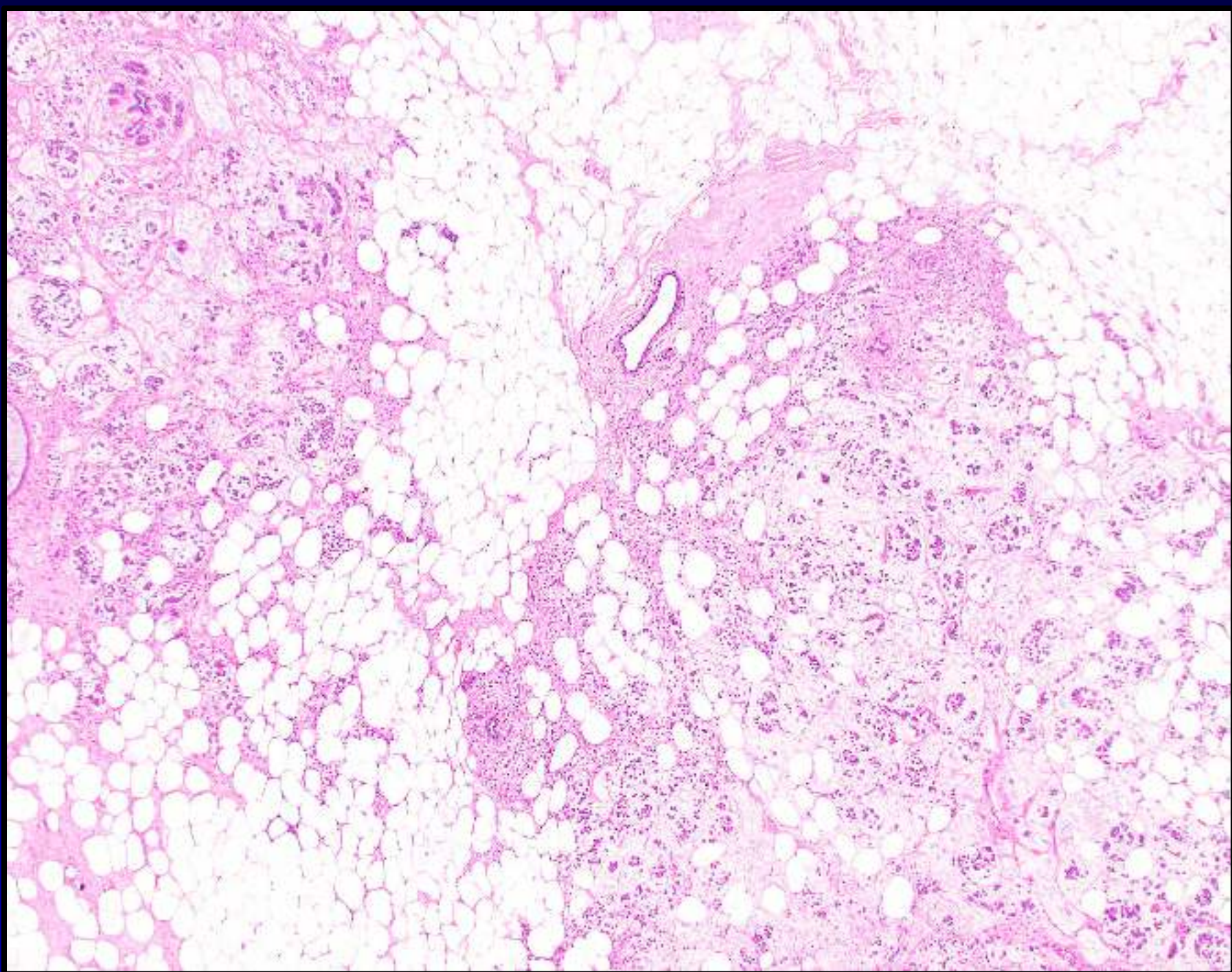
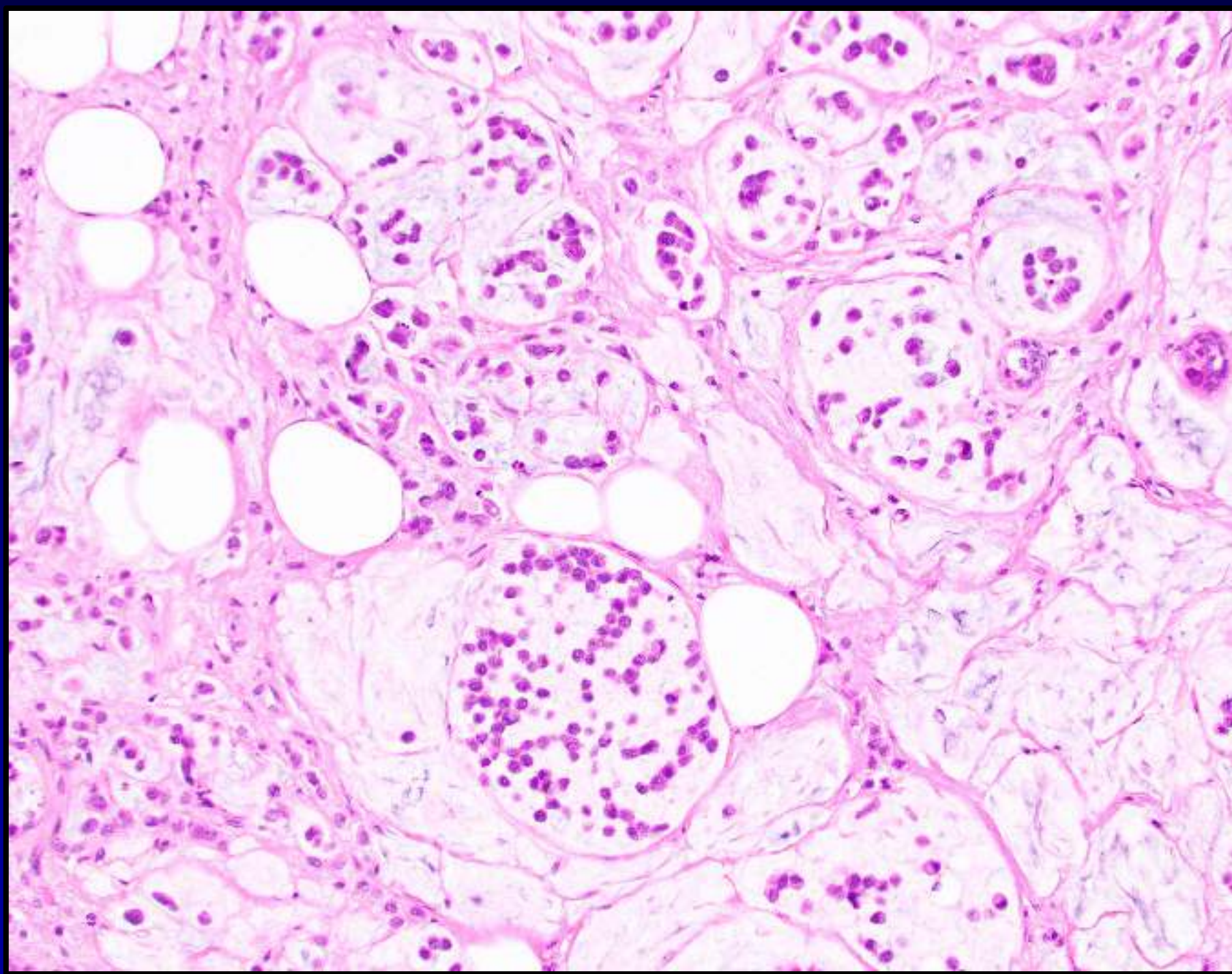
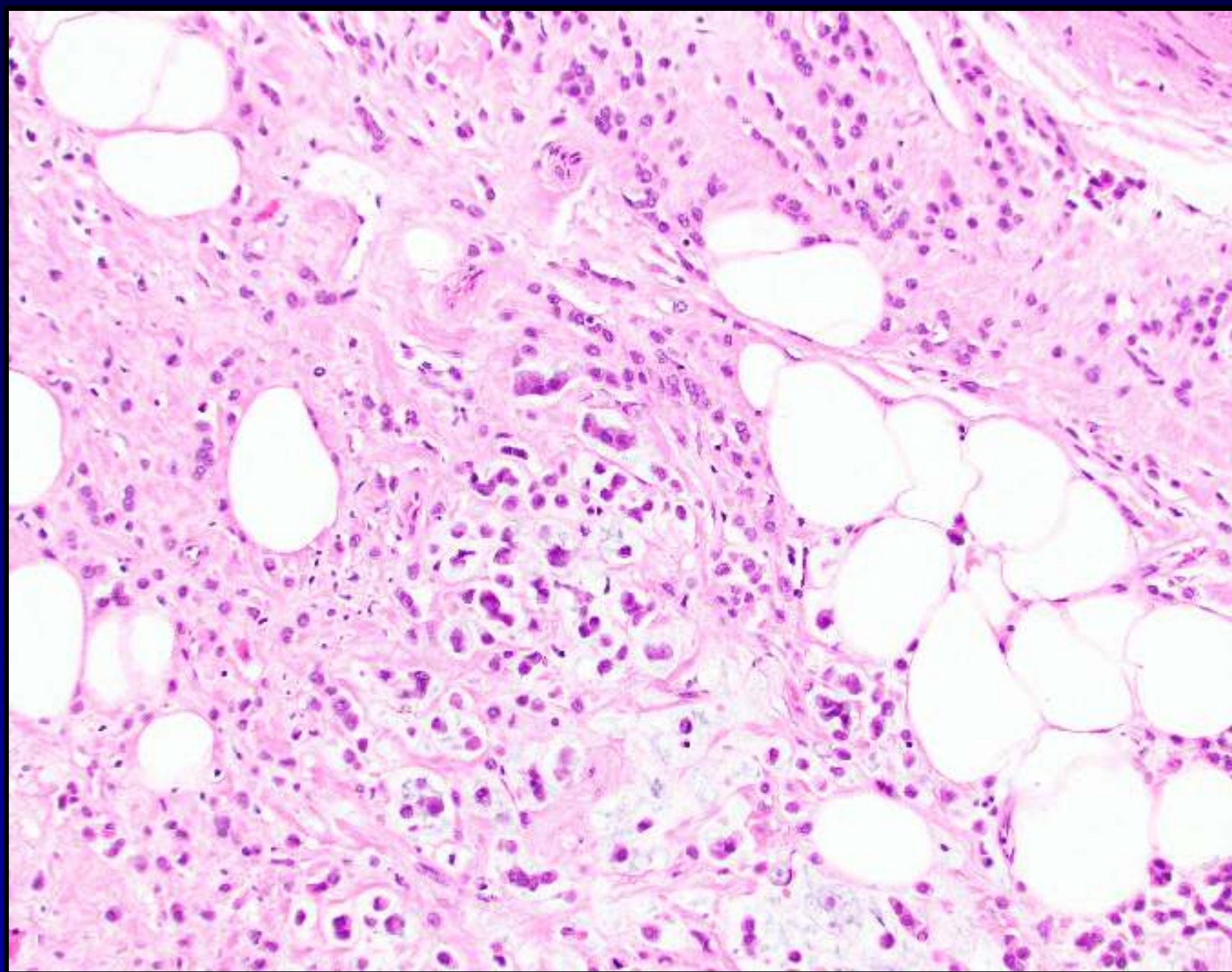


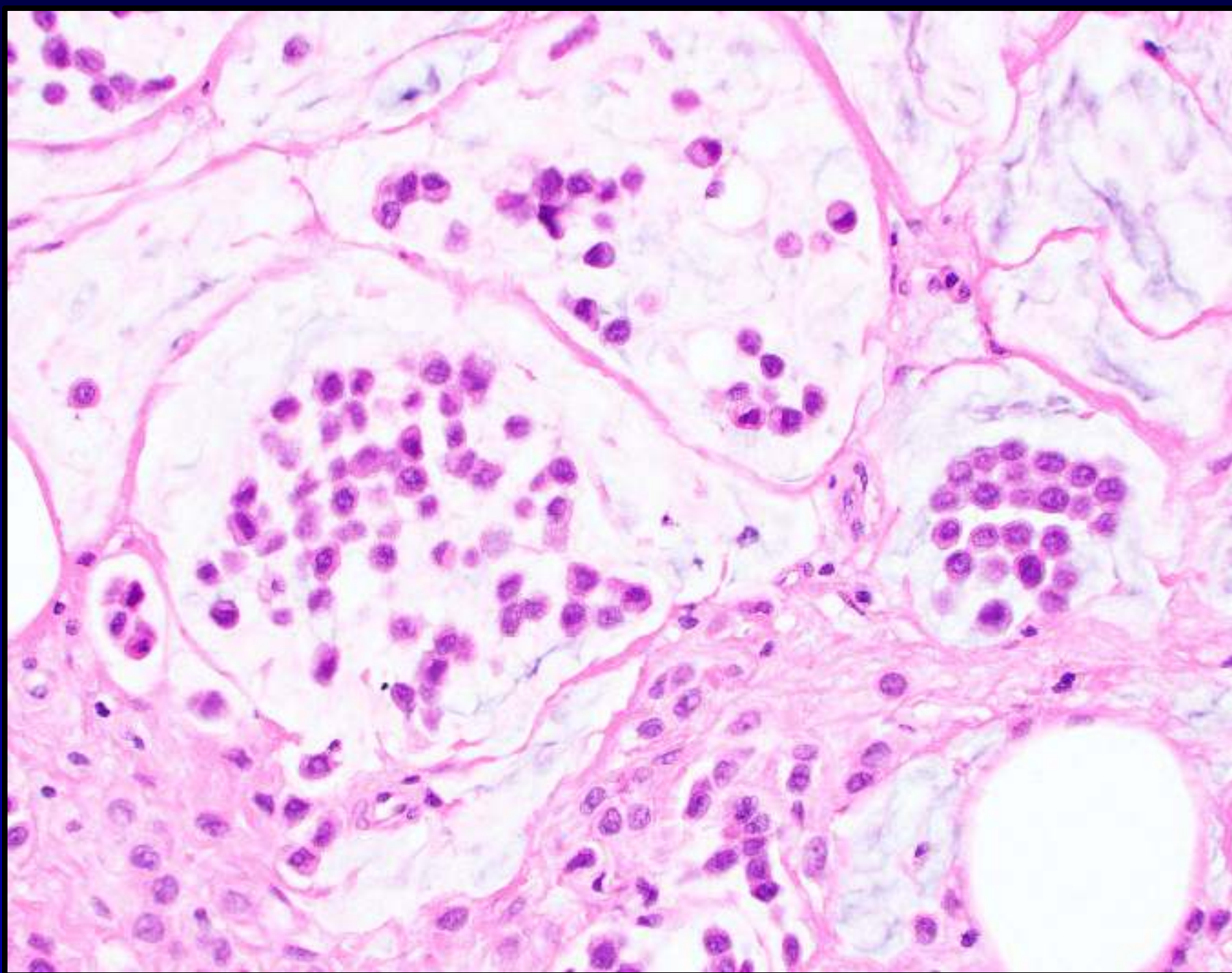
Case 3

- **A 58 year old female presented with an ill-defined mass on a screening mammogram.**
- **A core needle biopsy showed “mucinous carcinoma”.**
- **The images are from the subsequent surgical excision.**





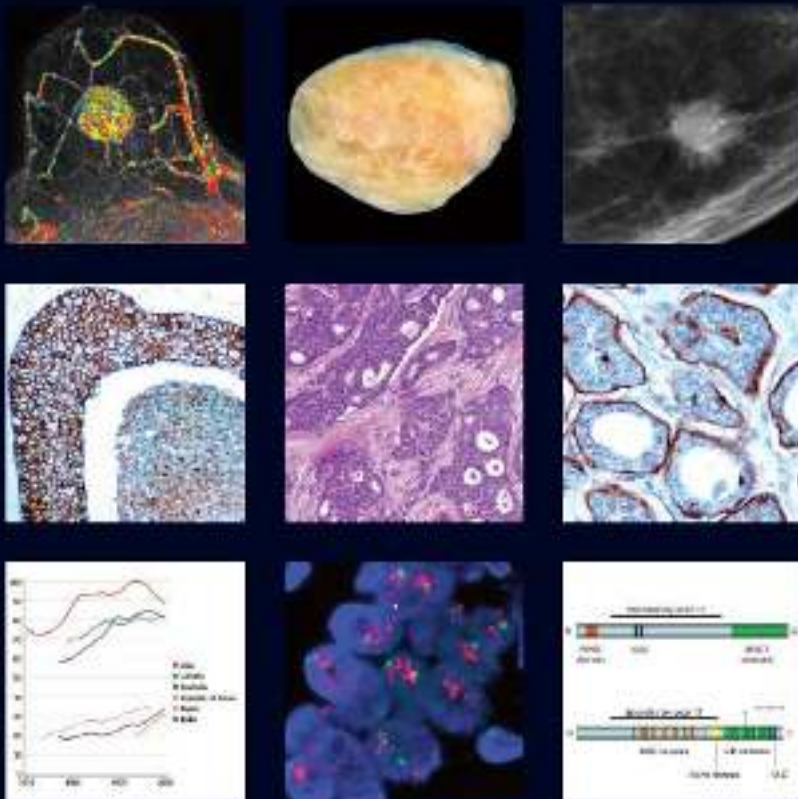




Mucinous Carcinoma?

