Radpath

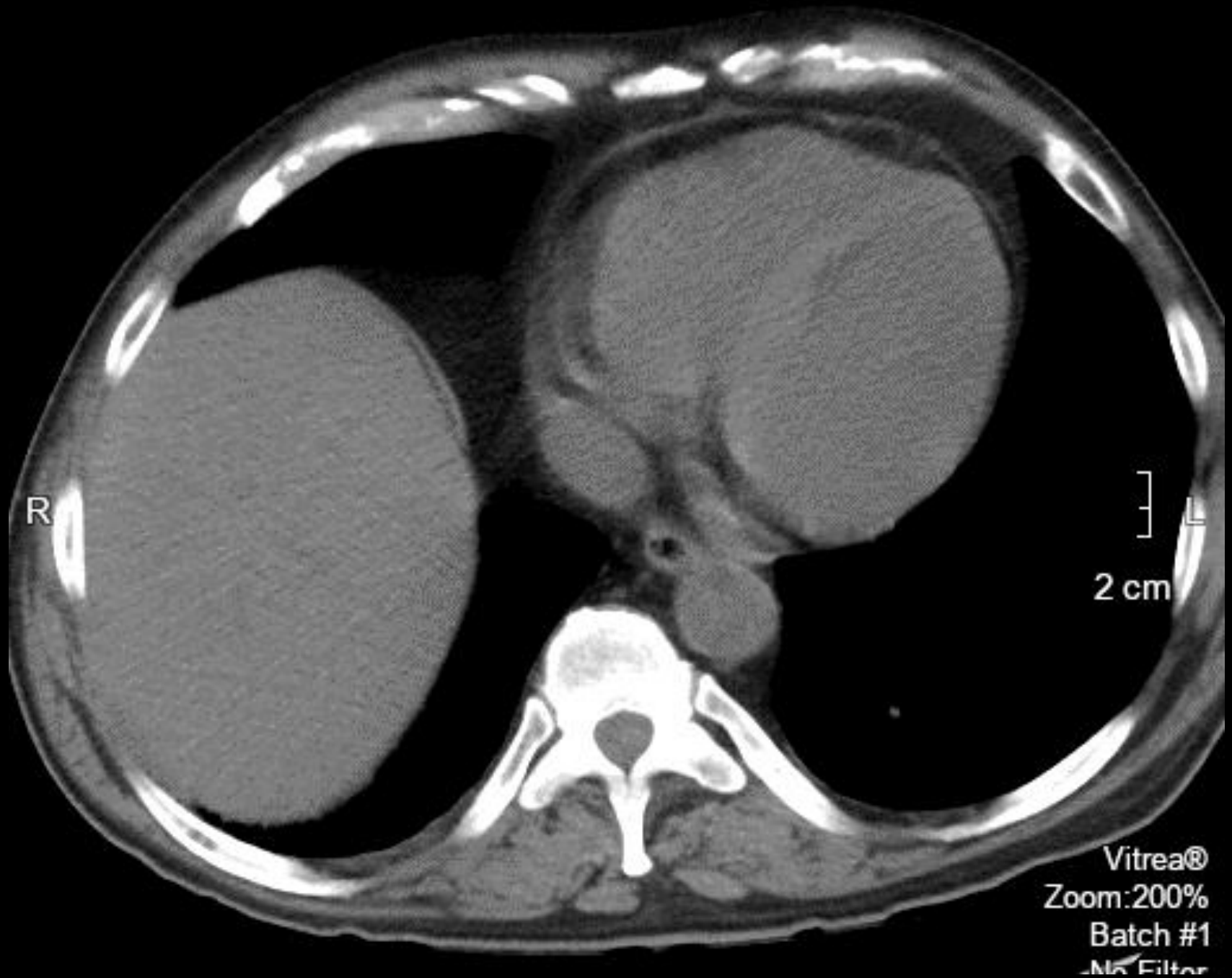
“Vague aches and pains”

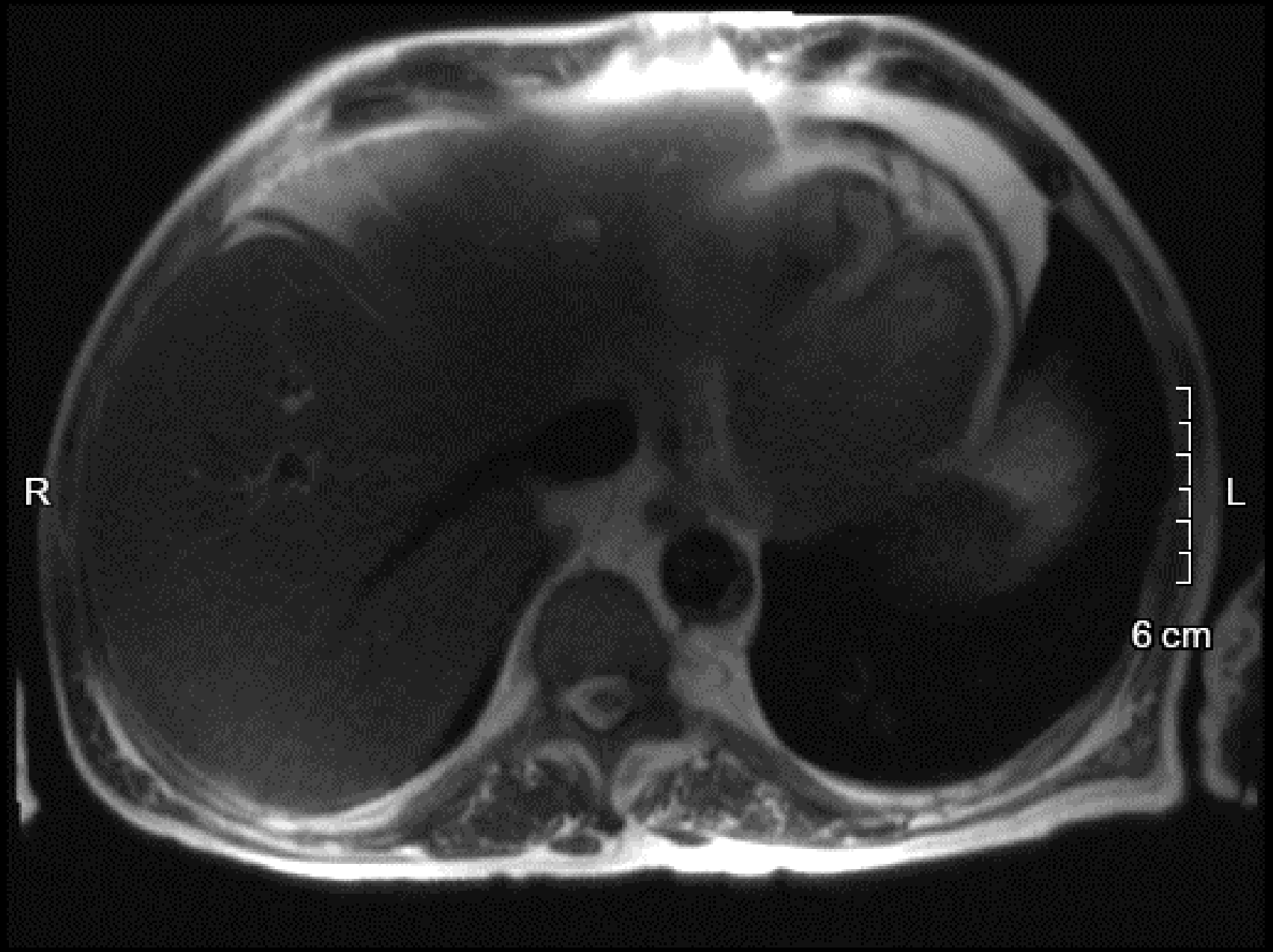
Junzi Shi MD
Radiology

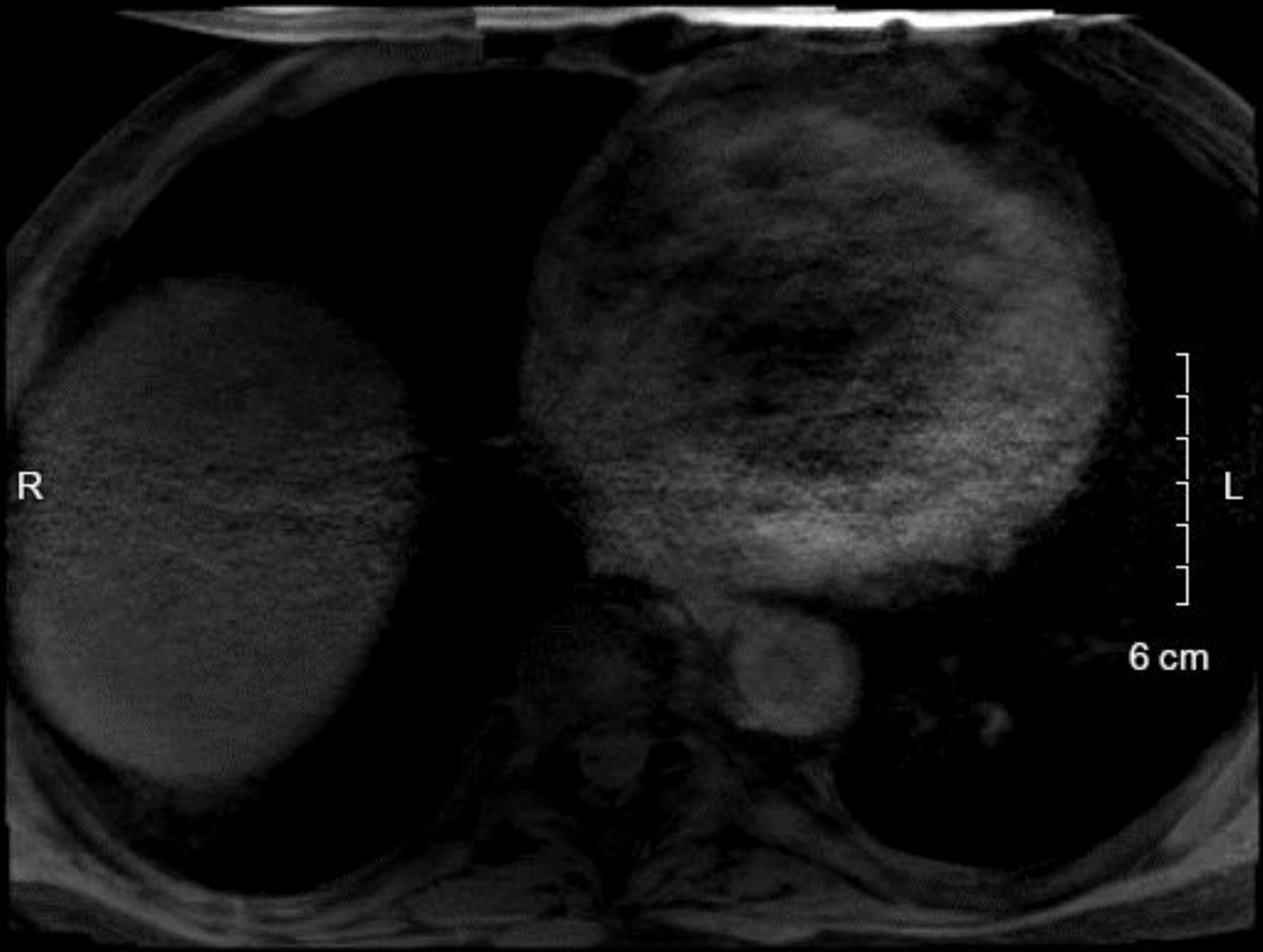
Tom Richardson MD, PhD
Pathology

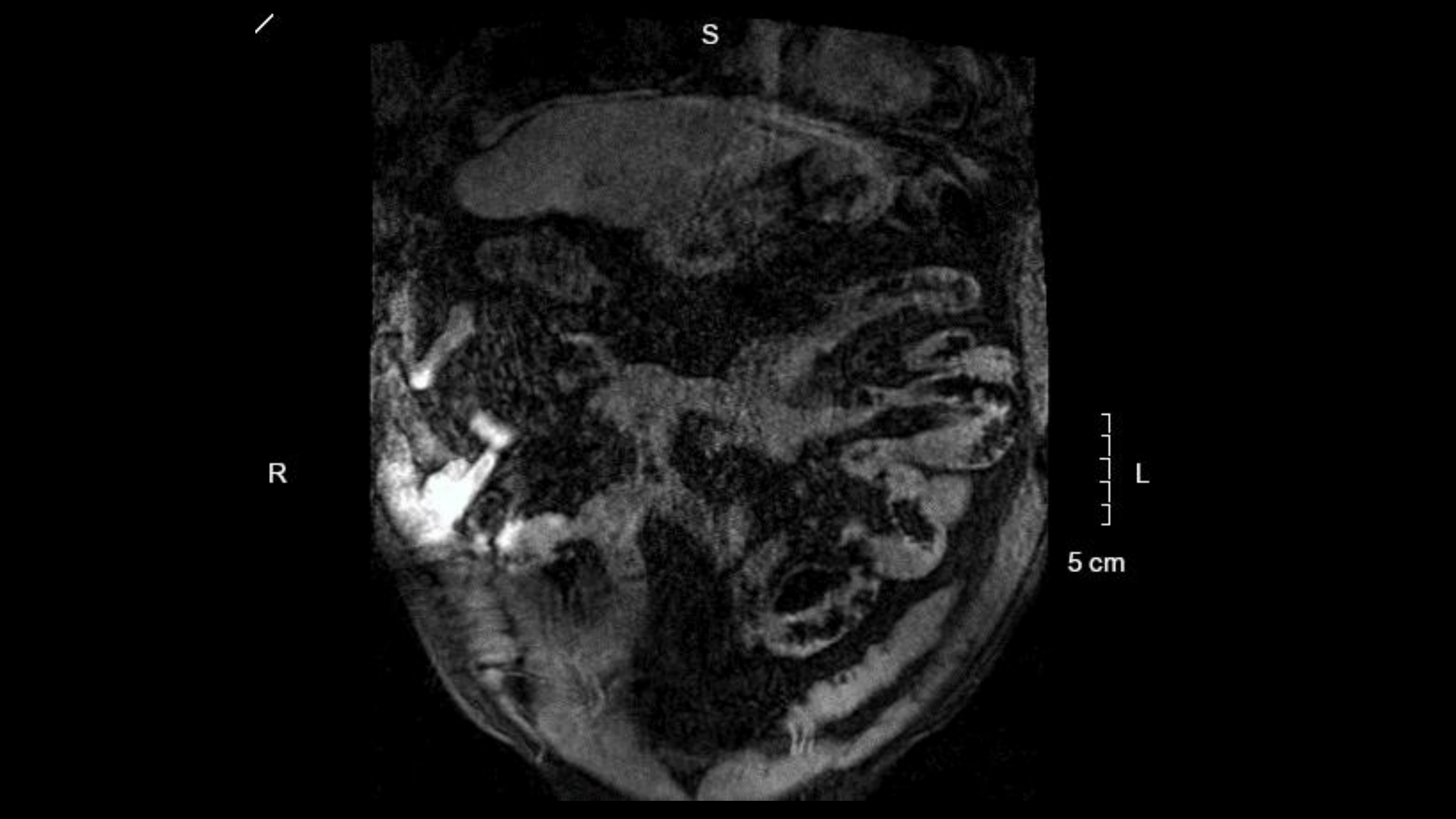
Case 1

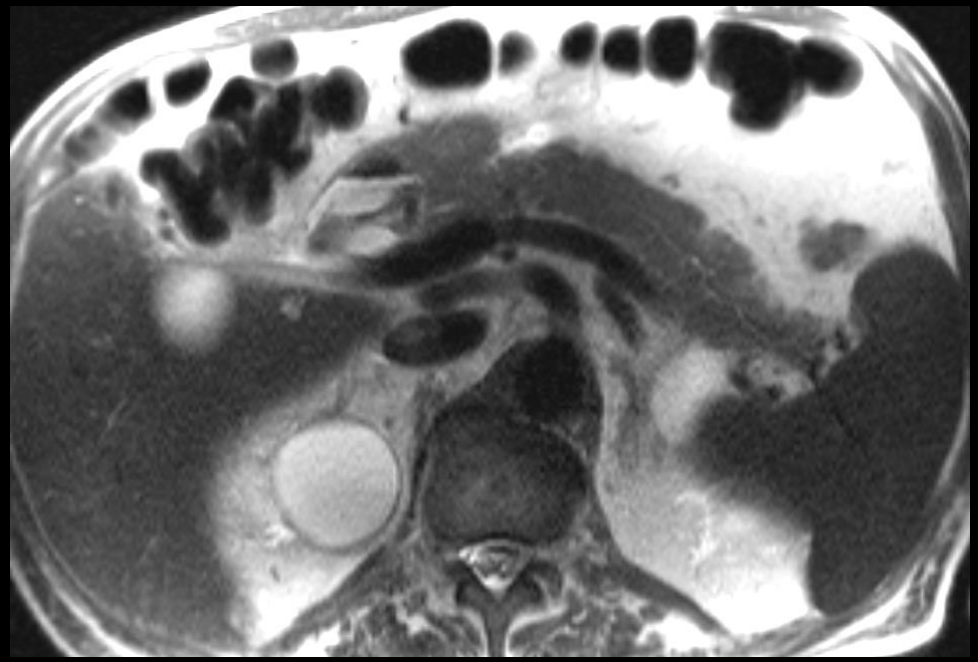
68yo male presents with fatigue, weight loss, and gross hematuria.

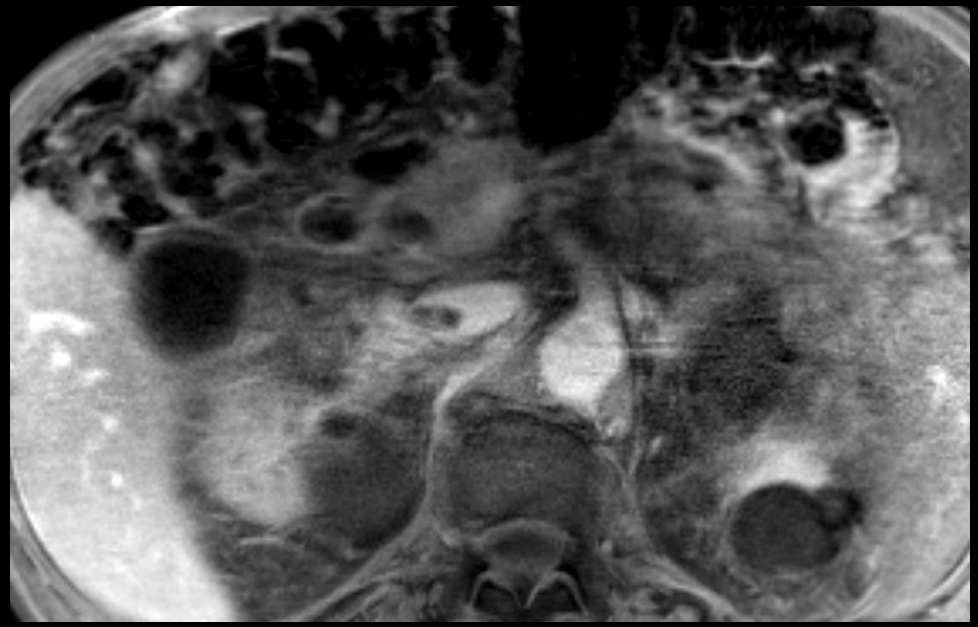

R
L
2 cm
Vitrea®
Zoom:200%
Batch #1


R
L
6 cm


R
L
6 cm


S
R
L
5 cm





Q: What is the most common type of RCC?

