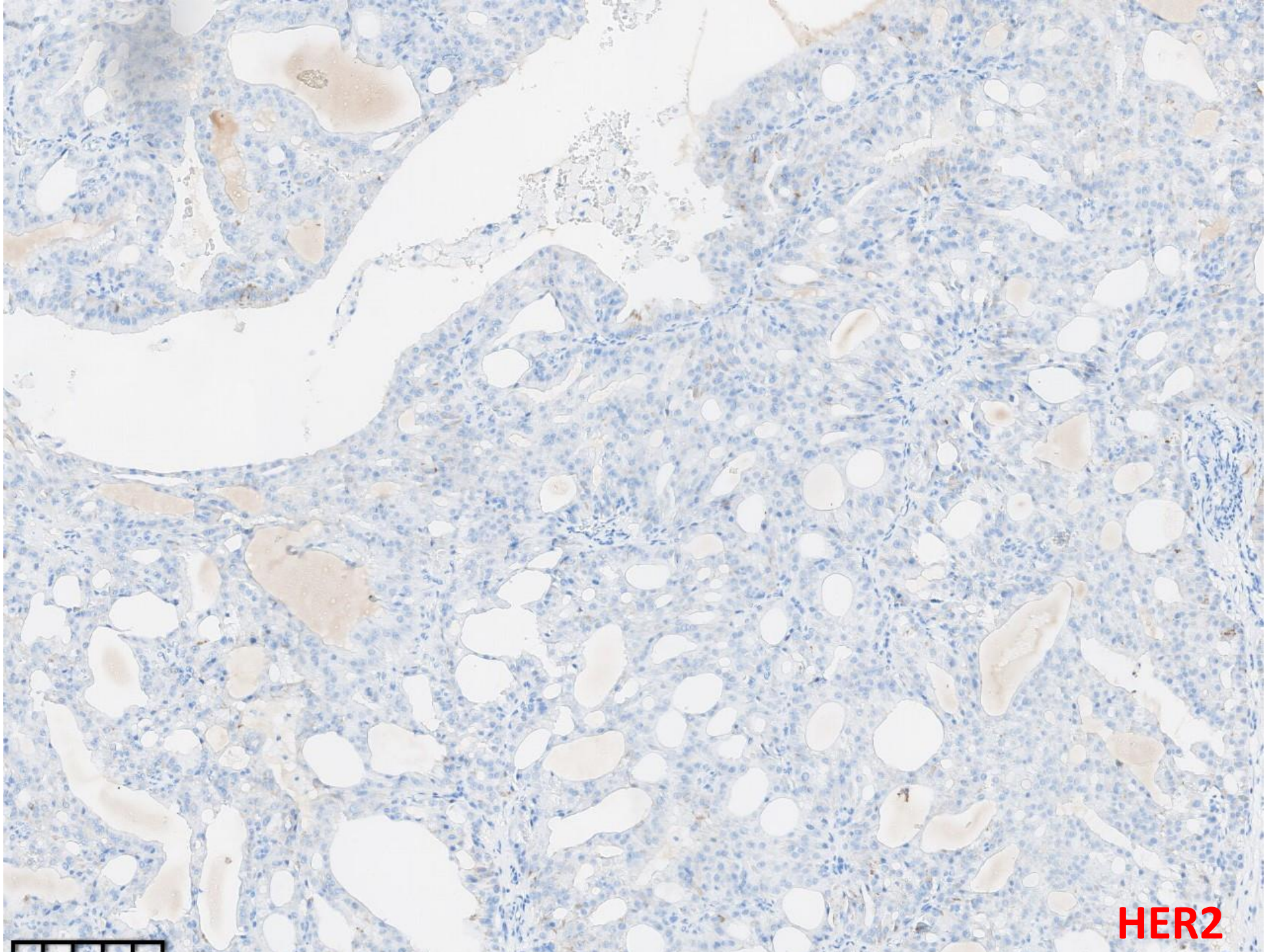

0 60 120 180 240 300µm

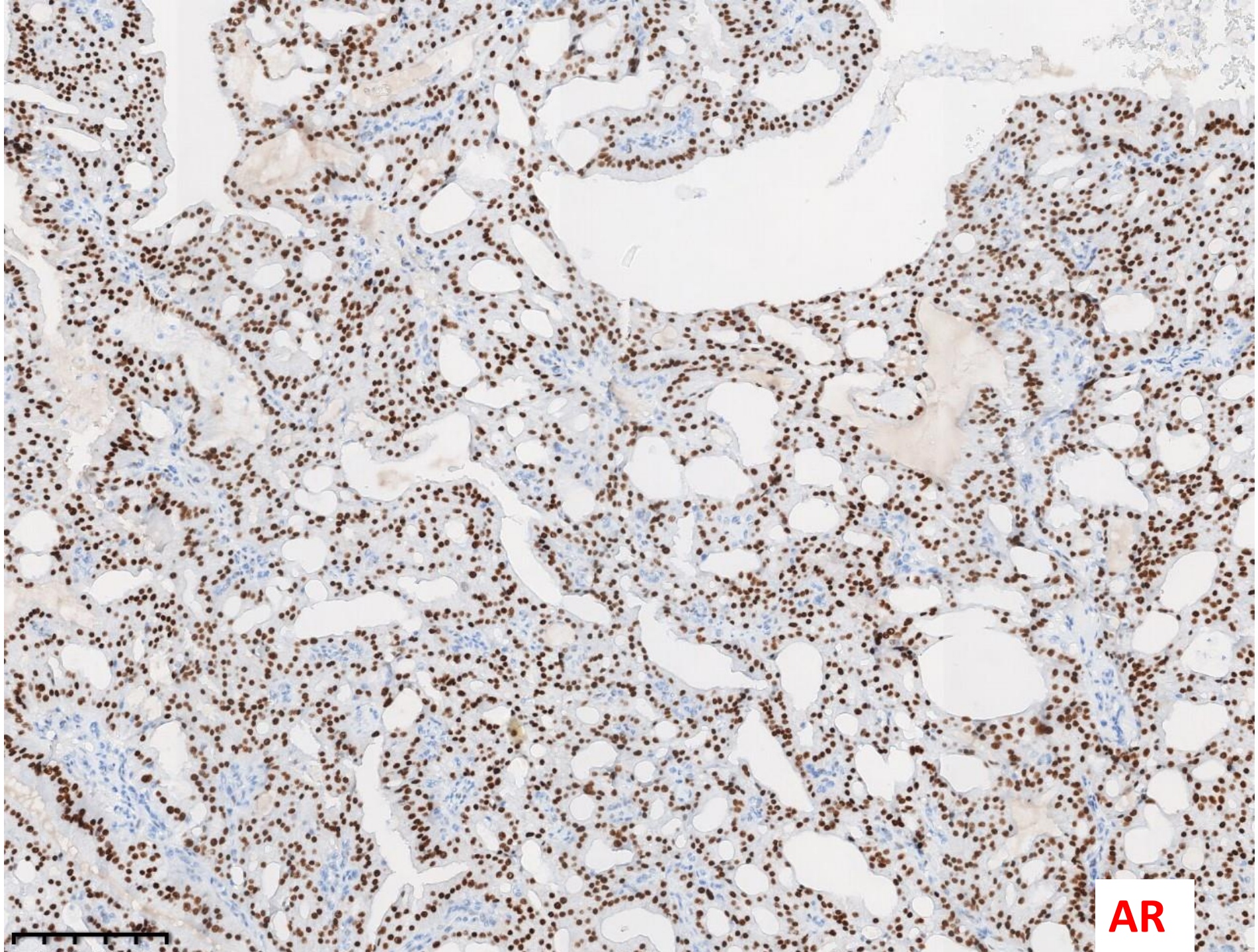


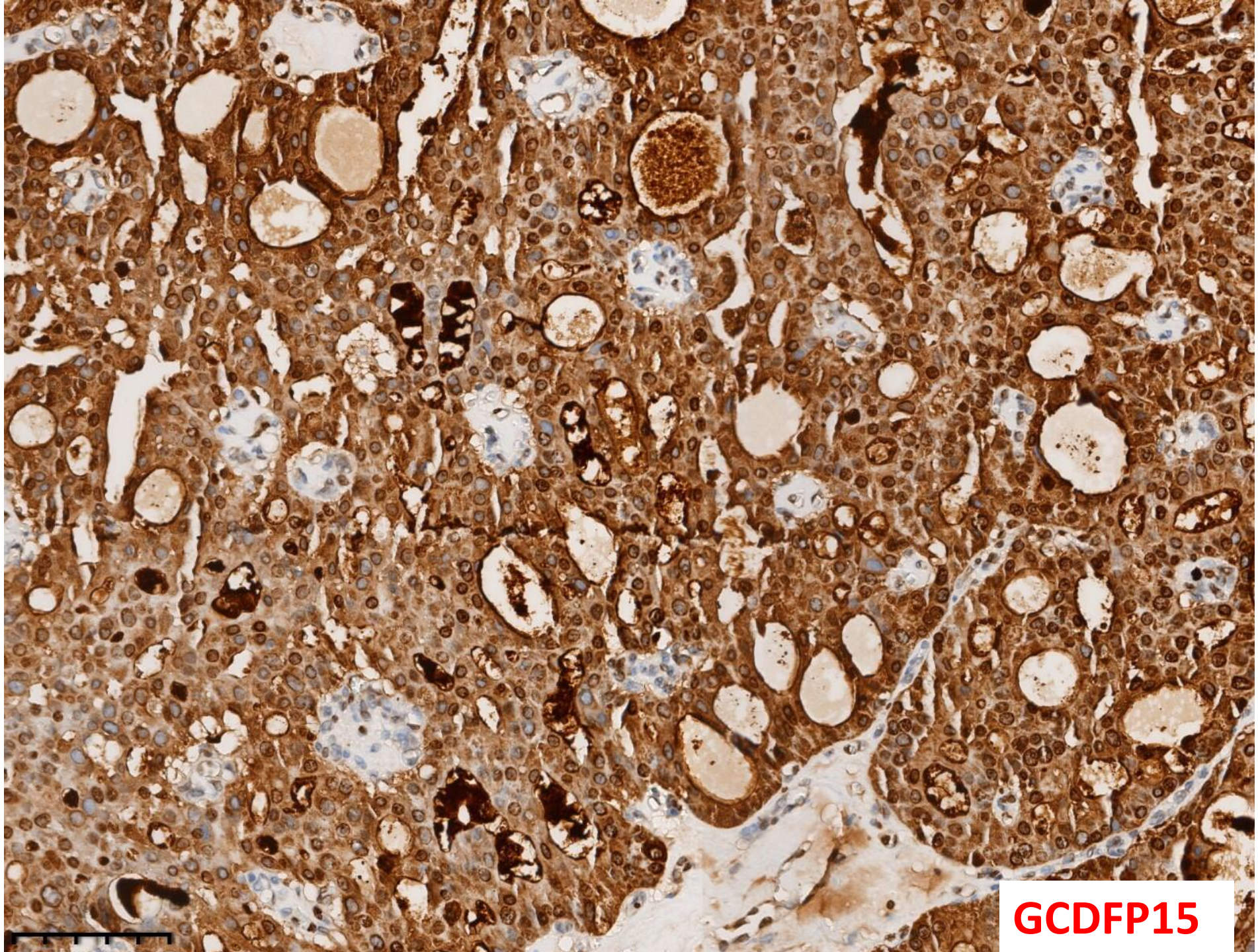



0 60 120 180 240 300μm
ER


0 40 80 120 160 200μm
PR


HER2


AR


GCDFP15

Encapsulated papillary carcinoma

- Encapsulated papillary carcinoma: fibrovascular stalks with low/intermediate grade neoplastic cells
- Immunophenotype: ER+, usually PR+, HER2-, low/moderate Ki-67 (Apocrine variant is an exception)
- Lesions with similar growth pattern but nuclear pleomorphism, high mitotic activity, or triple-negative/HER2+ phenotype: grade and stage as invasive carcinoma

Encapsulated papillary carcinoma (apocrine variant)

- In 2009, Seal et al reported 5 cases of encapsulated papillary carcinoma with classic morphology but apocrine cytology (GCDFP-15+, AR+), establishing the apocrine variant, with subsequent case reports published.
- Myoepithelial cell loss (within and around papillae)
- Triple-negative phenotype reported
- Sentinel lymph node biopsies: negative
- No recurrences in followed cases; biology appears similar to classic EPC

Triple-negative phenotype does not exclude encapsulated papillary carcinoma. Assess nuclear grade and apocrine features.