WHO Classification of Tumours of the Breast

Edited by Sunil R. Lakhani, Ian O. Ellis, Stuart J. Schnitt, Puay Hoon Tan, Marc J. van de Vijver

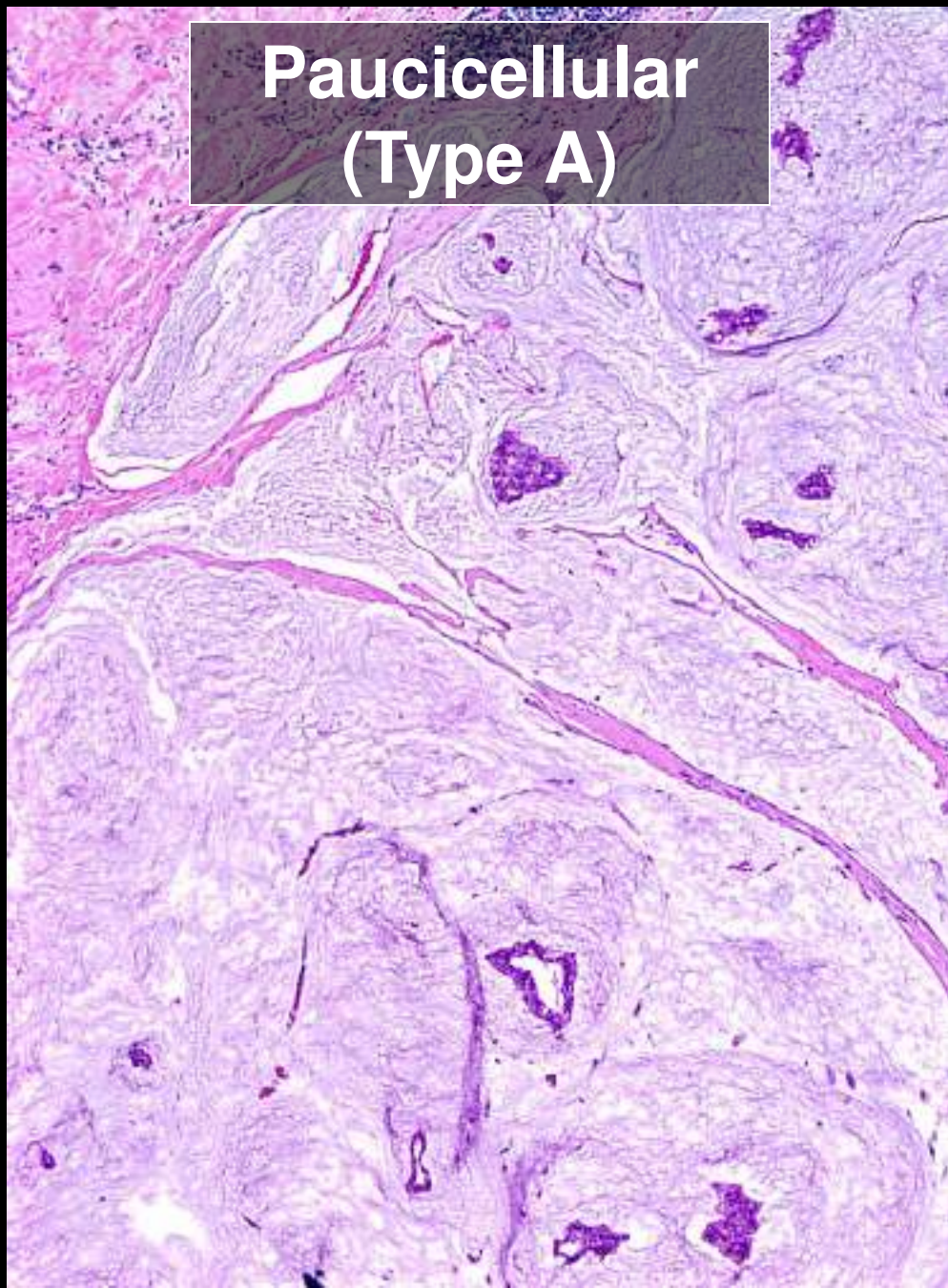


Mucinous carcinoma

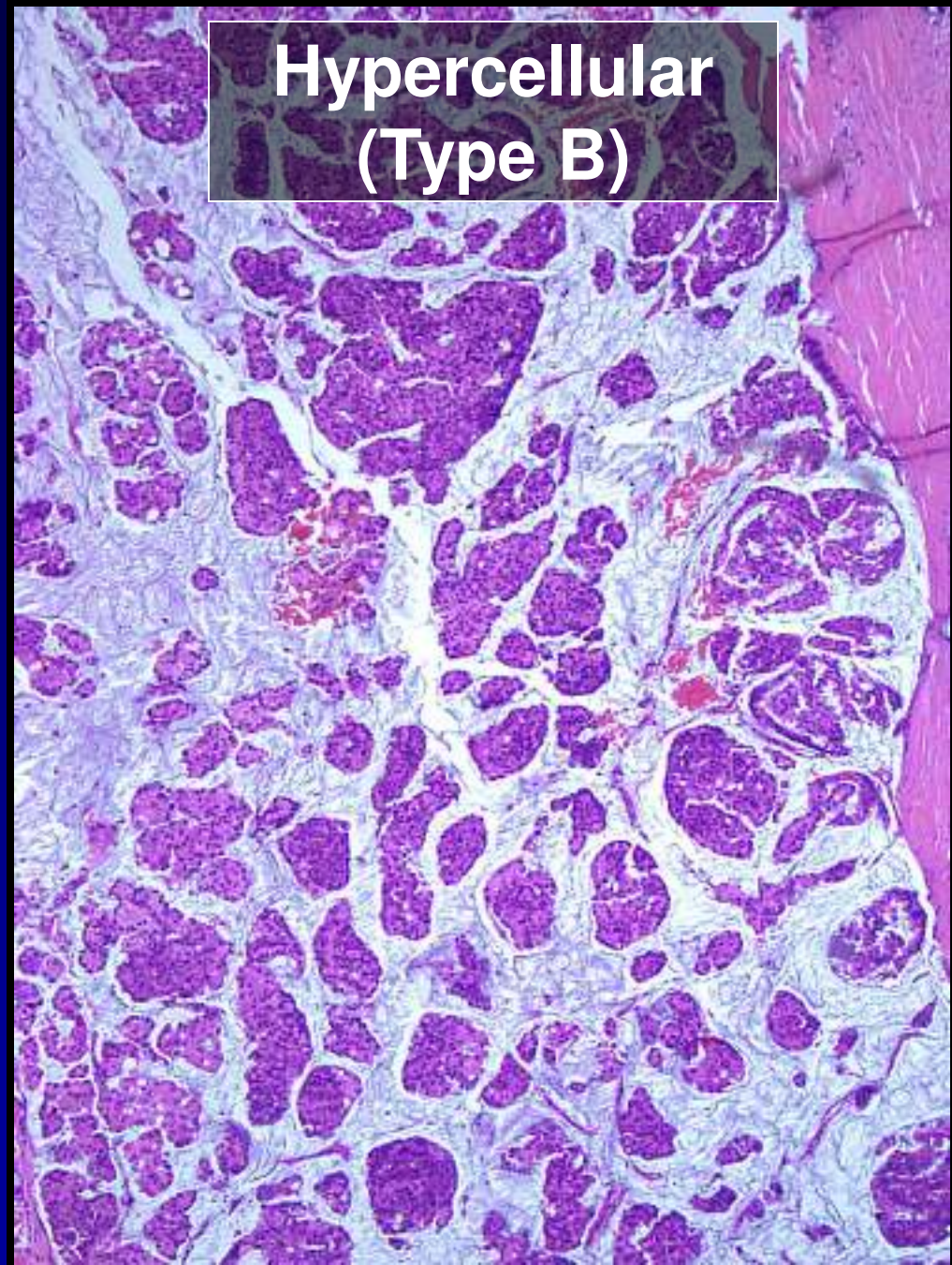
Definition

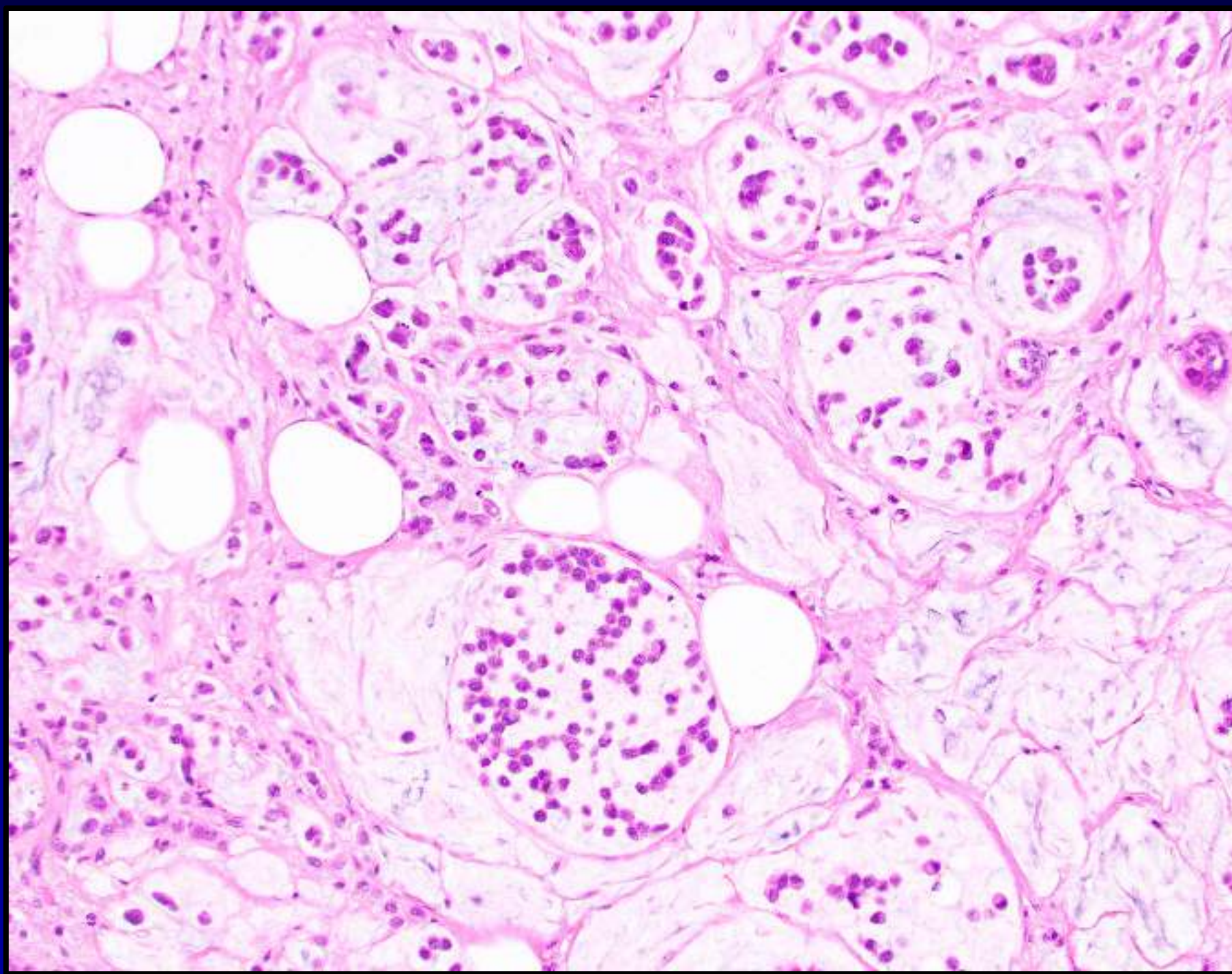
Mucinous carcinoma is characterized by clusters of generally small and uniform cells floating in large amounts of extra-cellular mucin.