A. Sarcomatoid
B. Clear cell
C. Papillary
D. Chromophobe
E. Collecting duct
F. Unclassified

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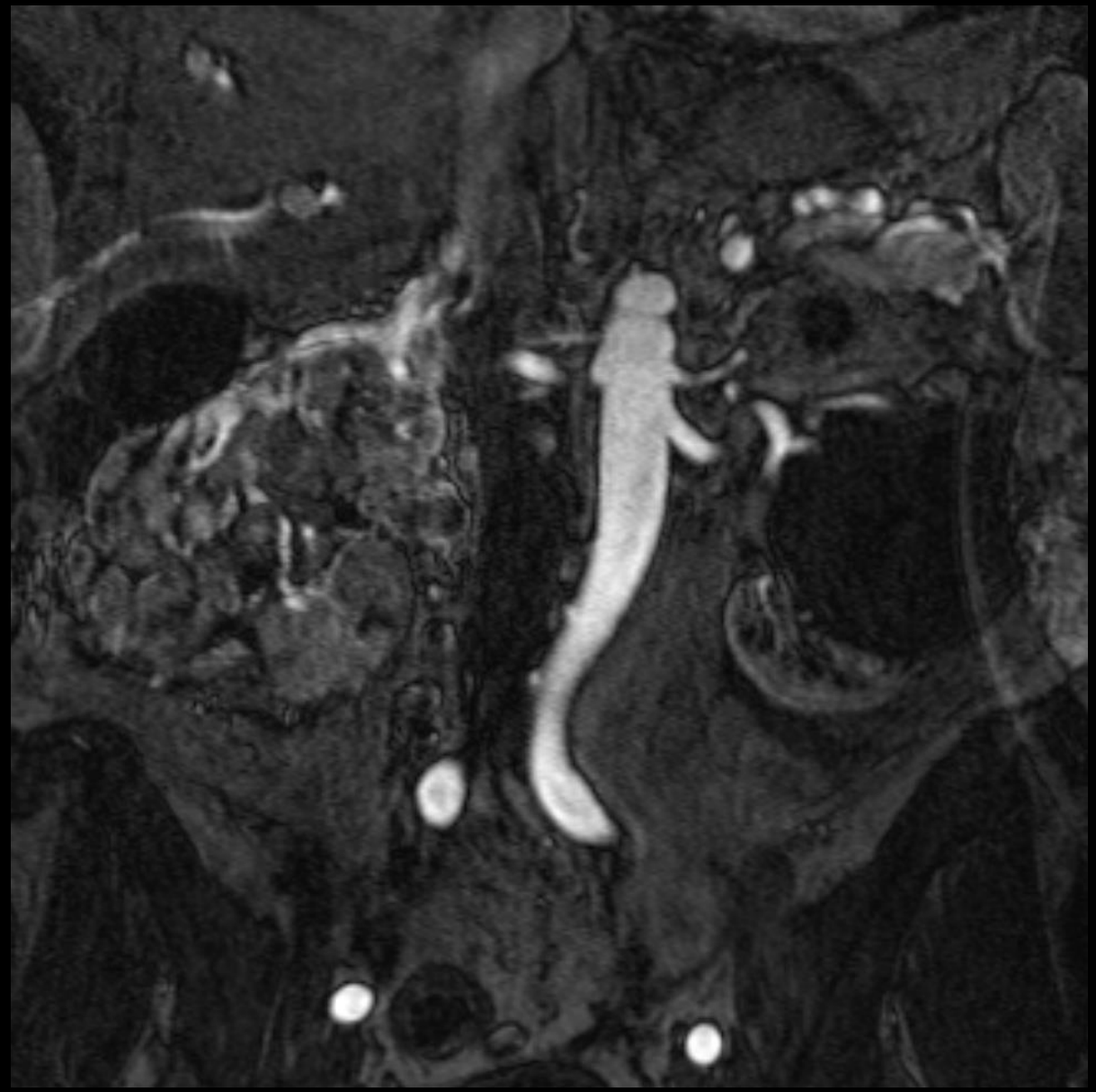


Q: Is this a bland or tumor thrombus?

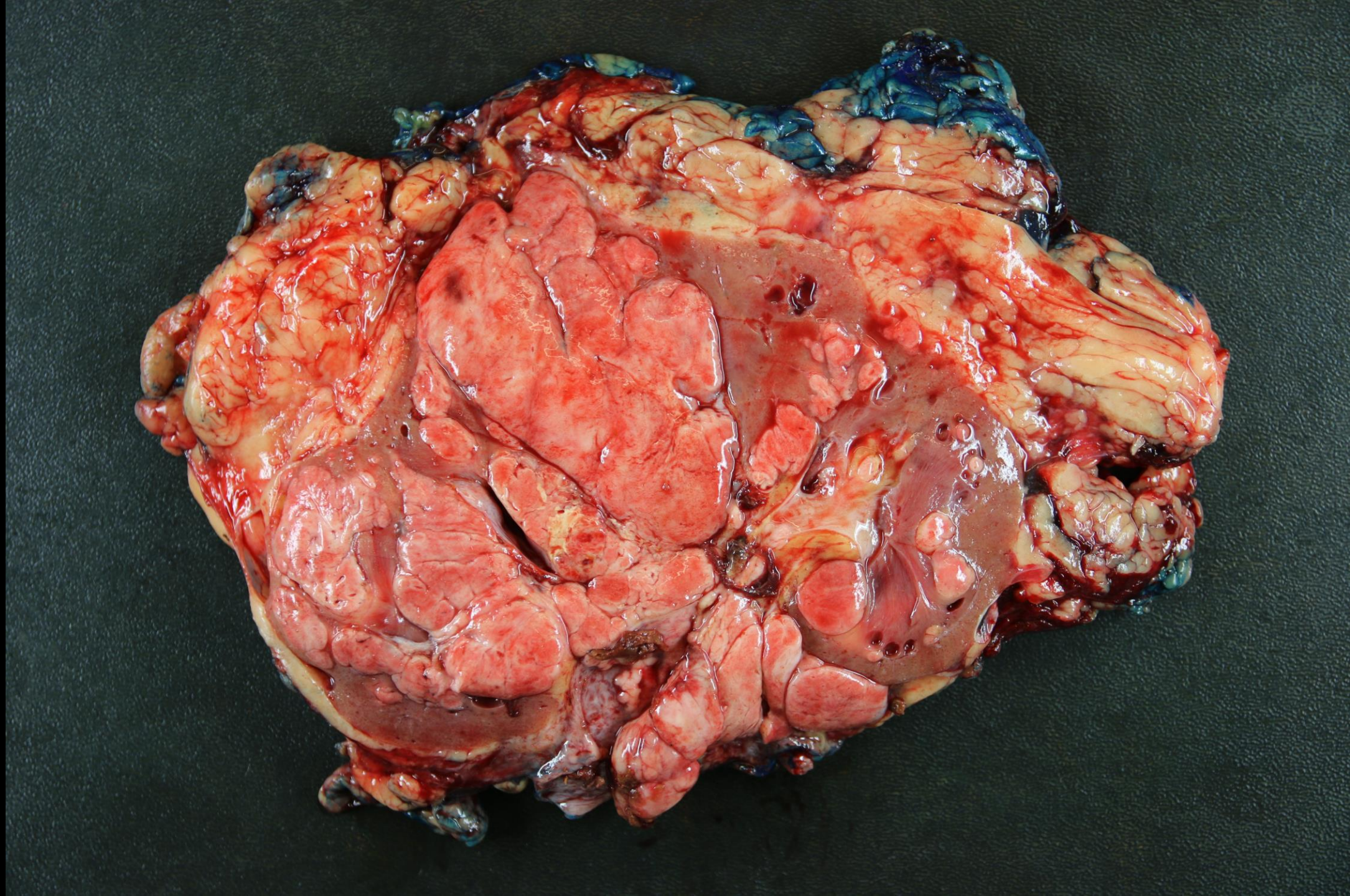
A. Bland thrombus
B. Tumor thrombus
C. Doesn’t matter

Professor Albert Richards
Orchid
1989

29625308

RCC with IVC thrombus

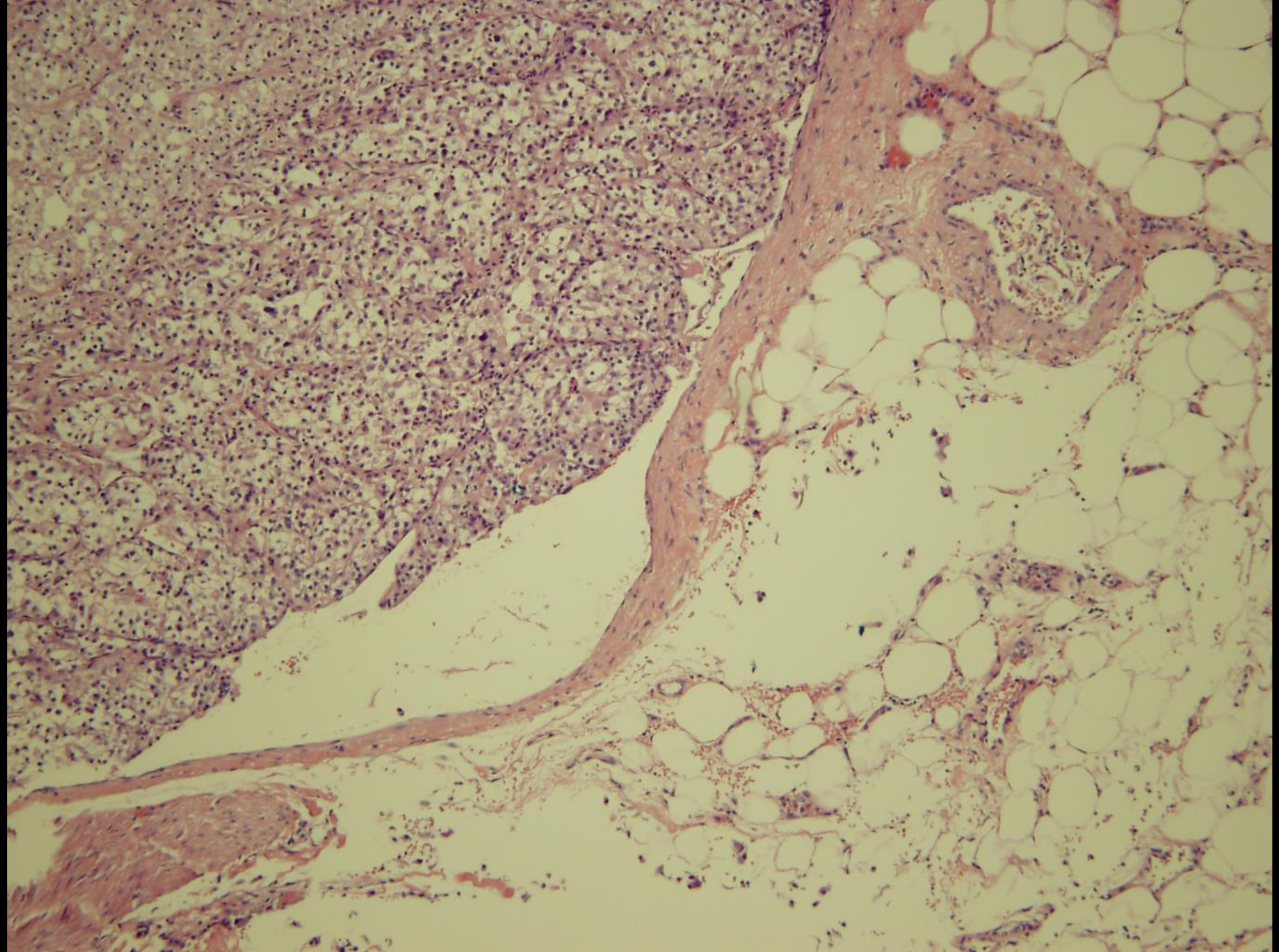
Gross



29625308

RCC with IVC thrombus

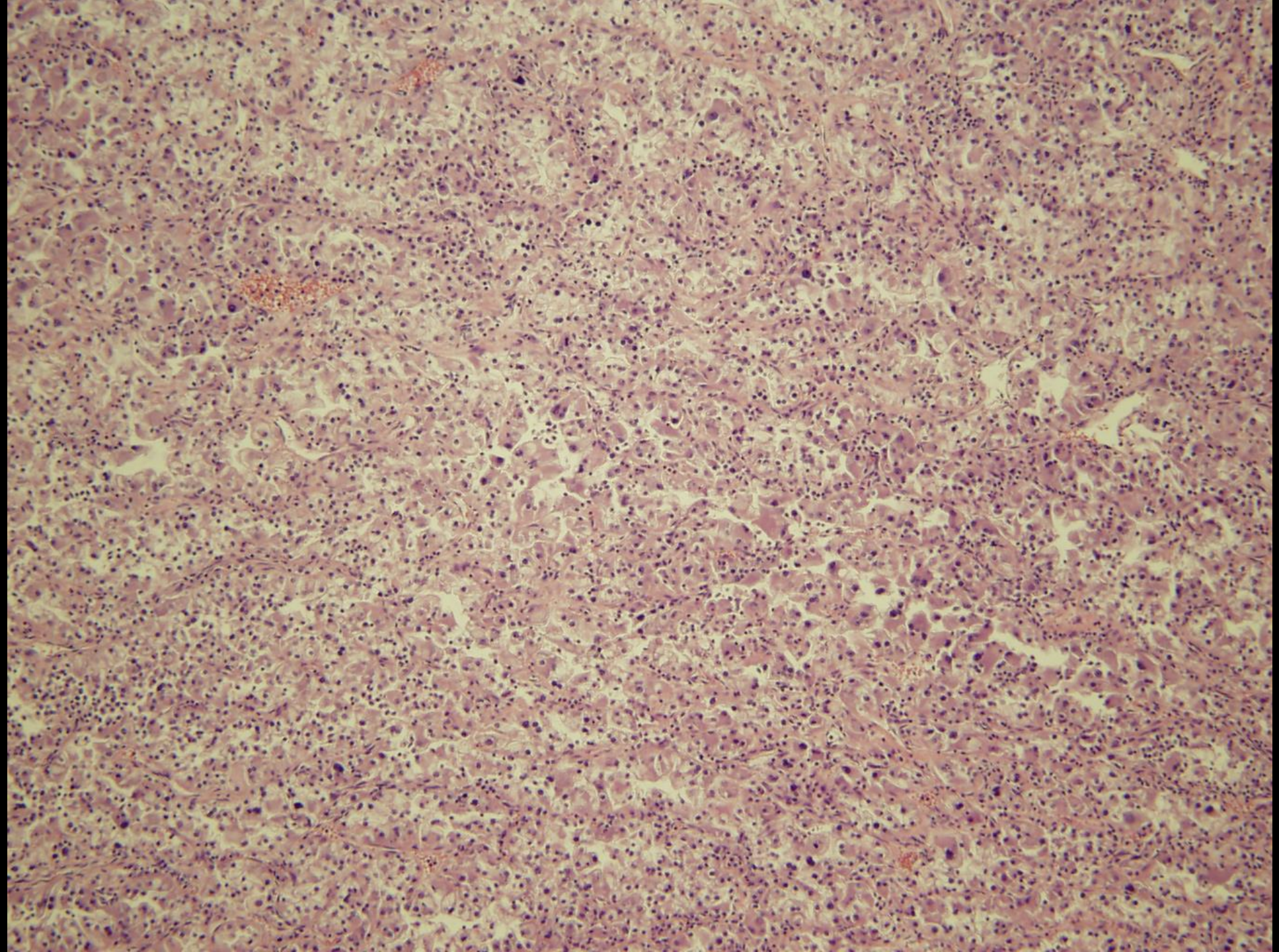
Renal vein margin -- positive



29625308

RCC with IVC thrombus

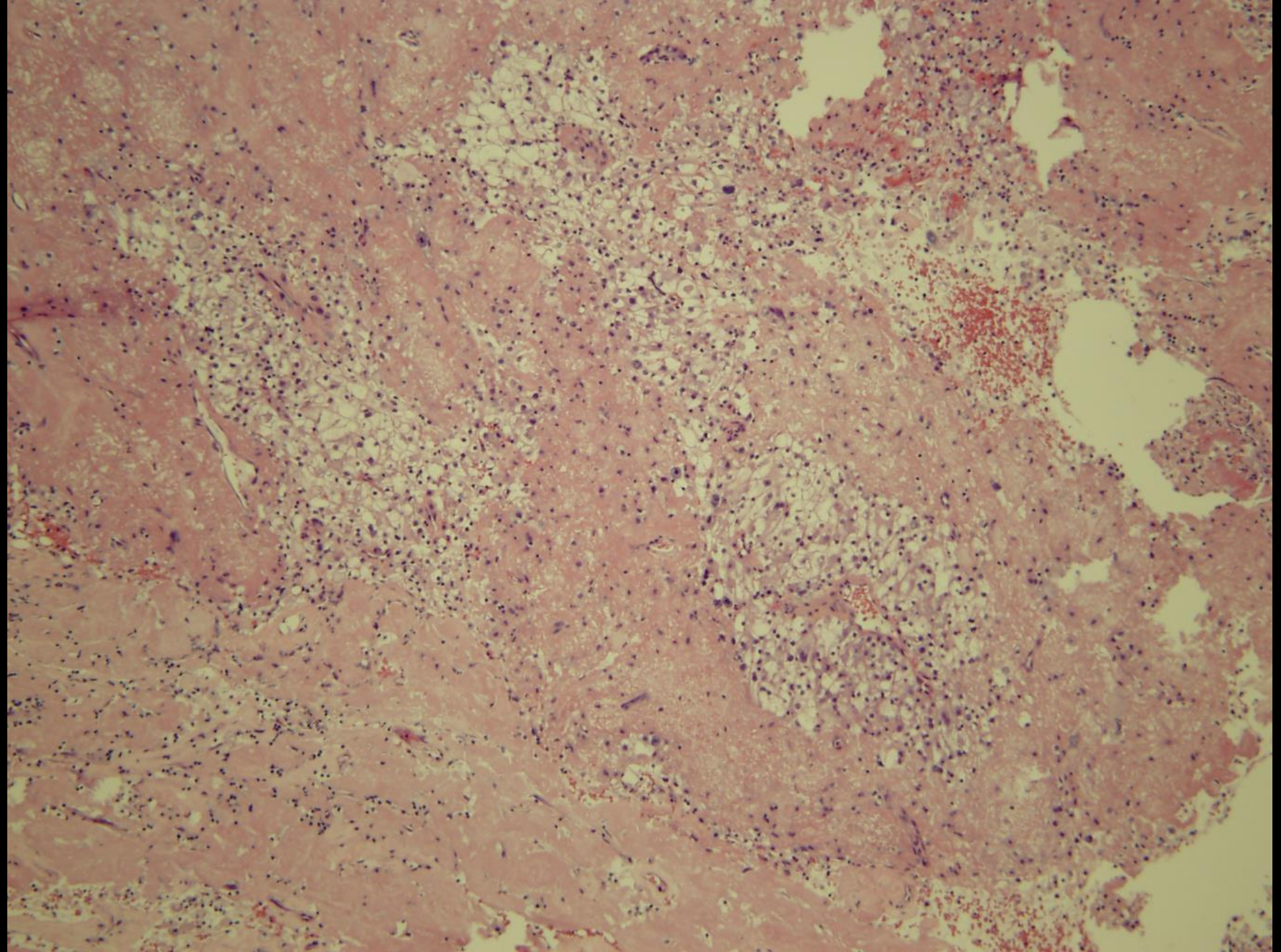
Main mass



29625308

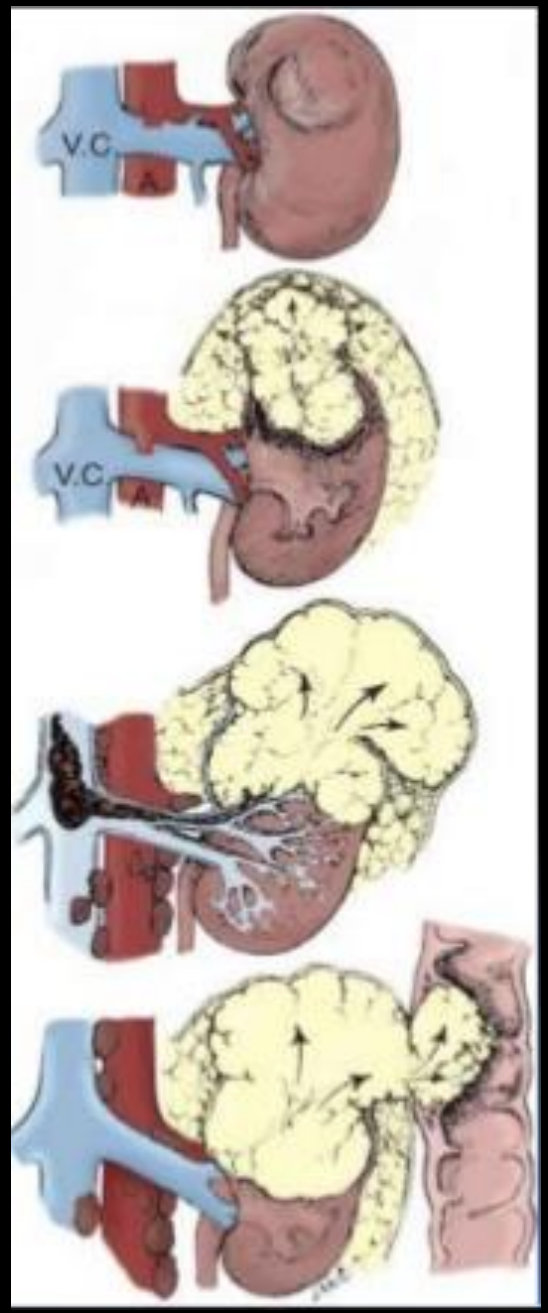
RCC with IVC thrombus

Tumor thrombus



RCC staging

- Important for surgical planning
- Perinephric invasion are the most common staging errors at CT
- Associated renal vein thrombus – level and extent
- IVC involvement



Q: RCC with associated IVC thrombus is considered which TNM stage?