261 Clinicopathological Characteristics of 22 Cases of Apocrine Encapsulated Papillary Carcinoma

Ke Zuo[1], Xiaoli Xu[1], Rui Bi[2], Ruohong Shui[1], Wentao Yang[1]
[1]Fudan University Shanghai Cancer Center, Shanghai, China, [2]Fudan University Shanghai Cancer Center, Shanghai Medical College, Fudan University, Shanghai, China

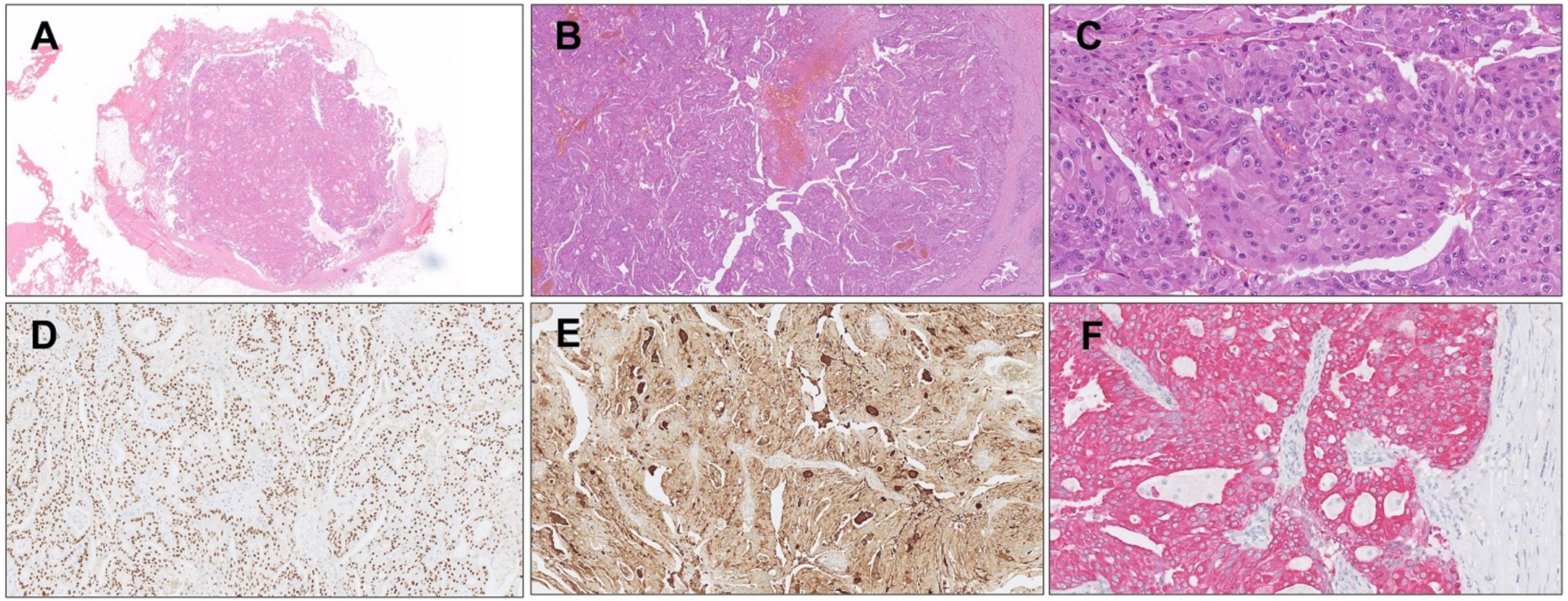
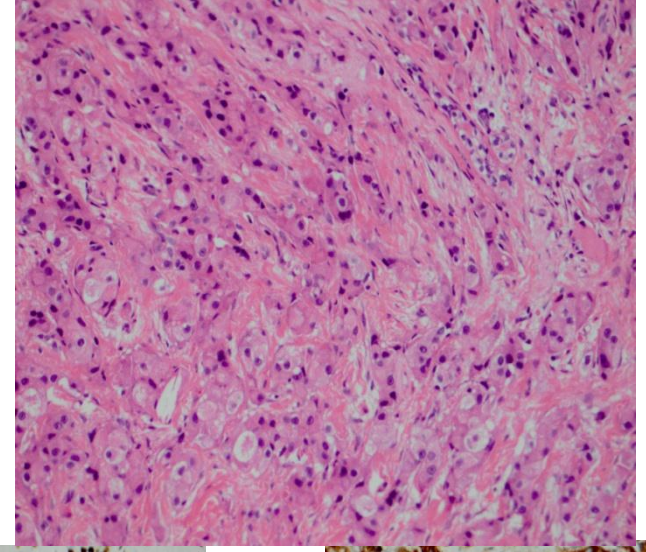


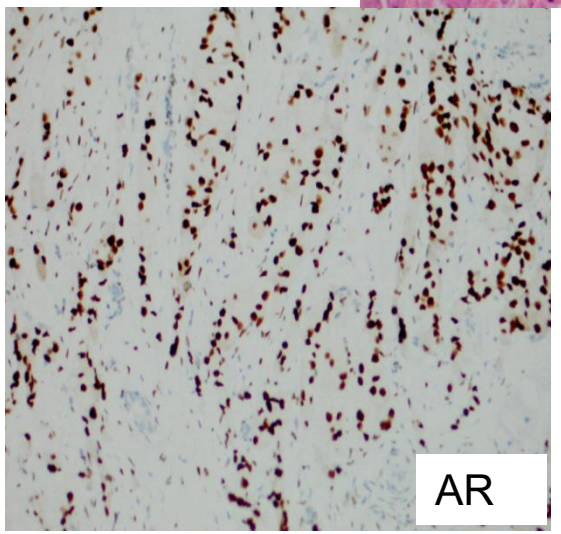
Figure 1. A. Typical AEPC presented with intracystic papillary component surrounded by a thick fibrous capsule at low power. **B.** Papillary structure of AEPC. **C.** Apocrine cytomorphology of AEPC. **D.** AEPC positive for AR. **E.** AEPC positive for GCDFP15. **F.** AEPC positive for AE1/AE3 (red) but negative for myoepithelial marker p63

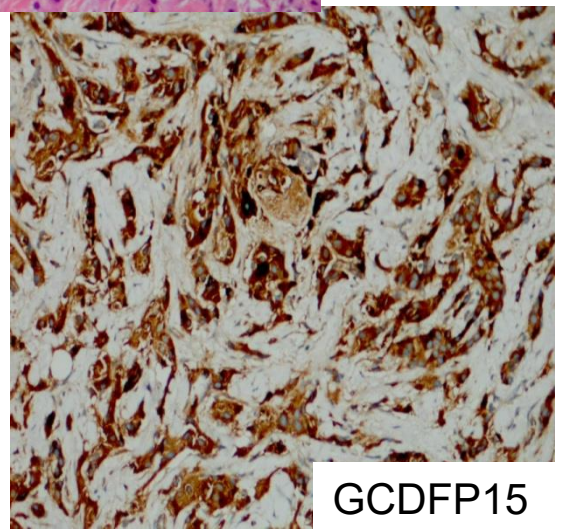
breast cancer (TNBC) of no special type. Therefore, the indolent biological behavior of AEPC is different from that of TNBC of no special type, but much closer to classical EPC. It might be more appropriate to treat patients with the same strategies for classical EPC.

Invasive carcinoma with apocrine differentiation

- **2012 WHO:** Included subtype, no diagnostic criteria
- **Current WHO:** >90% tumor cells with apocrine features (large cells, eosinophilic granular cytoplasm, nuclear enlargement, prominent nucleoli)
- **Ideal Standard:** Morphology PLUS immunophenotype: ER(-), PR(-), AR(+)
- **Important:** Morphology not specific; also common in HER2+ cancers. Cytoplasmic granularity may be subtle.