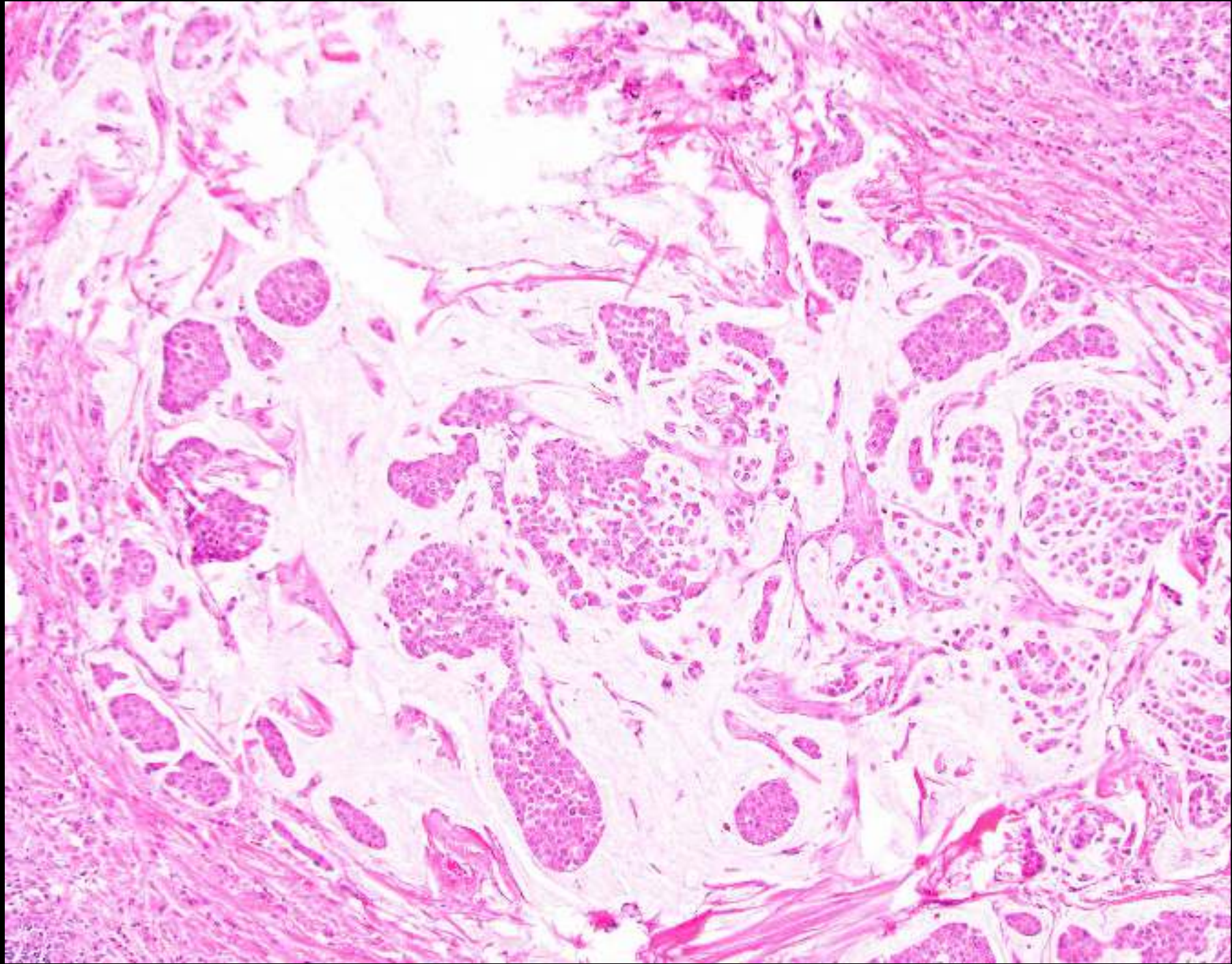
**Paucicellular
(Type A)**

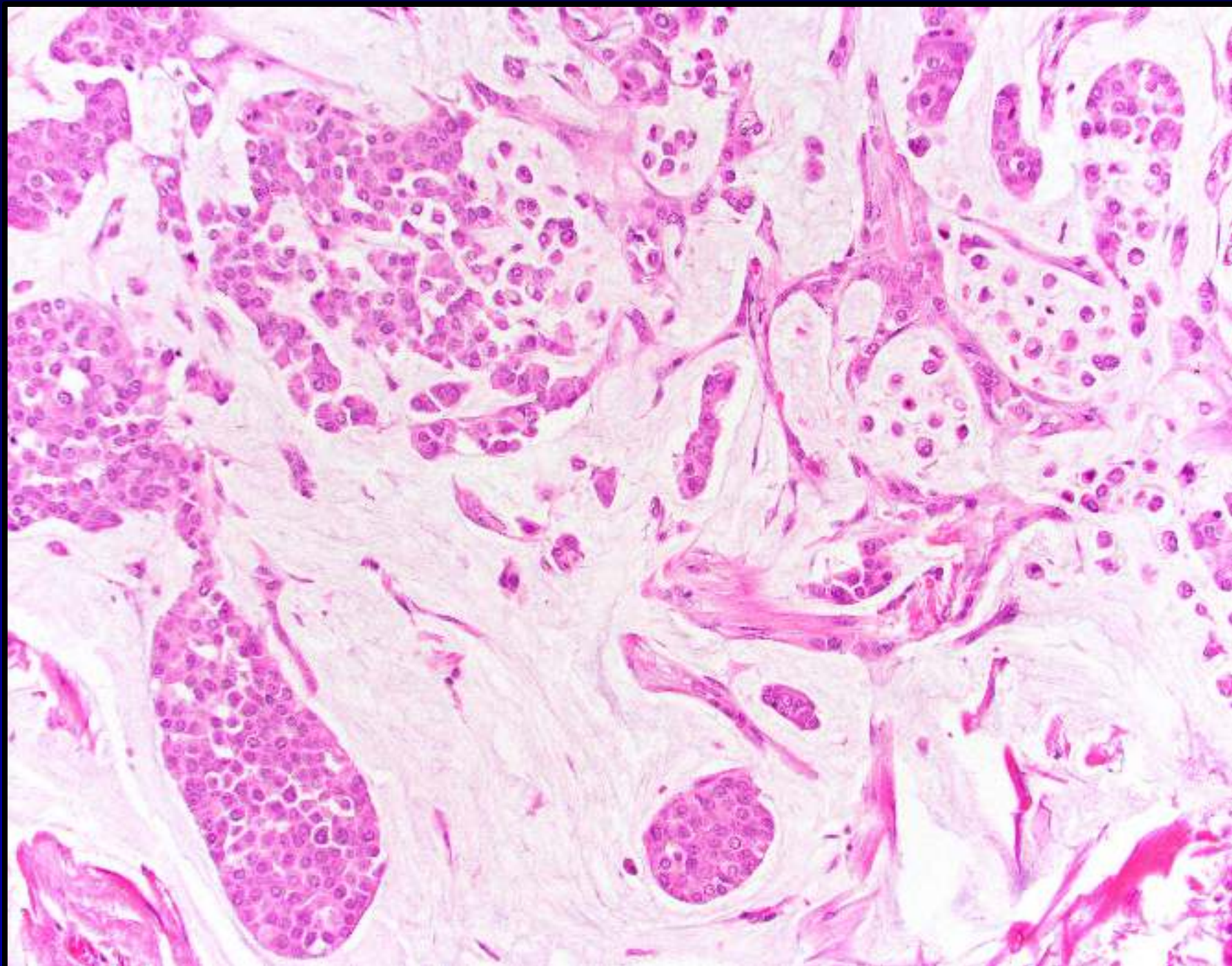


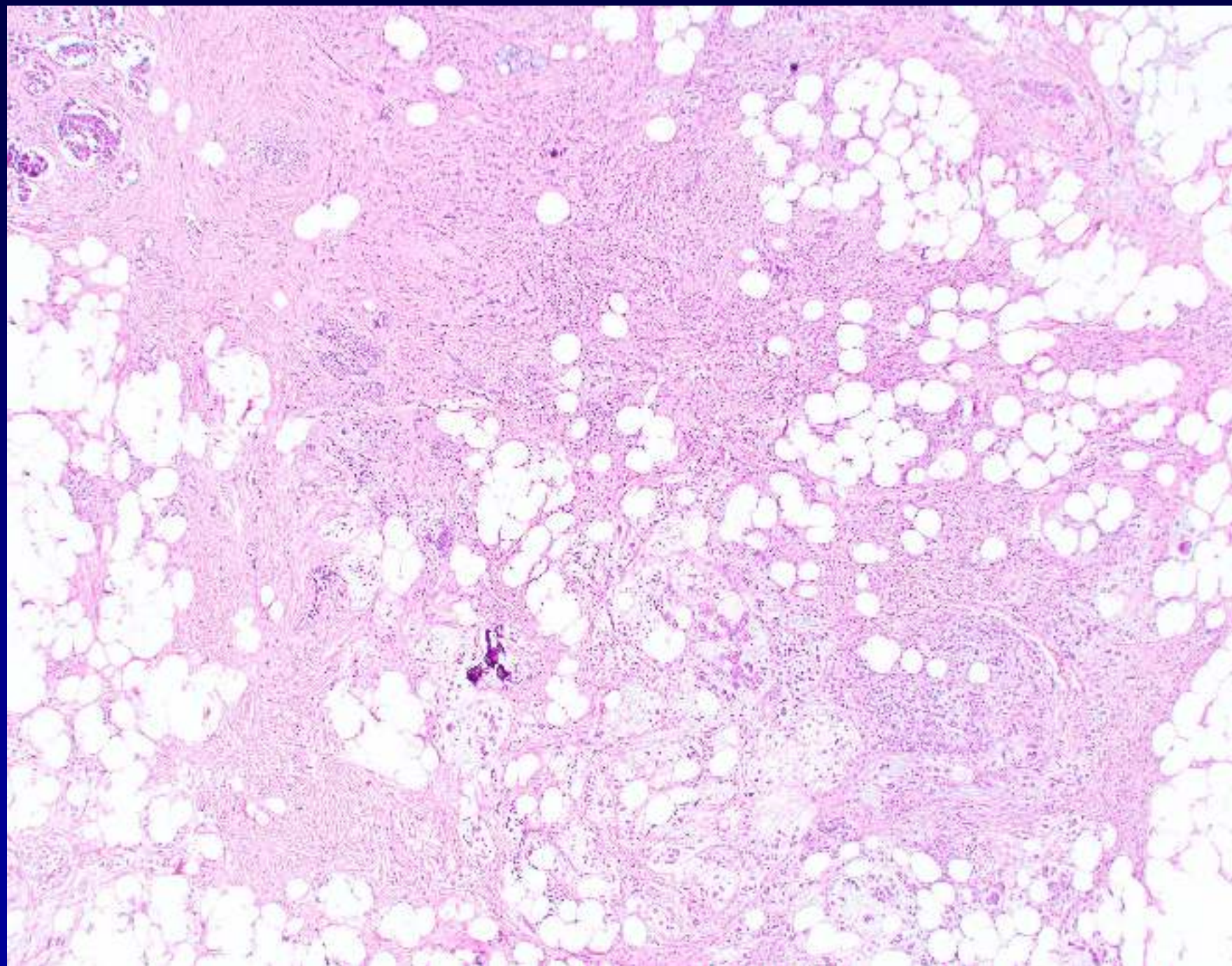
**Hypercellular
(Type B)**

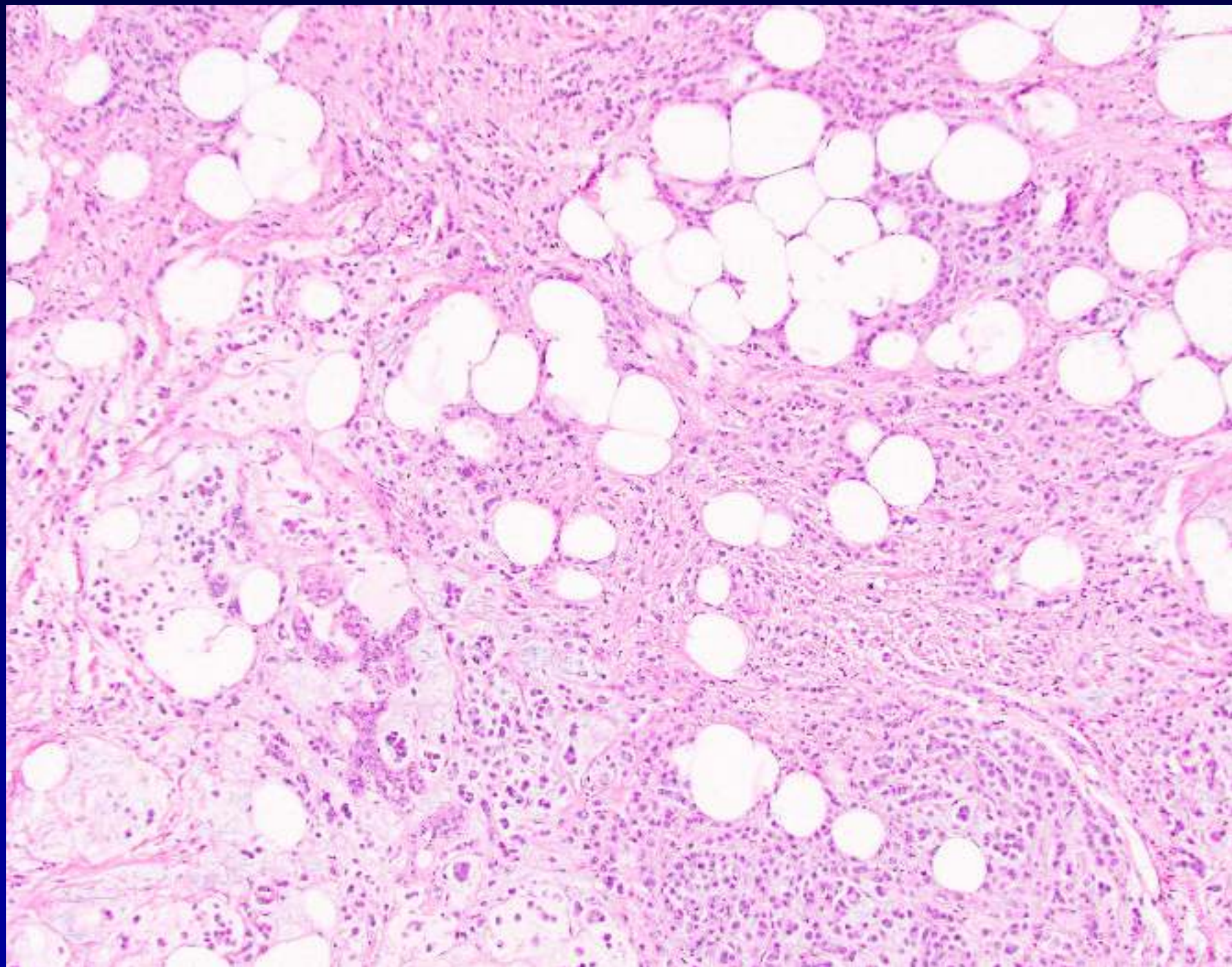


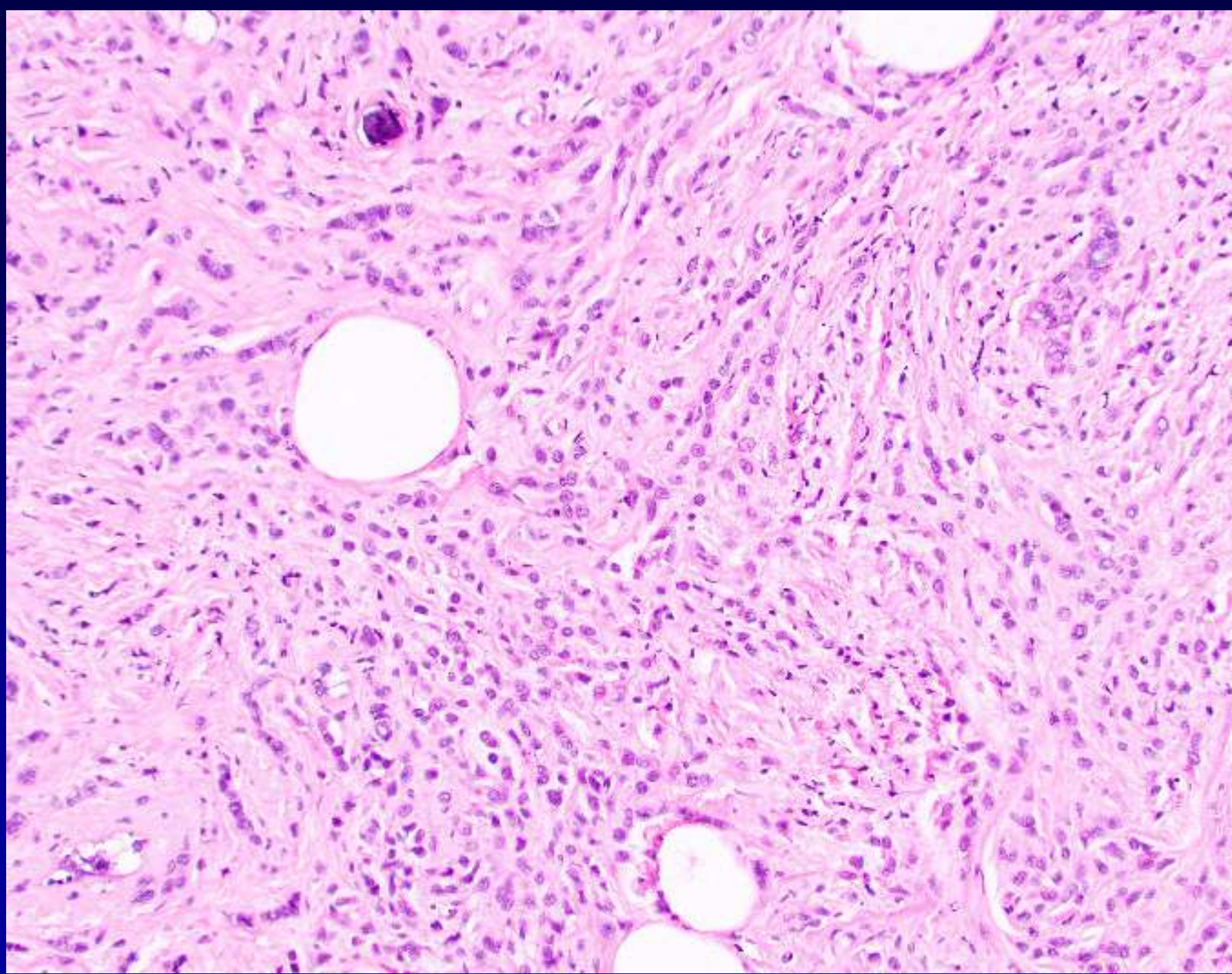


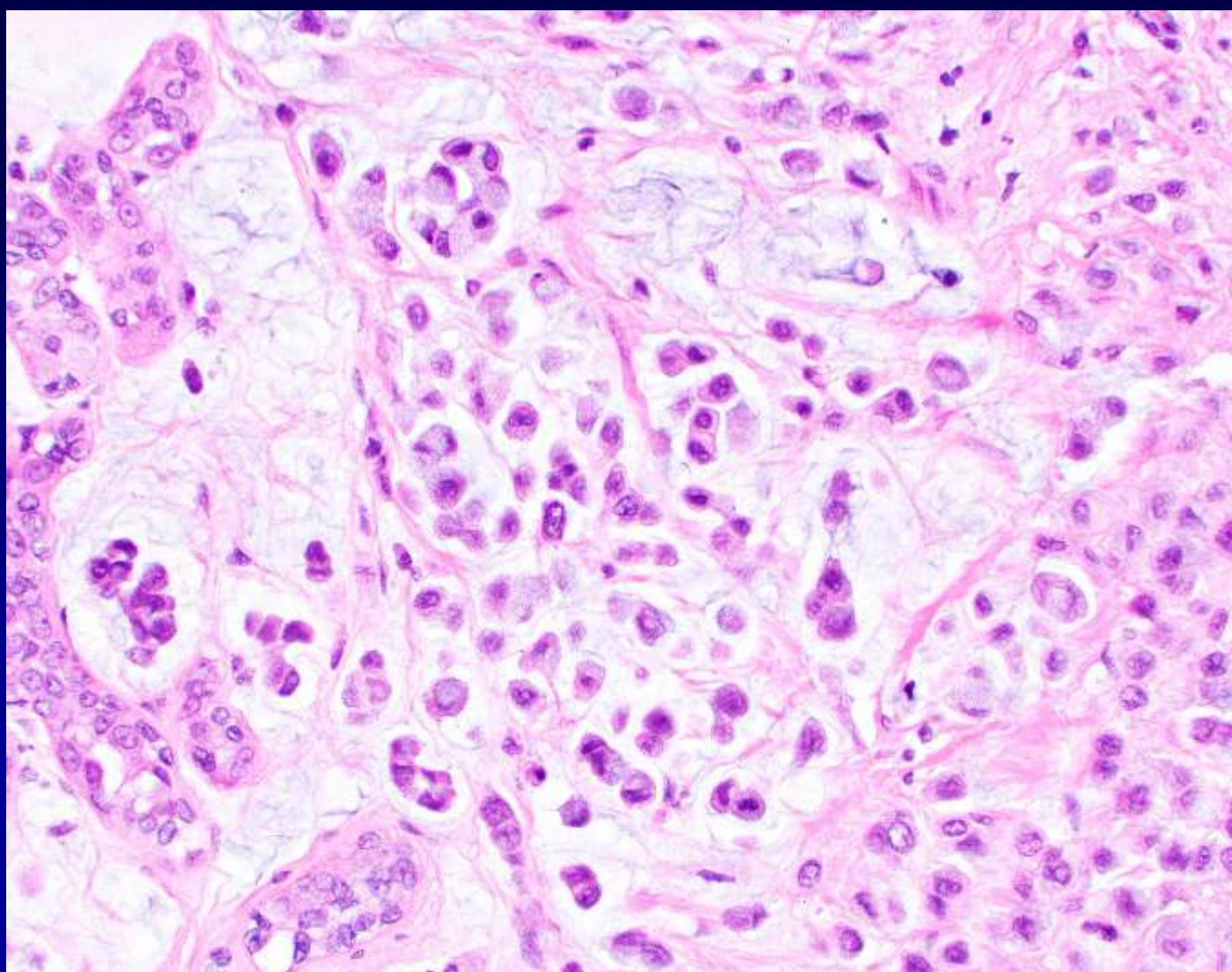


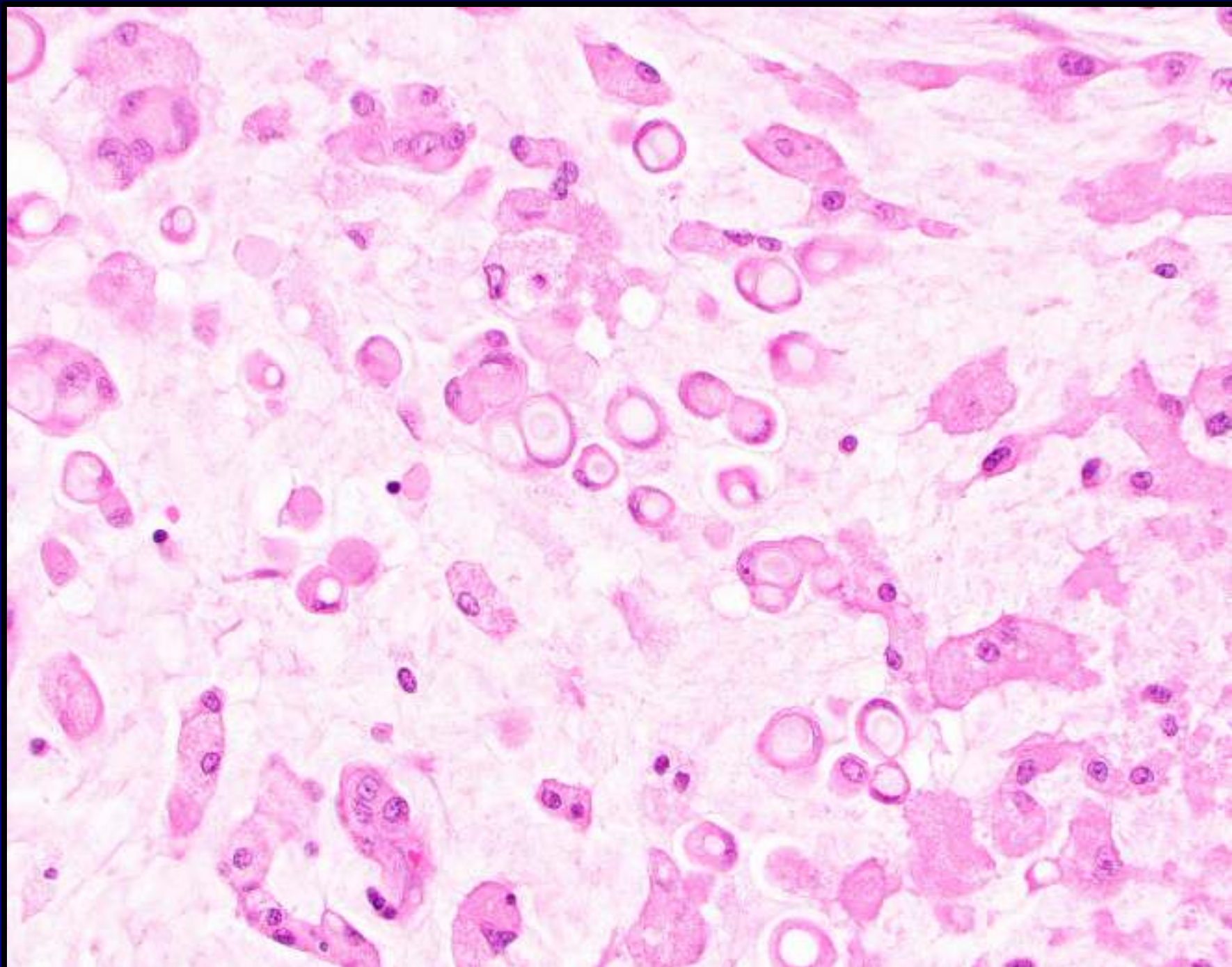


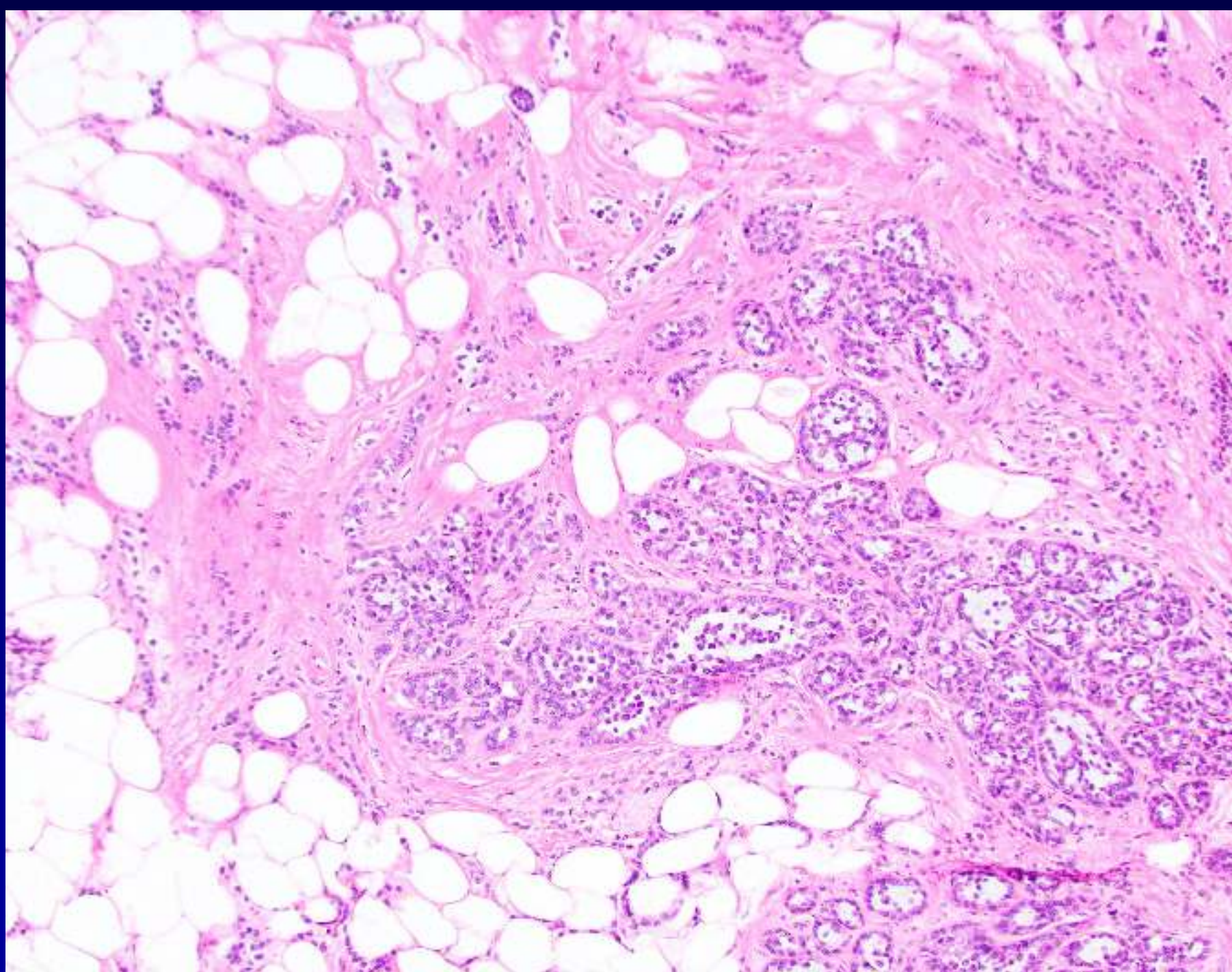


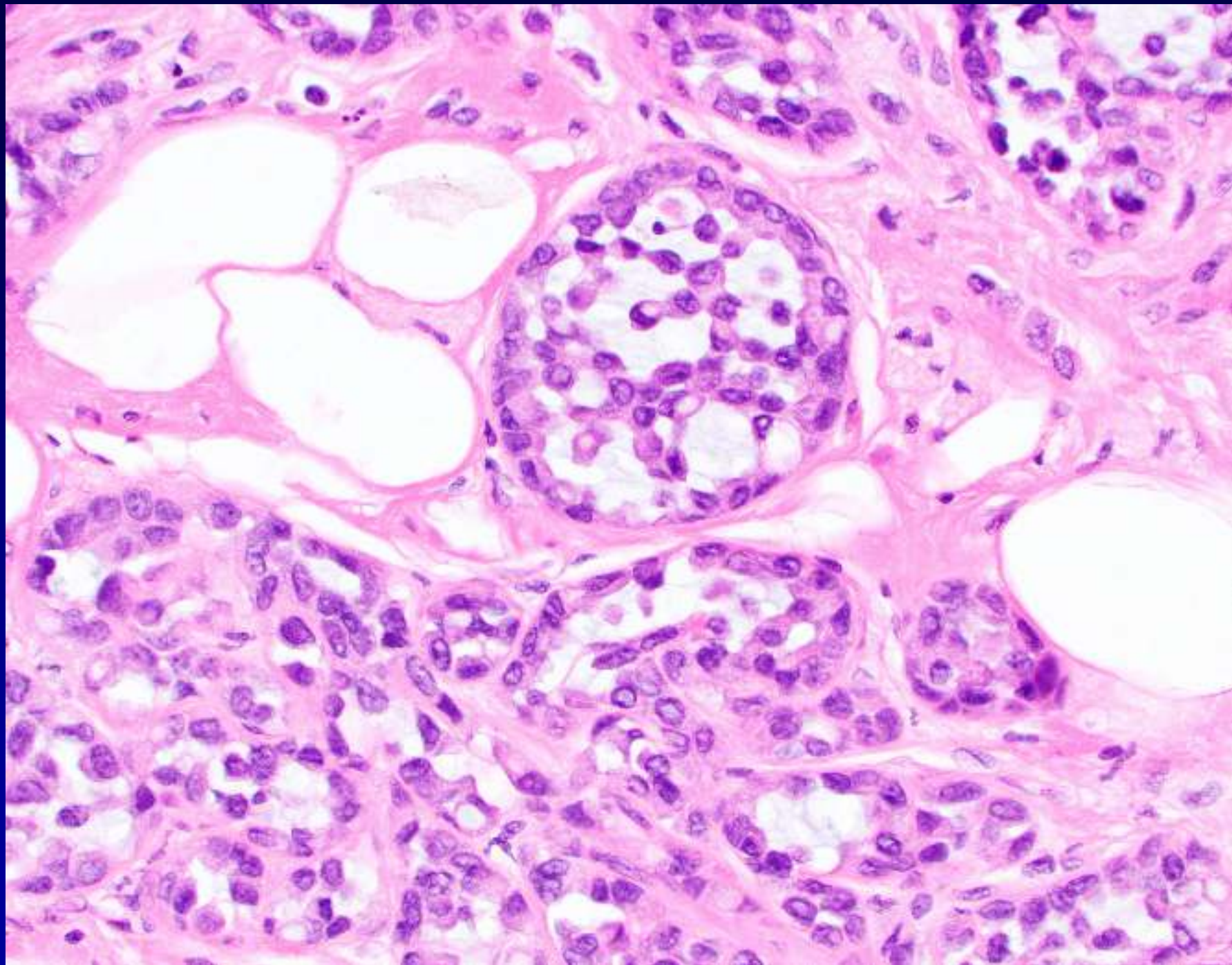




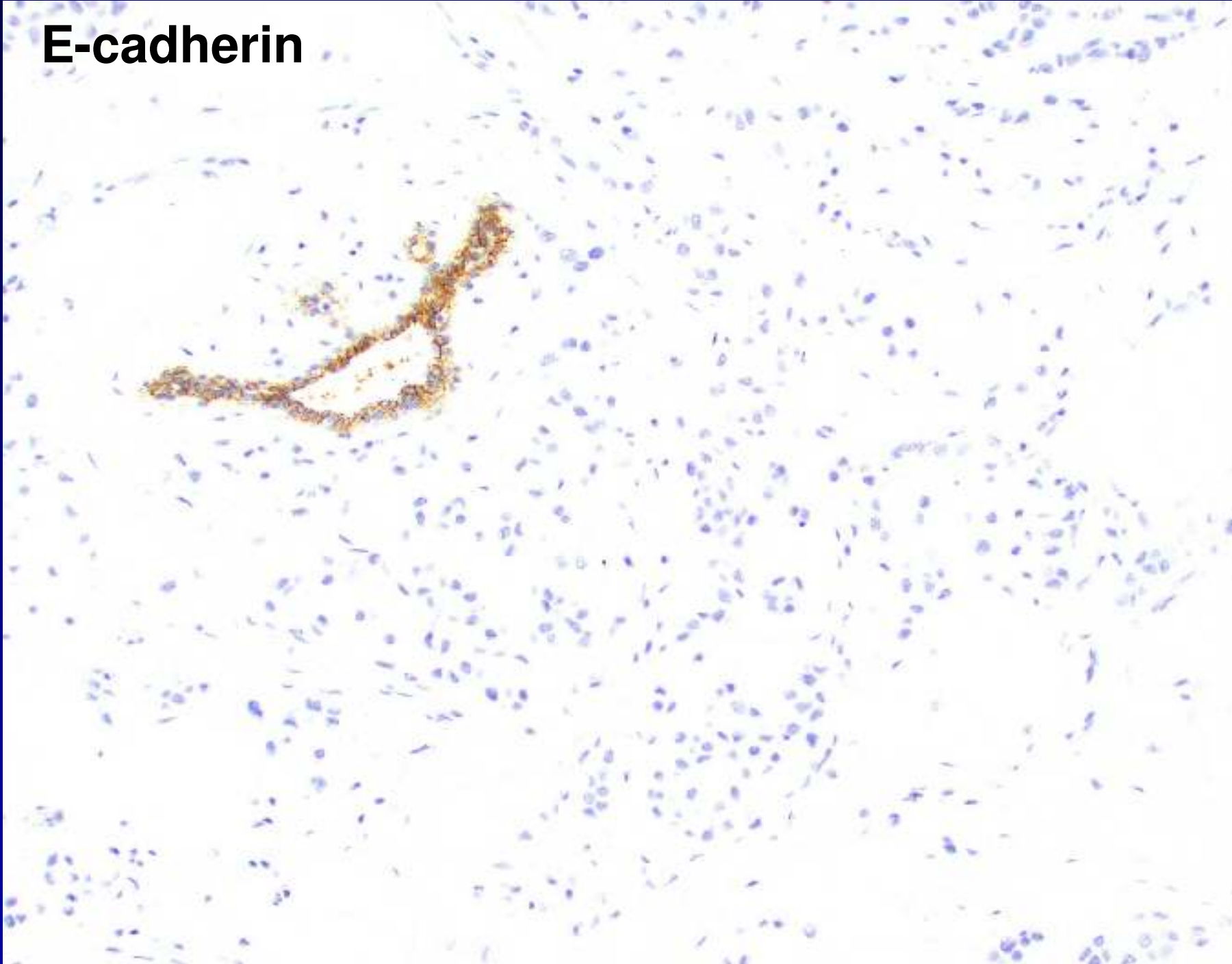








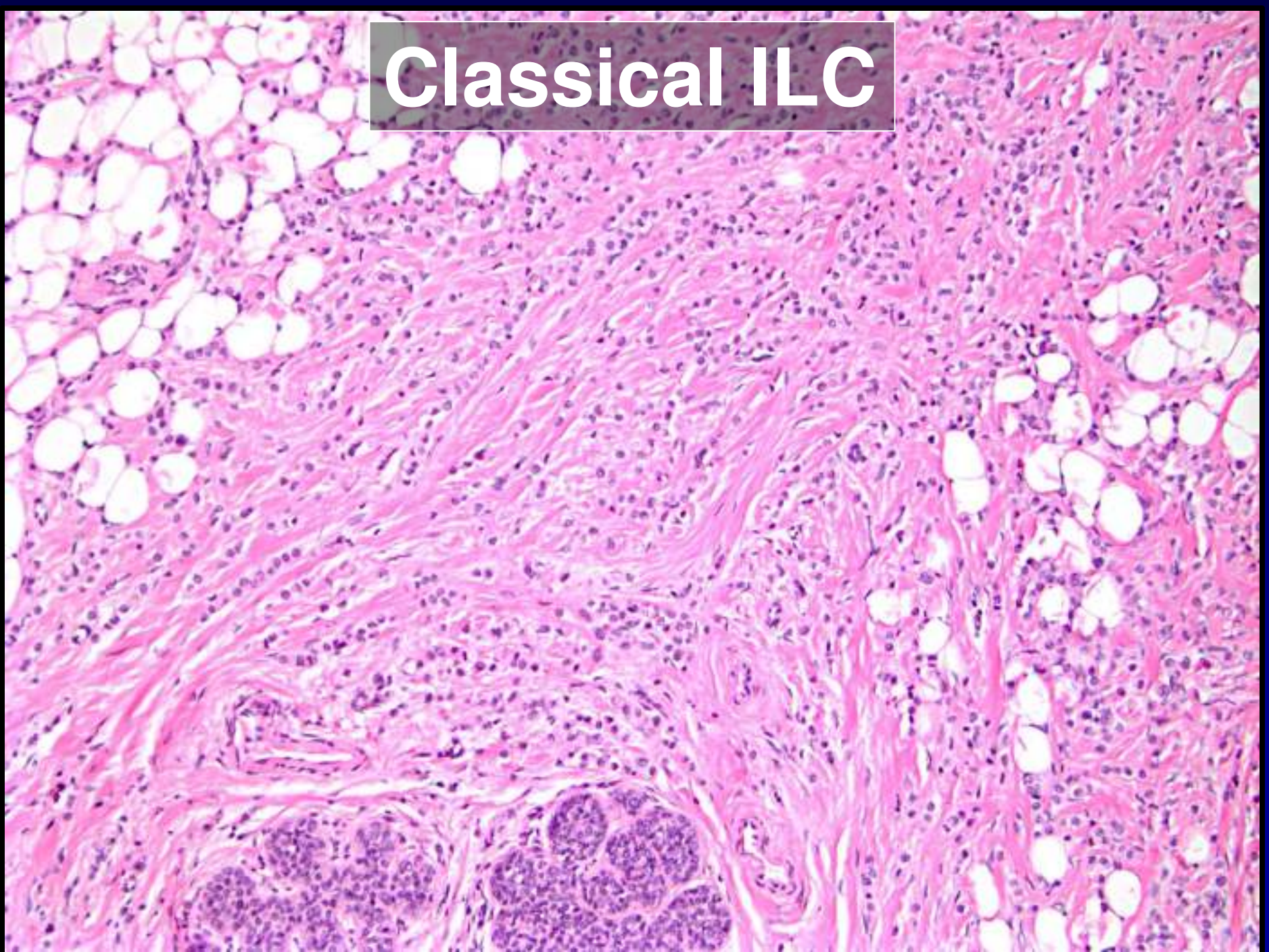
E-cadherin



Diagnosis

**Invasive Lobular Carcinoma
with Extracellular Mucin**

Classical ILC



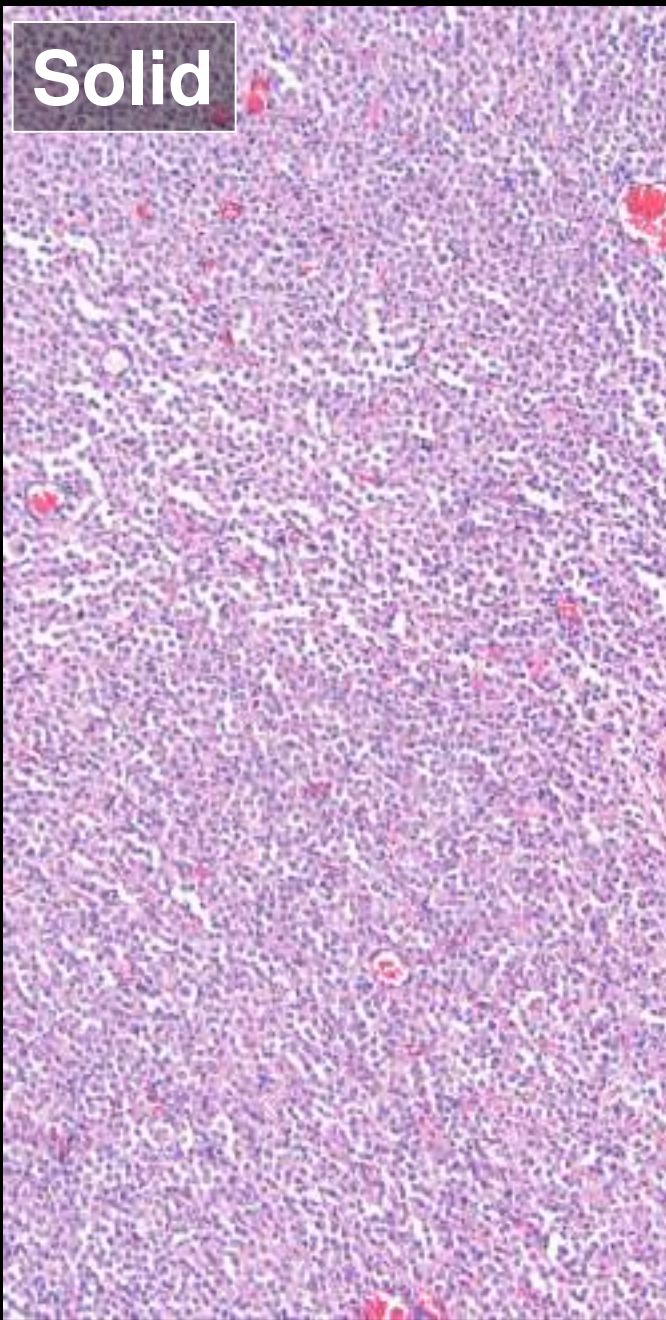
Variants of Invasive Lobular Carcinoma

- Architecture
- Cytology

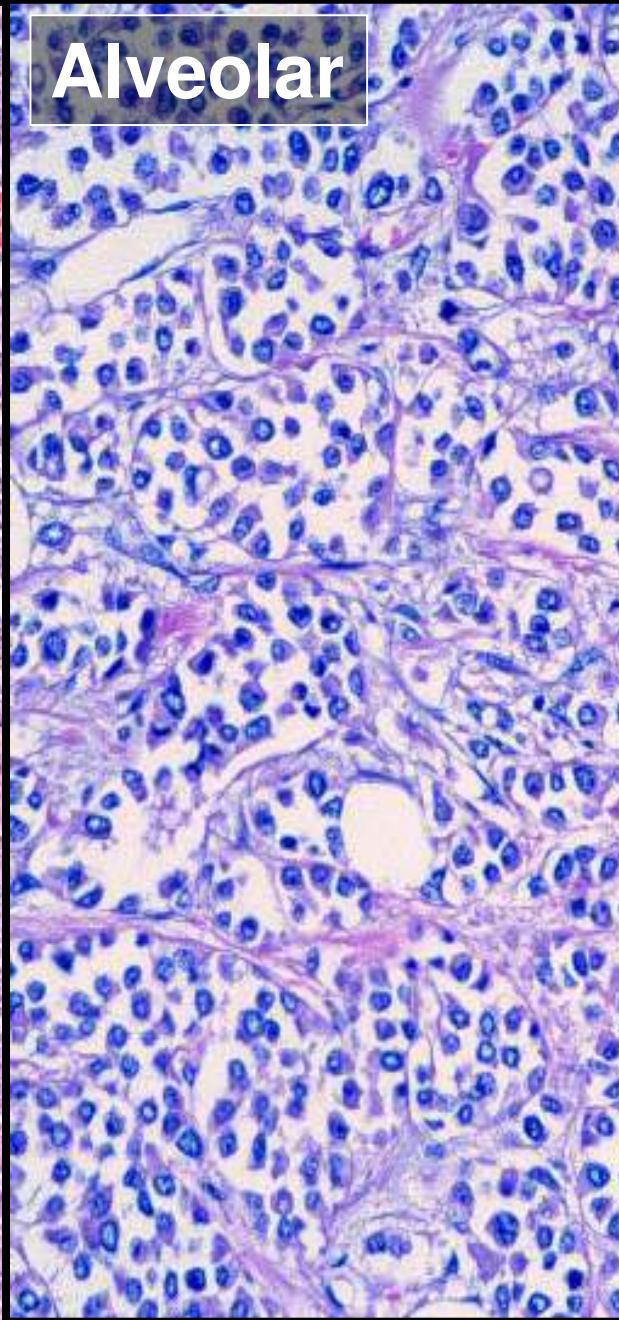
Variants of Invasive Lobular Carcinoma

- **Architecture**
 - **Solid**
 - **Alveolar**
 - **Tubulolobular**

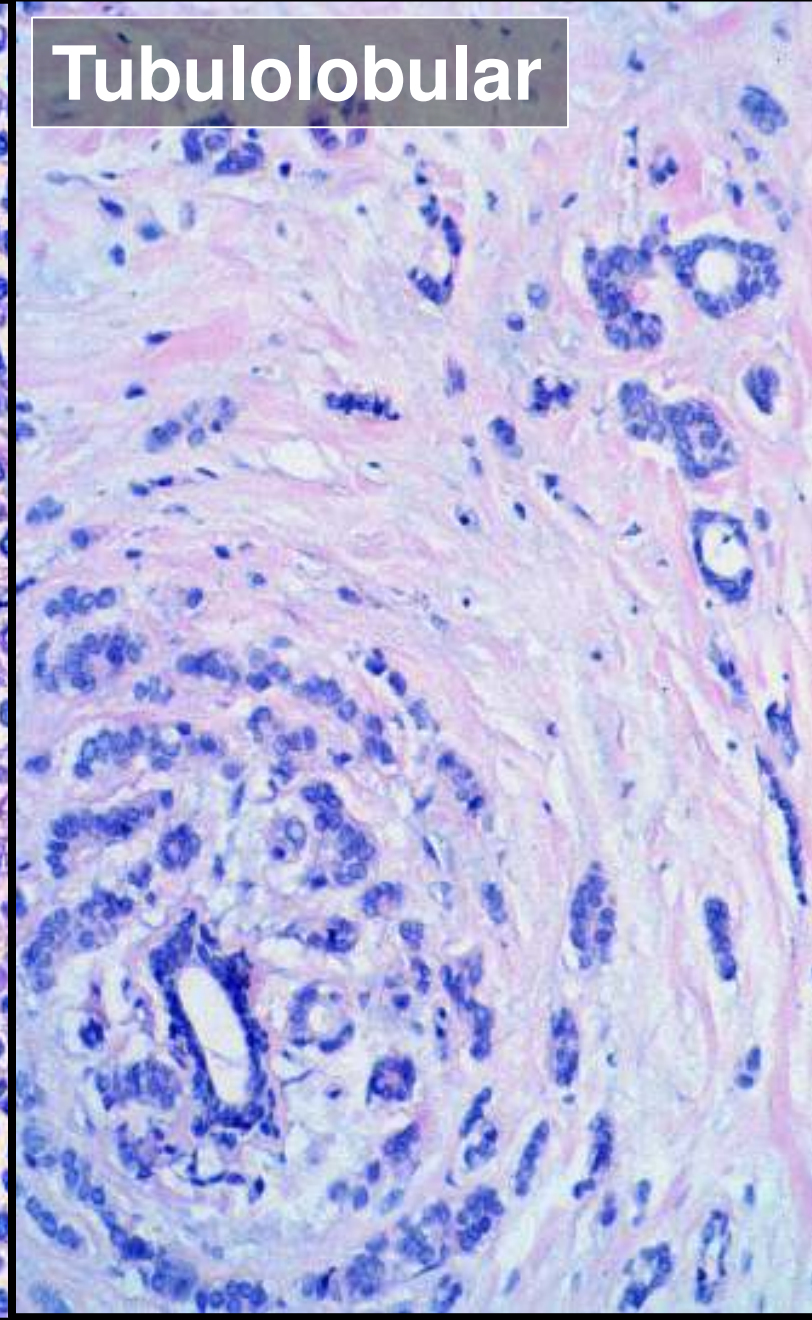
Solid



Alveolar



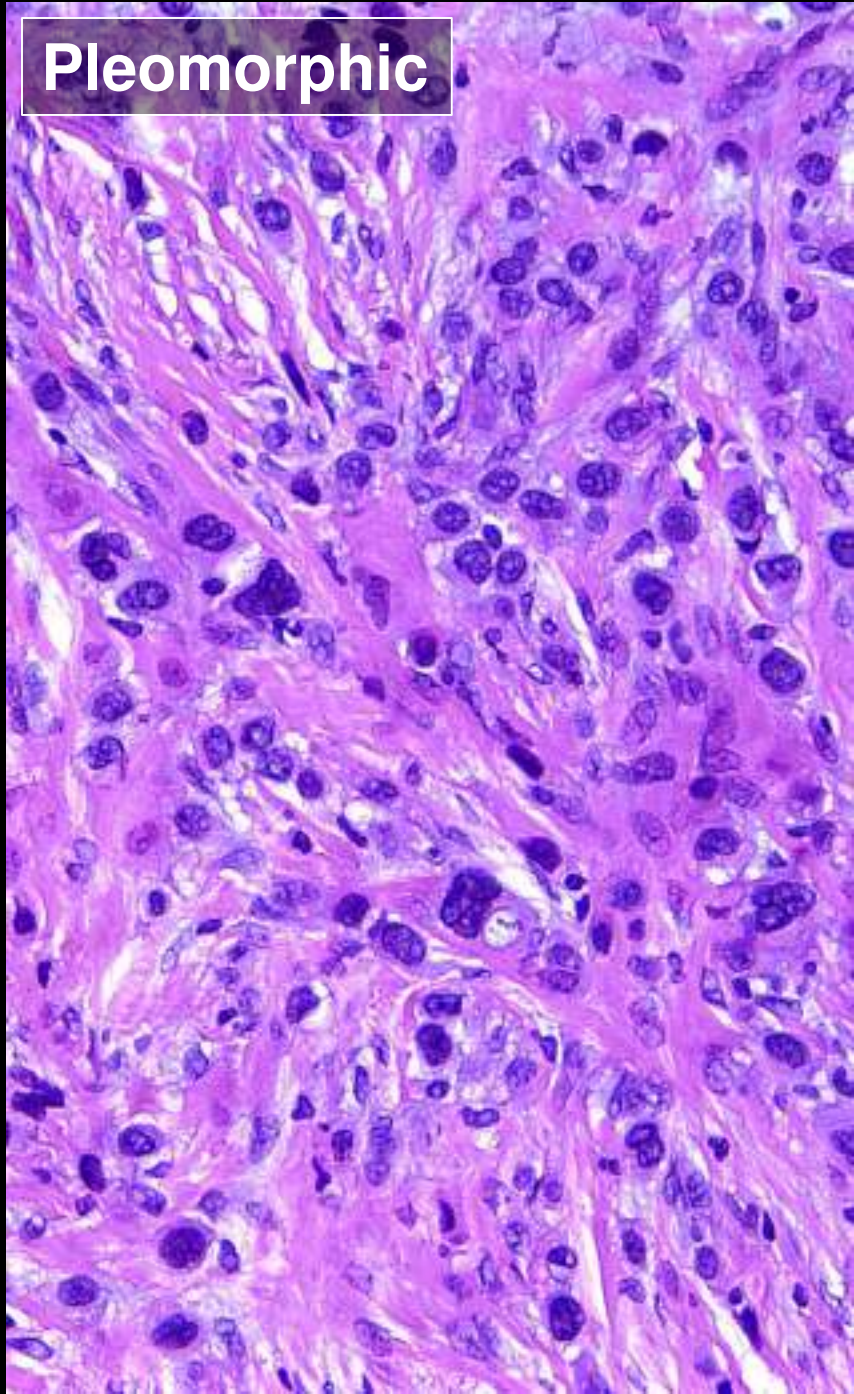
Tubulolobular



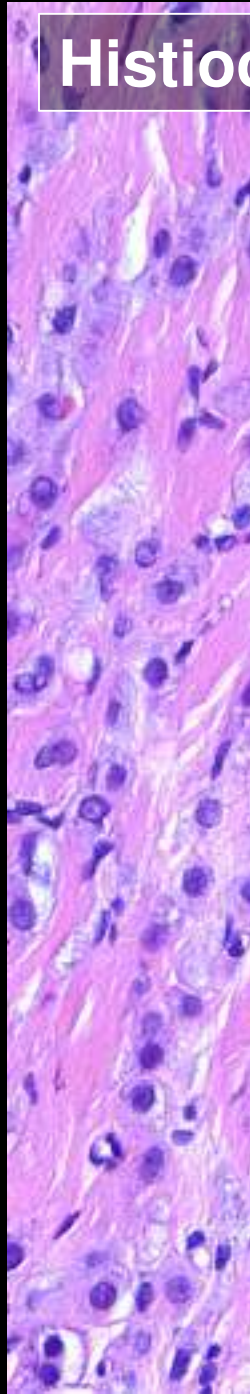
Variants of Invasive Lobular Carcinoma

- **Architecture**
 - Solid
 - Alveolar
 - Tubulolobular
- **Cytology**
 - Pleomorphic
 - Histiocytoid