A. I
B. II
C. IIIa
D. IIIb
E. IIIc

Q: RCC with associated IVC thrombus is considered which TNM stage?

A. I
B. II
C. IIIa
D. IIIb
E. IIIc

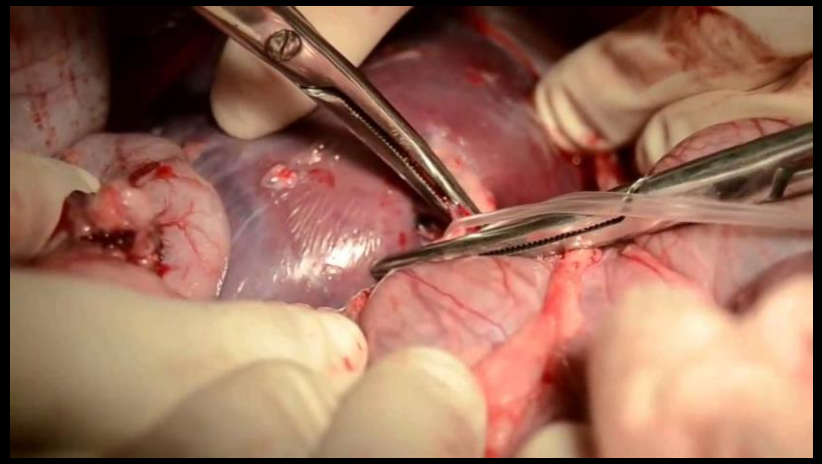
Tumour position	Robson	TNM	CT findings
Confined within renal capsule	I		Soft-tissue mass enhances less than normal renal
Small (<7 cm)		T1	parenchyma; central
Large (≥7 cm)		T2	necrosis in large RCC.
Spread to perinephric fat	II	T3a	Perinephric stranding; Perinephric collateral vessels; Soft-tissue mass in perinephric space
Venous thrombus	III A		
Renal vein only		T3b	Low-attenuation filling defect vein;
IVC infradiaphragmatic		T3c	Direct continuity of thrombus with primary mass;
IVC supradiaphragmatic		T4b	Enhanced thrombus
Regional lymph node metastases	III B	N1-N3	Lymph nodes 1 cm in diameter or larger
Direct invasion of adjacent organs	IV A	T4a	Obliteration of normal soft-tissues planes between tumor and adjacent organs
Distant metastases		M1	Metastases enhance with IV contrast material; Hepatic metastases best in arterial phase

IV: intravenous, IVC: inferior vena cava.

A. Marhuenda, M. I. Martín C. Deltoro, J. Santos, and Jose Rubio Briones. "Radiologic Evaluation of Small Renal Masses (I): Pretreatment Management". Adv Urol. 2008; 2008: 415848.

Surgical resection

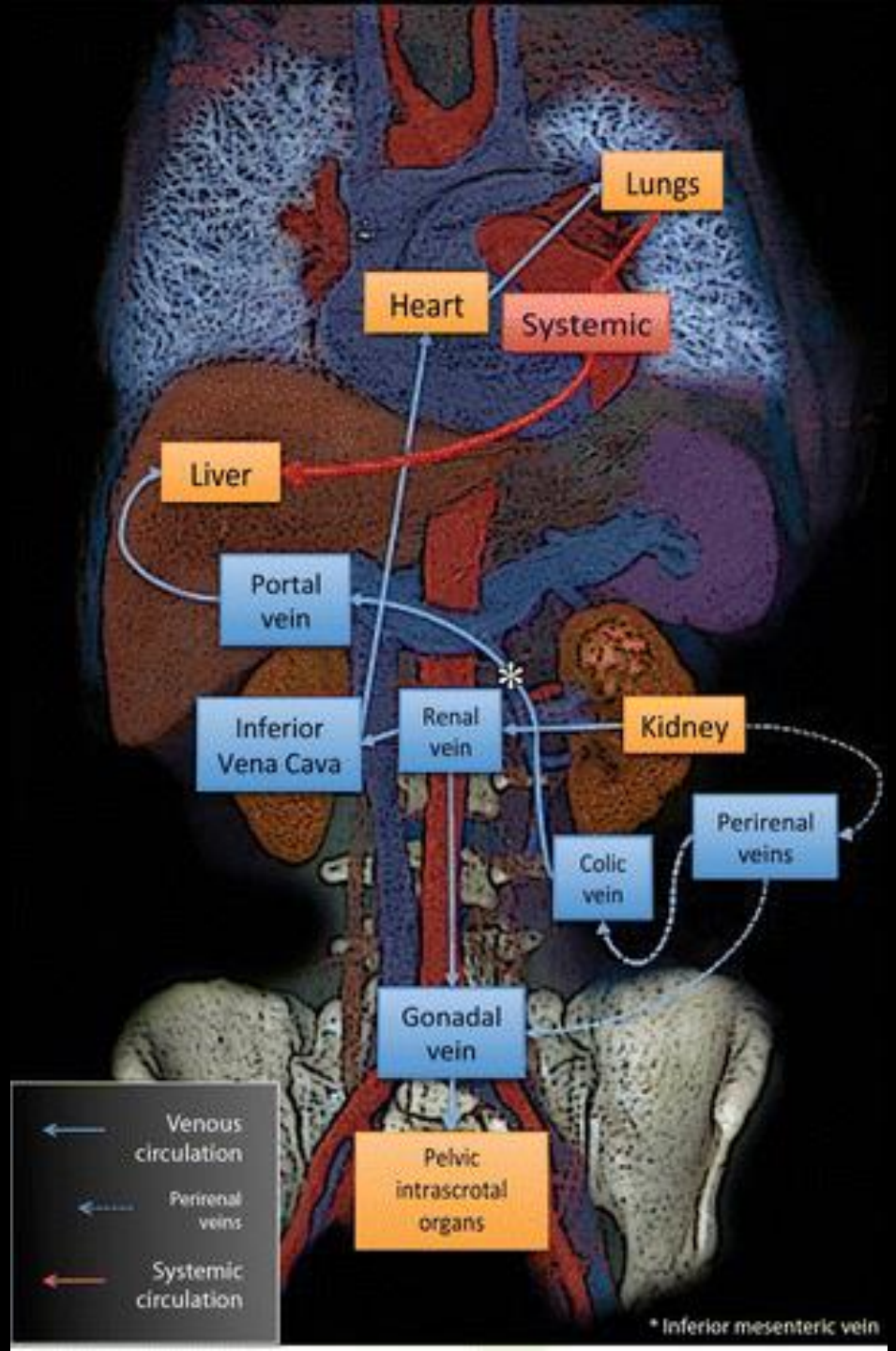
- Dissect and mobilize the ascending colon
- Elevate the right kidney and adrenal gland
- Ligate right renal vein and artery
- Cavoatrial thrombectomy:
  - mobilize left lobe of the liver by dividing attachments to diaphragm
  - dissect infrahepatic, retrohepatic and suprahepatic IVC
  - Ligate connecting vessels
  - Clamp bilateral renal veins



https://www.youtube.com/watch?v=A83ZY7AijFo

Morbidity of RCC

- Hemorrhage
- Thrombus
- Budd-Chiari syndrome
- Adrenal gland involvement
- Metastases

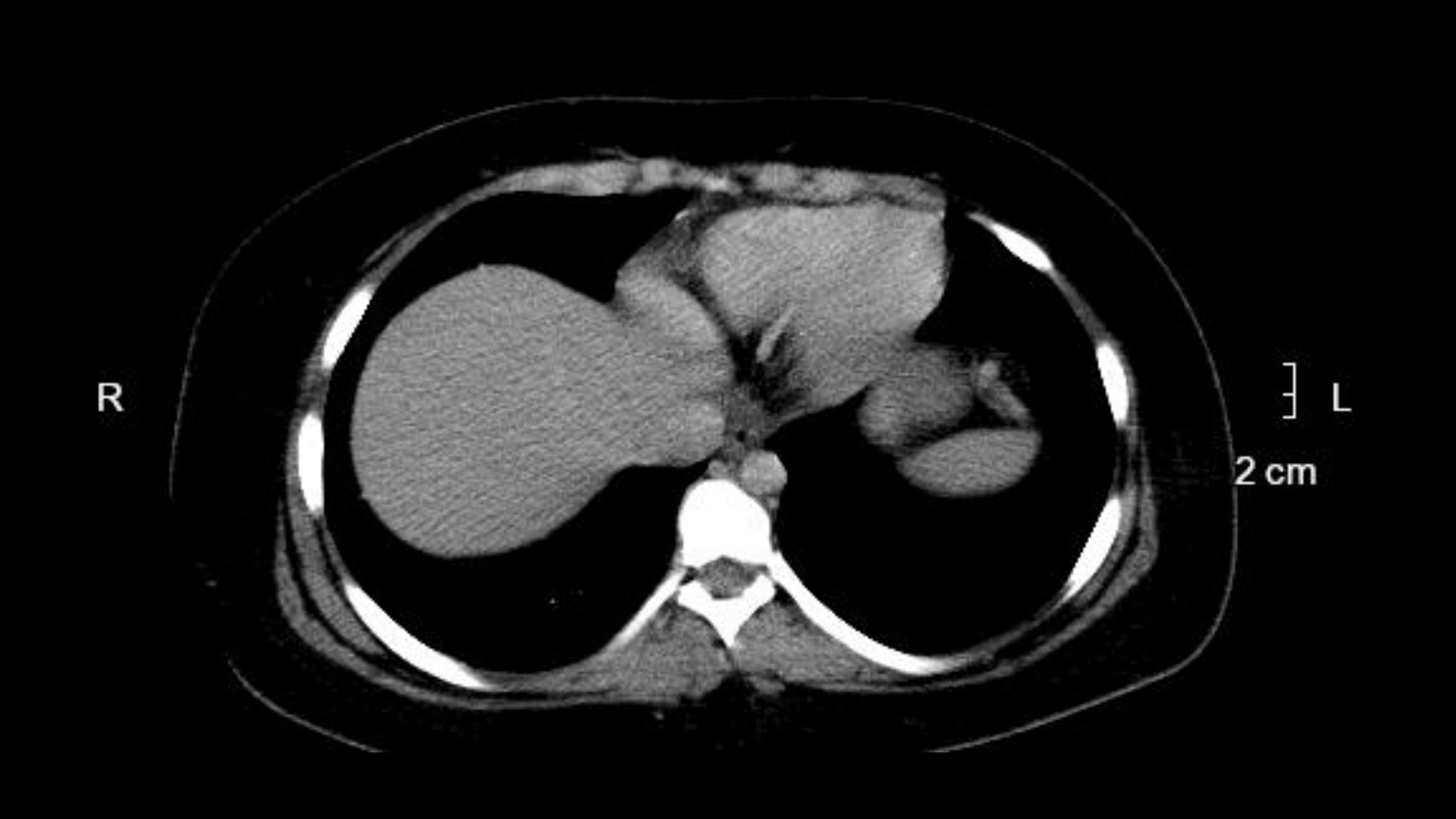


Brufau BP1, Cerqueda CS, Villalba LB, Izquierdo RS, González BM, Molina CN. "Metastatic renal cell carcinoma: radiologic findings and assessment of response to targeted antiangiogenic therapy by using multidetector CT." *Radiographics*. 2013 Oct;33(6):1691-716.

Professor Albert Richards
Chinese lantern
1982

Case 2

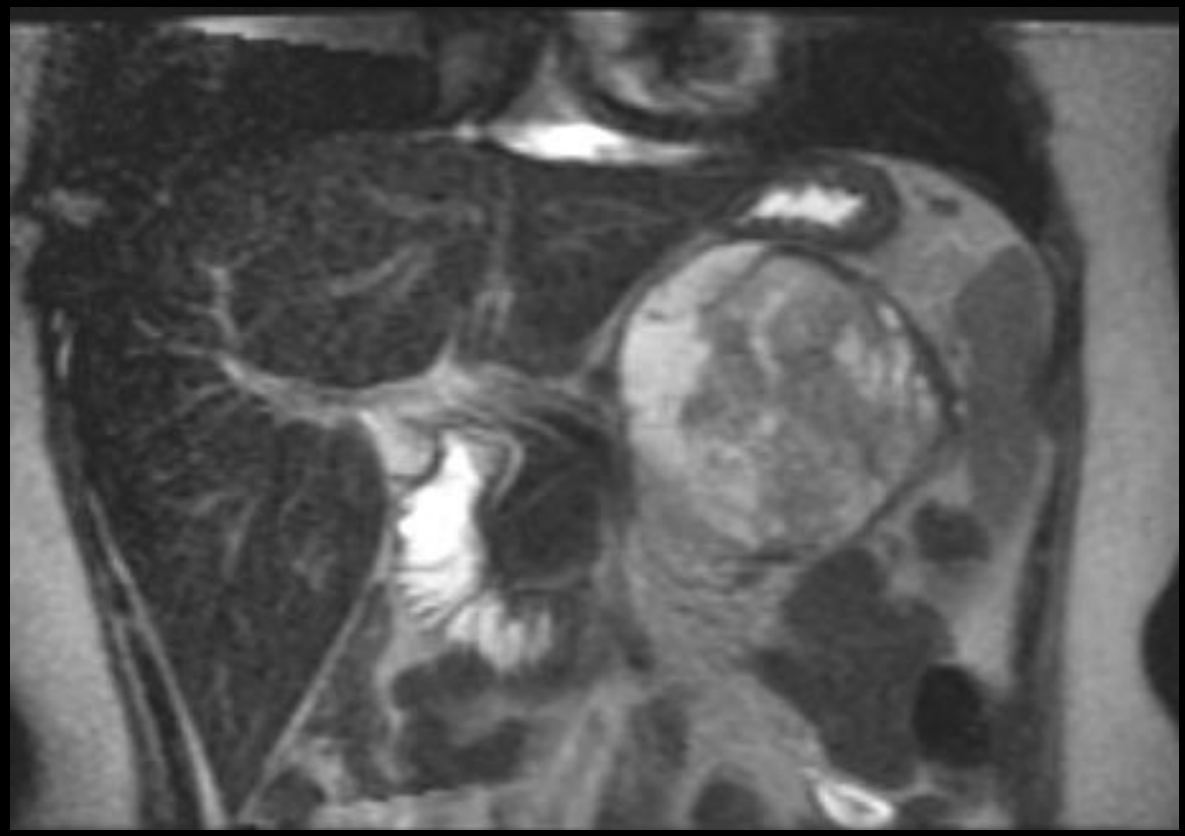
- 13yo female with right lower quadrant pain