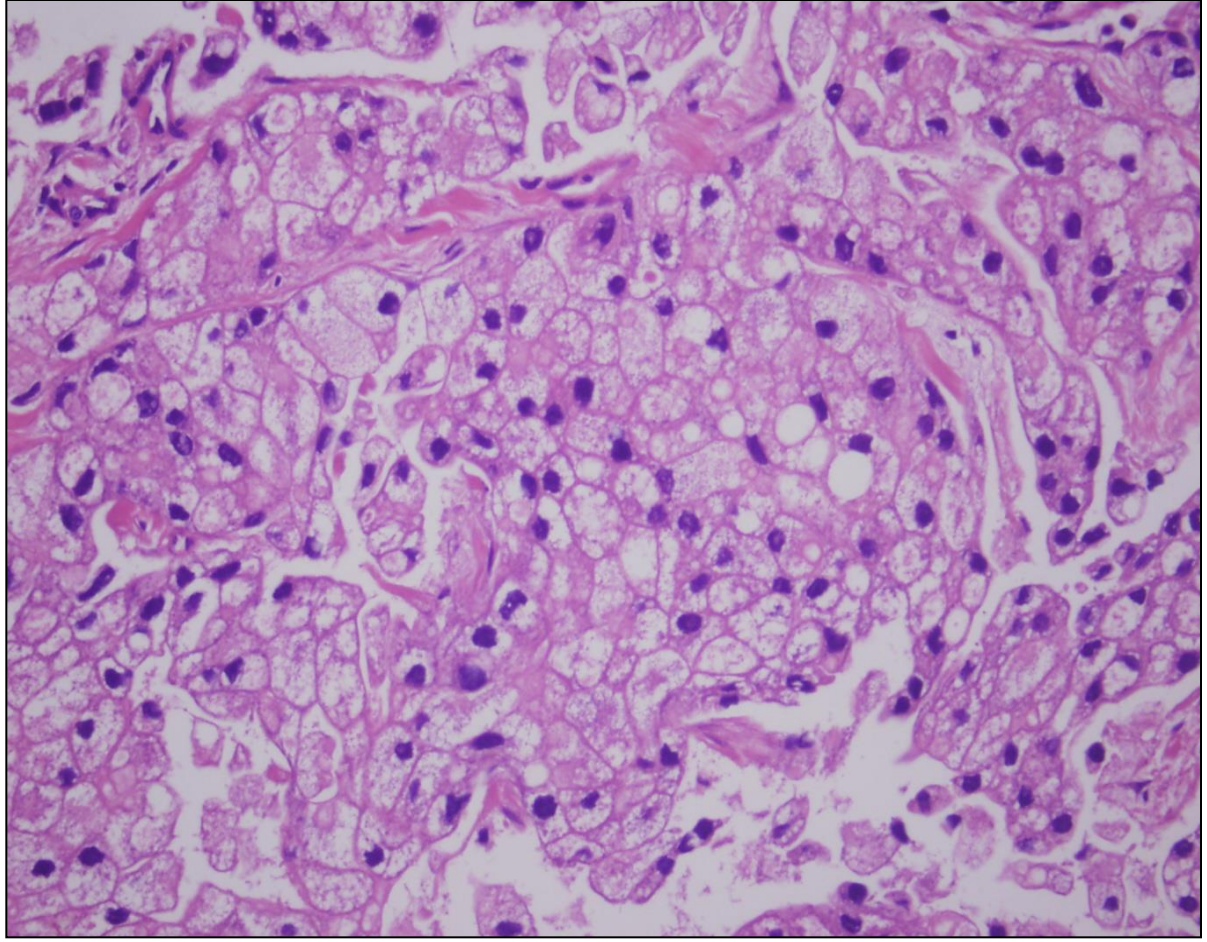


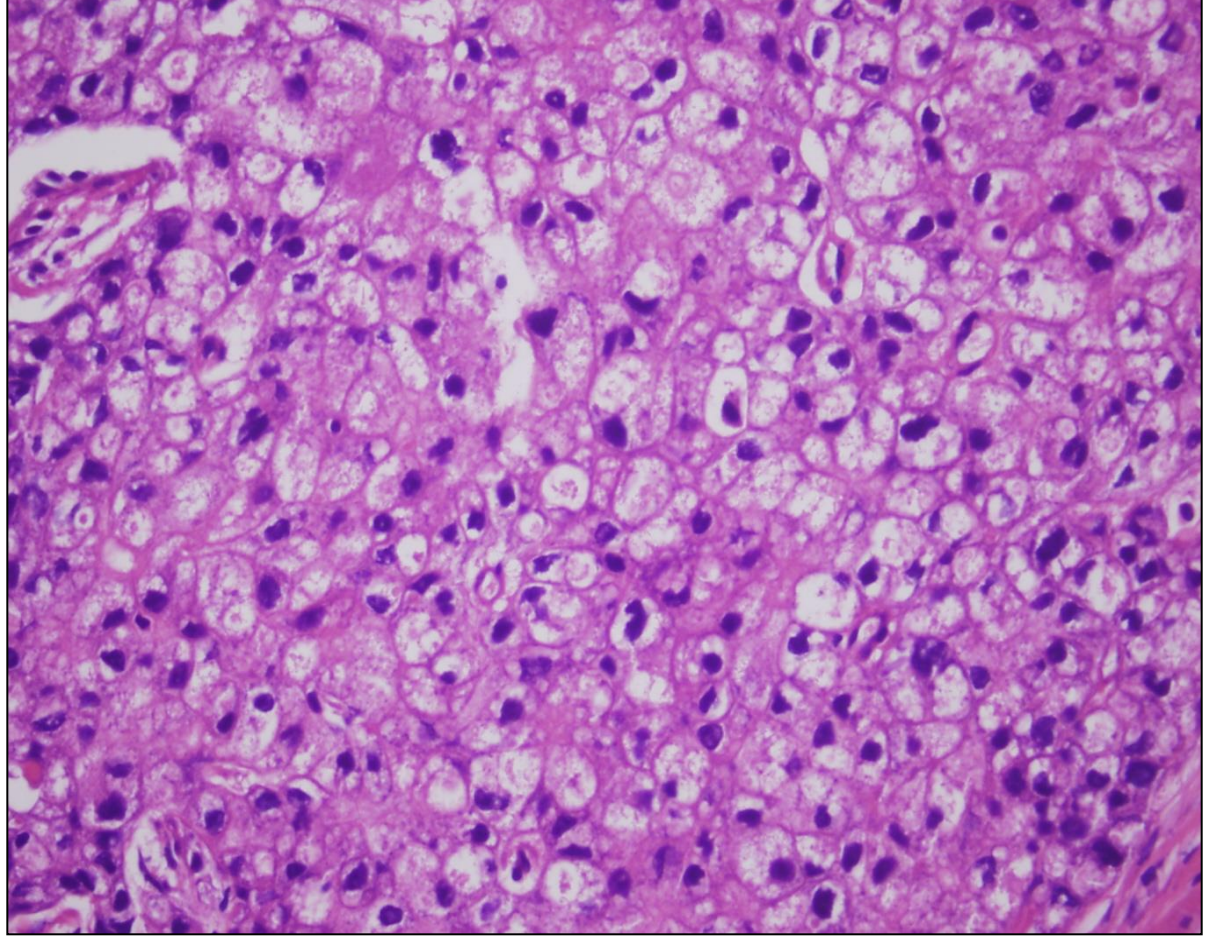




Recommended Diagnostic Approach:

1. Classic apocrine morphology
2. Immunophenotype: ER(-), PR(-), AR(+), GCDFP-15(+)
3. >90% of tumor cells meet above criteria





Differential diagnosis

- Histiocytoid carcinoma
- Oncocytic carcinoma
- Invasive lobular carcinoma
- Secretory carcinoma