 - Signet ring cell

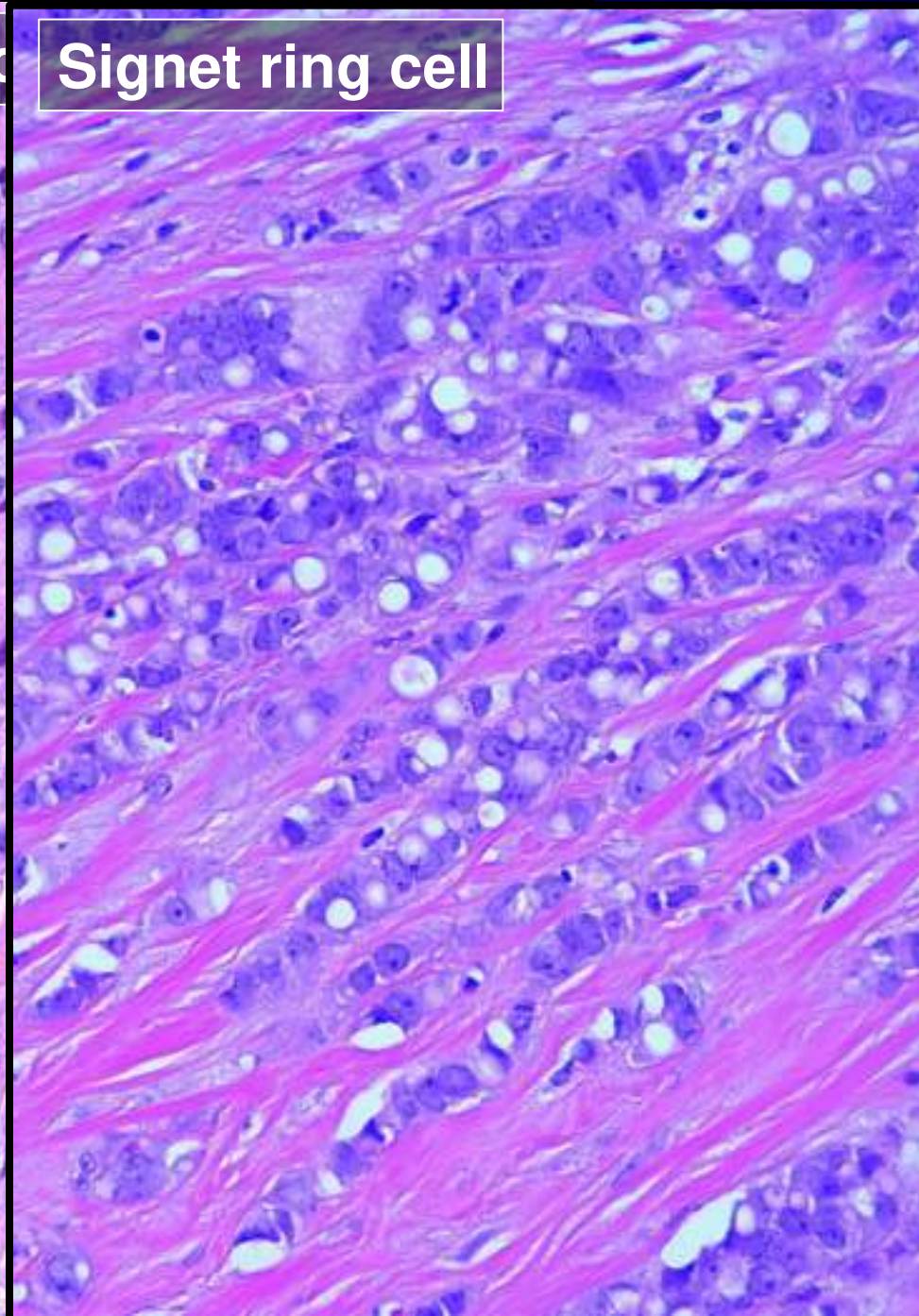
Pleomorphic



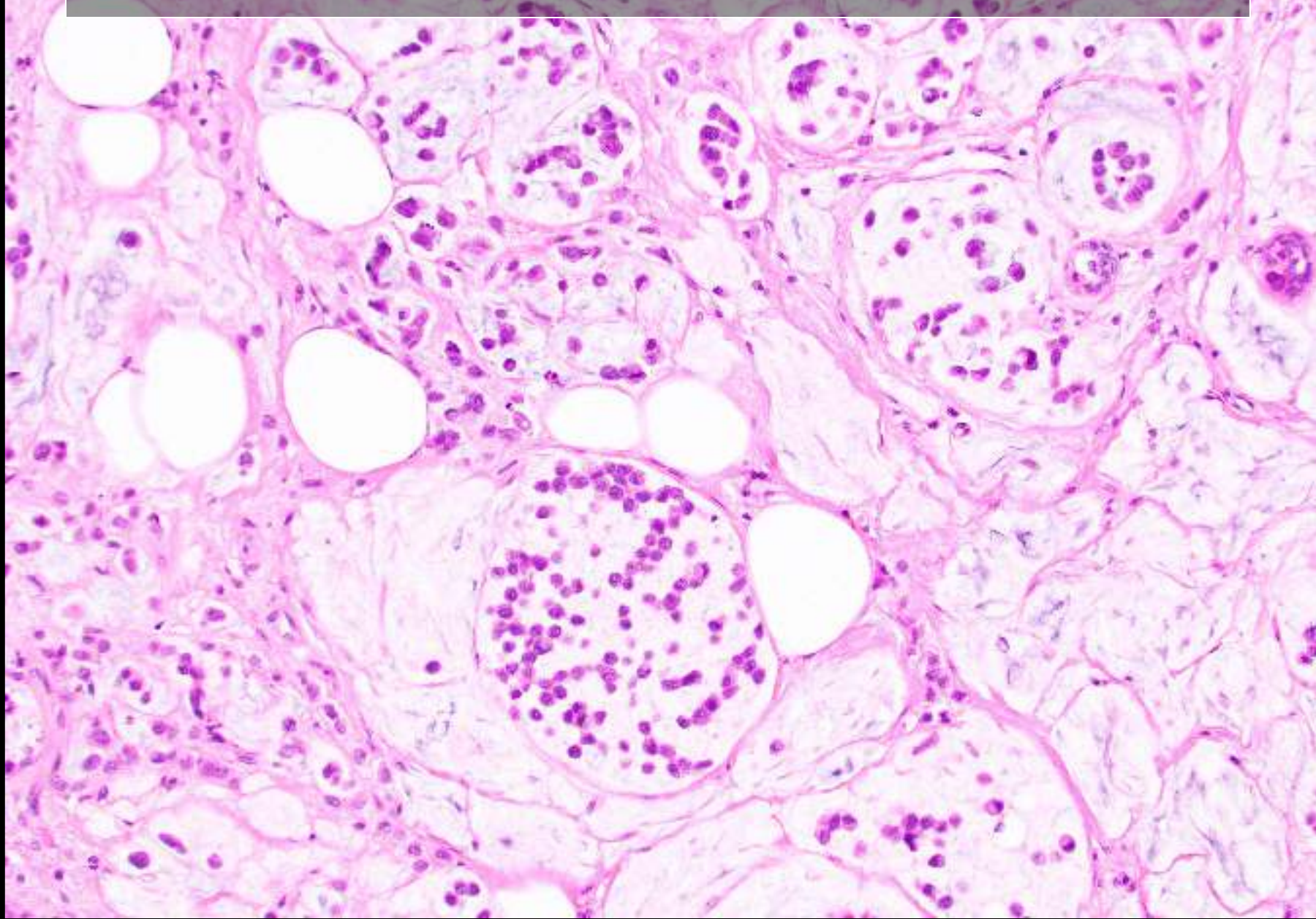
Histioc



Signet ring cell



ILC with Extracellular Mucin



ILC with Extracellular Mucin

- **RARE!**
 - 13 published cases (1 report with 8 cases; 5 single case reports)
 - 10 cases in recent series from BWH (to be presented at USCAP 2018, Soong, *et al*)

ILC with Extracellular Mucin

Clinico-Pathologic features

	Previously Reported (1998-2016)
Number of cases	13
Median age (range)	60 yrs (38-75)
Size >2cm	10/11 (91%)
Node positive	8/12 (67%)
ER+	9/9 (100%)
HER2+	2/12 (17%)
E-cadherin -	13 (100%)
Signet ring cells	13/13 (100%)
LCIS	9/12 (75%)

ILC with Extracellular Mucin

Clinico-Pathologic features

	Previously Reported (1998-2016)	BWH series (2001-2017)
Number of cases	13	10
Median age (range)	60 yrs (38-75)	69 yrs (31-77)
Size >2cm	10/11 (91%)	5 (50%)
Node positive	8/12 (67%)	5 (50%)
ER+	9/9 (100%)	9 (90%)
HER2+	2/12 (17%)	3 (30%)
E-cadherin -	13 (100%)	10 (100%)
Signet ring cells	13/13 (100%)	5/10 (50%)
LCIS	9/12 (75%)	6 (60%)

ILC with Extracellular Mucin

Outcome

	Previously Reported (1998-2016)
# with follow-up	5
Median follow-up	29 mos (21-68 mos)