R
L
2 cm

MRI abdomen

Ax T2

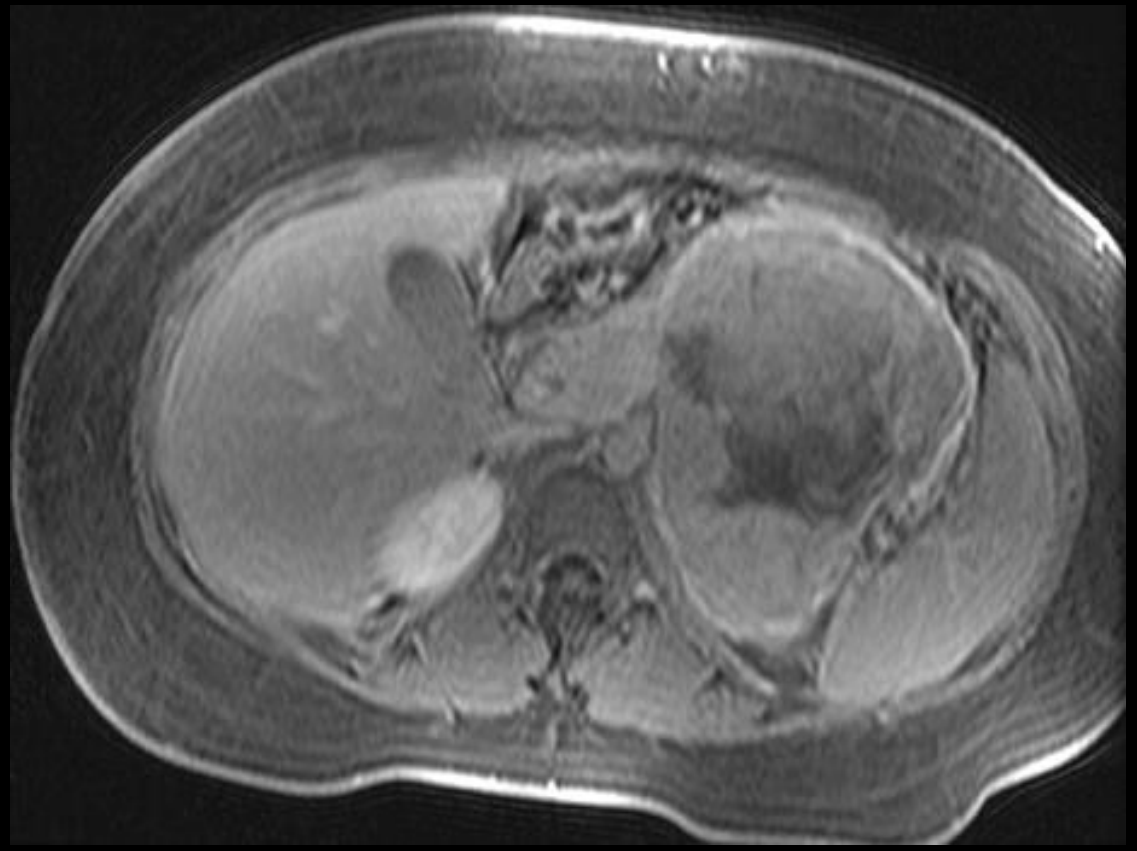
Coronal T2



Enhancement

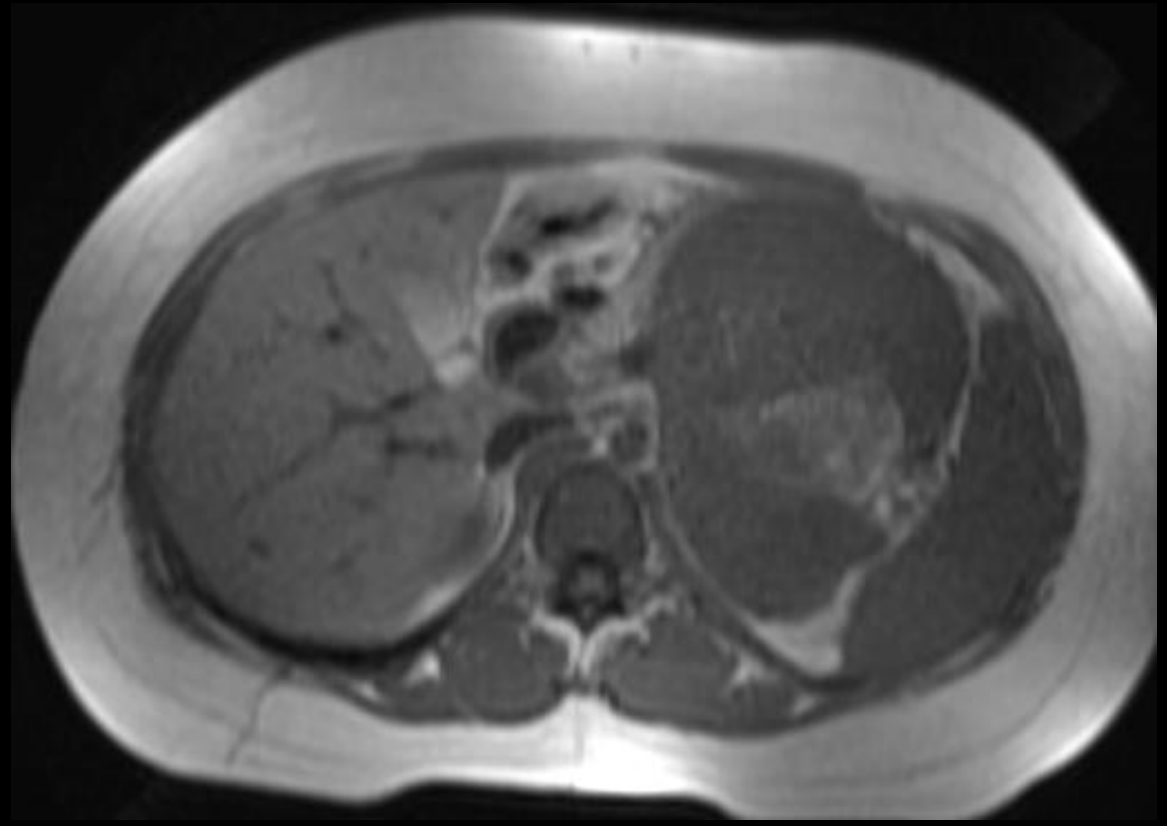
T1 pre

T1 post 5min



In and out of phase

In phase



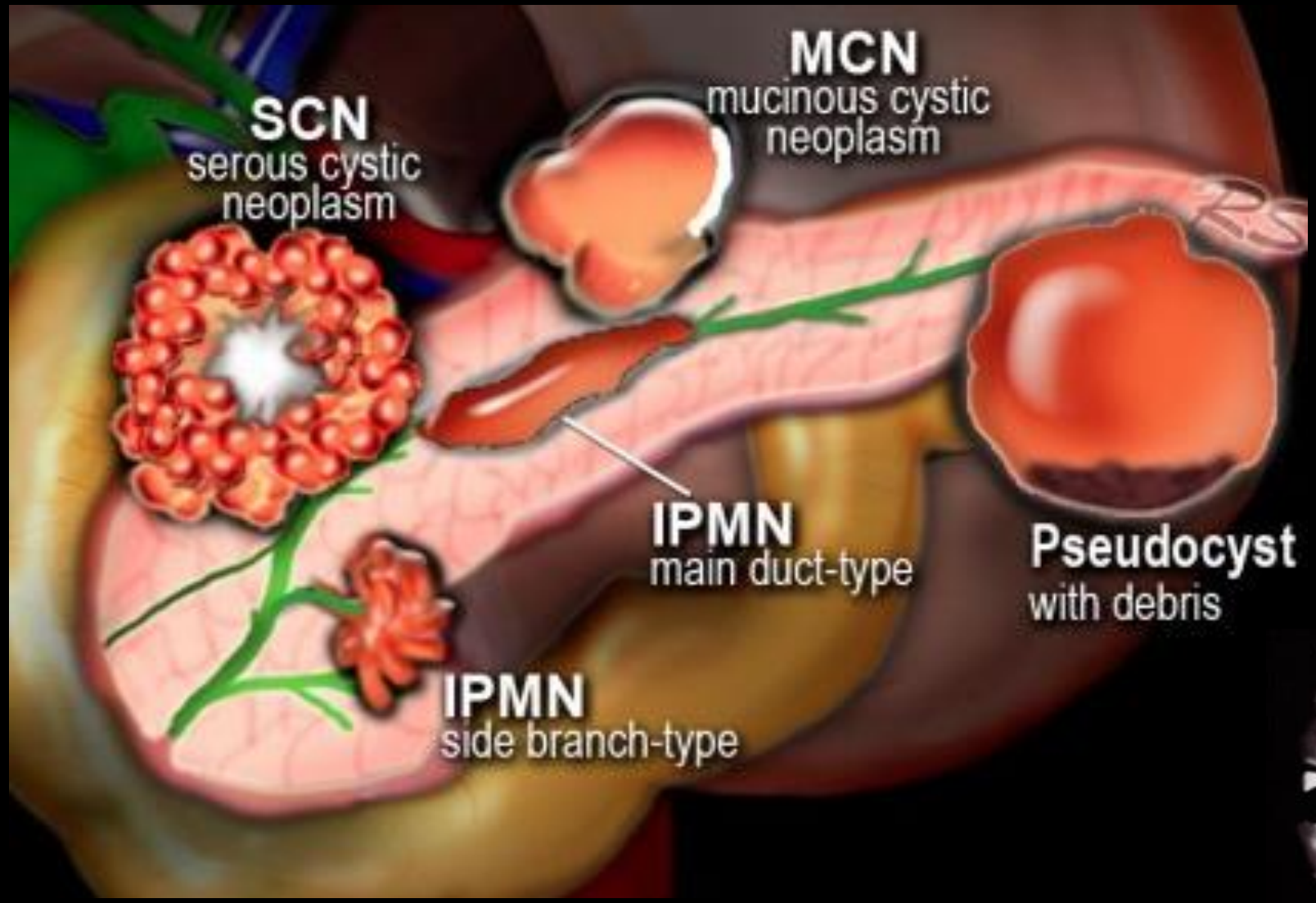
Out of phase

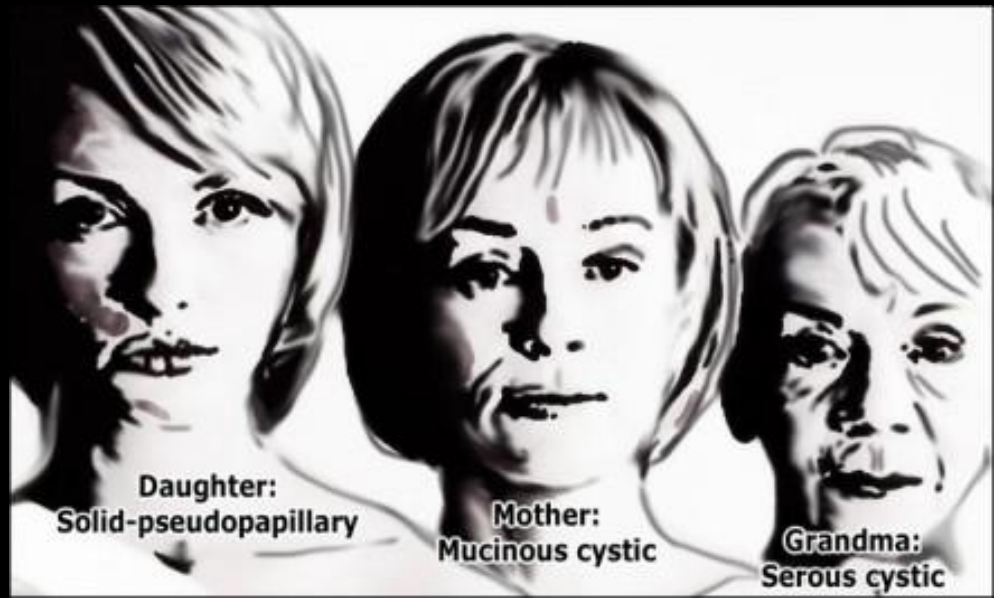
DDX

DDX Cystic pancreatic lesions

- **Unilocular**
  - pancreatic pseudocyst
  - intraductal papillary mucinous neoplasms (IPMN)
  - serous cystadenoma
  - von Hippel Lindau syndrome
  - autosomal dominant polycystic kidney disease (ADPKD)
  - cystic fibrosis
- **Macrocystic/multilocular**
  - mucinous cystic neoplasm(s) of pancreas: usually body and tail
  - intraductal papillary mucinous neoplasms (IPMN)
  - acinar cell cystadenocarcinoma
- **Microcystic**
  - serous cystadenoma: usually head; 30% have central scar
- **Cystic with a solid component**
  - solid pseudopapillary tumour of pancreas
  - primary ductal pancreatic tumour with cystic degeneration
  - Insulinoma, glucogonoma
- Cystic teratoma
- Metastases

DDX in younger children:
- Pancreatoblastoma
- Wilms tumor
- Neuroblastoma





http://www.radiologyassistant.nl/en/p4ec7bb77267de/pancreas-cystic-lesions.html

Professor Albert Richards
Azalea
1990

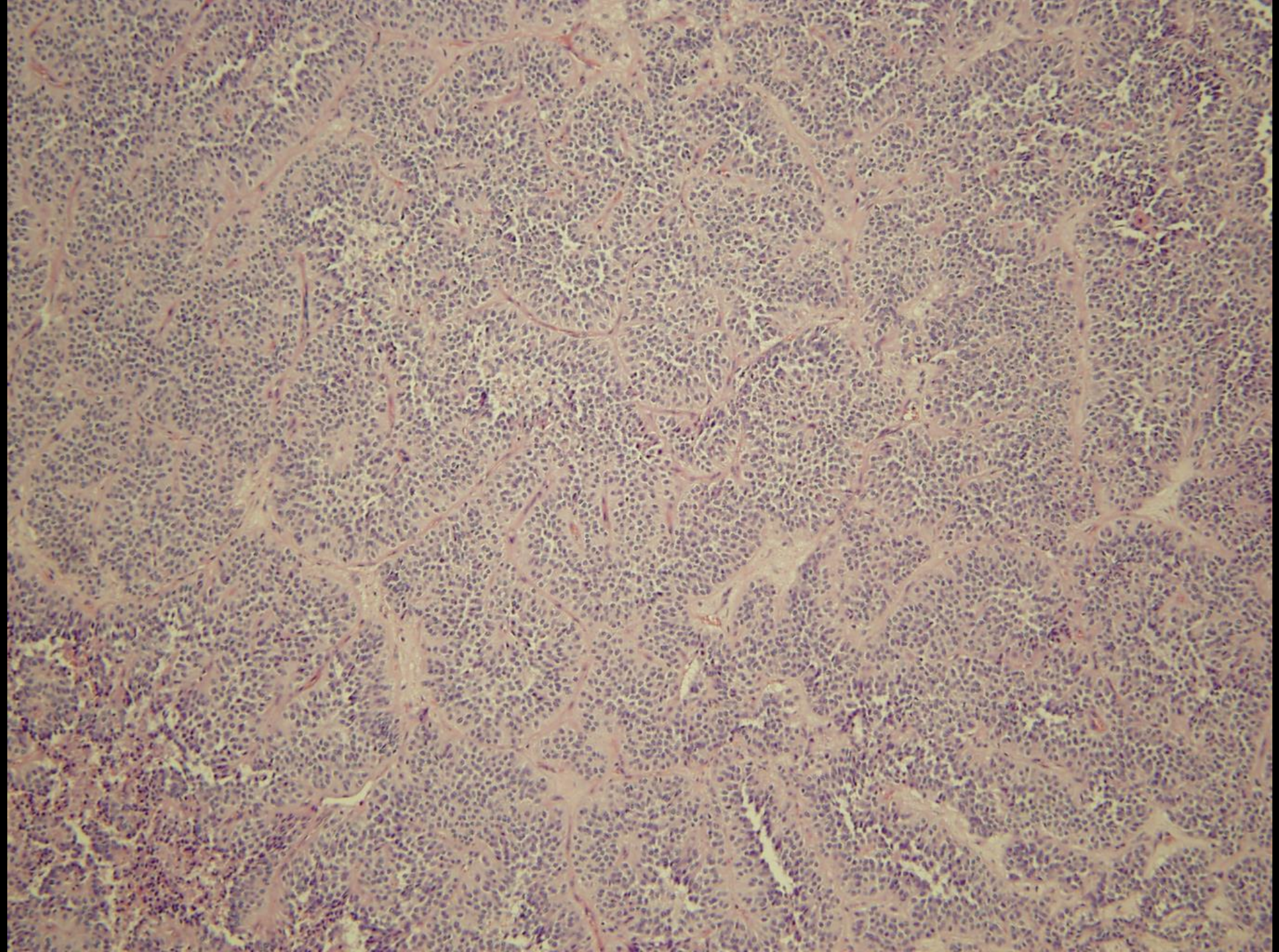
35431063

Solid pseudopapillary tumor

Gross

35431063

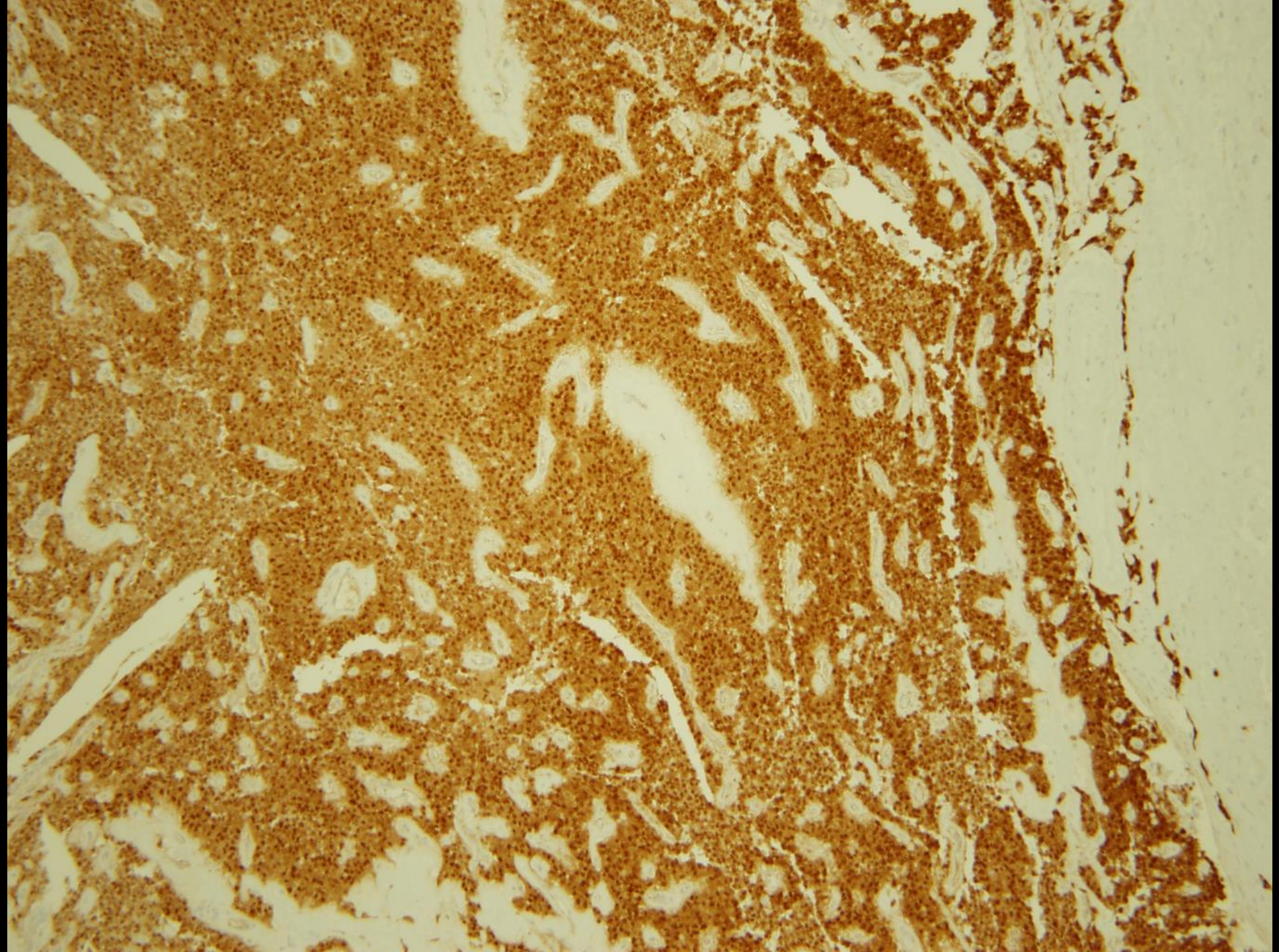
Solid pseudopapillary tumor



35431063

Solid pseudopapillary tumor

Beta-catenin



Solid pseudopapillary tumor of the pancreas

- Rare, 1-2% of exocrine pancreatic tumors
- Females of Asian or African descent in 2nd and 3rd decades of life
- Large lesion at the time of diagnosis, median size is 8 cm
- Predilection for pancreatic tail
- Varying amounts of necrosis, hemorrhage, and cystic change
- Purely solid on MRI in 80% of cases
- Case study[1]: 50% pseudocapsule, 40% had internal calcification, while 30% showed splenic invasion.

1. Yu et al. " MR Imaging Features of Small Solid Pseudopapillary Tumors: Retrospective Differentiation From Other Small Solid Pancreatic Tumors." *American Journal of Roentgenology*. 2010;195: 1324-1332
2. http://www.radiologyassistant.nl/en/p4ec7bb77267de/pancreas-cystic-lesions.html

Solid pseudopapillary tumor of the pancreas

- Mass effect on pancreatic duct
- Mass effect on splenic vein -> portosystemic shunt
- Most lesions are benign, ~15% can be malignant.
- Complete resection is associated with long-term survival, even with metastatic disease.