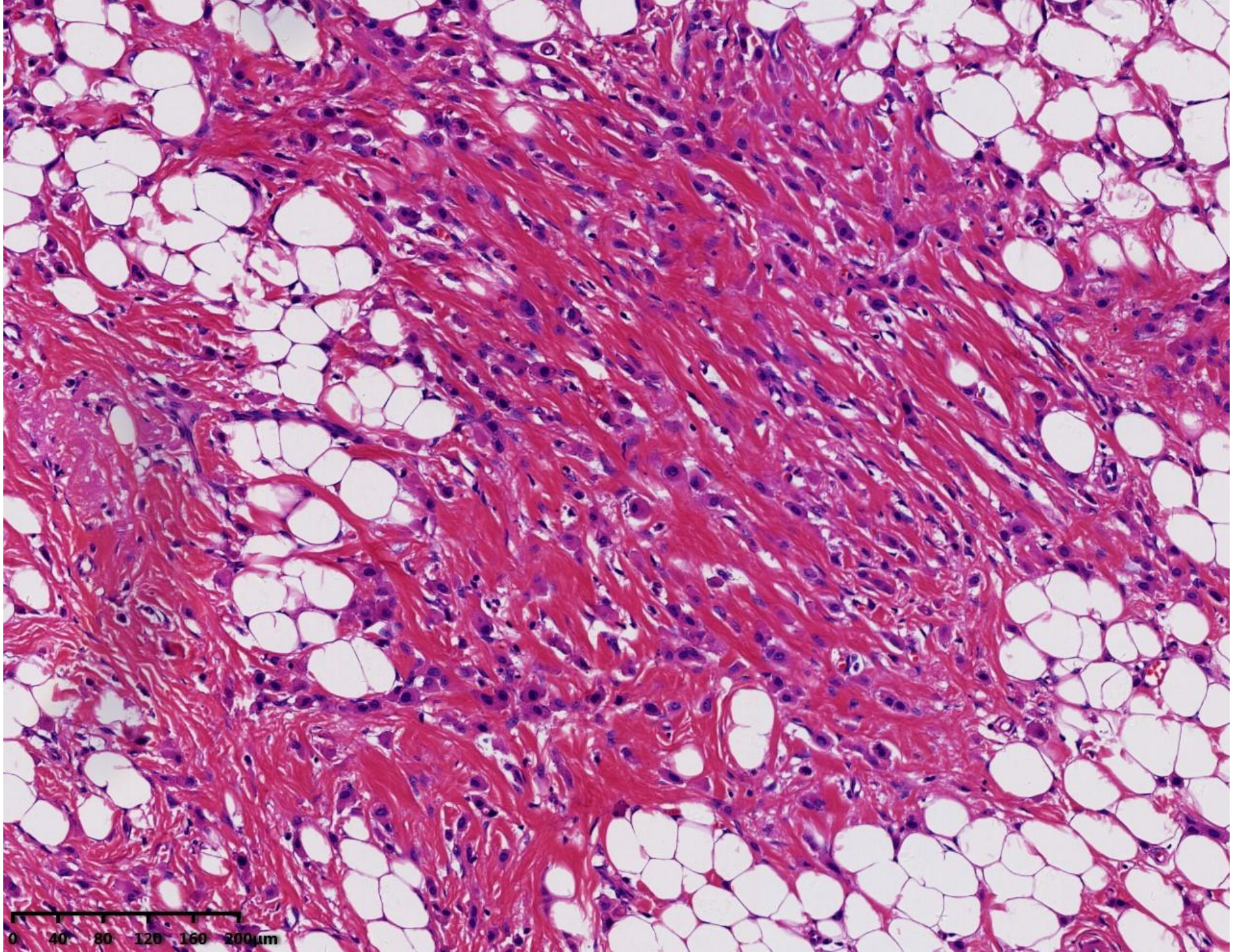
Lipid-rich carcinoma

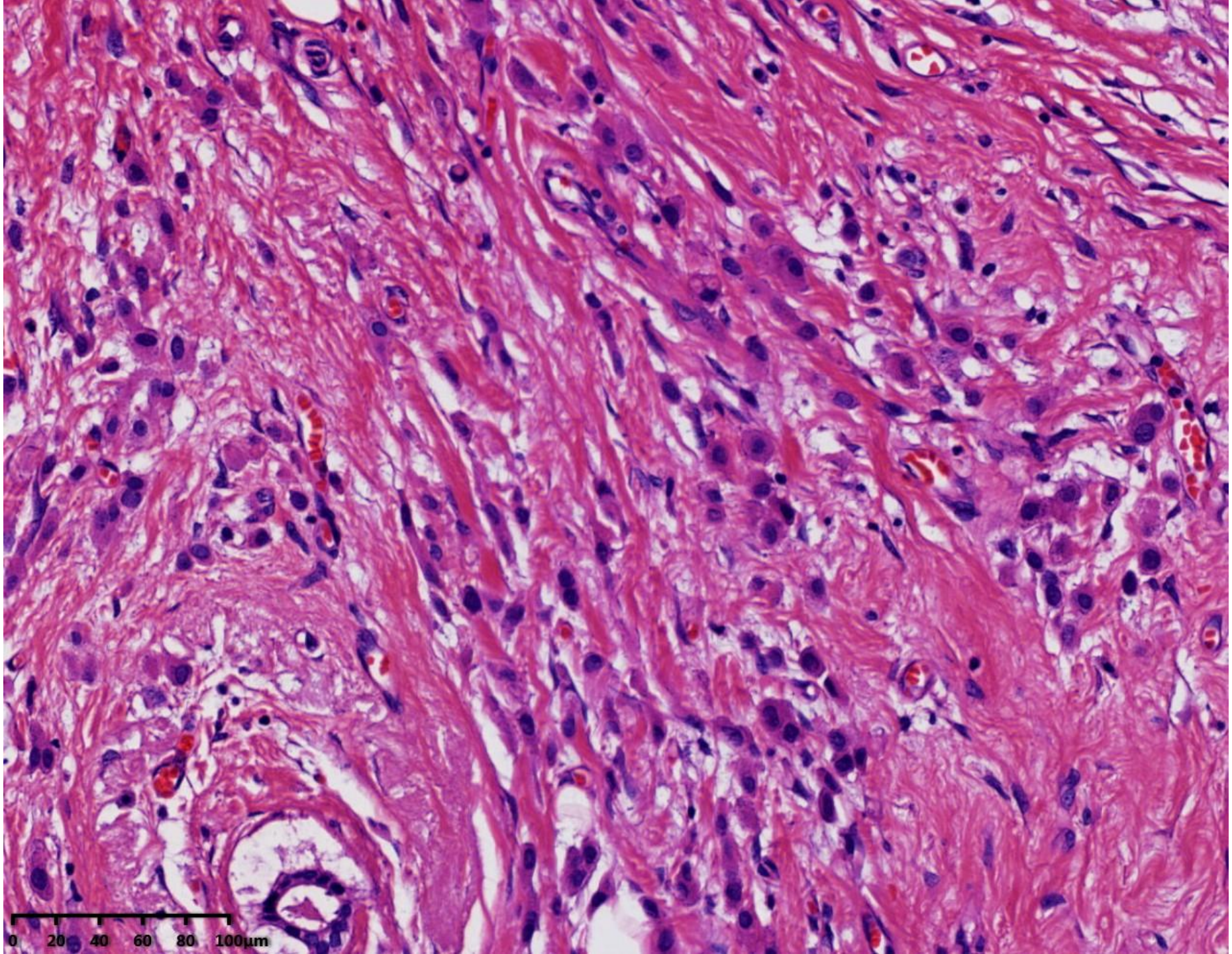
Granular cell tumor

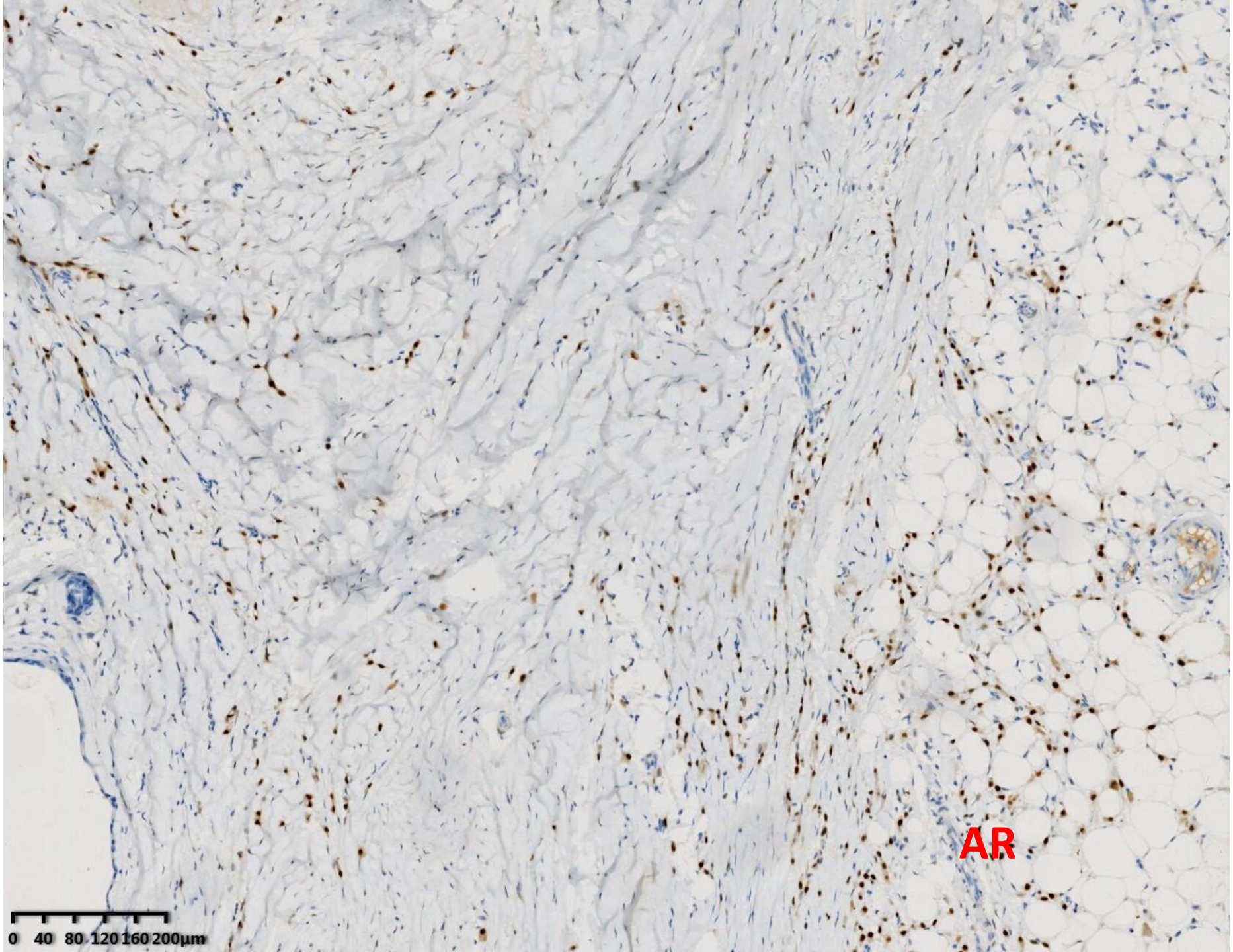
Malignant melanoma

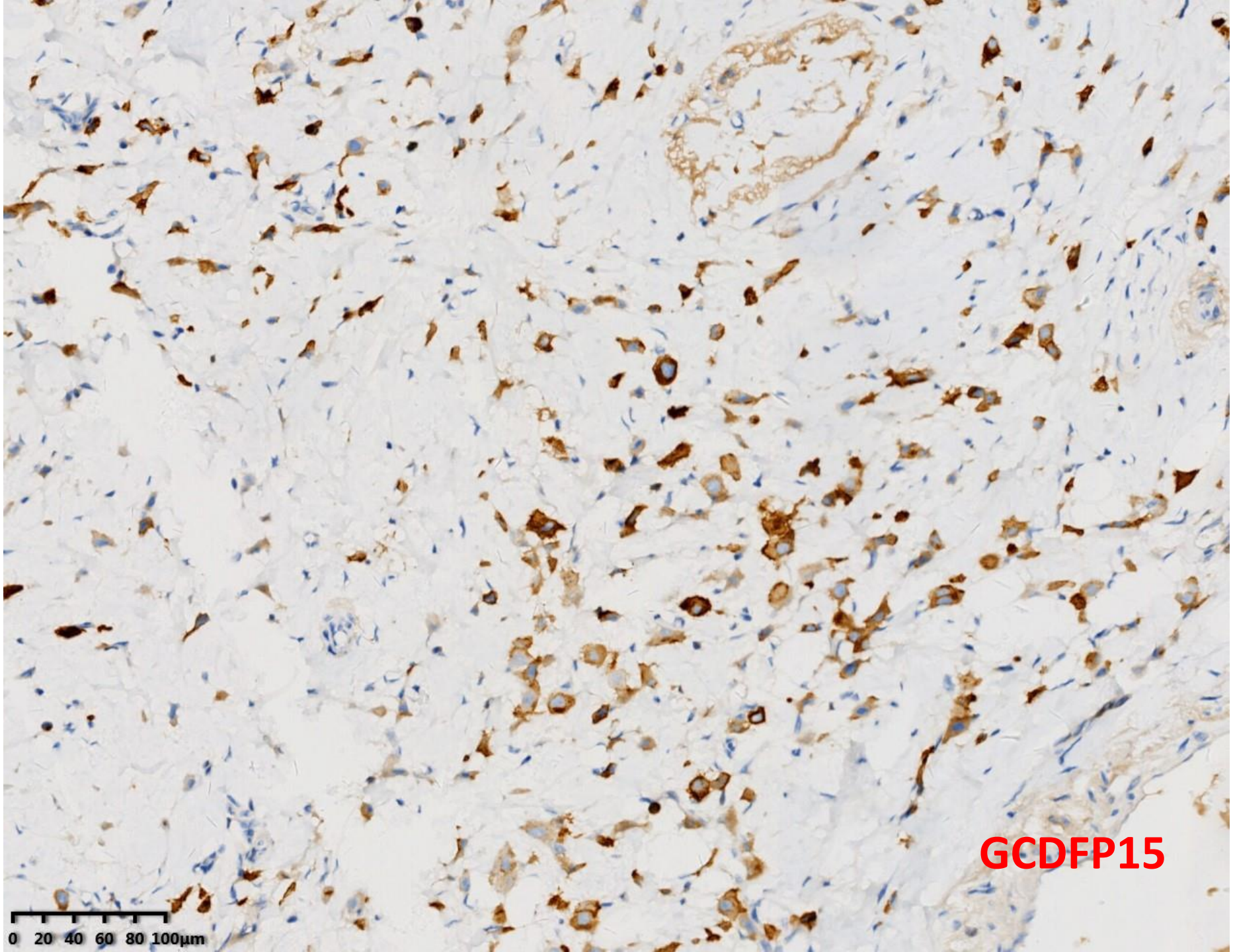
Histiocytic reaction

F/60, 2.8×2.3 cm mass, lower outer quadrant of right breast

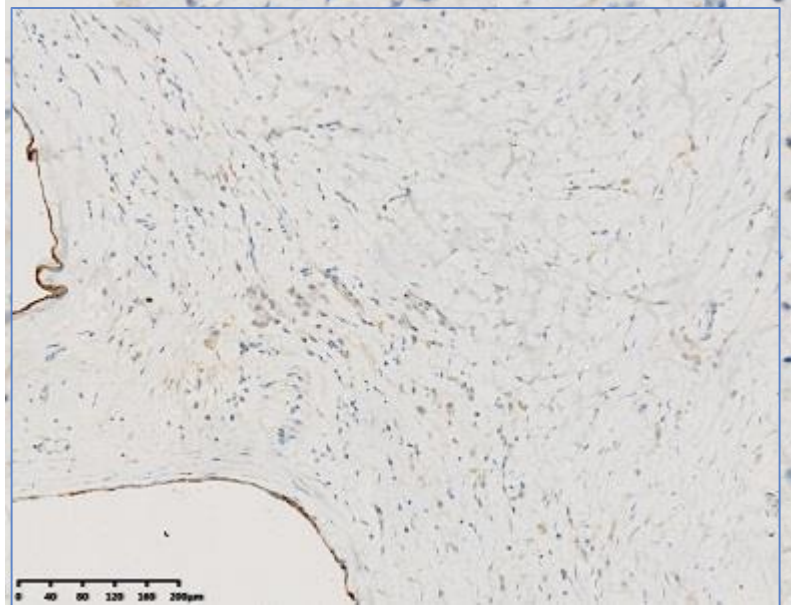

0 40 80 120 160 200µm


0 20 40 60 80 100µm


AR
0 40 80 120 160 200μm

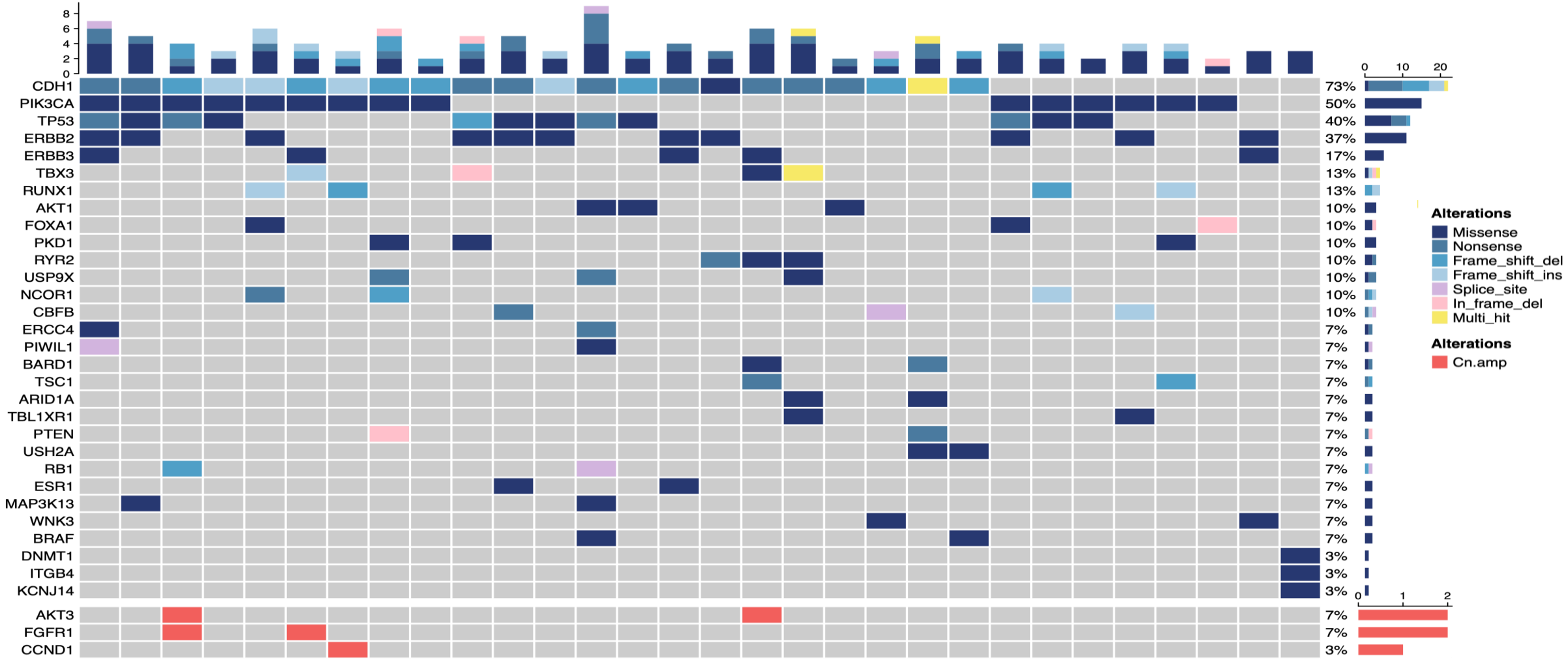

GCDFP15
0 20 40 60 80 100µm

Invasive lobular carcinoma with apocrine differentiation



E-Cadherin

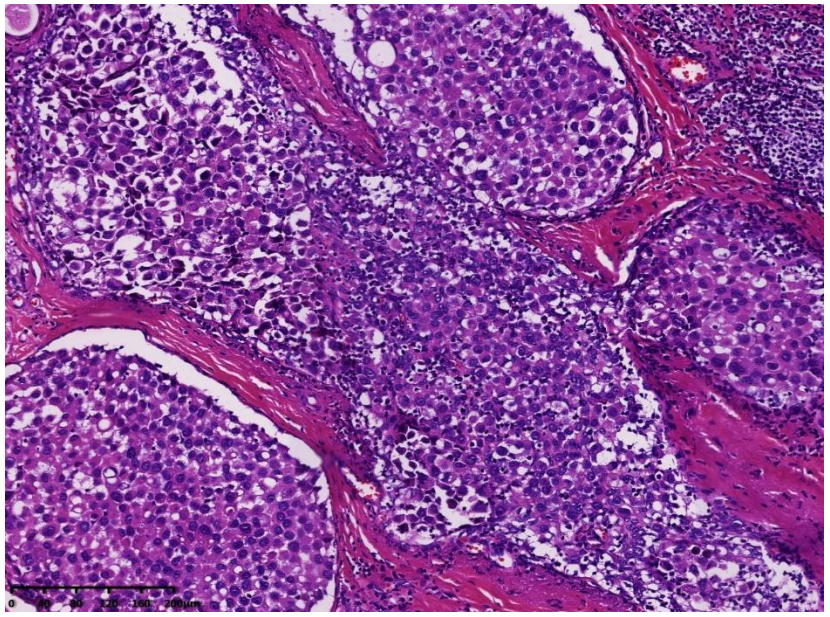
AR+TNBC invasive lobular carcinoma

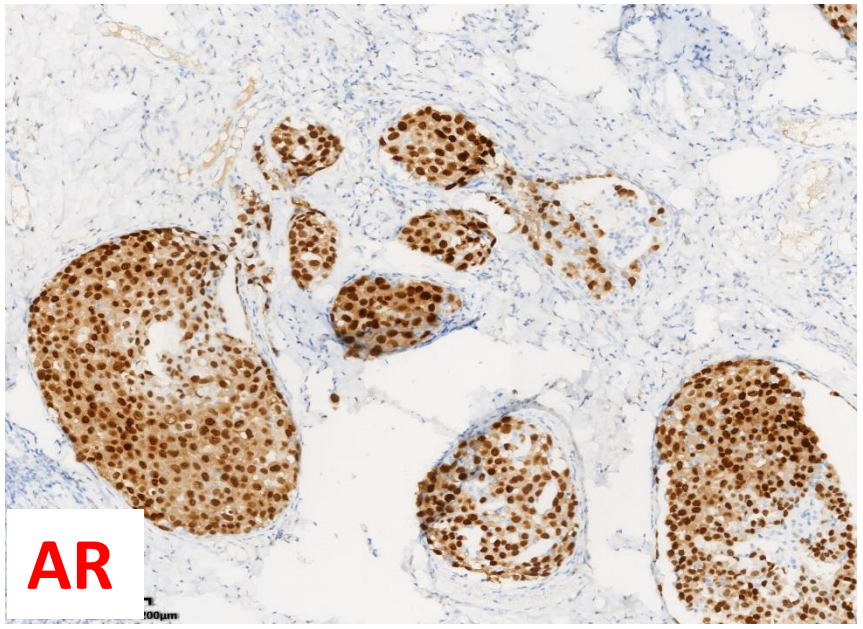


- HER2/ERBB2 mutaion：36.67%（11/30），all were activating mutation，including p.L755S，p.S310F/Y, p.V842I， p.V777L，p.D769N， p.D769Y， p.T862A， p.H787Y

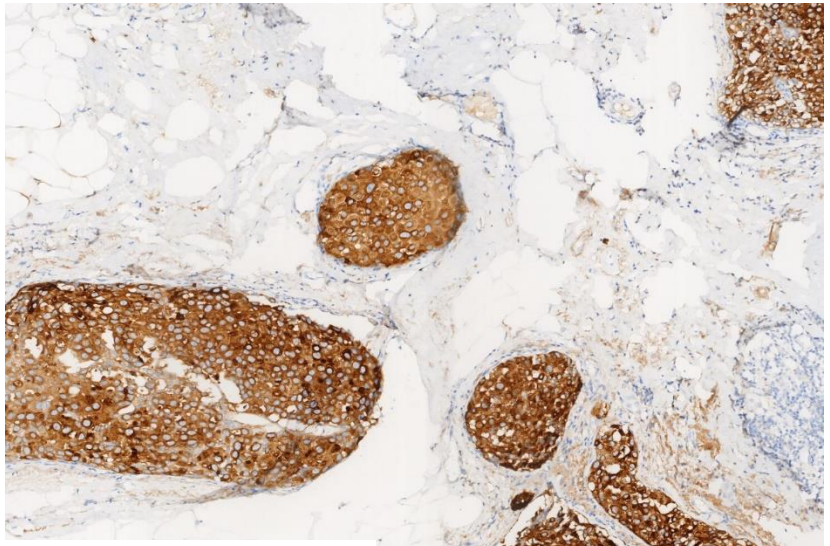
Unpublised data from FUSCC

Pleomorphic lobular carcinoma in situ

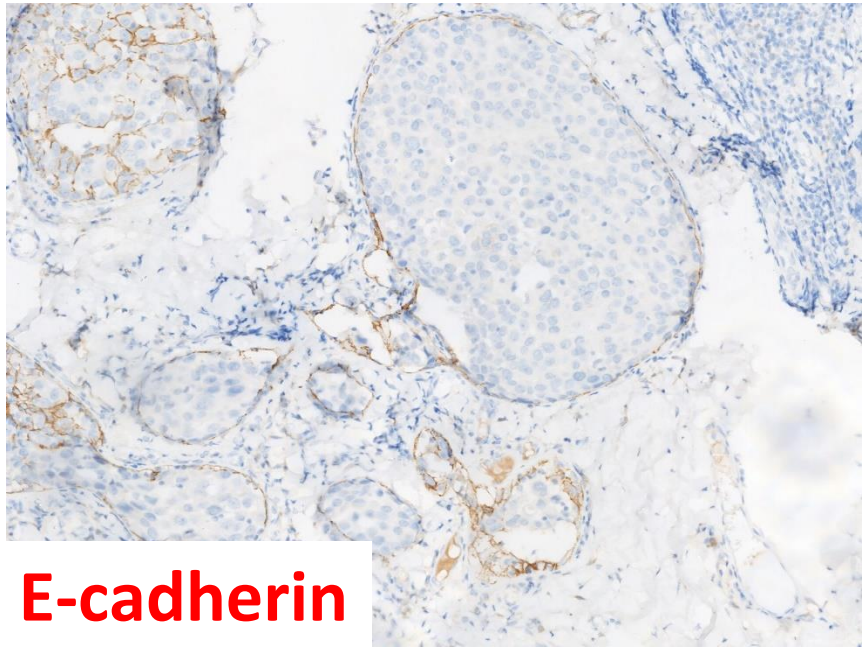




AR