Loco-regional	1/5 (20%)
Distant mets	1/5 (20%)
Both loco-regional and distant mets	1/5 (20%)
DOD	2/5 (40%)

ILC with Extracellular Mucin

Outcome

	Previously Reported (1998-2016)	BWH series (2001-2017)
# with follow-up	5	10
Median follow-up	29 mos (21-68 mos)	36 mos (3-97 mos)
Loco-regional	1/5 (20%)	1/10 (10%)
Distant mets	1/5 (20%)	4/10 (40%)
Both loco-regional and distant mets	1/5 (20%)	0
DOD	2/5 (40%)	2/10 (20%)

Genomic Alterations

Soong, USCAP 2018

- **8 cases studied by Oncopanel (447 genes, CNVs and mutations)**
 - **16q loss, 1q gain (lobular signature): 6 cases**
 - **22q loss: 5 cases**
 - **18q loss: 5 cases**

Genomic Alterations

Soong, USCAP 2018

CDH1 (frameshift/deleterious variant)								
Pathogenic mutations	PIK3CA							
	TP53							
	PTEN							
	RB1							
	ERBB3							
	MUTYH							
High-copy amplifications	FGFR1							
	WHSC1L1							
	ERBB2							
	CDK12							

Breast Lesions with Extracellular Mucin Production

- **Malignant**

- Mucinous carcinoma
- Solid papillary carcinoma
- Mucinous variant of invasive micropapillary carcinoma
- Mucinous cystadenocarcinoma
- Mucoepidermoid carcinoma
- Invasive lobular carcinoma with extracellular mucin