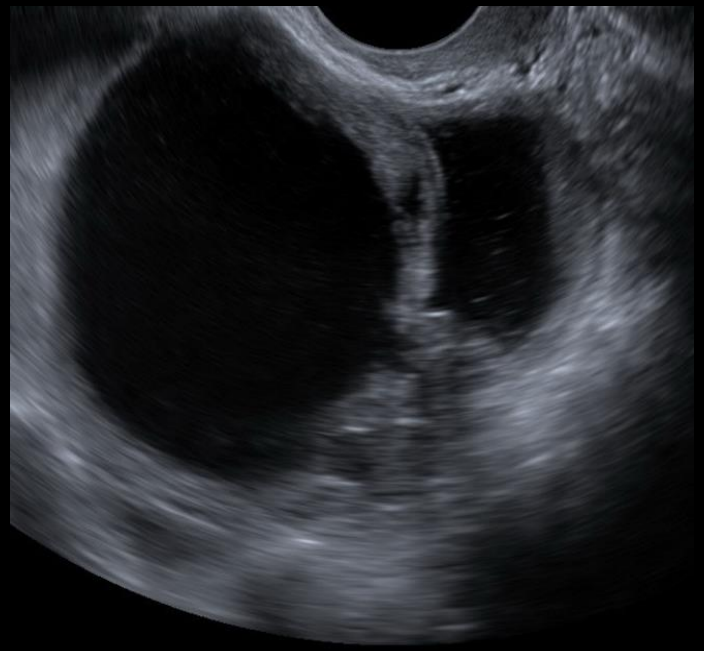
Take away points

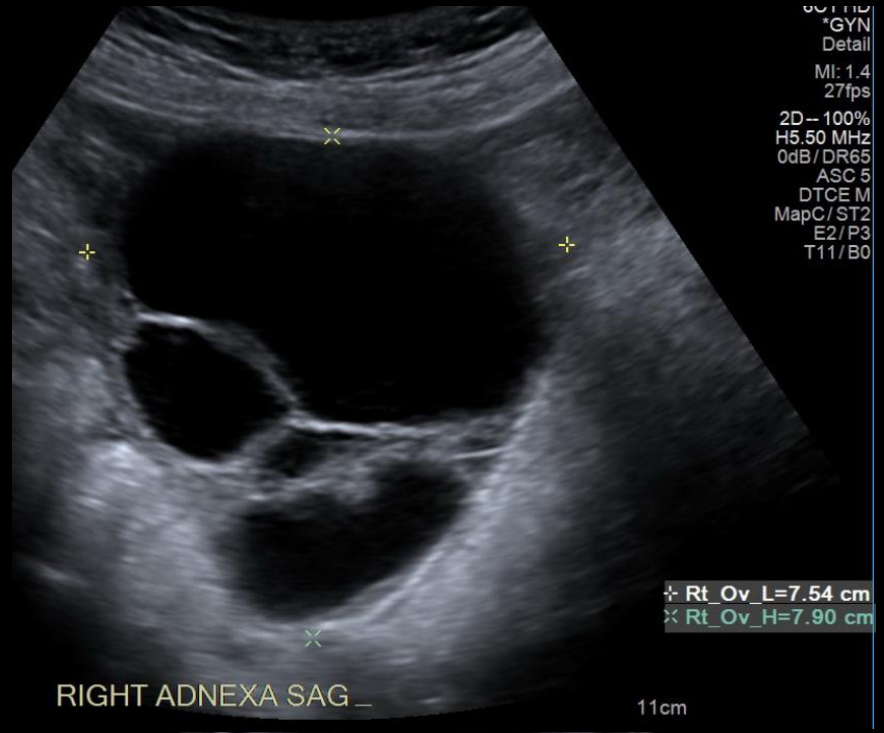
- CT imaging features of pancreatic solid pseudopapillary neoplasms (SPNs) correlate well with their pathologic findings.
- A well-defined mixed solid-cystic pancreatic mass in a young woman should raise the suspicion of SPN.
- Small SPNs may not have the pathognomonic imaging features and can be purely solid.

Case 3

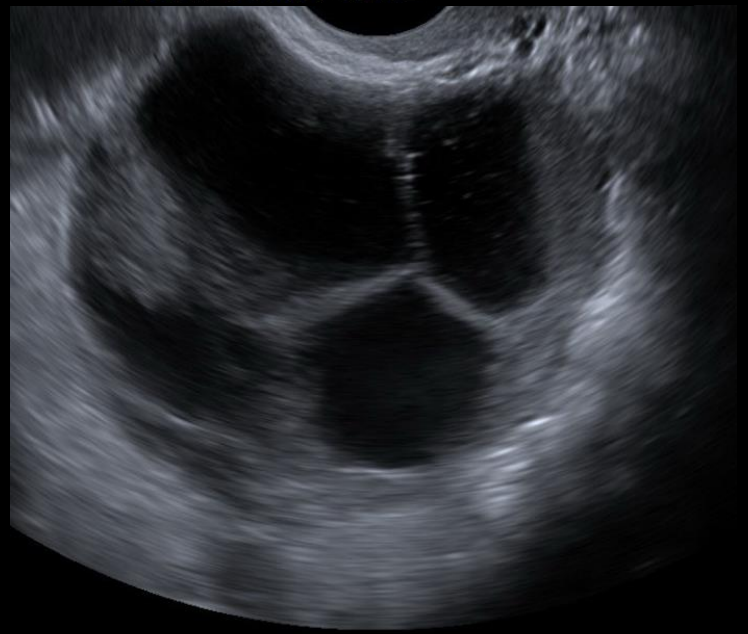
- 46yo female from Bermuda with routine ultrasound which found an ovarian cyst with plan to follow-up. Now presents with abdominal discomfort, bloating, and urinary frequency.

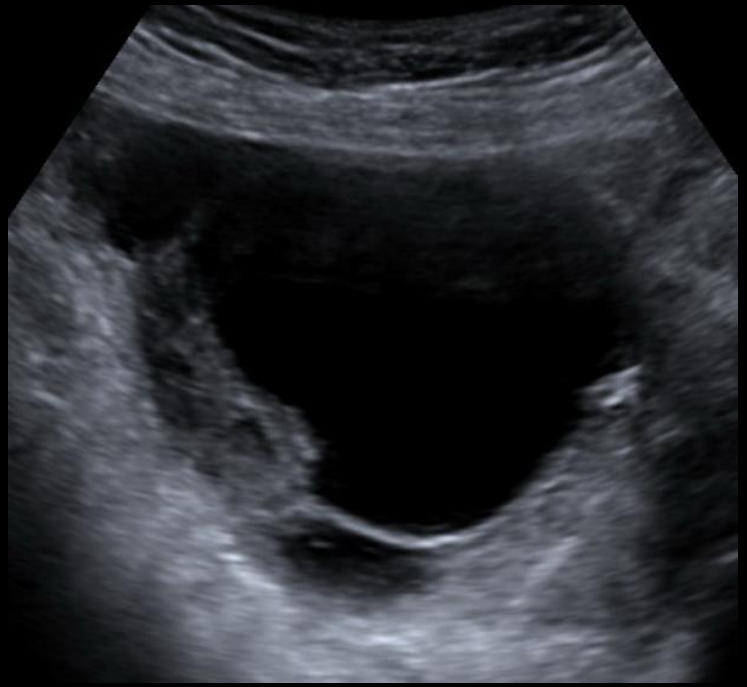

RIGHT ADNEXA TRANS _

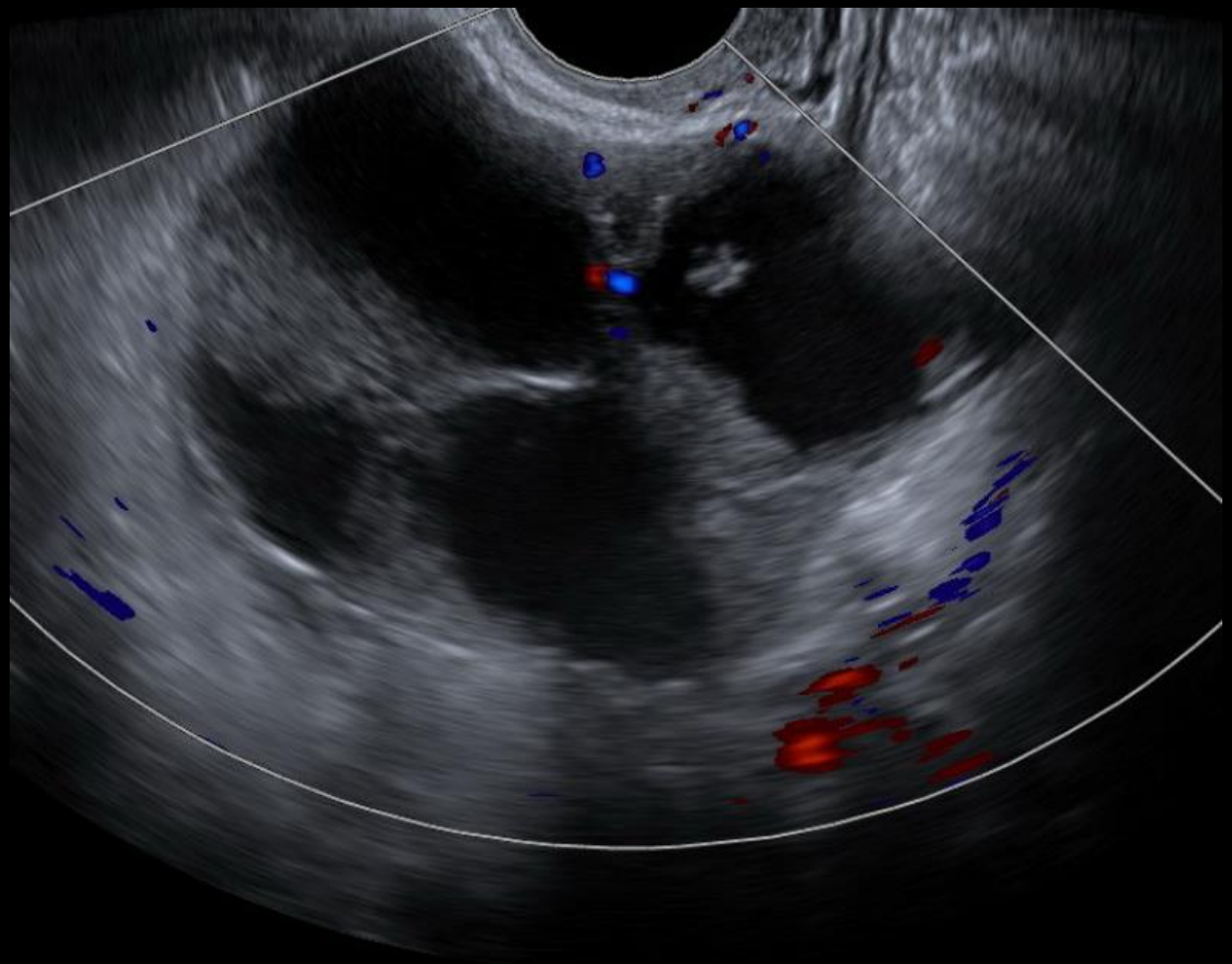

RIGHT OVARY SAG _

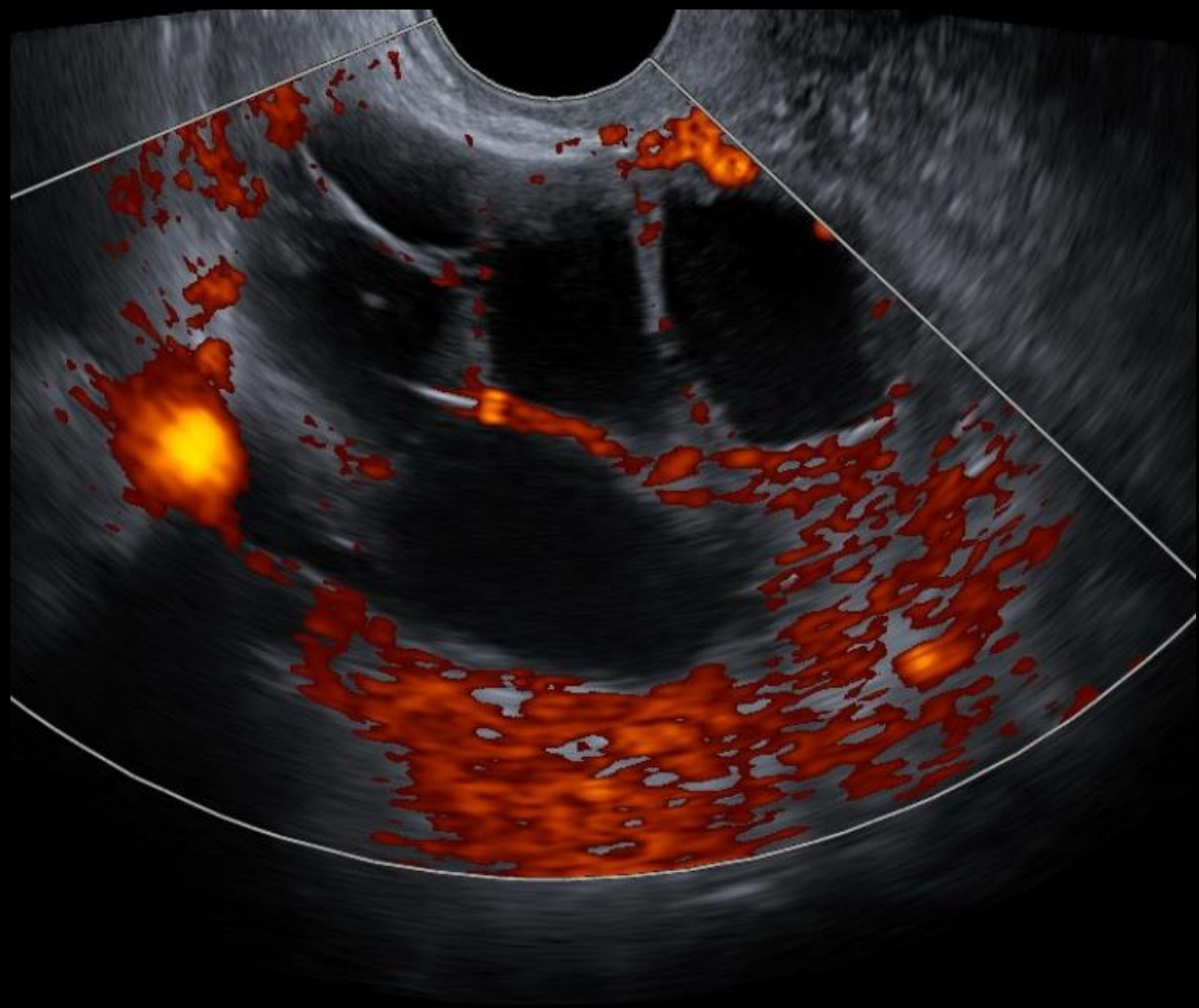

*GYN
Detail
MI: 1.4
27fps
2D – 100%
H5.50 MHz
0dB / DR65
ASC 5
DTCE M
MapC / ST2
E2 / P3
T11 / B0
Rt_Ov_L=7.54 cm
Rt_Ov_H=7.90 cm
RIGHT ADNEXA SAG _
11cm