GCDFP15



E-cadherin

- Diagnosis relies on cytology features
- Marked nuclear pleomorphism (>4x lymphocyte)
- ± Comedo necrosis
- ± Apocrine differentiation
- Differential: High-grade DCIS
- High Ki-67, often ER-, HER2+

Apocrine Variant of Pleomorphic Lobular Carcinoma In Situ

Further Clinical, Histopathologic, Immunohistochemical, and Molecular Characterization of an Emerging Entity

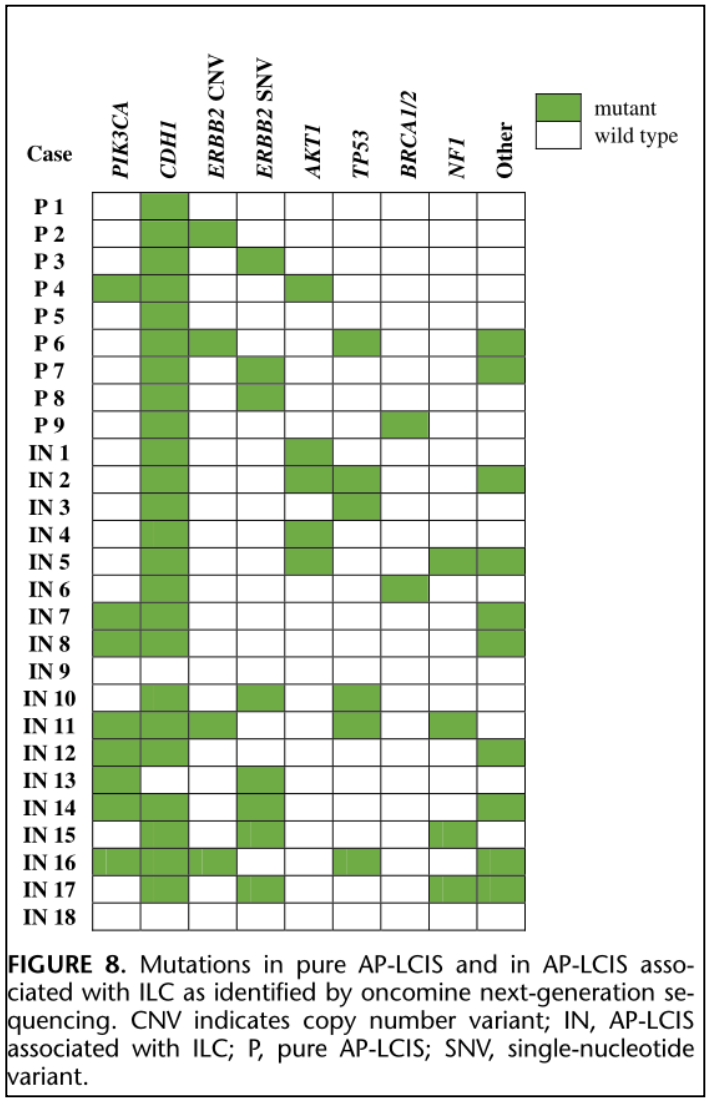


FIGURE 8. Mutations in pure AP-LCIS and in AP-LCIS associated with ILC as identified by oncomine next-generation sequencing. CNV indicates copy number variant; IN, AP-LCIS associated with ILC; P, pure AP-LCIS; SNV, single-nucleotide variant.

AP-LCIS Profile:

- Ki-67 >15%, AR+ 90%
- Aurora A+ (38%), no significant association with recurrence, invasion, or lymph node metastasis
- Clinicopathologically identical to P-LCIS
- No unique markers by NGS
- 2/13 recurrences (57mo F/U), zero metastases
- AP-LCIS = high-grade LCIS variant with P-LCIS-like features