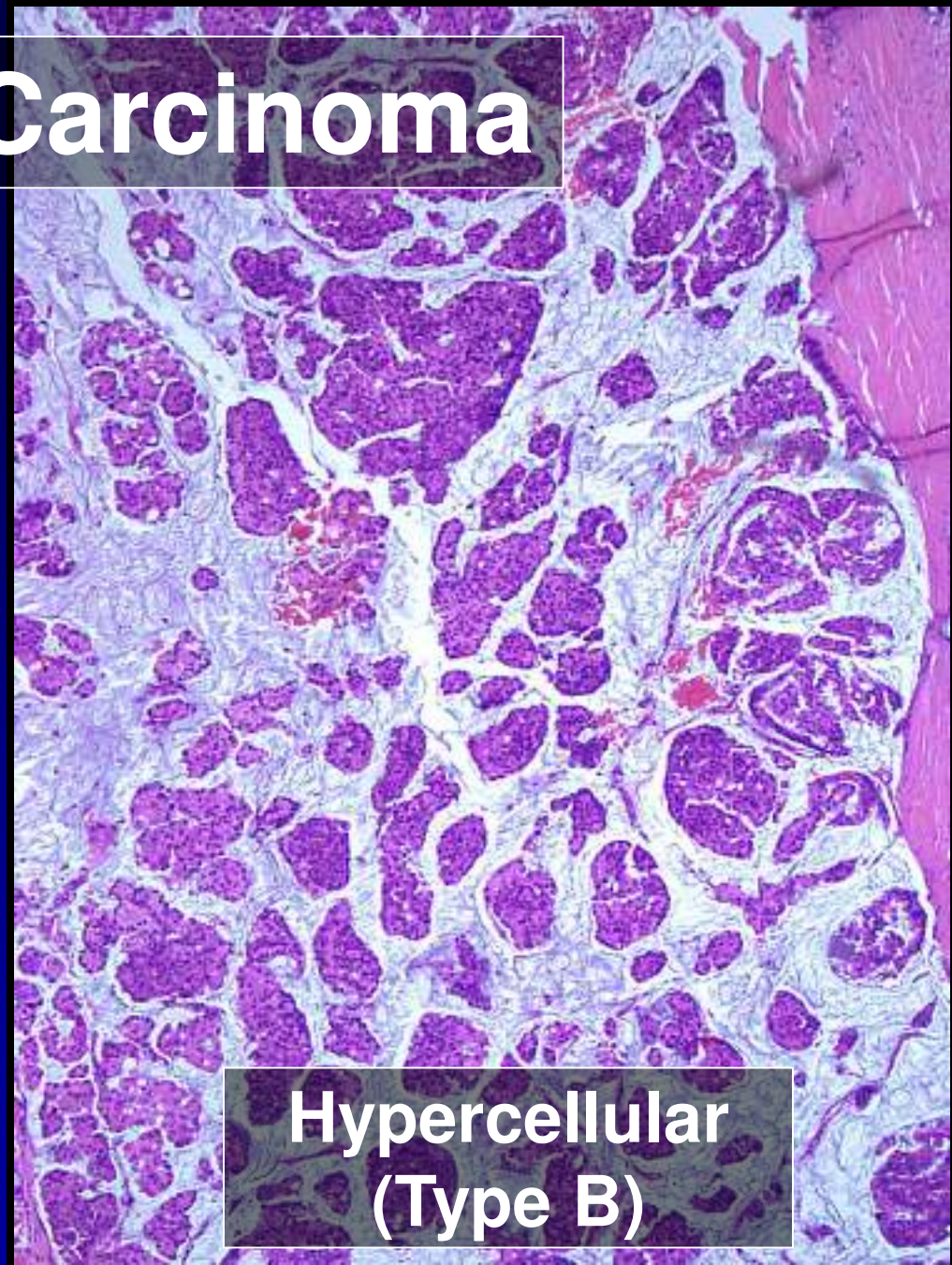
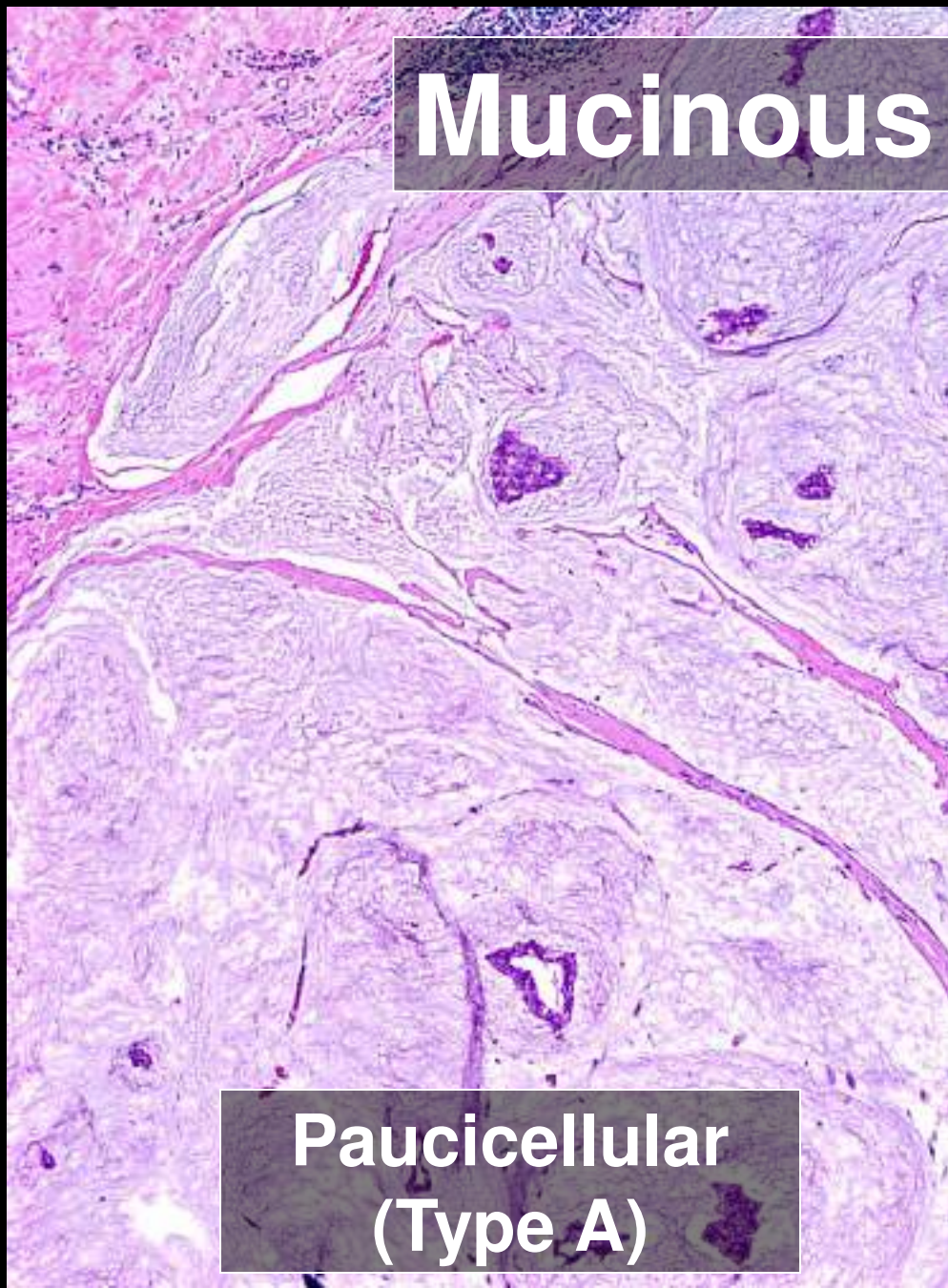
Breast Lesions with Extracellular Mucin Production

- DCIS with mucin production
- Benign
 - Mucocele-like lesions

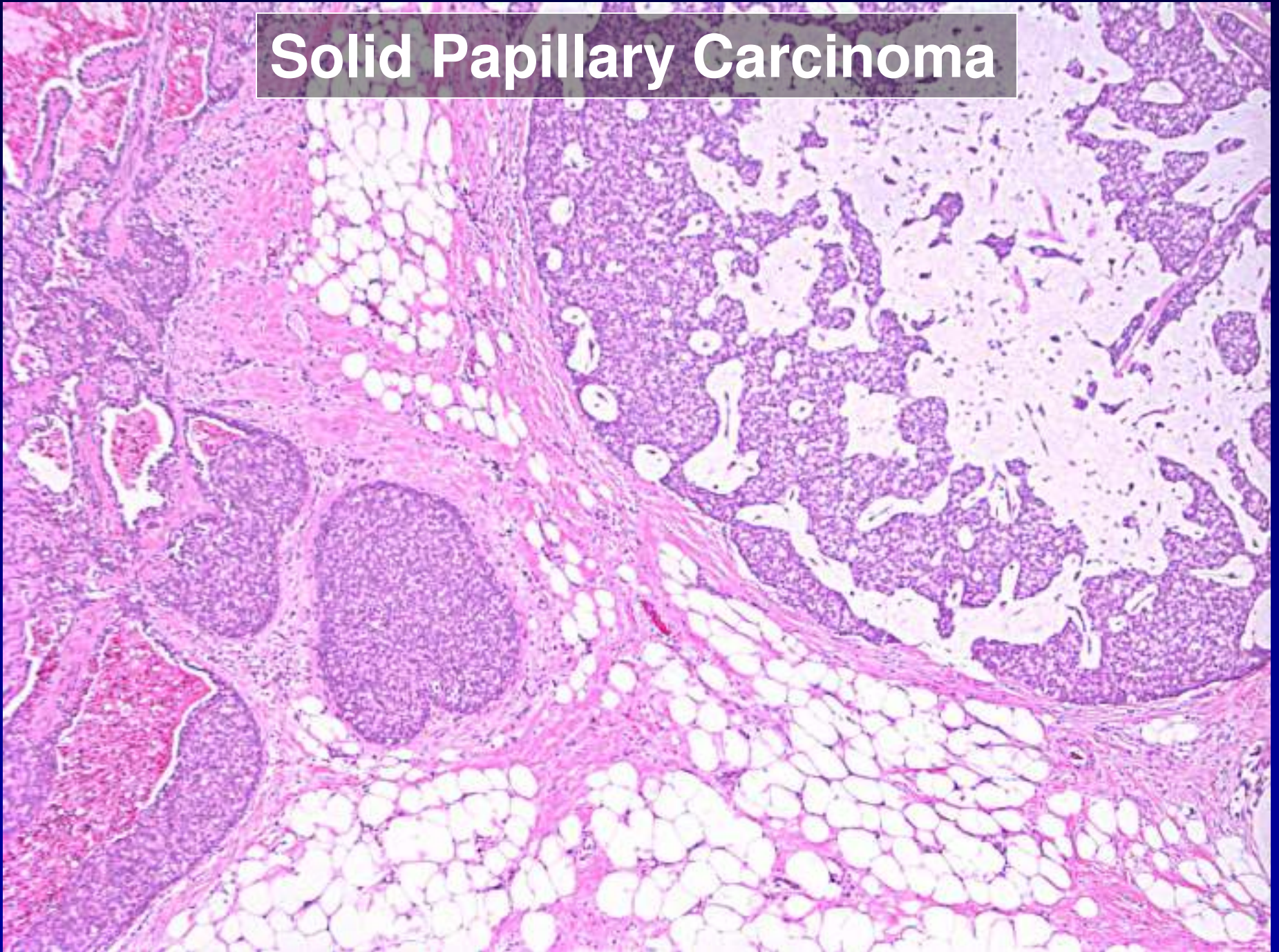
Mucinous Carcinoma

**Paucicellular
(Type A)**

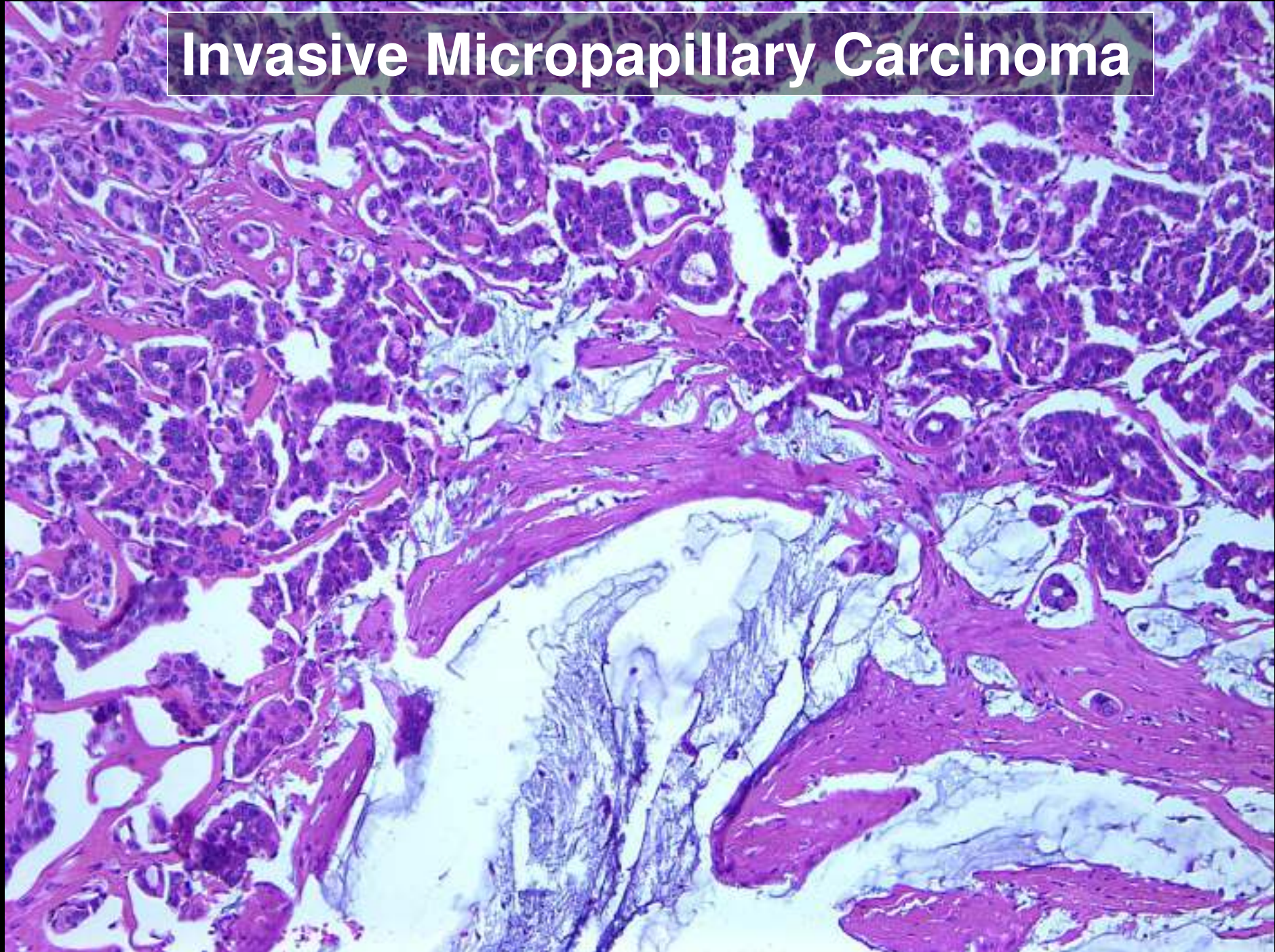
**Hypercellular
(Type B)**



Solid Papillary Carcinoma



Invasive Micropapillary Carcinoma



Mucinous and Invasive Micropapillary Carcinoma

Walsh and Bleiweiss, 2001

- **80 cases of invasive carcinoma with pure or partial micropapillary component**
- **Foci of “mucinous carcinoma” in 11 cases (14%)**
- **Cells in mucin pools had same cytologic features as those in invasive micropapillary component**

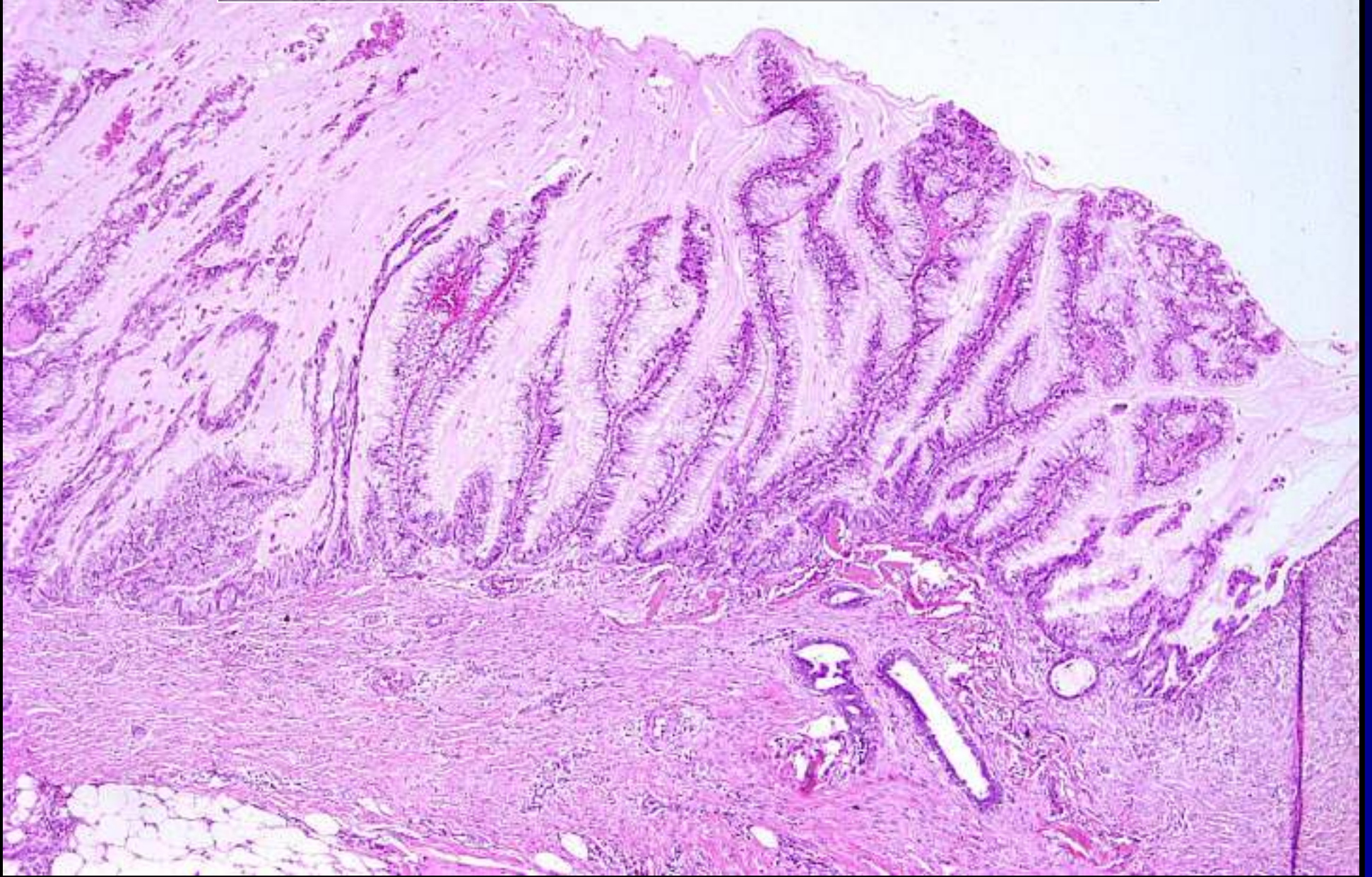
Mucinous micropapillary carcinoma of the breast: an aggressive counterpart to conventional pure mucinous tumors[☆]

Violetta Barbashina MD*, Adriana D. Corben MD, Muzaffar Akram MS,
Christina Vallejo MD, Lee K. Tan MD

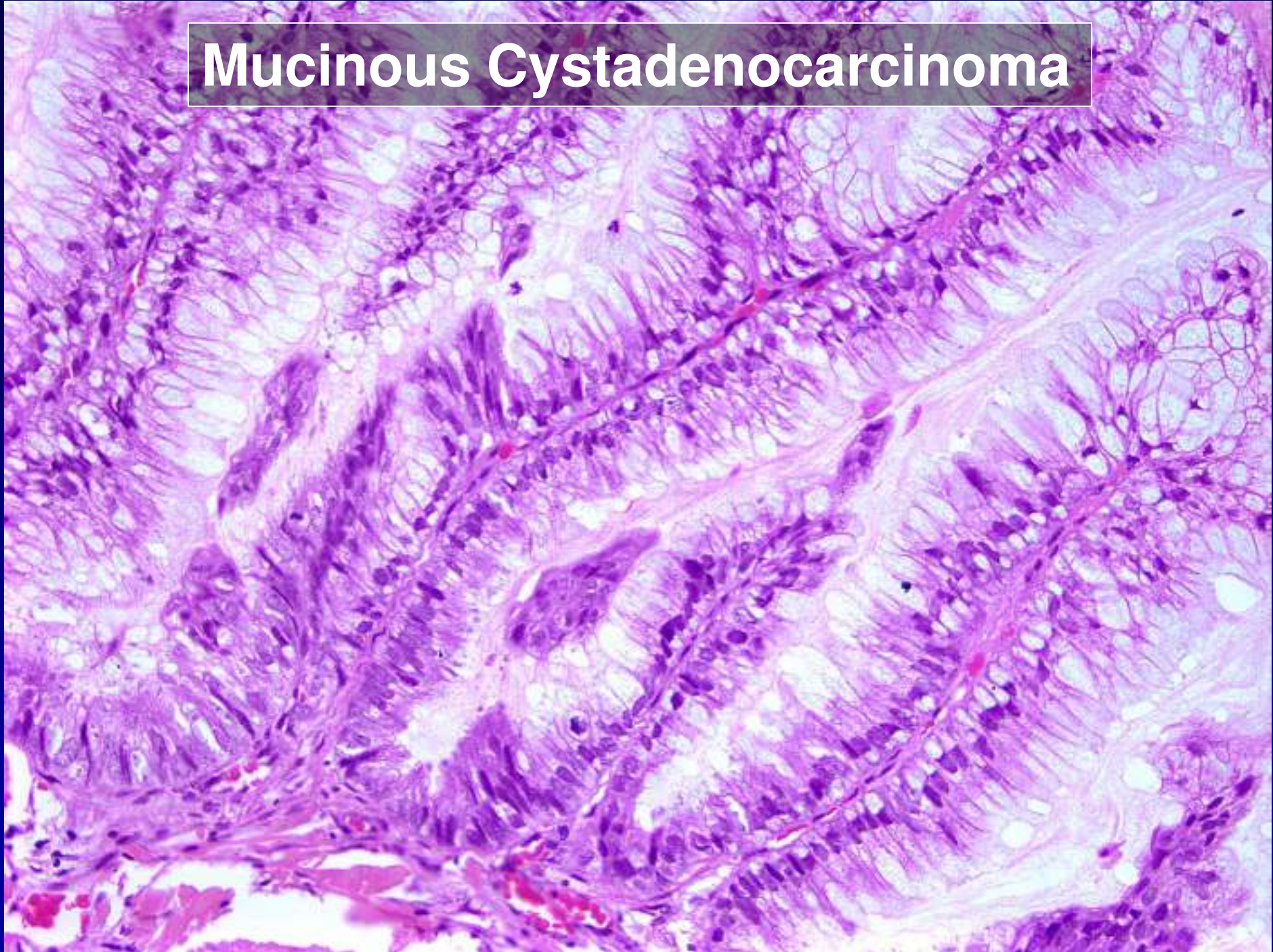
Hum Pathol 2013

- **15 cases**
- **When compared with classical mucinous carcinomas**
 - More frequent LVI (60% vs 8%)
 - More frequent LN mets (33% vs 4%)
 - More frequently HER2+ and p53+