RIGHT ADNEXA TRANS |
1


RIGHT OVARY SAG _
8cm

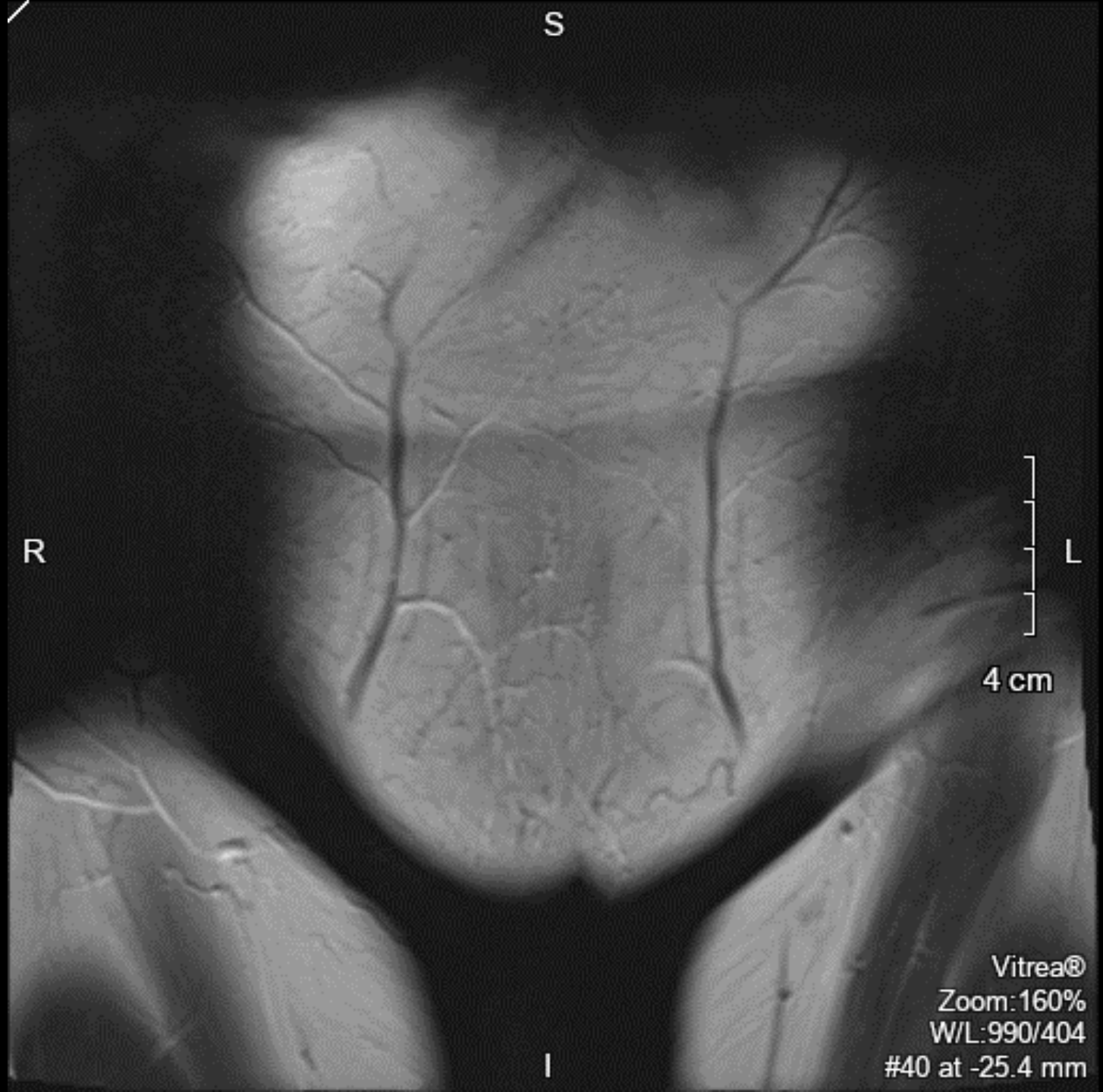



RIGHT OVARY SAG _
9cm


RIGHT OVARY TRANS |
9cm

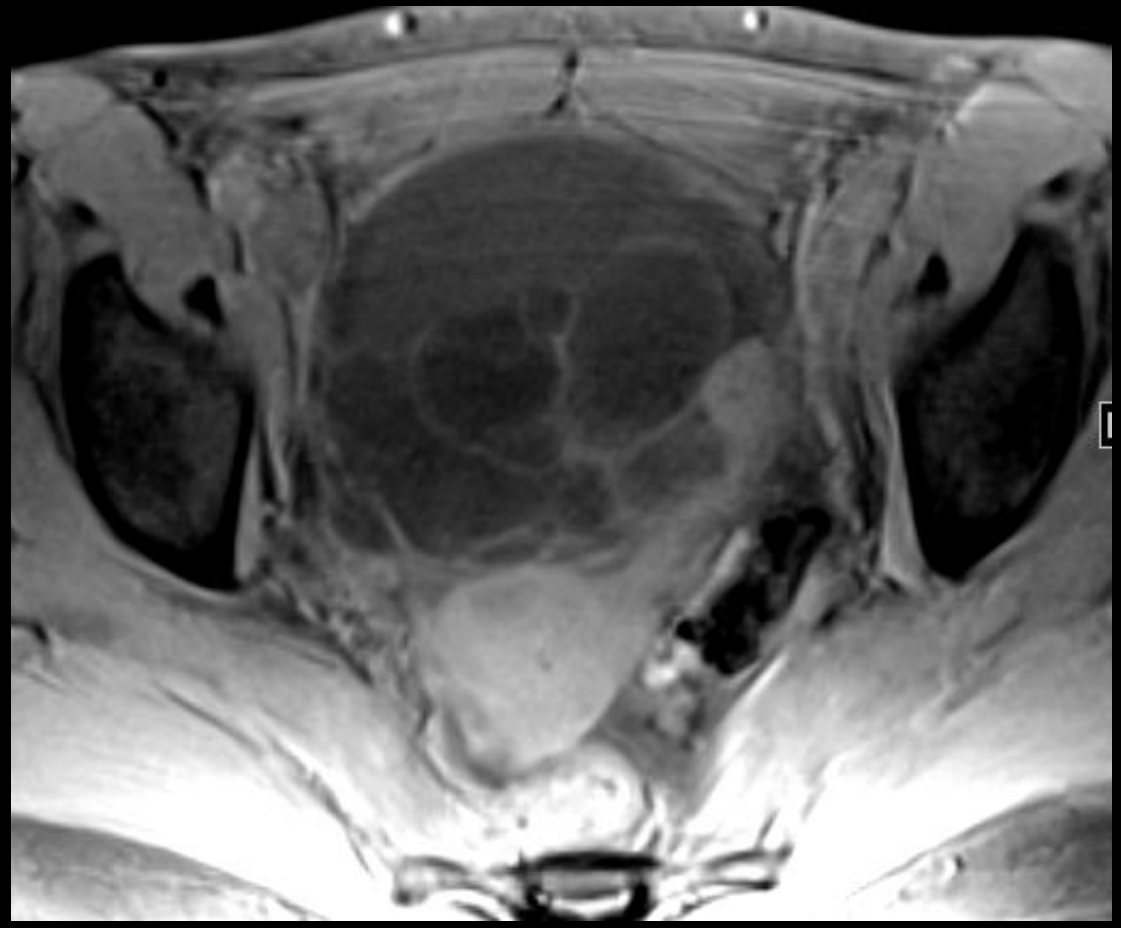
DDX


R
L
2 cm

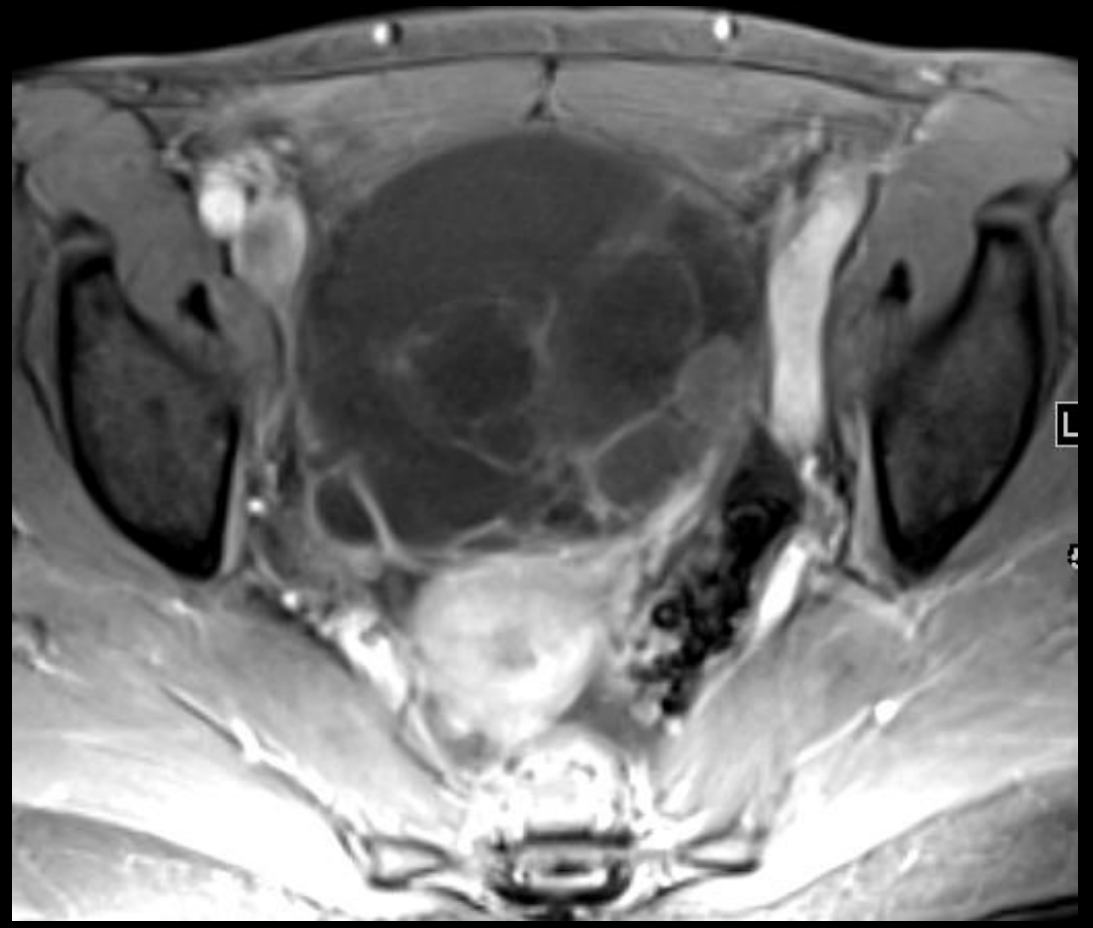

S
R
L
4 cm
I
Vitrea®
Zoom:160%
W/L:990/404
#40 at -25.4 mm

Enhancement

T1 pre

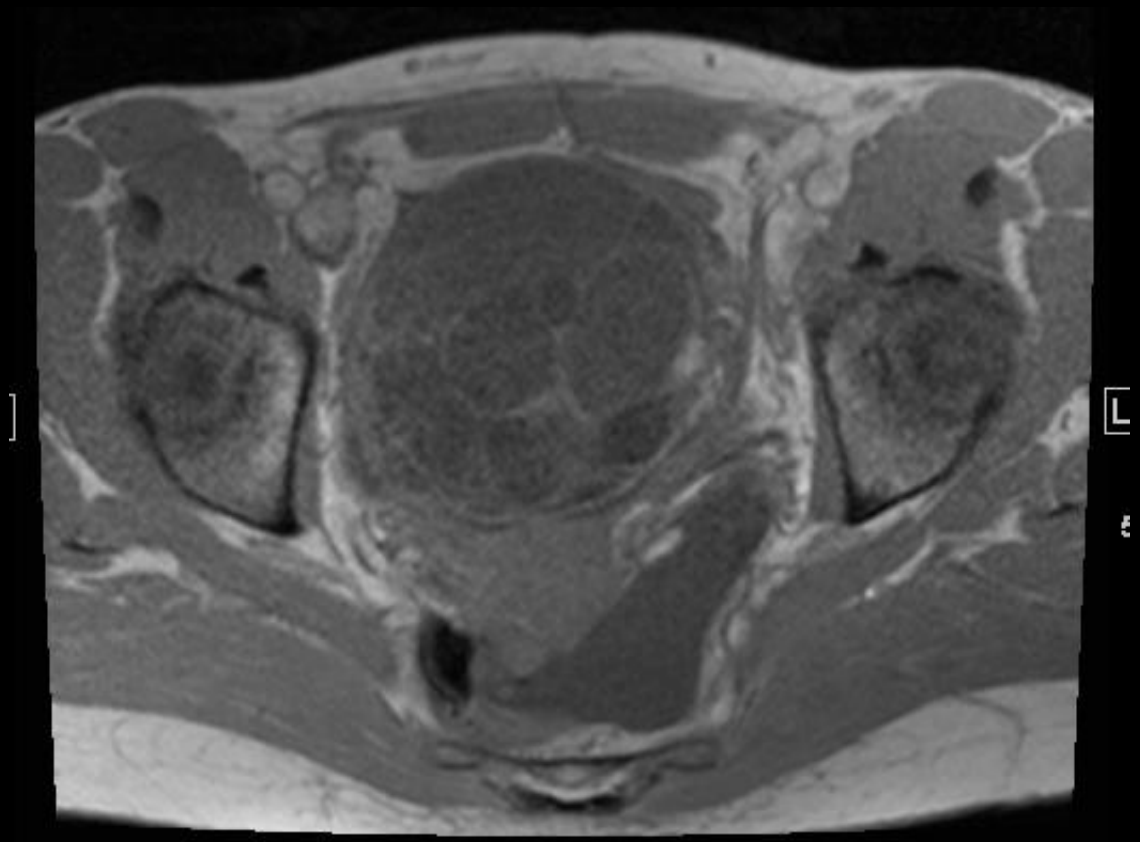


T1 post

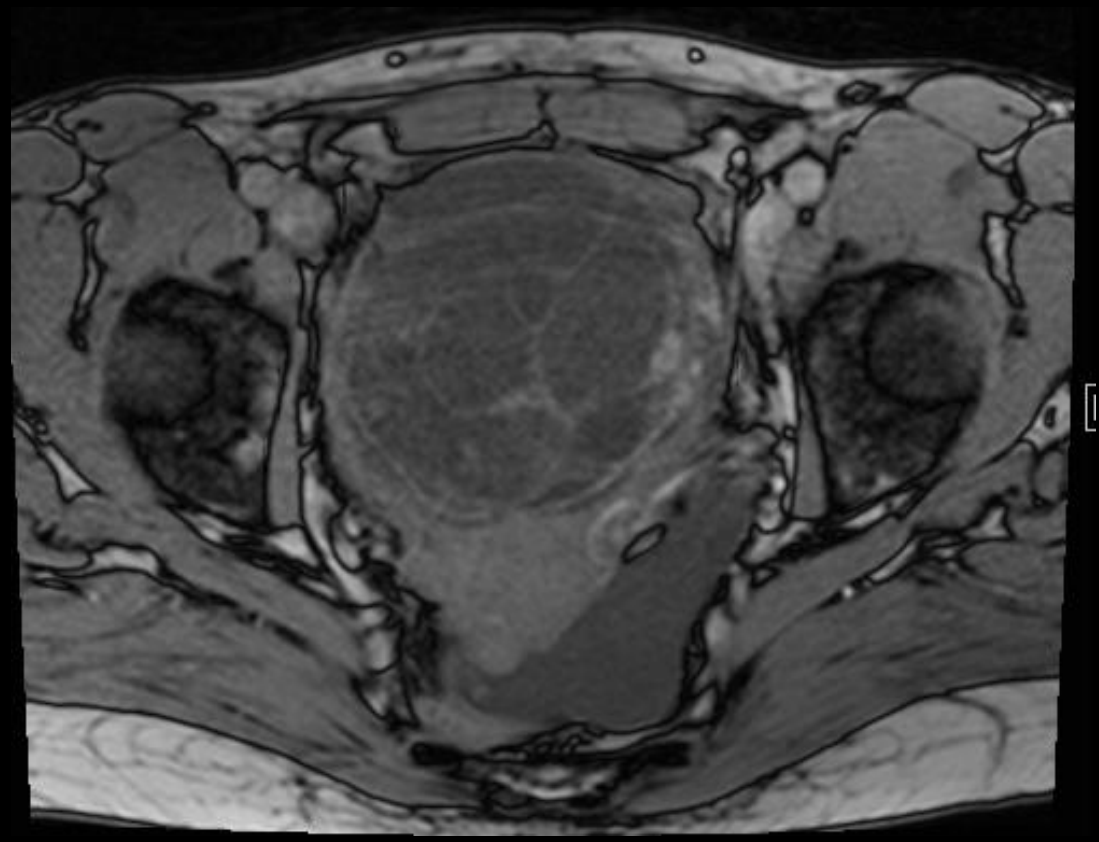


In and out of phase

In phase



Out of phase



Ovarian cancer

- Epithelial (85%), germ cell, sex cord–stromal, or metastatic
  - Epithelial: serous, mucinous, endometrioid, clear cell, and Brenner tumors
    - Cell type cannot be determined on the basis of imaging, biopsy or excision is necessary.
- Mucinous cystadenocarcinoma:
  - Bilateral lesions occur 5-10% of the stage I cases.
  - Multilocular, with numerous smooth thin-walled cysts.
  - Mucoid material within the cysts, sometimes with hemorrhagic or cellular debris.
  - Proportion of solid, nonfatty, non-fibrous tissue is best predictor of malignancy.
  - Elevated serum CA-125 levels (>35 U/mL) have been found at radioimmunoassay in more than 80% of ovarian cancer patients

Q: Is CA-125 a tumor-specific antigen?

- Yes
- No

CA-125

- Elevated in approximately 1% of healthy control subjects.
- Elevated in patients with liver cirrhosis, endometriosis, first-trimester pregnancy, pelvic inflammatory disease, and pancreatitis.
- Elevated in 40% of patients with advanced intraabdominal nonovarian malignancy.

Jeong YY et al. "Imaging Evaluation of Ovarian Masses." RadioGraphics 2000 20:5, 1445-1470.

Professor Albert Richards
Viburnum
1995

34329995

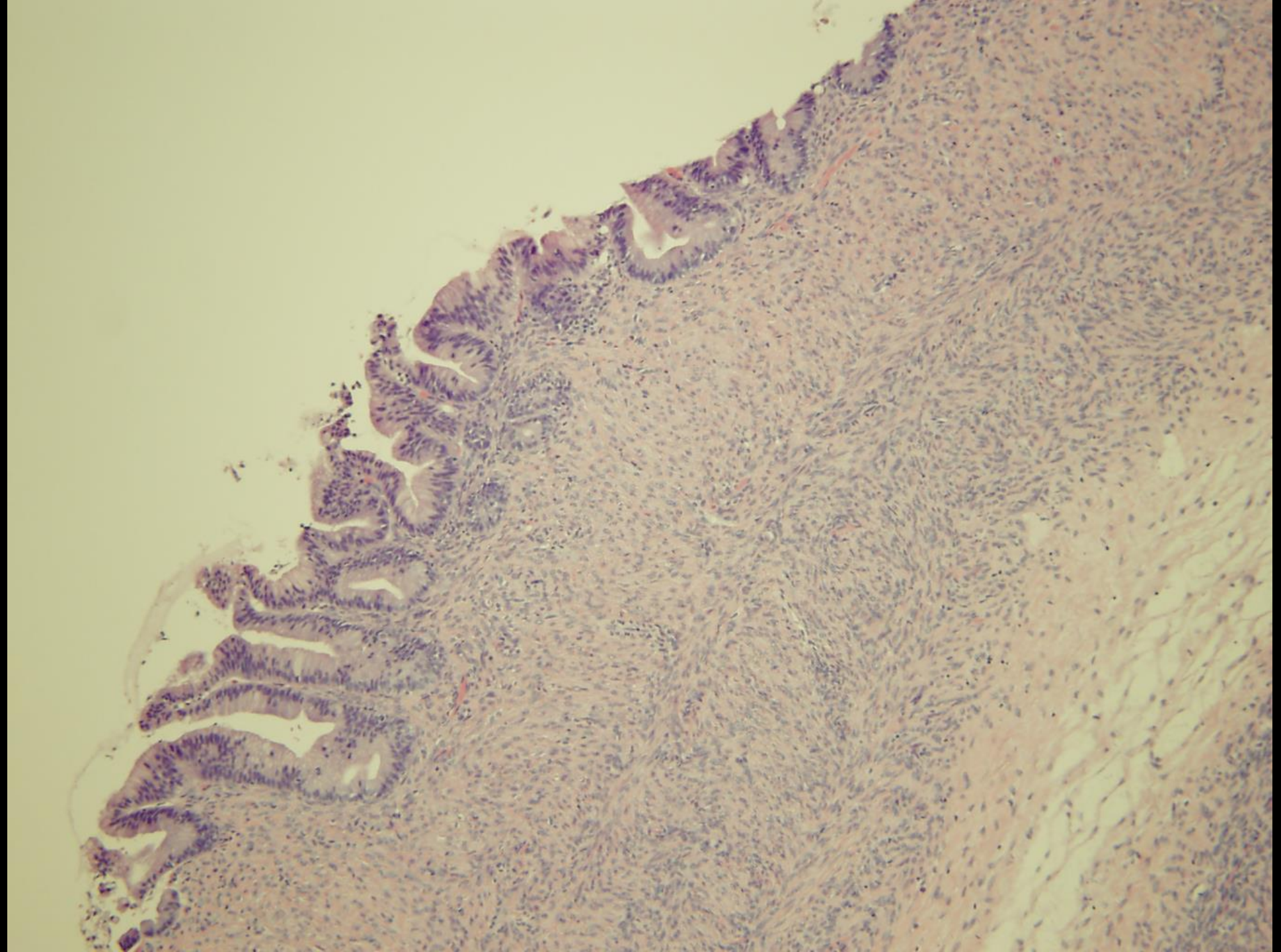
Mucinous adenocarcinoma arising in background of mucinous borderline and intraepithelial carcinoma

Gross

34329995

Mucinous adenocarcinoma arising in background of mucinous borderline and intraepithelial carcinoma

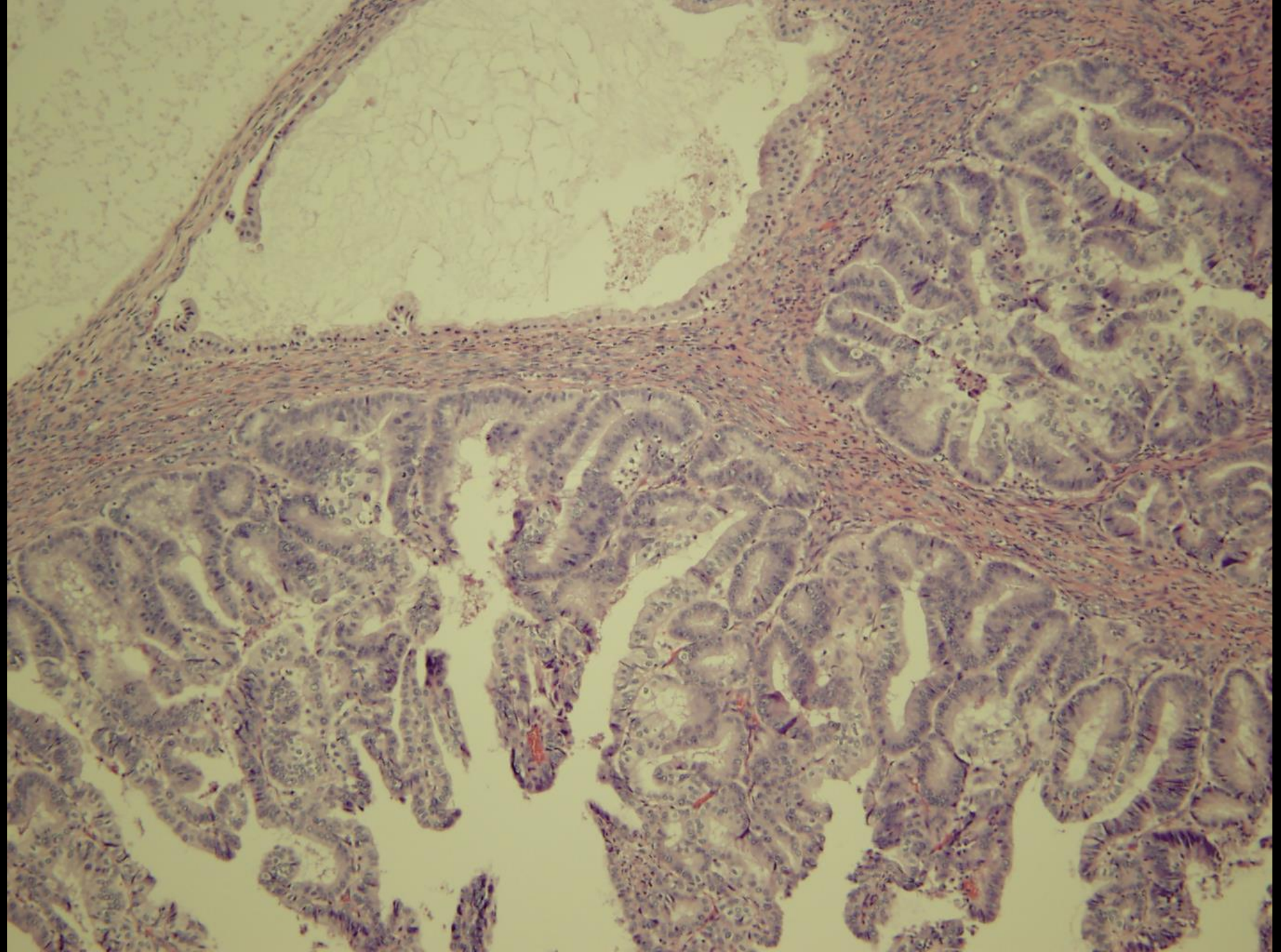
Intraepithelial component



34329995

Mucinous adenocarcinoma arising in background of mucinous borderline and intraepithelial carcinoma