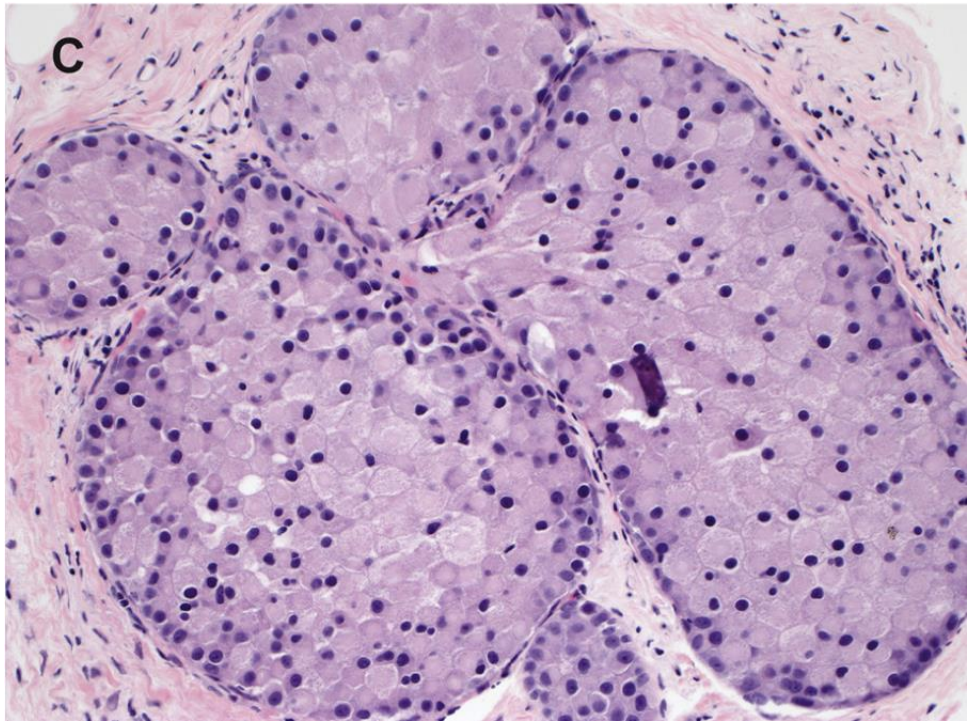
Am J Surg Pathol. 2020;44(8):1092-1103

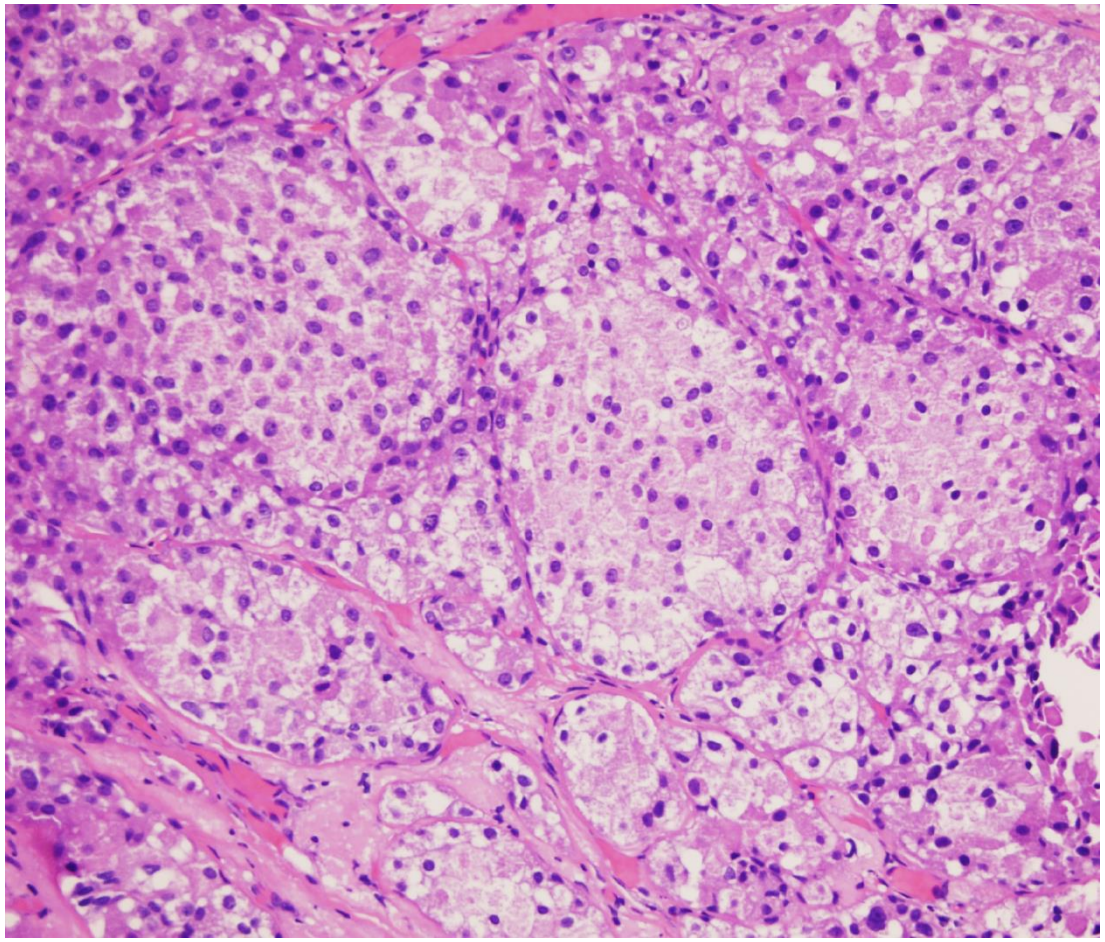
Practical diagnostic challenges

Apocrine cytology present but insufficient for pleomorphic subtype diagnosis

LCIS with apocrine features:

- ER/PR(-), unlike classic ER/PR(+) LCIS
- Current classification remains undefined
- Clinical significance uncertain





Immunohistochemistry of apocrine lesions

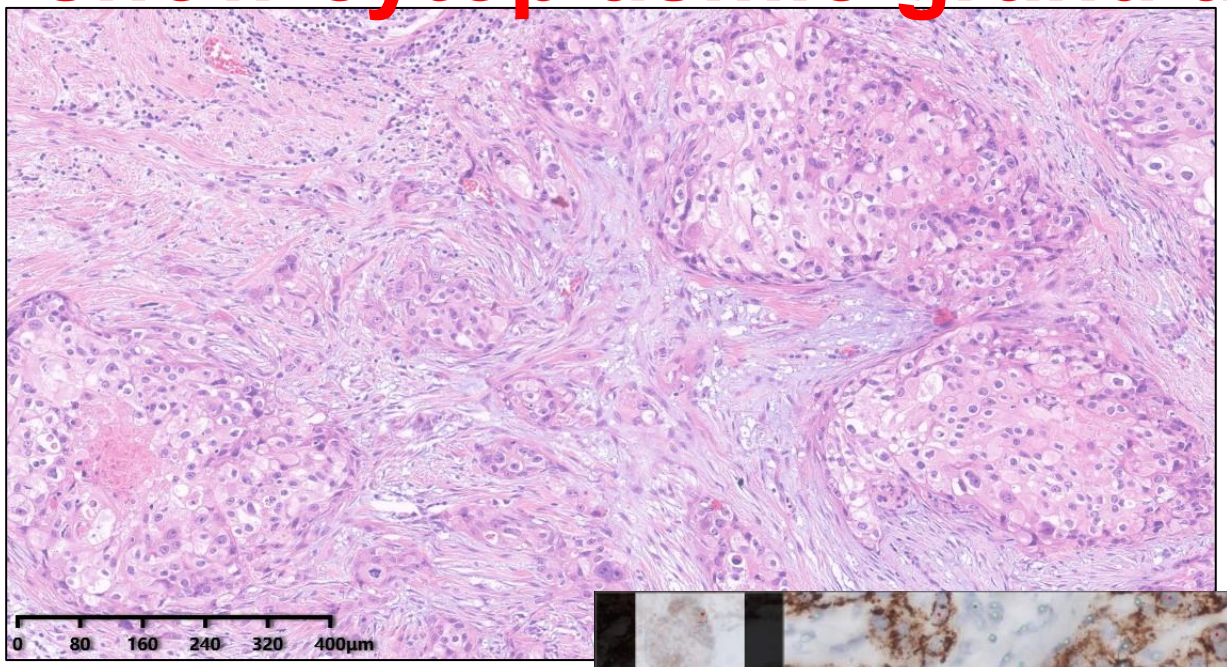
	Benign apocrine proliferations	Apocrine DCIS	Invasive apocrine carcinoma
Oestrogen receptor	0% positive[17,39]	0–6% positive[25,39]	3.8–60% positive[39,41]
Progesterone receptor	0% positive[17,39]	0–3% positive[25,39]	5.8–40% positive[39,41]
Proliferation index (Ki67)	0–14.5 [16,46] Mean 2.7%[18]	0.4–28.7[25] Mean 14.7%[18]	6.9–23.7 [18] Mean 15.3%[18]
Androgen receptor	100% positive [17,39]	97% positive[25]	56–100% positive[39,41,42]
BCL2	0% positive[39,46]	0–3% positive[25,39]	50% positive[39]
p53	0–30% positive[16,39,46]	62–67% positive[25,39]	46–50% positive[18,39]
c-myc	100% positive[46–48]	Not known	Not known
HER2 protein overexpression	10–57% positive*[16,46]	47% positive[25]	50% positive[42]

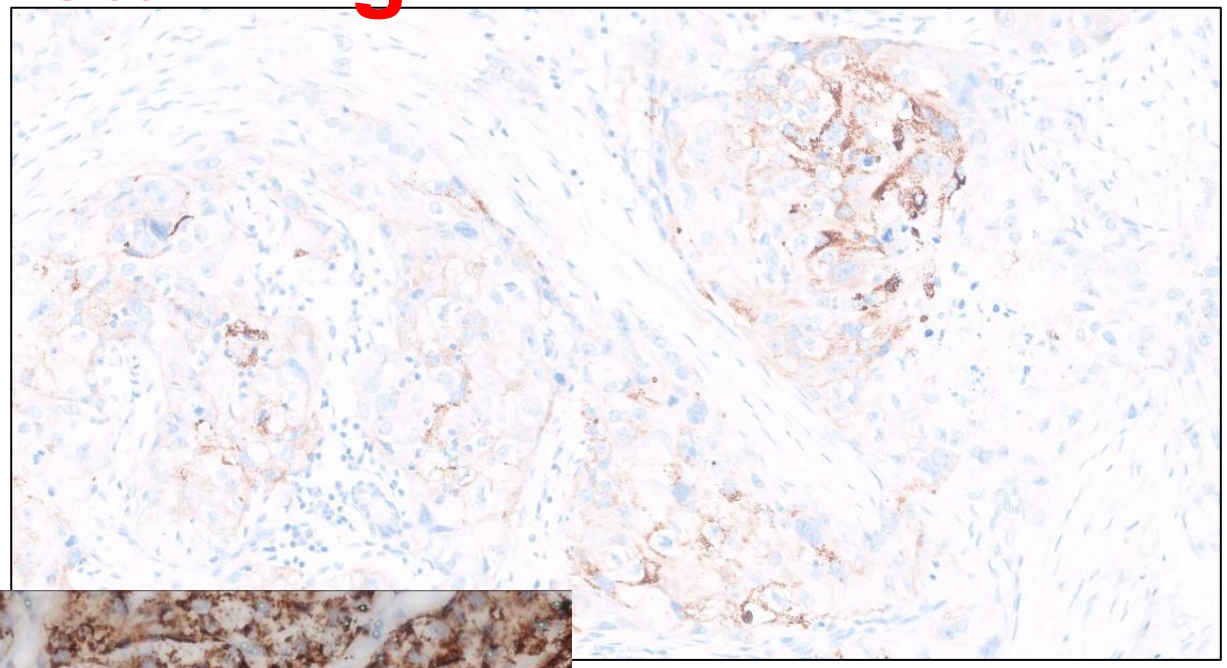
DCIS, Ductal carcinoma *in situ*.
*These cases did not show *HER2* gene amplification.

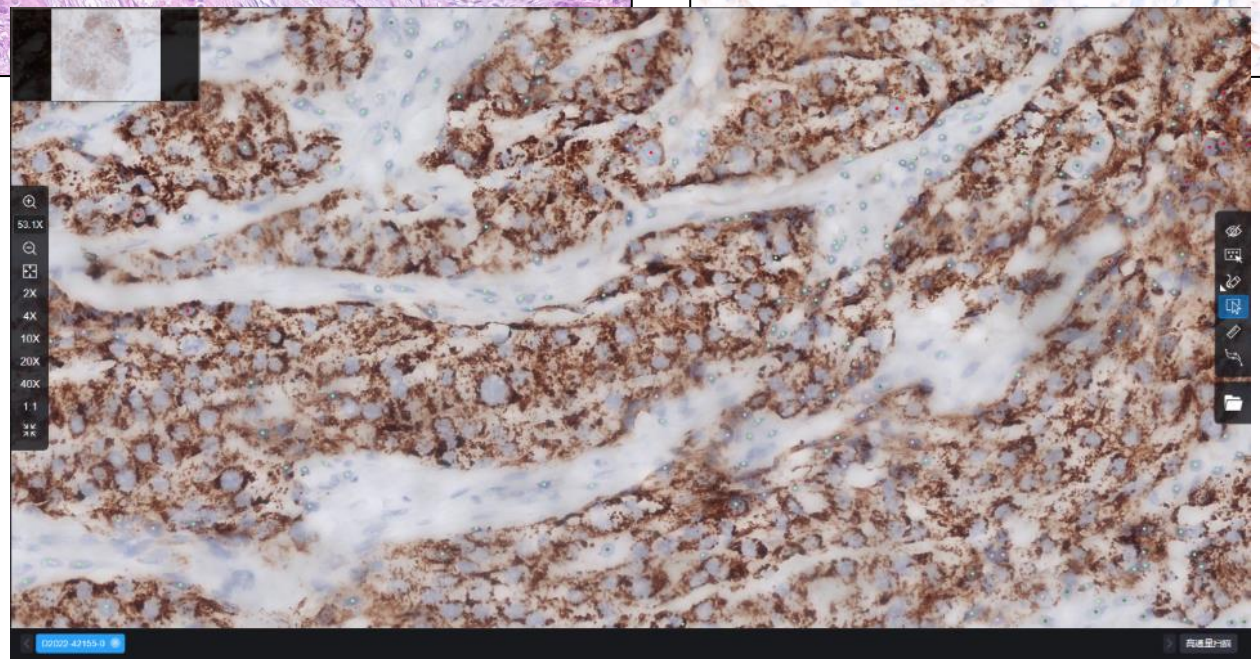
For TNBC with low Ki-67, consider special subtypes including apocrine carcinoma.