Mucinous Cystadenocarcinoma

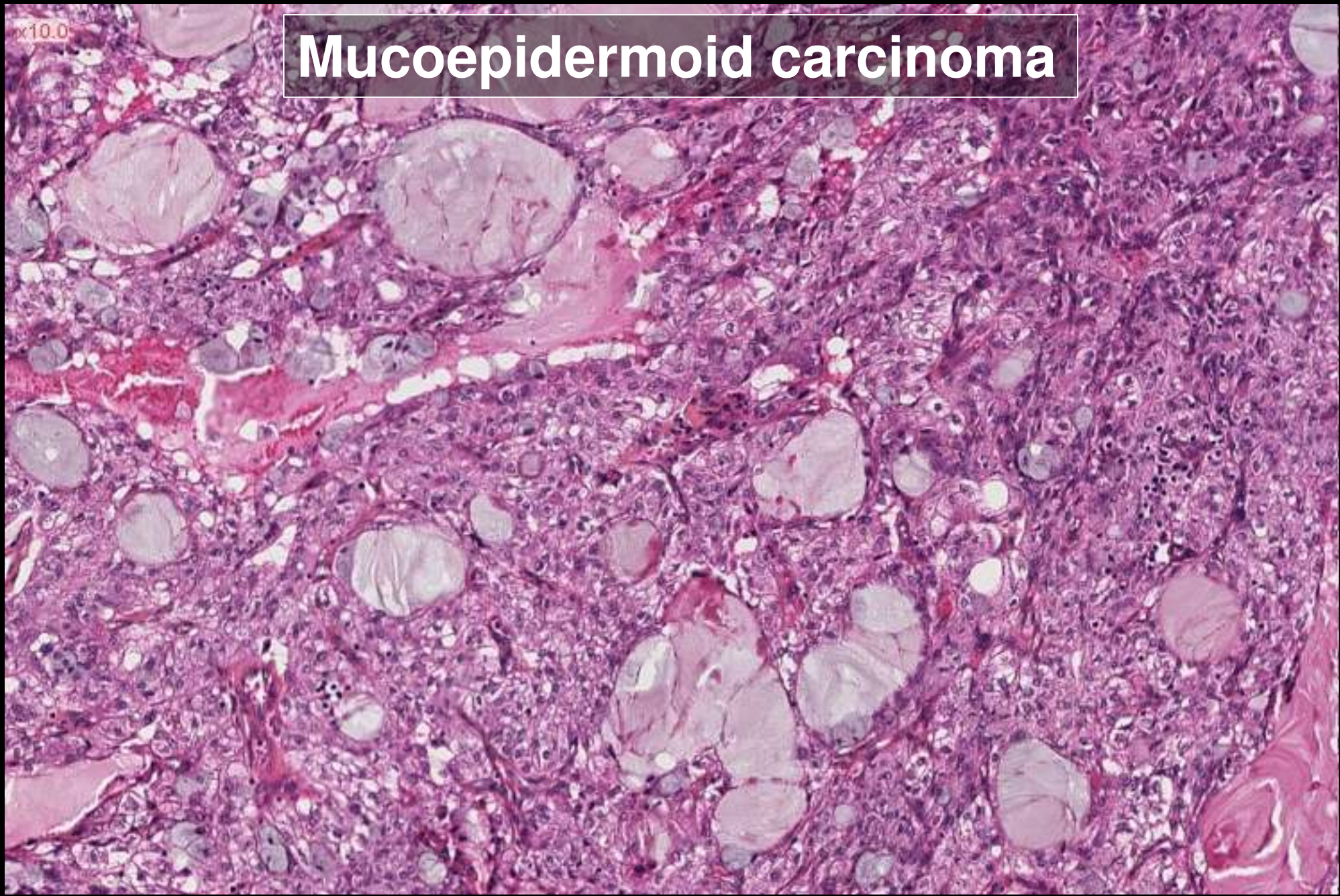


Mucinous Cystadenocarcinoma

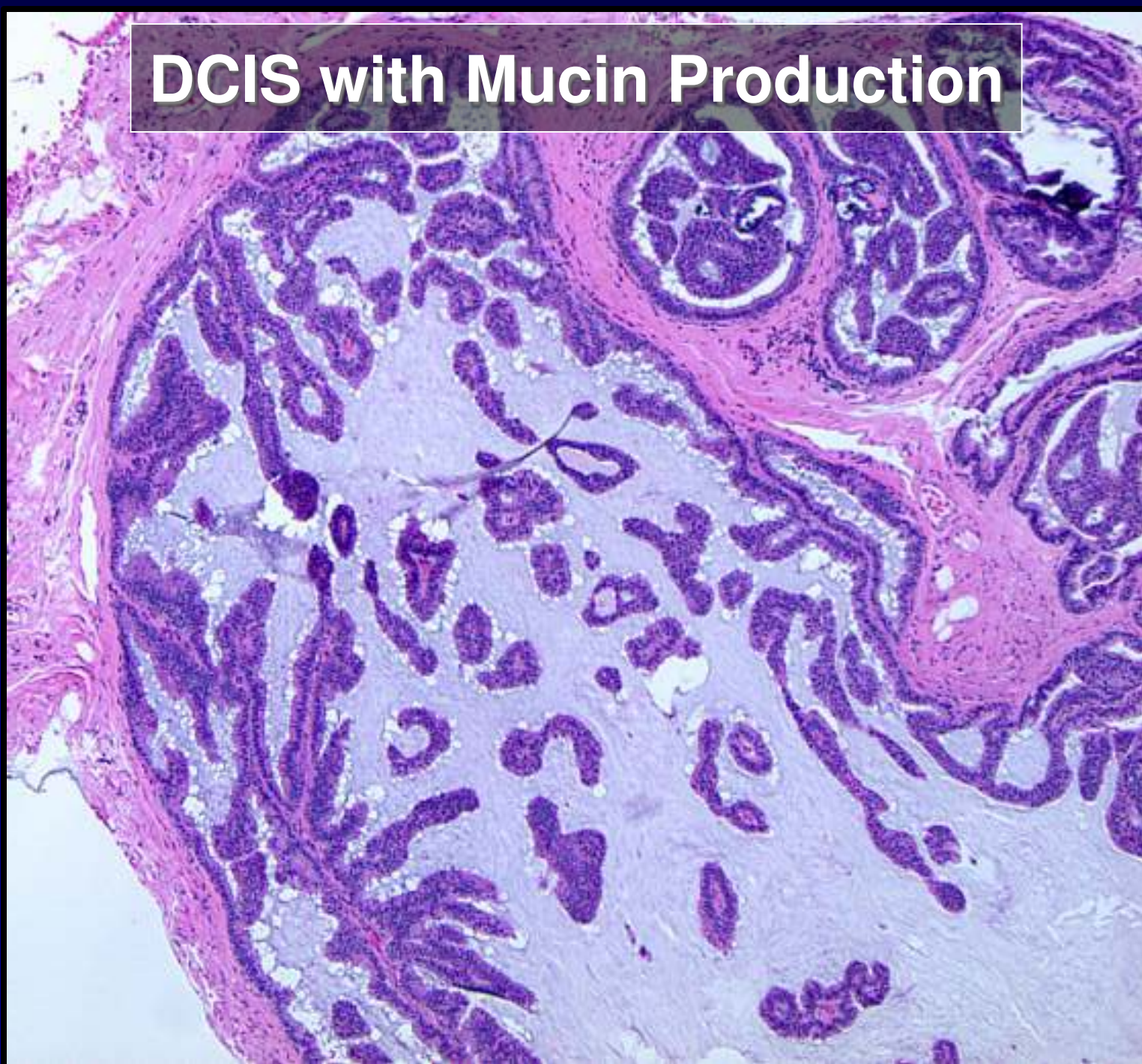


x10.0

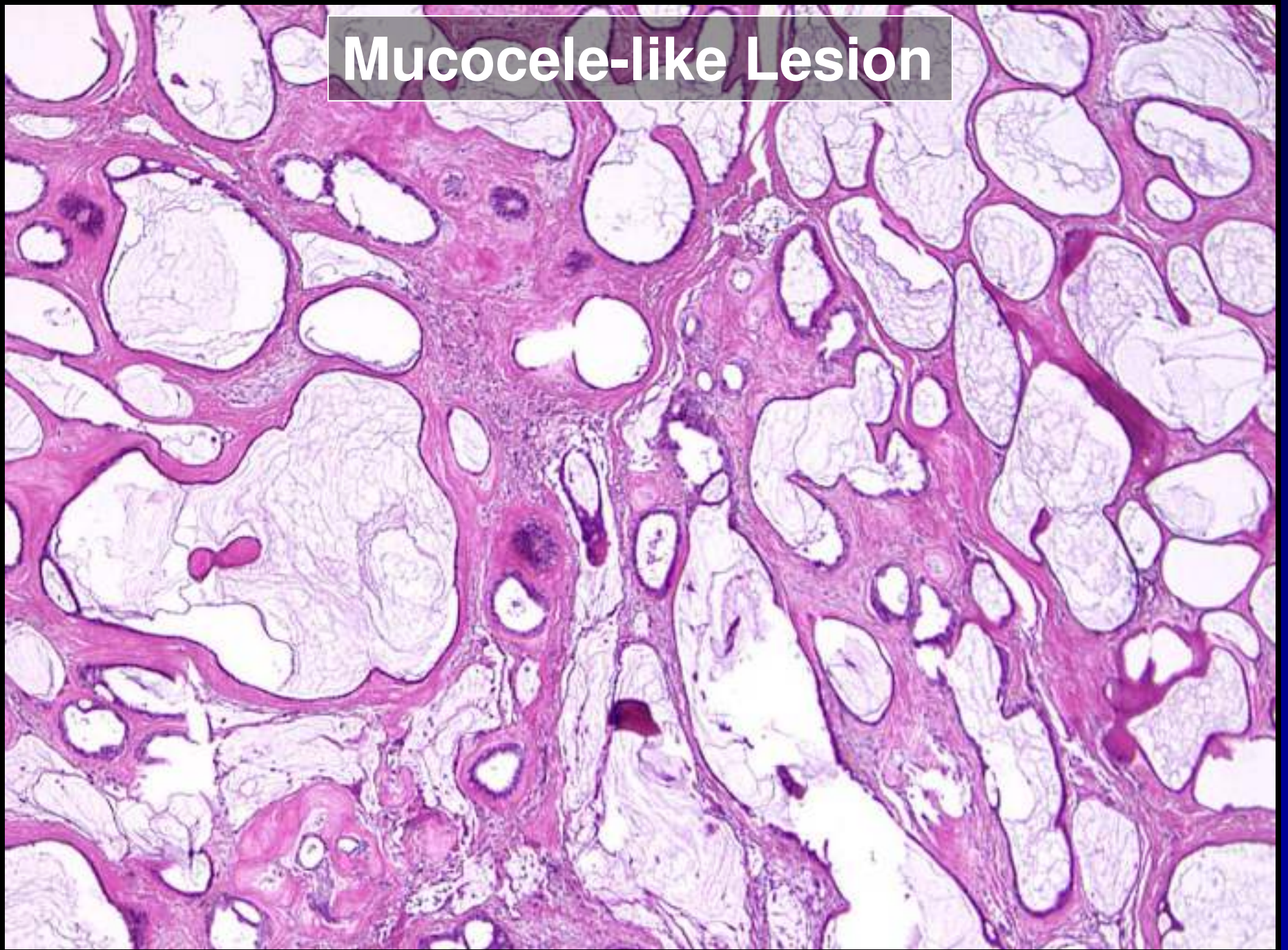
Mucoepidermoid carcinoma



DCIS with Mucin Production

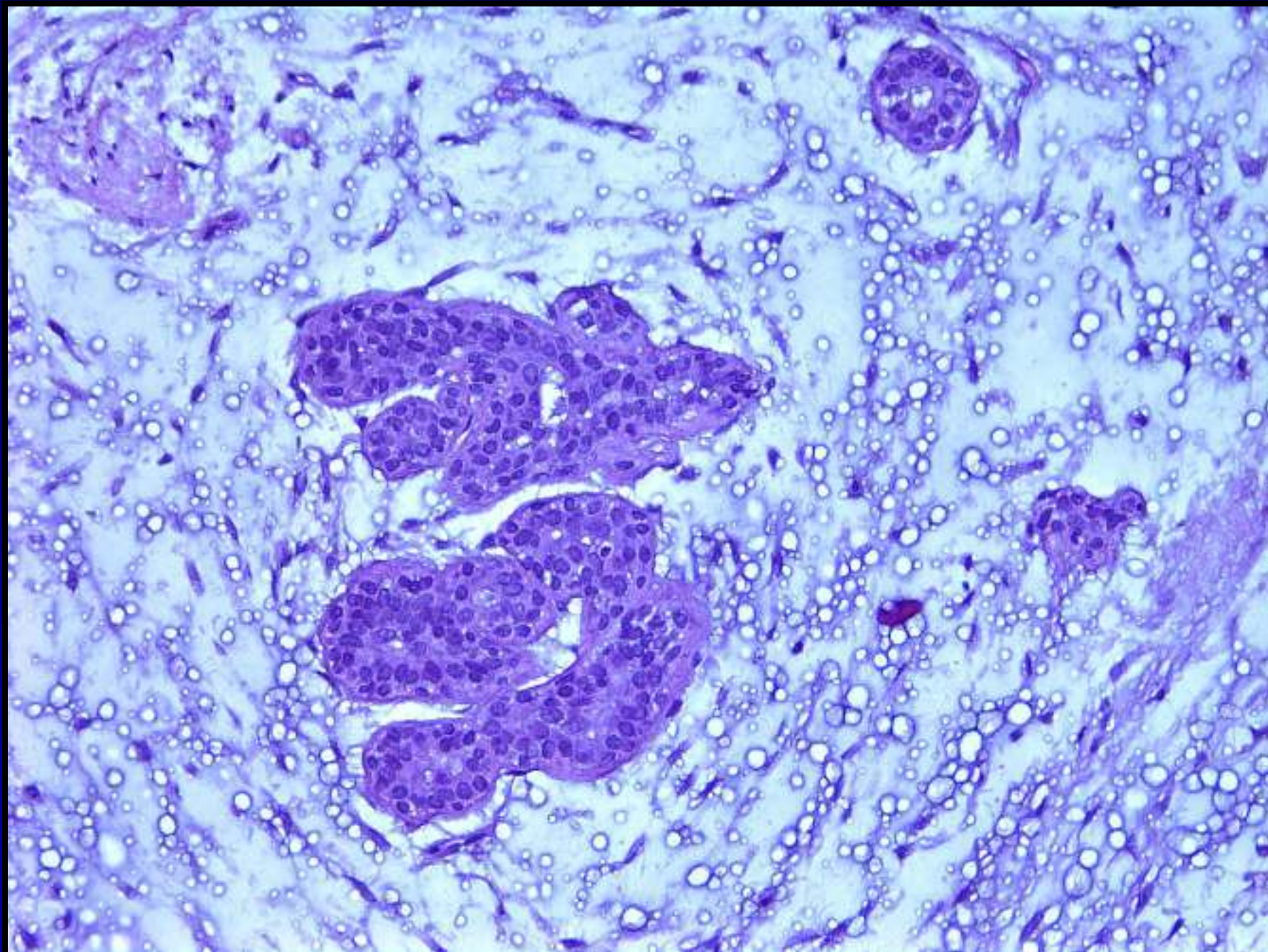


Mucocele-like Lesion



Mimics of Mucinous Lesions

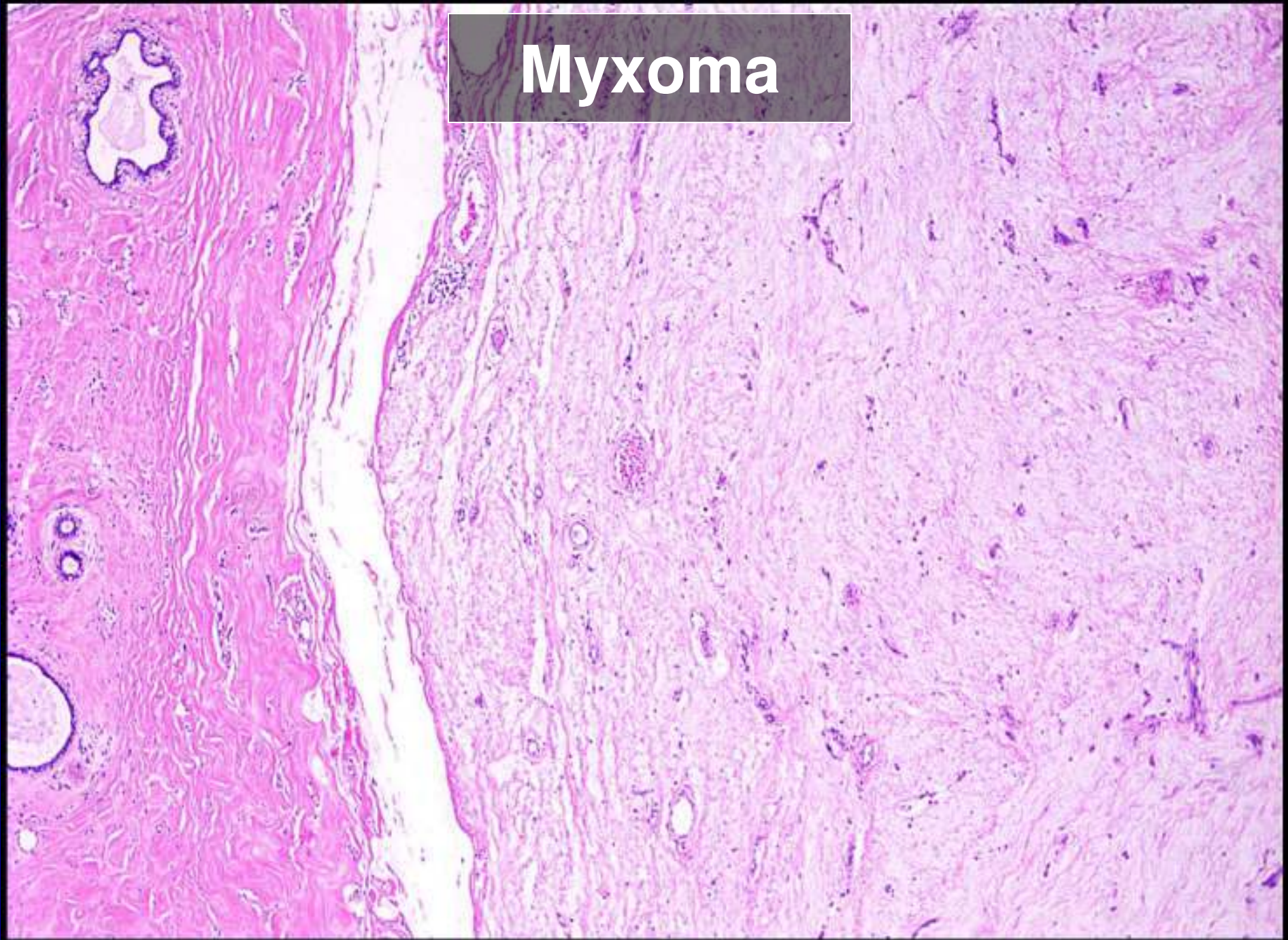
- **Fibroadenoma with myxoid stroma**
- **Myxoma**
- **Neurofibroma**
- **Matrix-producing metaplastic carcinoma**
- **Adenoid cystic carcinoma**
- **Collagenous spherulosis**