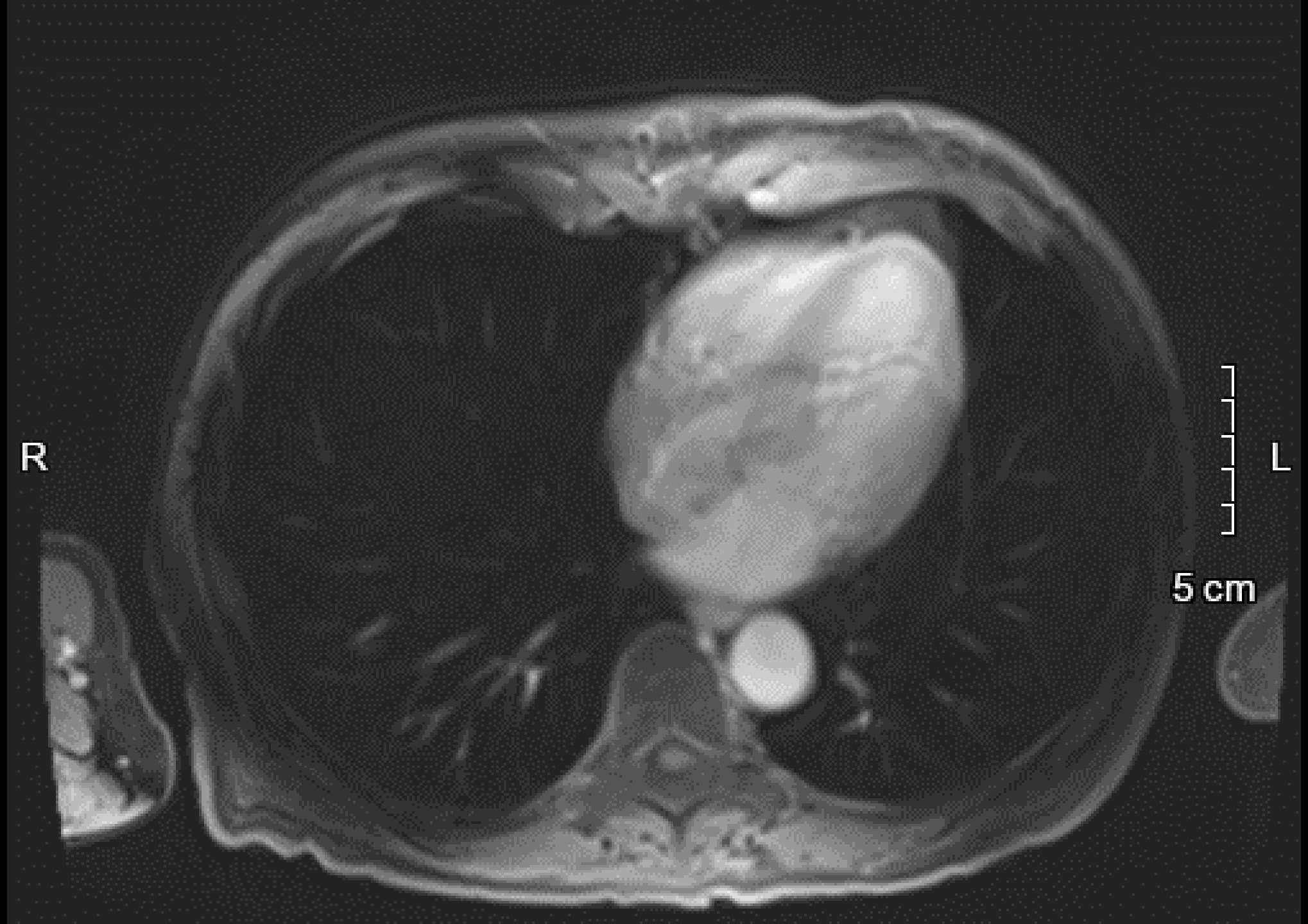
Mucinous adenocarcinoma adjacent to borderline

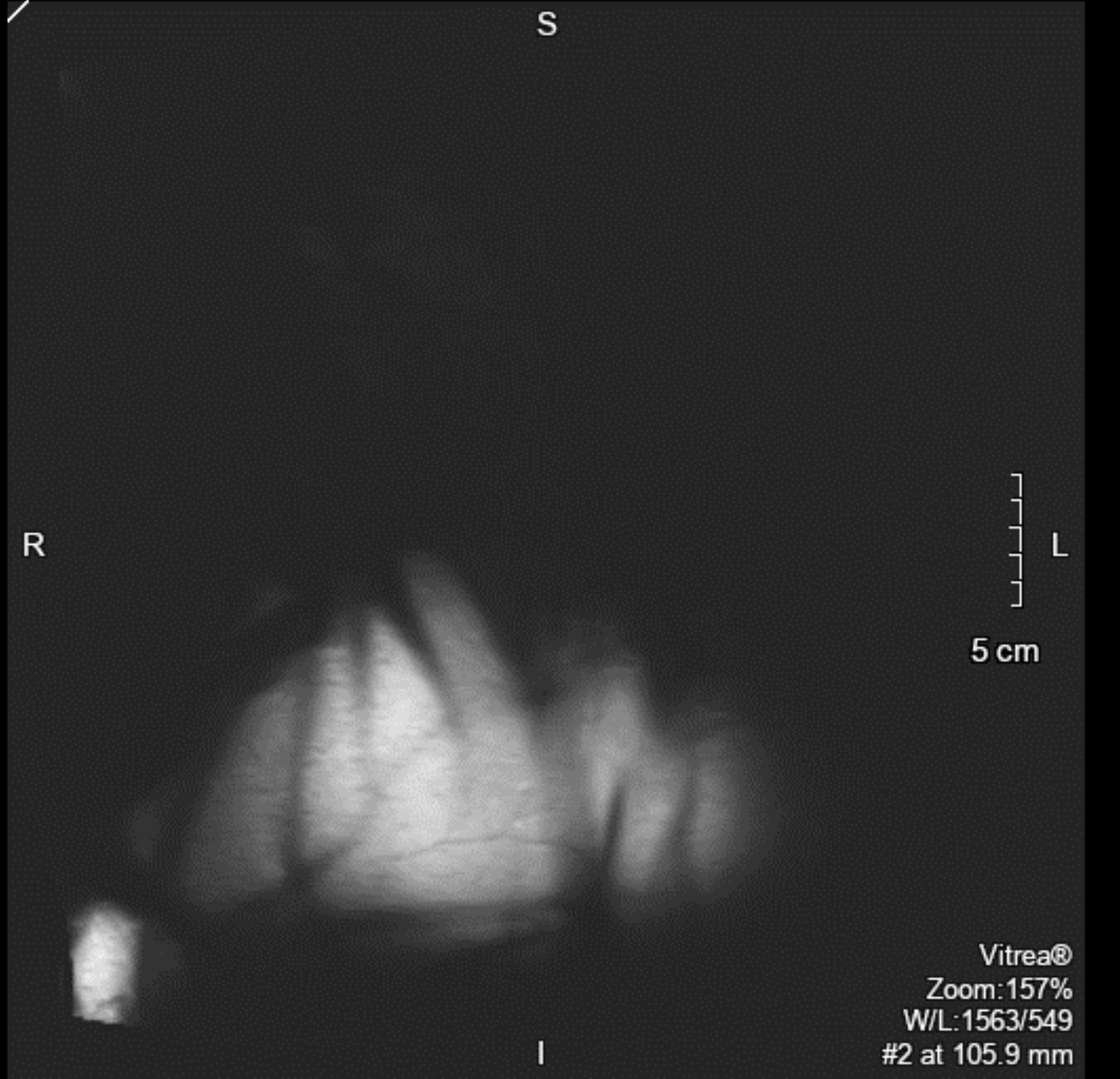


Case 4

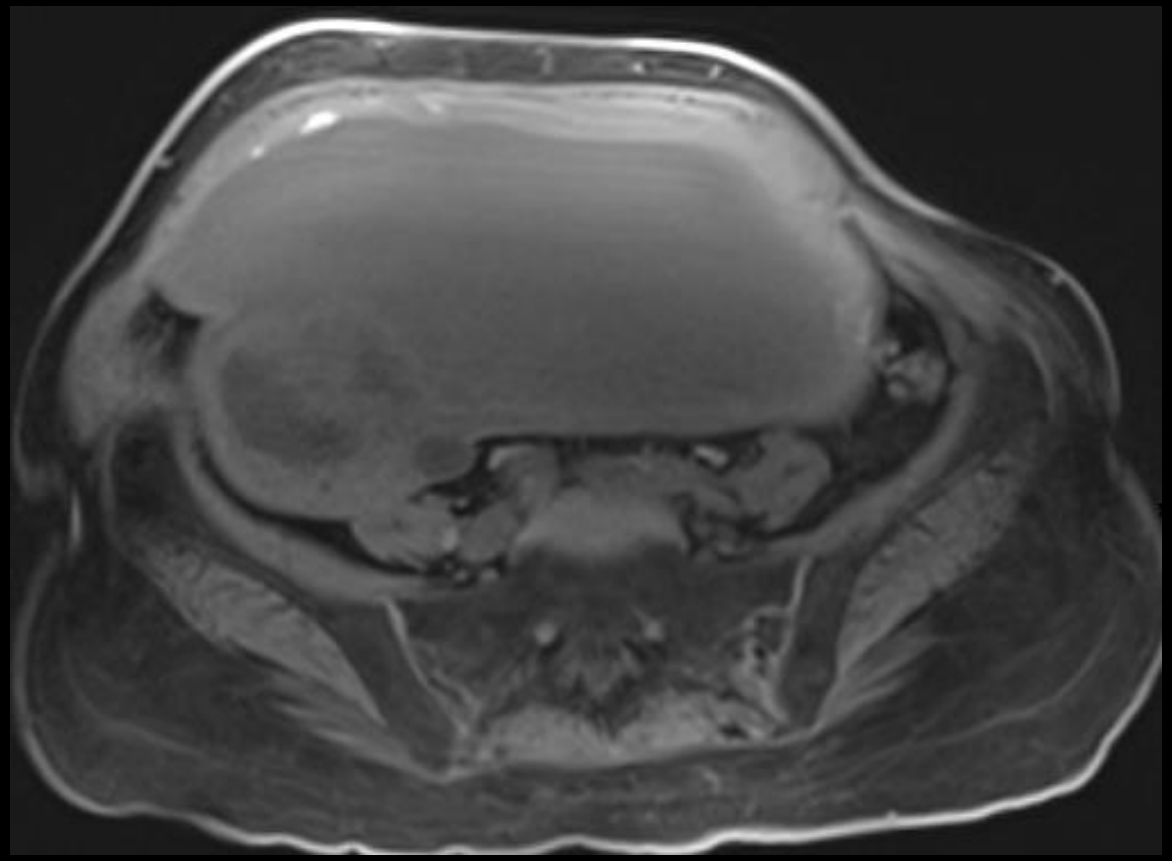
- 68yo female with progressive abdominal distension, fatigue, loss of appetite, and diffuse crampy abdominal pain.
- CA-125 of 9000 U/mL


R
L
2 cm

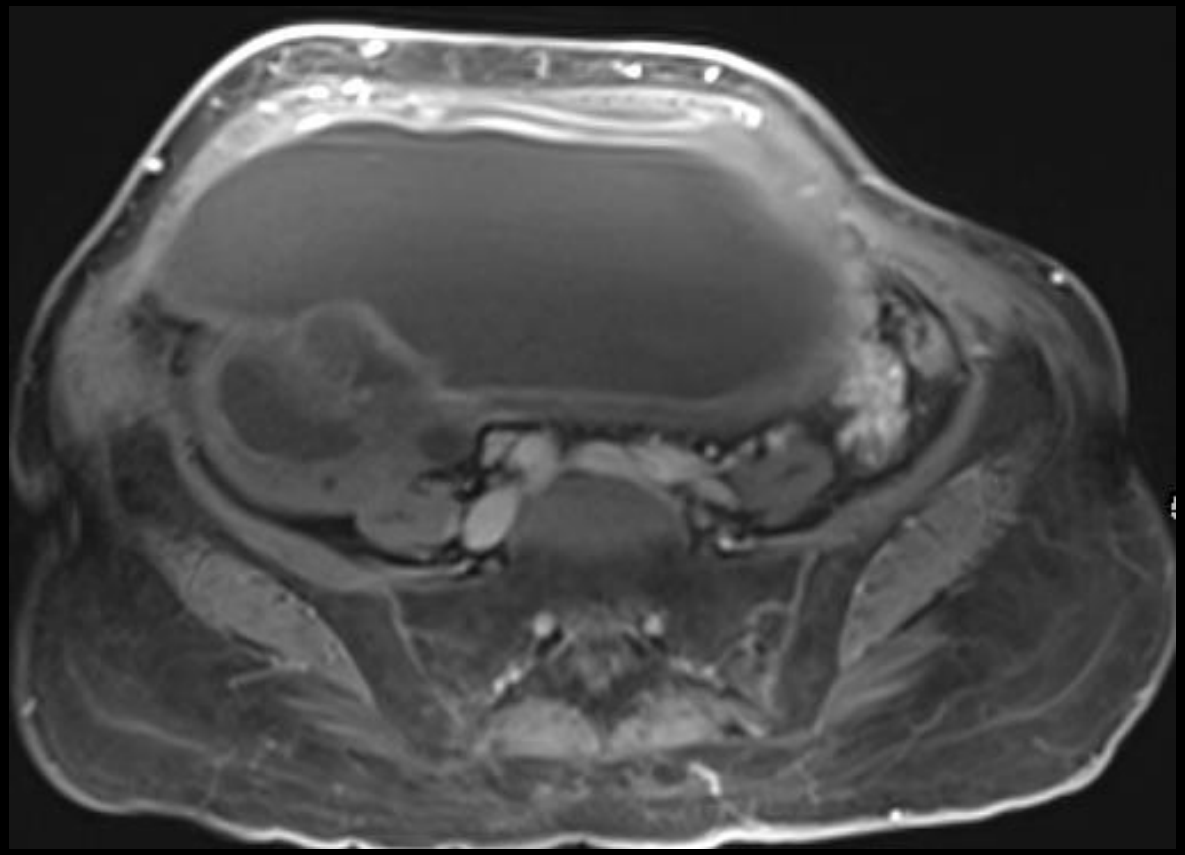

R
L
5 cm


S
R
L
5 cm
I
Vitrea®
Zoom:157%
W/L:1563/549
#2 at 105.9 mm

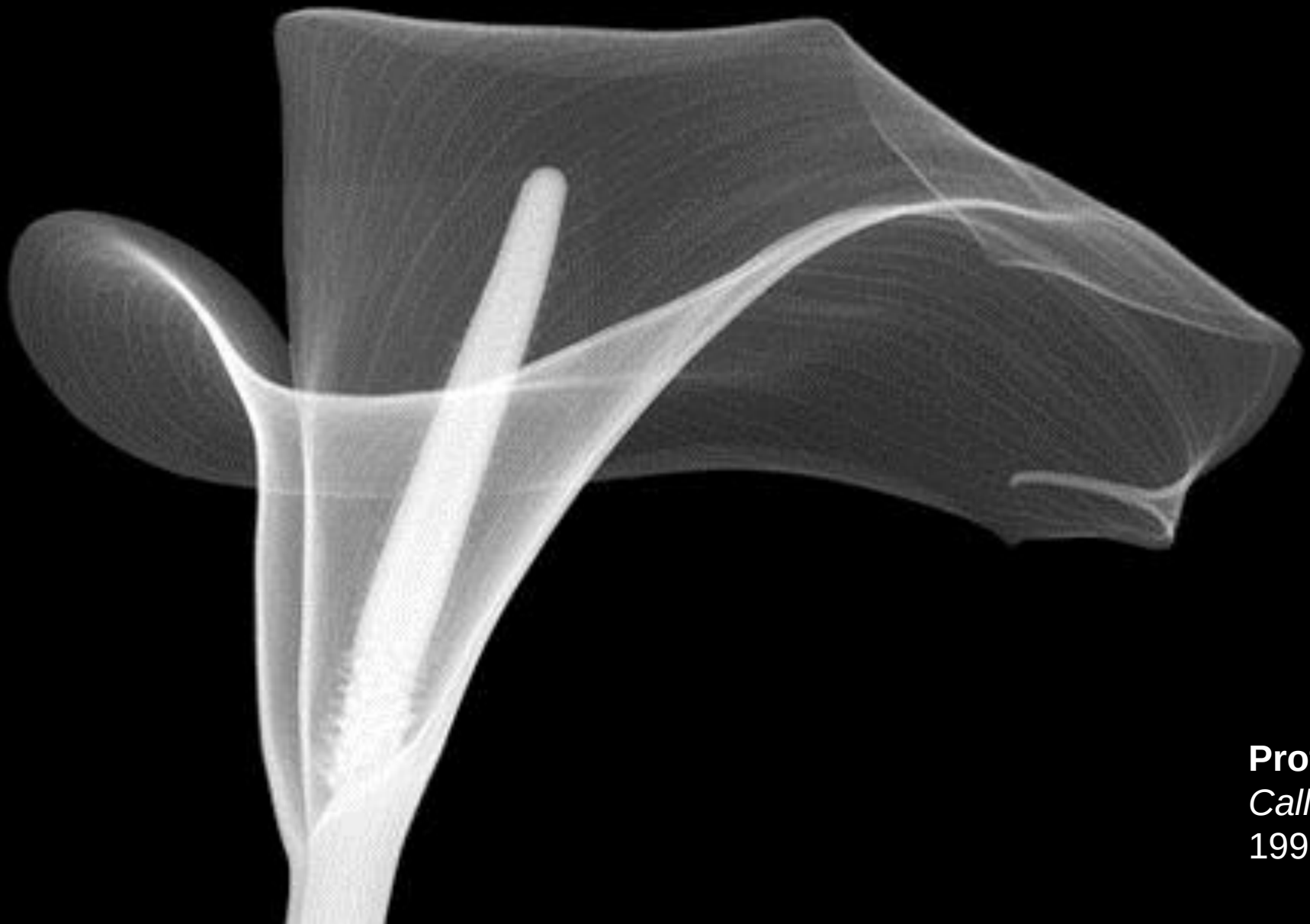
T1 pre



T1 post



DDX



Professor Albert Richards
Calla lily
1997

35285949

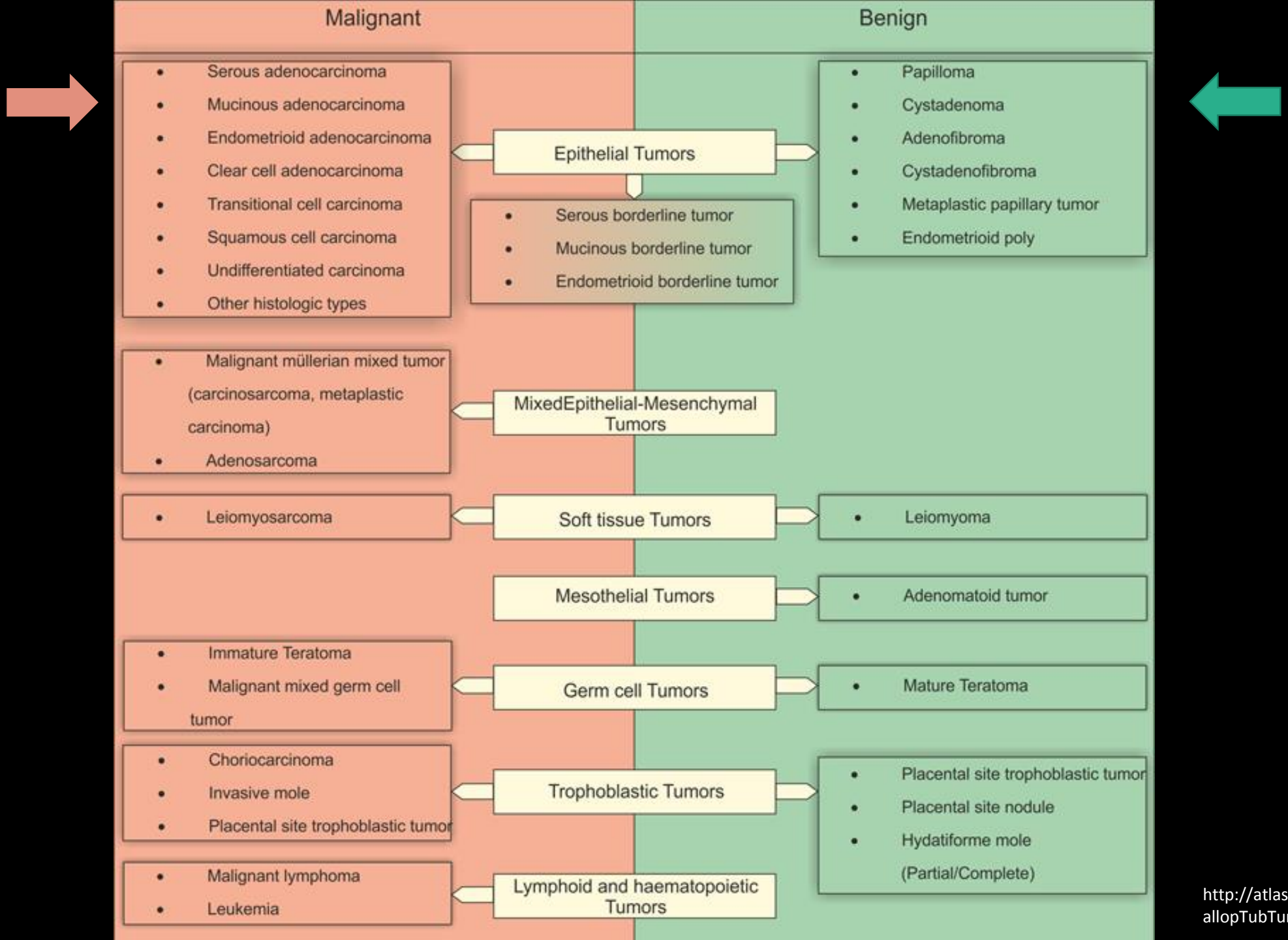
Serous cystadenofibroma

Serous cystadenoma

- Benign
- Most common type of ovarian epithelial tumour
- 40-50yo, bilateral in 15% of cases
- Composed of unilocular or multilocular cysts filled with clear watery fluid.
- The lining of the cyst is flat or may contain small papillary projections.
- Psammomatous calcification