F P O'Malley, Histopathology, 2008, 52: 3-10

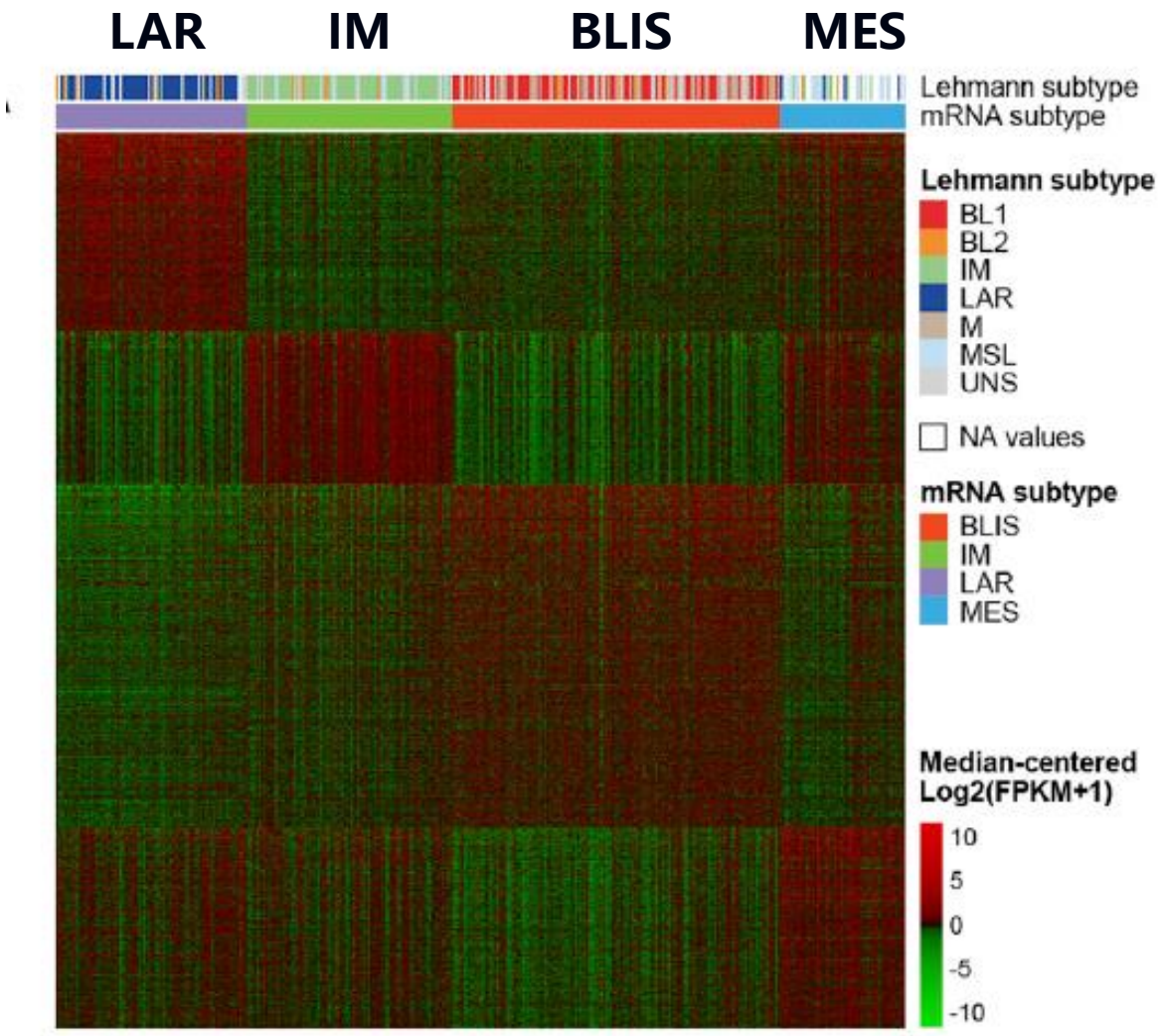
HER2 expression in apocrine carcinoma may show cytoplasmic granular staining







TNBC is a heterogeneous group
— FUSCC Molecular Classification of TNBC

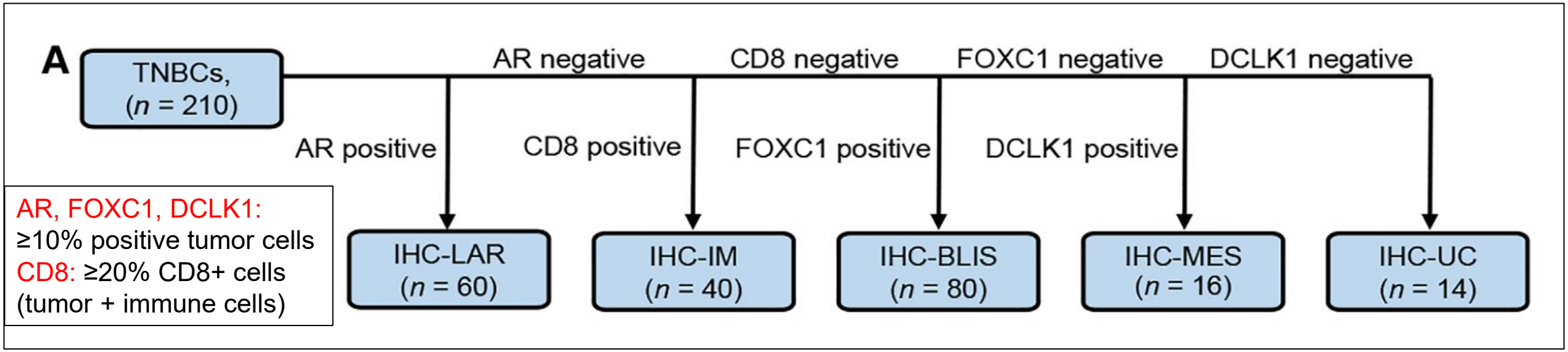


Cancer Cell. 2019;35(3):428-440

Multi-omics analysis of 465 TNBC cases identified 4 molecular subtypes.

- **LAR:** Luminal androgen receptor subtype (23%)
- **IM:** Immunomodulatory subtype(24%)
- **BLIS:** Basal-like and immune-suppressed subtype (39%)
- **MES:** Mesenchymal-like subtype (15%)

IHC-Based Subtyping Strategy



IHC-LAR	AR (+)
IHC-IM	AR (−) and CD8(+)
IHC-BLIS	AR(−), CD8(−), and FOXC1(+)
IHC-MES	AR(−), CD8(−), FOXC1(−) and DCLK1(+)
IHC-UC	AR(−), CD8(−), FOXC1(−) and DCLK1(−)

Molecular classification and treatment strategies for TNBC ----FUSCC

Subtype	BLIS	IM	LAR	MES
Clinical	poor prognosis (5-year RFS, 84%)	good prognosis (5-year RFS, 94%)	high prevalence in Asians; poor prognosis (5-year RFS, 88%); elderly patients; related to apocrine differentiation; androgen receptor-positive	poor prognosis (5-year RFS, 79%)
Mutation	*TP53* (77%); no other frequent mutation; enrichment of the HRD mutation signature	*TP53* (81%) no other frequent mutation; enrichment of the HRD mutation signature	*TP53* (61%) PI3K-AKT pathway (~70%) *ERBB2* (9%)	mutation profile between LAR and the other two groups
Copy number	high chromosomal instability; frequent 9p23 and 12p13 amplification	relatively high chromosomal instability	low chromosomal instability; *CDKN2A/B* loss (*RB1* neutral)	copy-number profile between LAR and the other two groups
Treatment	low HRD score: escalated chemotherapy, intensive monitoring; high HRD score: platinum drugs	immune checkpoint inhibitors	endocrine therapy; targeting ERBB2 and CDK4/6 inhibitors	targeting CSCs; STAT3 inhibitor

Cancer Cell. 2019;35(3):428-440

Neoadjuvant chemotherapy for luminal androgen receptor (LAR) breast cancer: potential predictive biomarkers and genetic alterations

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USCAP 112TH ANNUAL MEETING

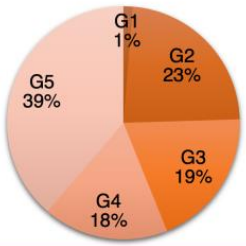
FACING THE UNKNOWN

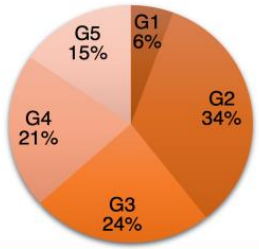
USCAP UNITED STATES AND CANADIAN ACADEMY OF PATHOLOGY

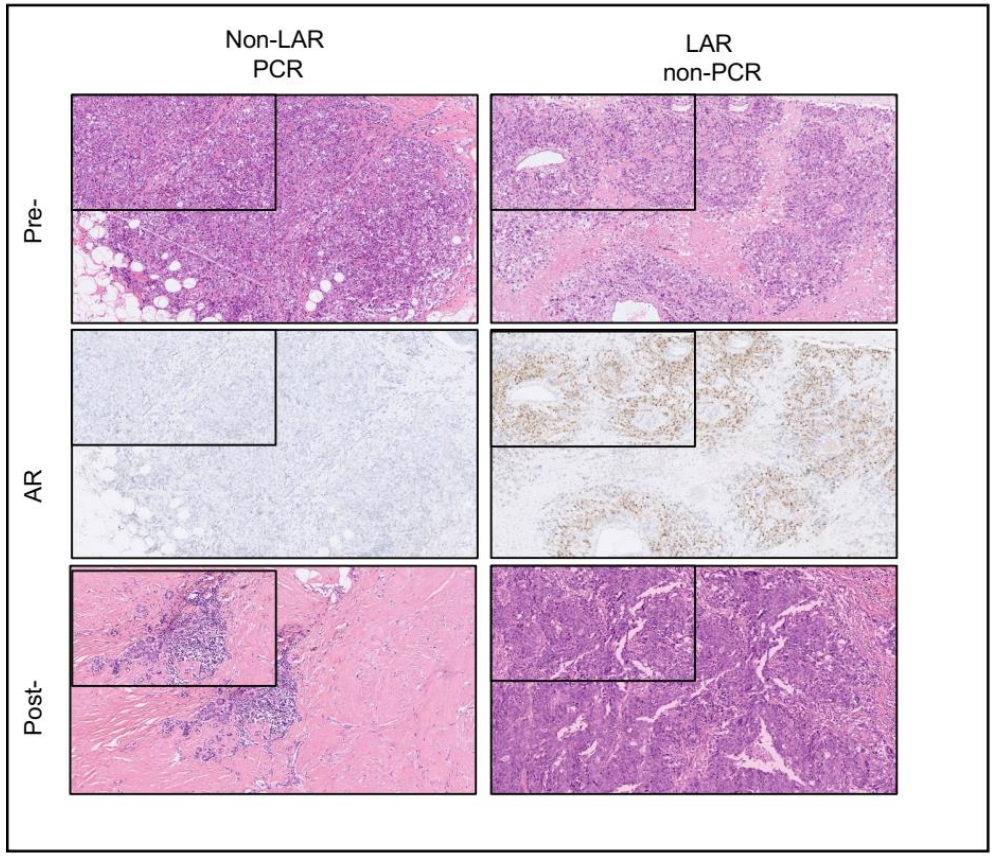
Creating a Better Pathologist

LAR subtype presented a lower pCR rate(12.68%) and lower MP grade compared to non-LAR subtype

			Non-LAR		LAR		
			n	%	n	%	
	226		155	68.58	71	31.42	
Pathological response							< 0.001
pCR	62	**27.43**	53	34.19	9	12.68	
Non-pCR	164	72.57	102	65.81	62	87.32	
Miller-Payne grade							0.003
G1	6	2.65	2	1.29	4	5.63	
G2	60	26.55	36	23.23	24	33.8	
G3	47	20.8	30	19.35	17	23.94	
G4	42	18.58	27	17.42	15	21.13	
G5	71	31.42	60	38.71	11	15.49	
Miller-Payne grade							0.016
≥90%	113	50	87	56.13	26	36.62	
< 90%	113	50	68	43.87	45	63.38	







Modern Pathology
https://doi.org/10.1038/s41379-020-0589-x

USCAP

ARTICLE

Invasive apocrine carcinoma of the breast: clinicopathologic features and comprehensive genomic profiling of 18 pure triple-negative apocrine carcinomas