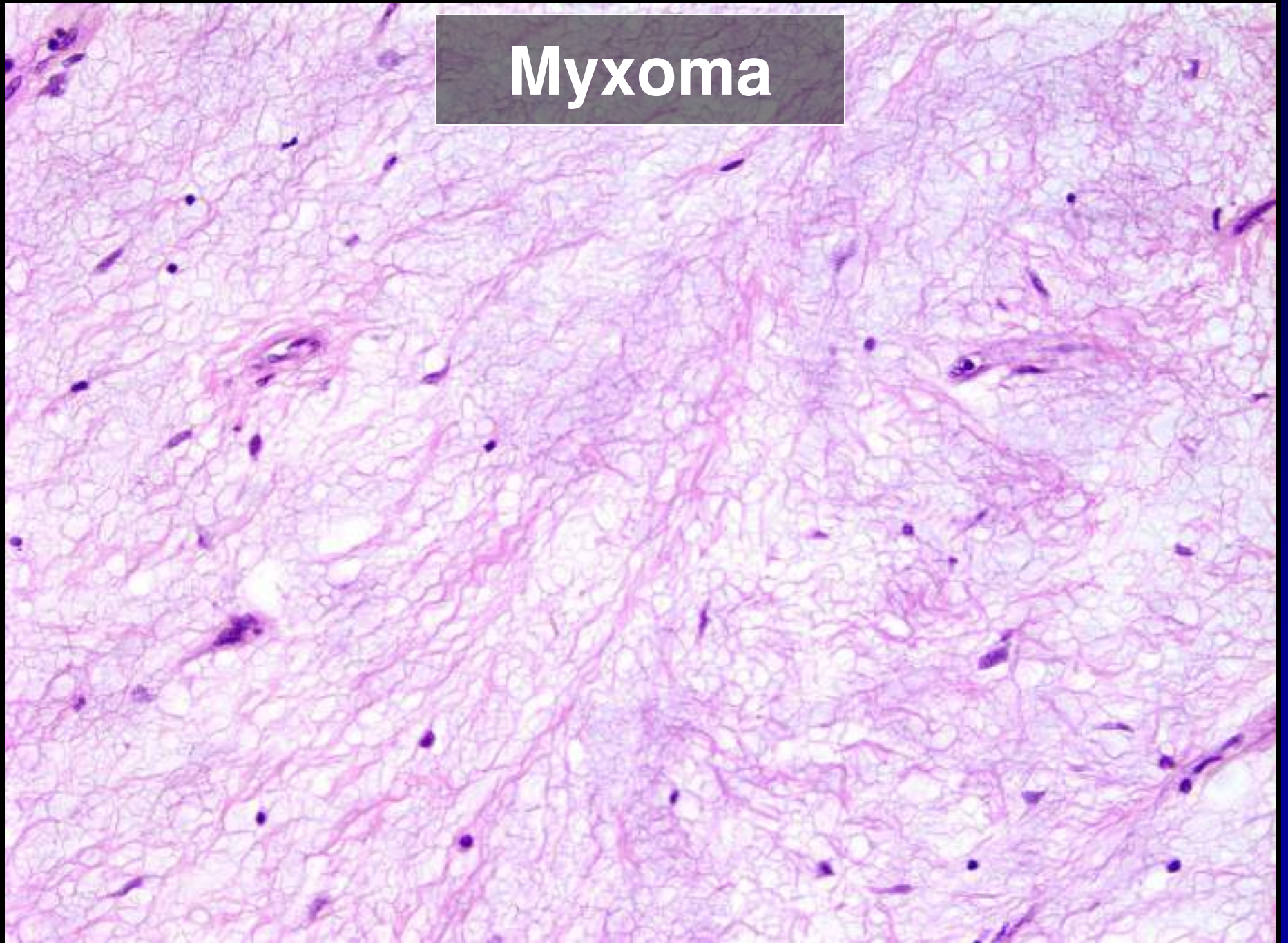
Fibroadenoma with myxoid stroma



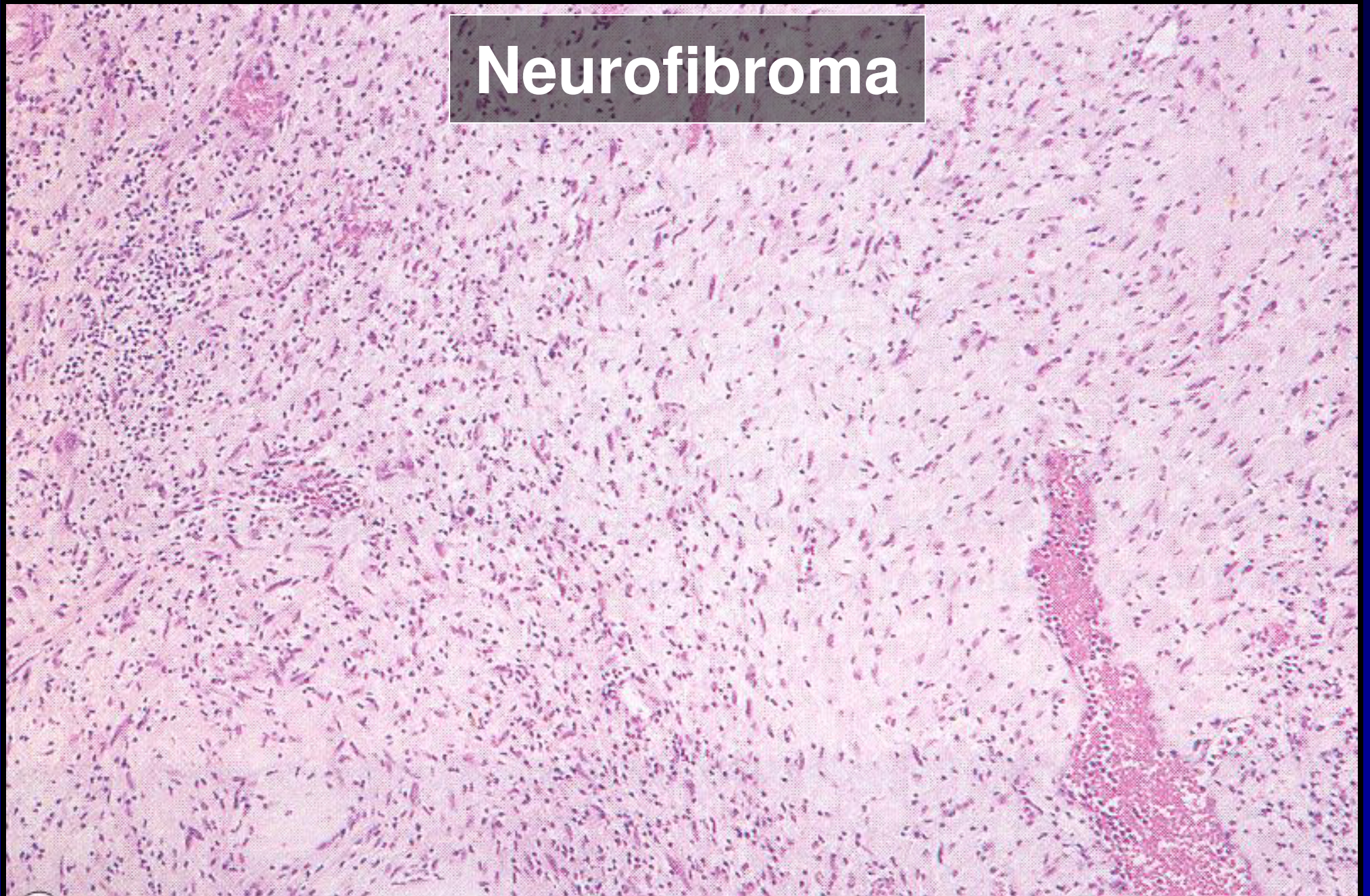
Myxoma



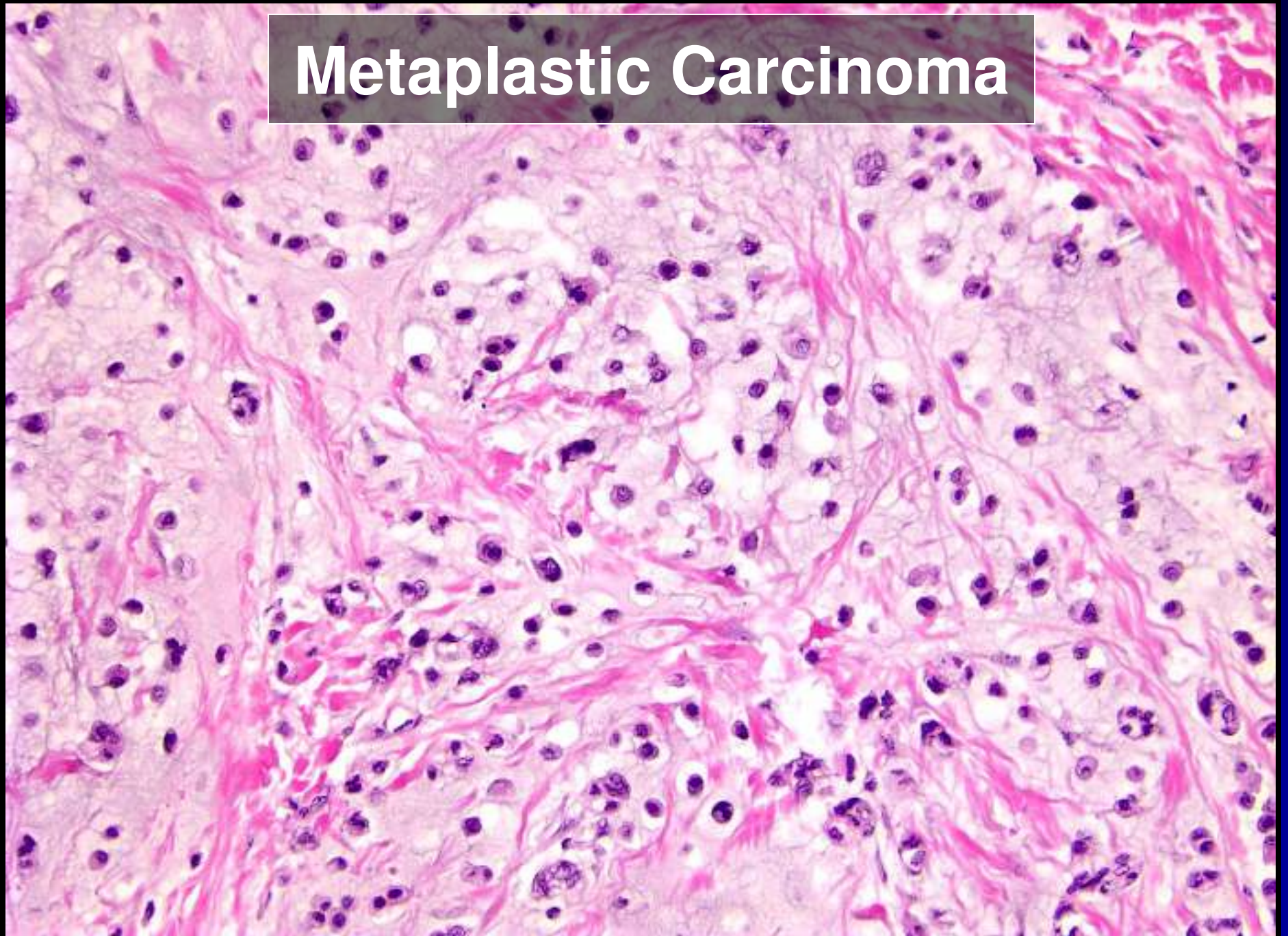
Myxoma



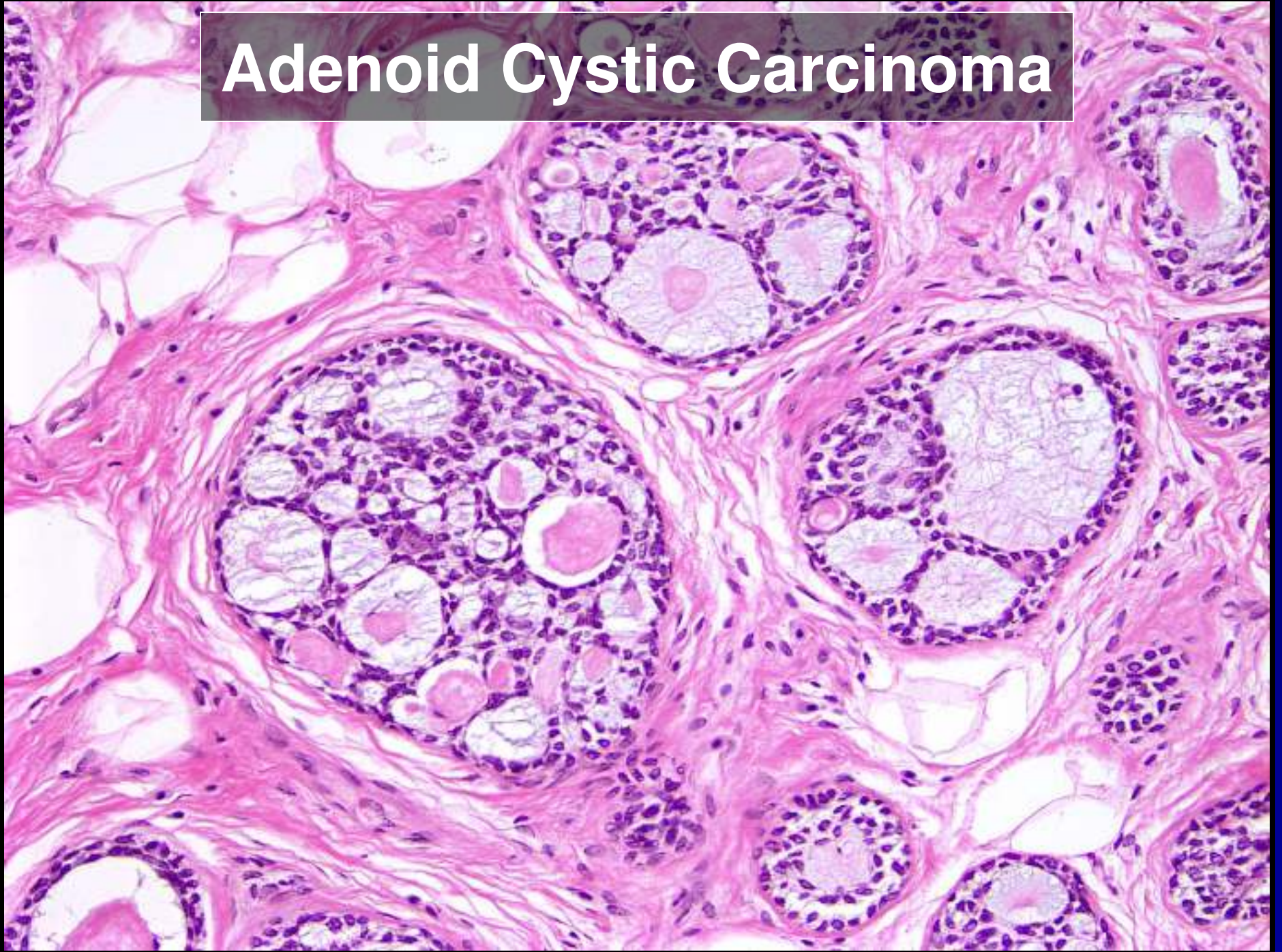
Neurofibroma



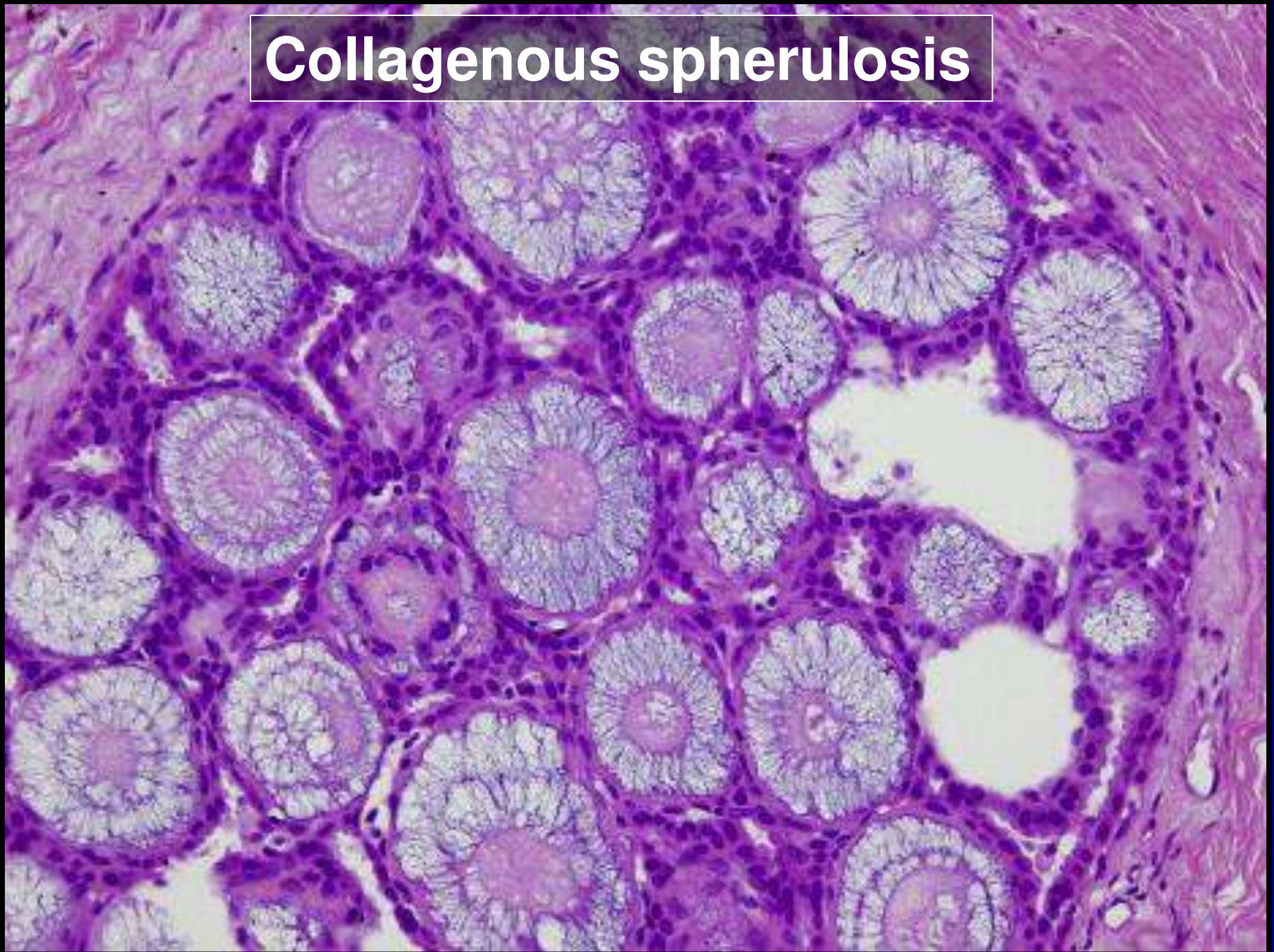
Metaplastic Carcinoma



Adenoid Cystic Carcinoma



Collagenous spherulosis



ILC with Extracellular Mucin

Summary

- **Rare variant of ILC seen primarily in older (post-menopausal) women**
- **Relatively aggressive clinical course**
- **Should not be mistaken for conventional mucinous carcinoma, a breast cancer type associated with a favorable prognosis**

Case 3

Diagnosis

Invasive lobular carcinoma with extracellular mucin