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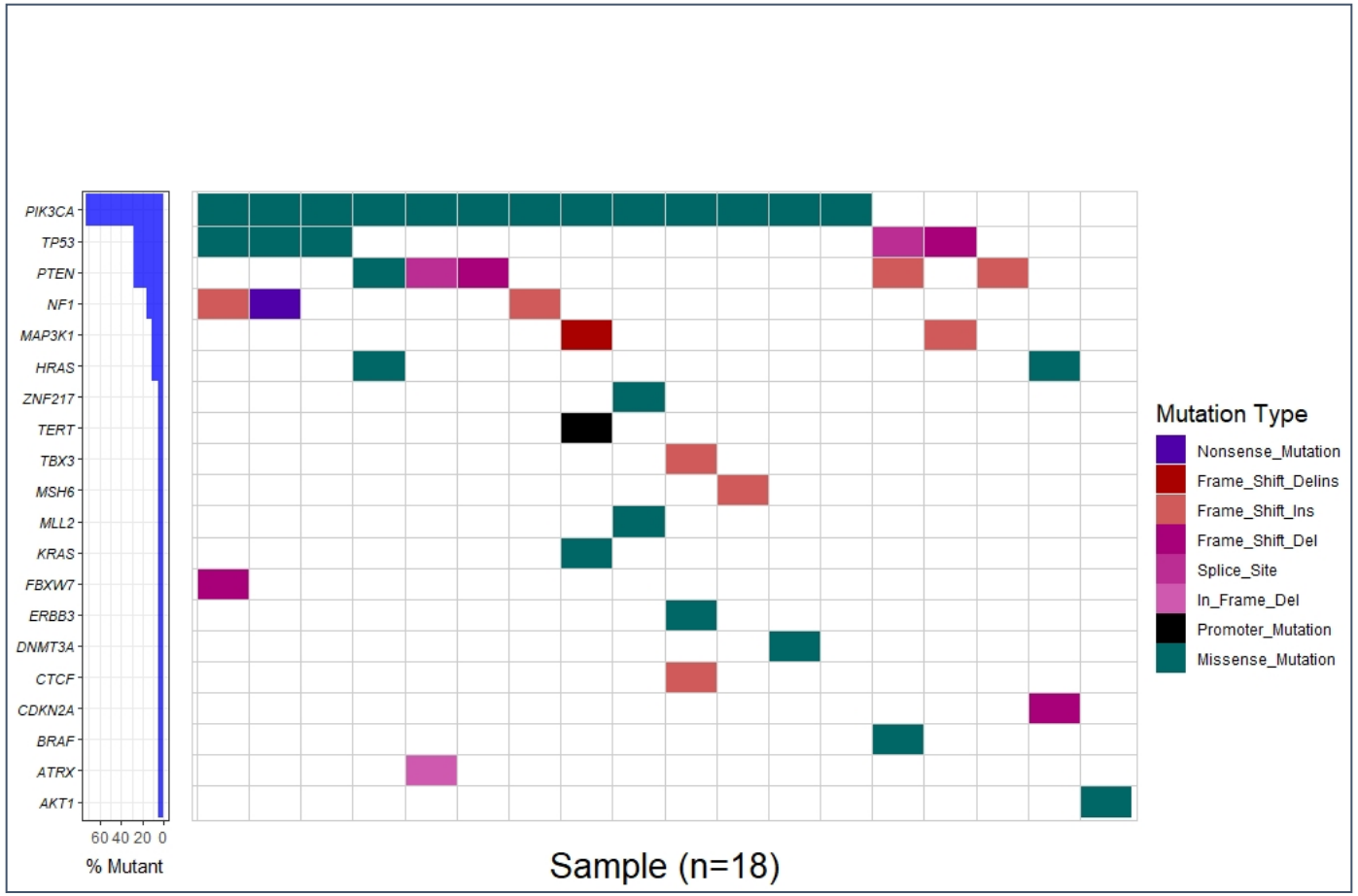
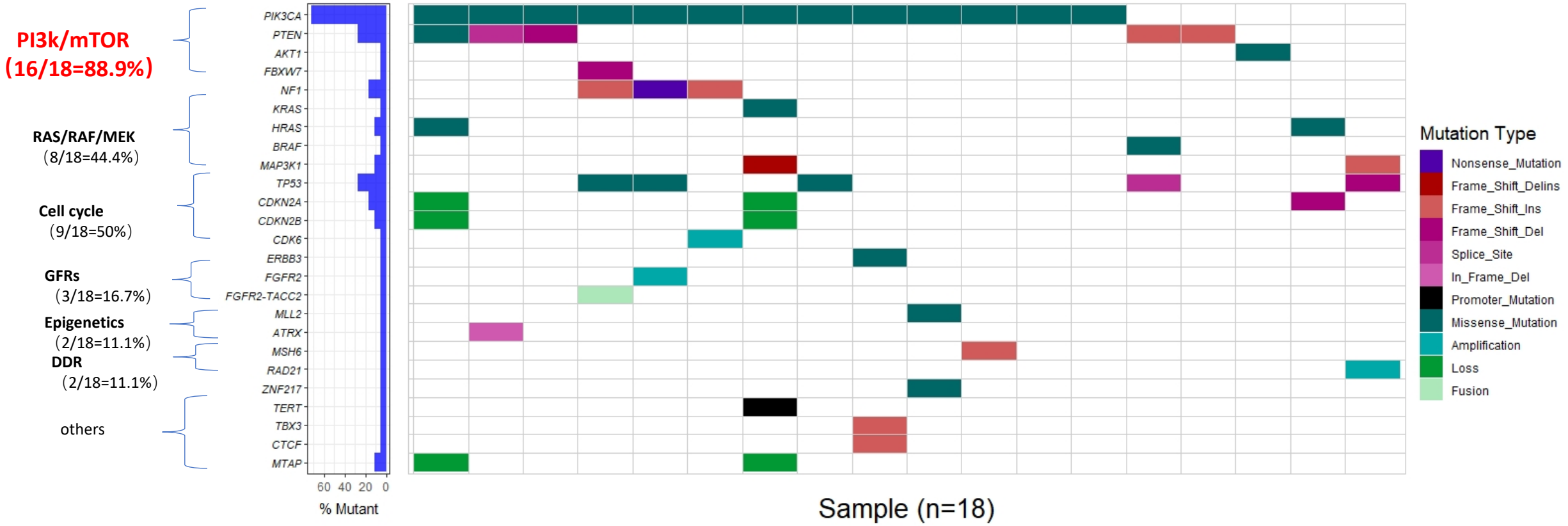


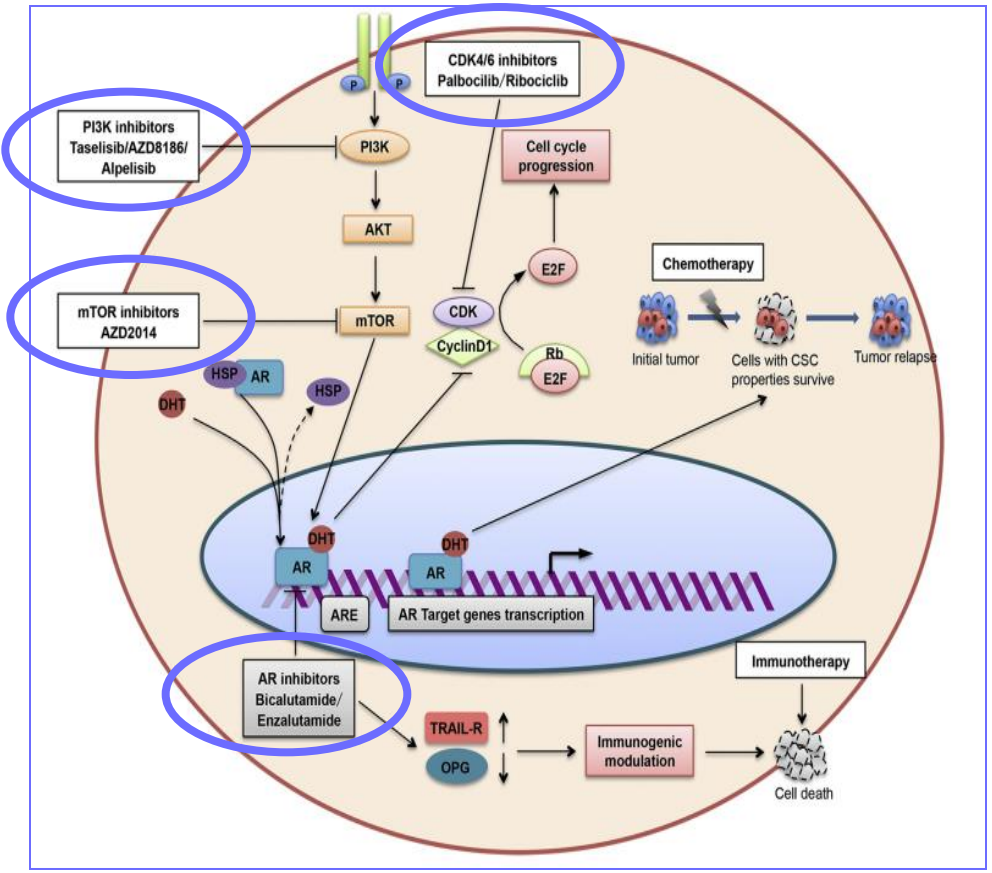
Gene	SNV	CNV_	Rearrangement_count	Sum	Percent
PIK3CA	13	0	0	13	0.72
PTEN	5	1	0	6	0.33
TP53	5	0	0	5	0.28
CDKN2A	1	2	0	3	0.17
NF1	3	0	0	3	0.17
HRAS	2	0	0	2	0.11
MAP3K1	2	0	0	2	0.11
CDKN2B	0	2	0	2	0.11
MTAP	0	2	0	2	0.11
FGFR2	0	1	1	2	0.11
BRAF	1	0	0	1	0.06
MLL2	1	0	0	1	0.06
ZNF217	1	0	0	1	0.06
DNMT3A	1	0	0	1	0.06
ERBB3	1	0	0	1	0.06
TERT	1	0	0	1	0.06
KRAS	1	0	0	1	0.06
AKT1	1	0	0	1	0.06
FBXW7	1	0	0	1	0.06
TBX3	1	0	0	1	0.06
CTCF	1	0	0	1	0.06
MSH6	1	0	0	1	0.06
ATRX	1	0	0	1	0.06
RAD21	0	1	0	1	0.06
CDK6	0	1	0	1	0.06

NGS Study of Invasive Apocrine Carcinoma ---- FUSCC

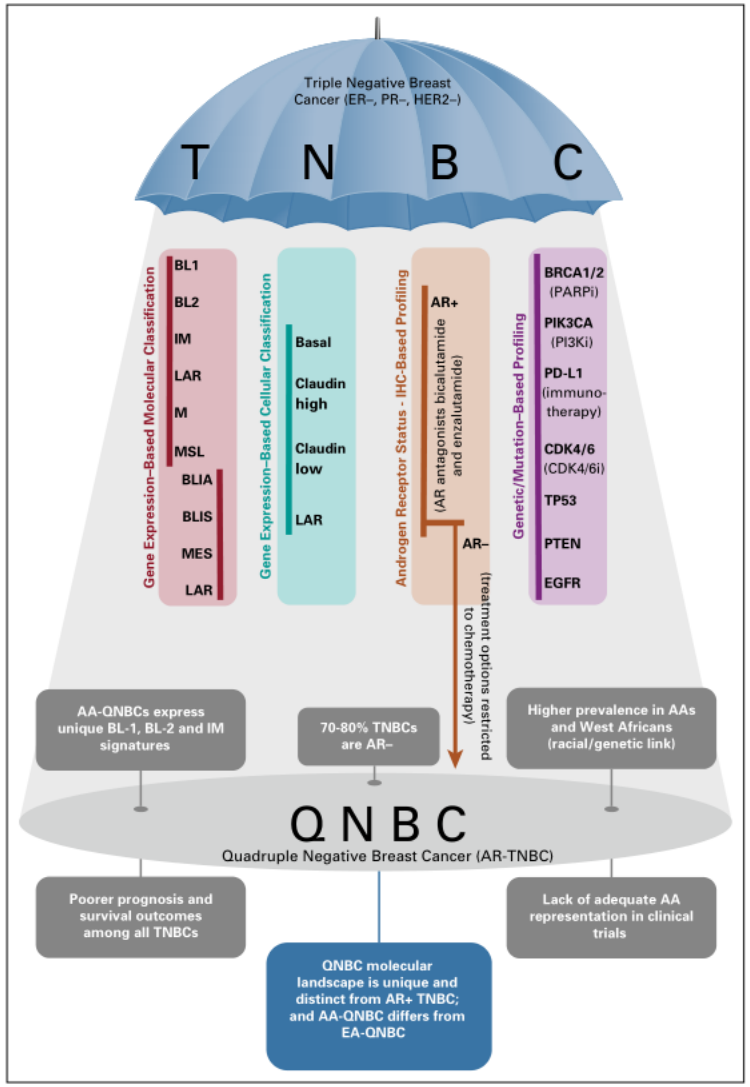


Three patients had concurrent PIK3CA and PTEN mutations

QNBC (Quadruple Negative Breast Cancer)



- CDK4/6 inhibitors
- PI3K inhibitors
- mTOR inhibitors
- AR antagonists



- AR-Negative TNBC
- 70-80% of all TNBC cases
- Distinct genomic alterations from AR+ TNBC

Biochim Biophys Acta Rev Cancer. 2018;1870(2):283-290


Thank you