Feature	Benign	Malignant
Size		
Component	Entirely cystic	Solid tissue Papillary projections
Wall	Thin (<3 mm)	Thick
Ascites	None	With possible implants
Other		Adenopathy Invasion

From Jung SE, Lee JM, Rha SE, et al. CT and MR imaging of ovarian tumors with emphasis on differential diagnosis. Radiographics 22;1305–1325, 2002.



http://atlasgeneticsoncology.org/Tumors/FallopTubTumID5279.html

Feature	Serous	Mucinous
Clinical		
Benign	25%	20%
Malignant	50%	10%
Ratio	60% benign 15% low-grade 25% malignant	80% benign 10–15% low-grade 5–10% malignant
Imaging		
Size	Smaller	Larger
Morphology	Unilocular Thin-walled	Multilocular Small locules
Signal intensity	Uniform	Variable
Papillary projections	Common	Rare
Calcification	Psammomatous	Linear
Bilaterality	Frequent	Rare
Carcinomatosis	More common	Pseudomyxoma peritonei

From Jung SE, Lee JM, Rha SE, et al. CT and MR imaging of ovarian tumors with emphasis on differential diagnosis. Radiographics 22;1305–1325, 2002.

Ascites in a female

- Peritoneal carcinomatosis
  - Peritoneal deposits, bowel implants, scalloping
  - Paracolic gutters, pouch of Douglas, sigmoid mesocolon, ileocecal junction, anterior parietal peritoneum, and subphrenic space
- Meig's syndrome
- Ectopic pregnancy
- Ovarian hyperstimulation syndrome

Ascites in general

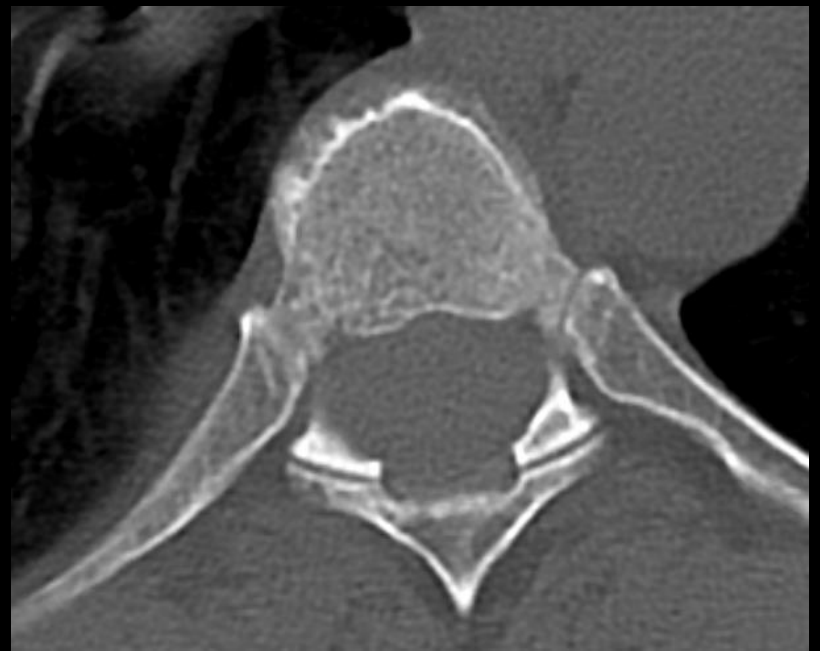
- Cirrhosis, congestive heart failure, nephrosis
- Hypoproteinemia
- Portal vein thrombosis
- Pancreatitis, appendicitis, peritonitis
- Hepatic metastases
- Peritoneal dialysis

Case 5

- 51yo female with history of remote L4-5 discectomy who presents with 1 year of back pain, with new "heaviness" of her lower extremities and numbness/tingling.

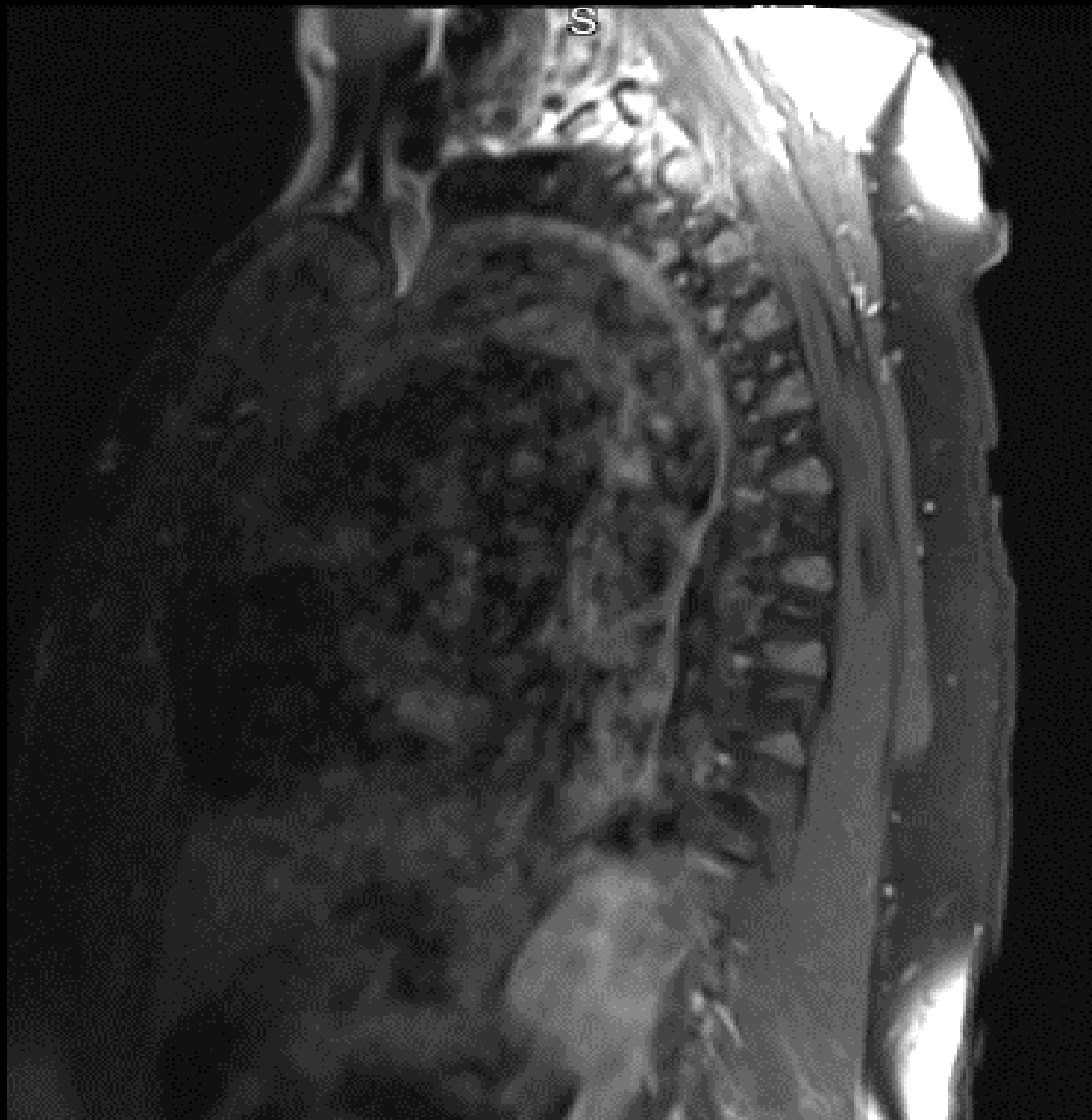
Case courtesy of Dr. Jeff Dileo


L





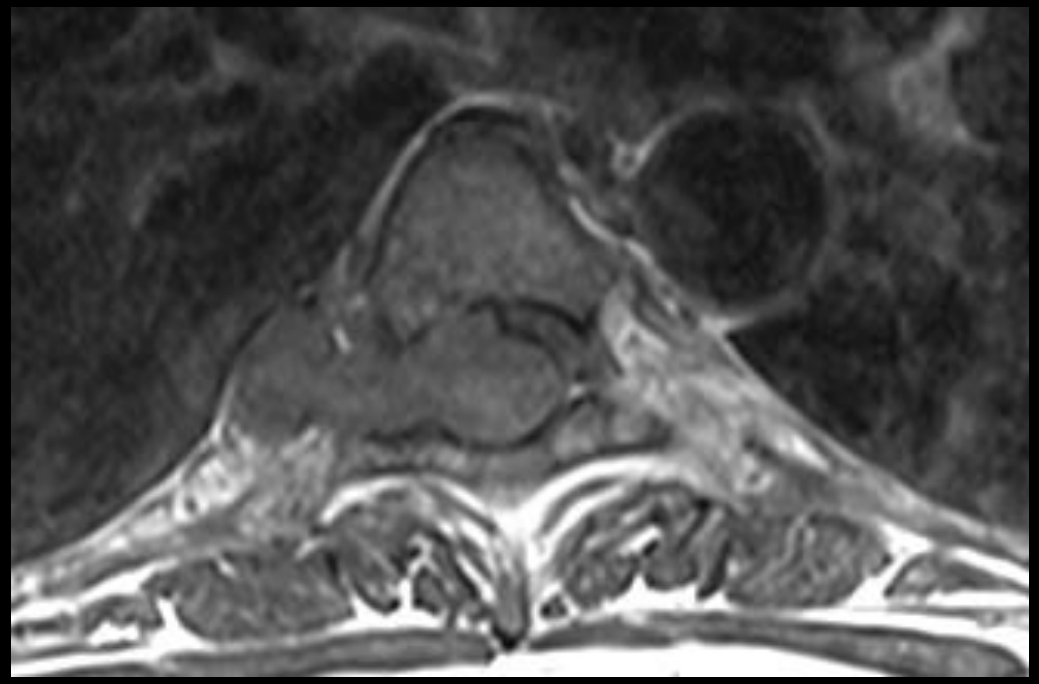

S


S

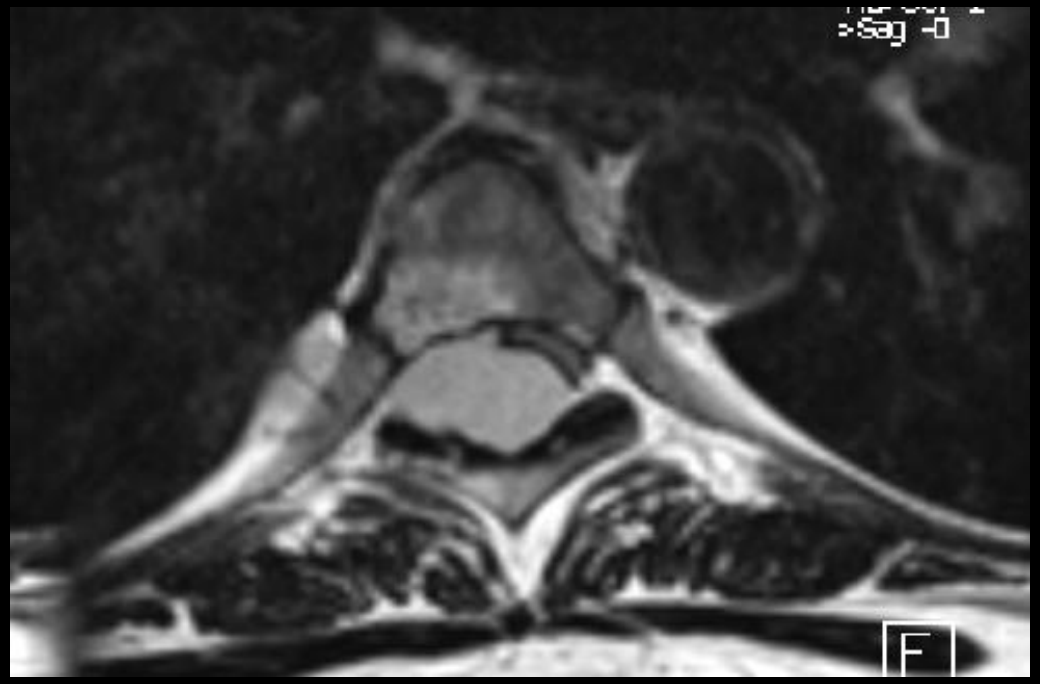
Sag T1

Sag T1 post FS

Ax T1 pre



Ax T2



DWI


AH
PF
5 cm
W: 146
L: 64
MAG: 4.5
SE: 12
IM: 11
FR
13CC DOTAREM

ADC


PF
5 cm
W: 2289
L: 1123
MAG: 4.5
SE: 13
IM: 10
FR
13CC DOTAREM

Q: Where is this mass located?

A. Intramedullary
B. Extramedullary intradural
C. Extramedullary extradural
D. Vertebral body

Q: Where is this mass located?

A. Intramedullary
B. Extramedullary intradural
C. Extramedullary extradural
D. Vertebral body

DDX

DDX spinal masses

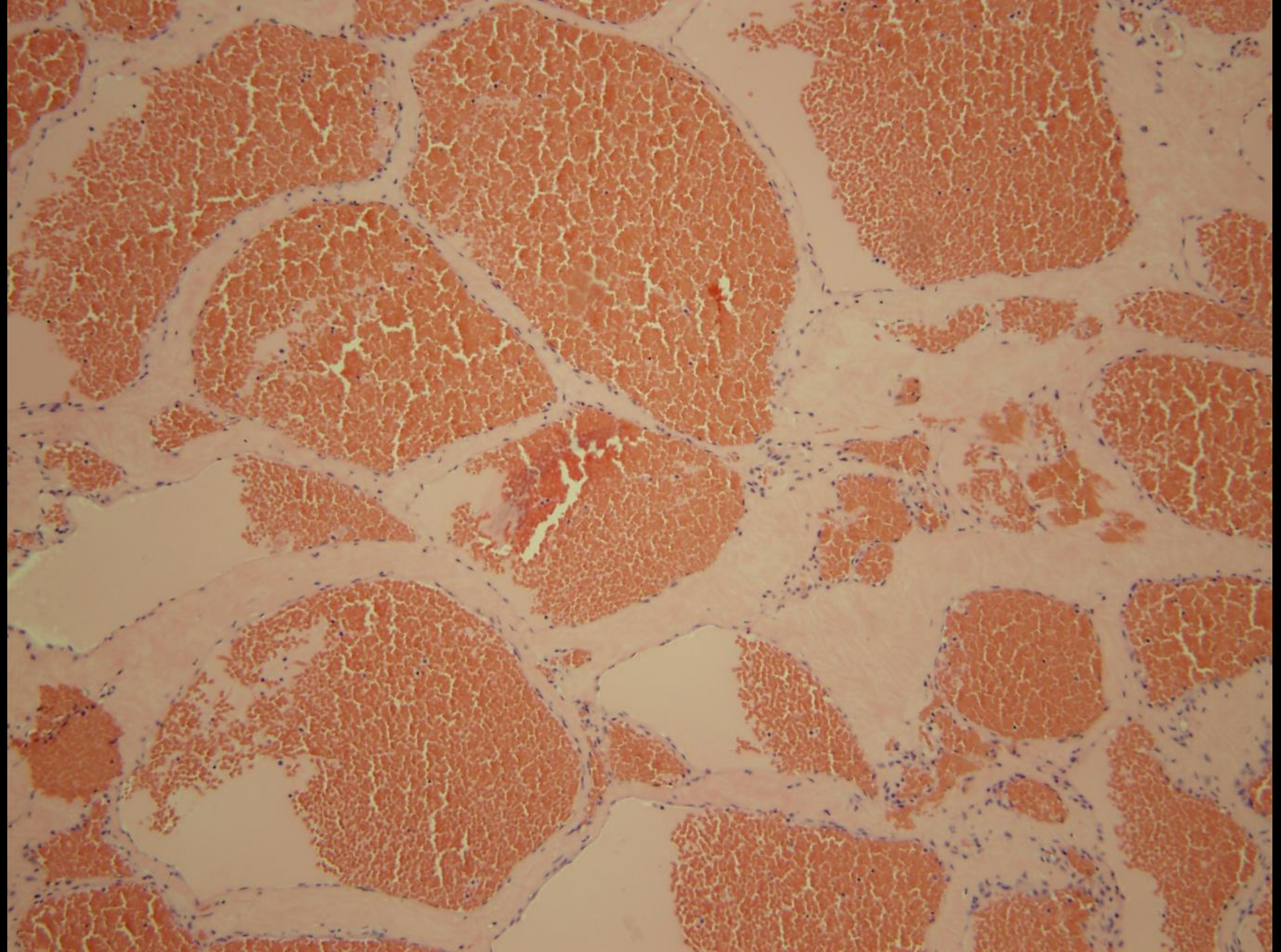
- Intramedullary:
  - Ependymoma
  - Astrocytoma
- Intradural extramedullary:
  - Drop metastases
  - Meningioma
  - Neurofibroma
  - Schwannoma
  - AVF/AVM

- Extradural:
  - Epidural lipomatosis
  - Angiolipoma
  - Epidural metastases
  - Hemangioma
  - Hemangiopericytoma
  - Degenerative nucleus pulposus
  - Abscess
  - Hematoma

Professor Albert Richards
Passion flower
1989

15971104

Atypical hemangioma



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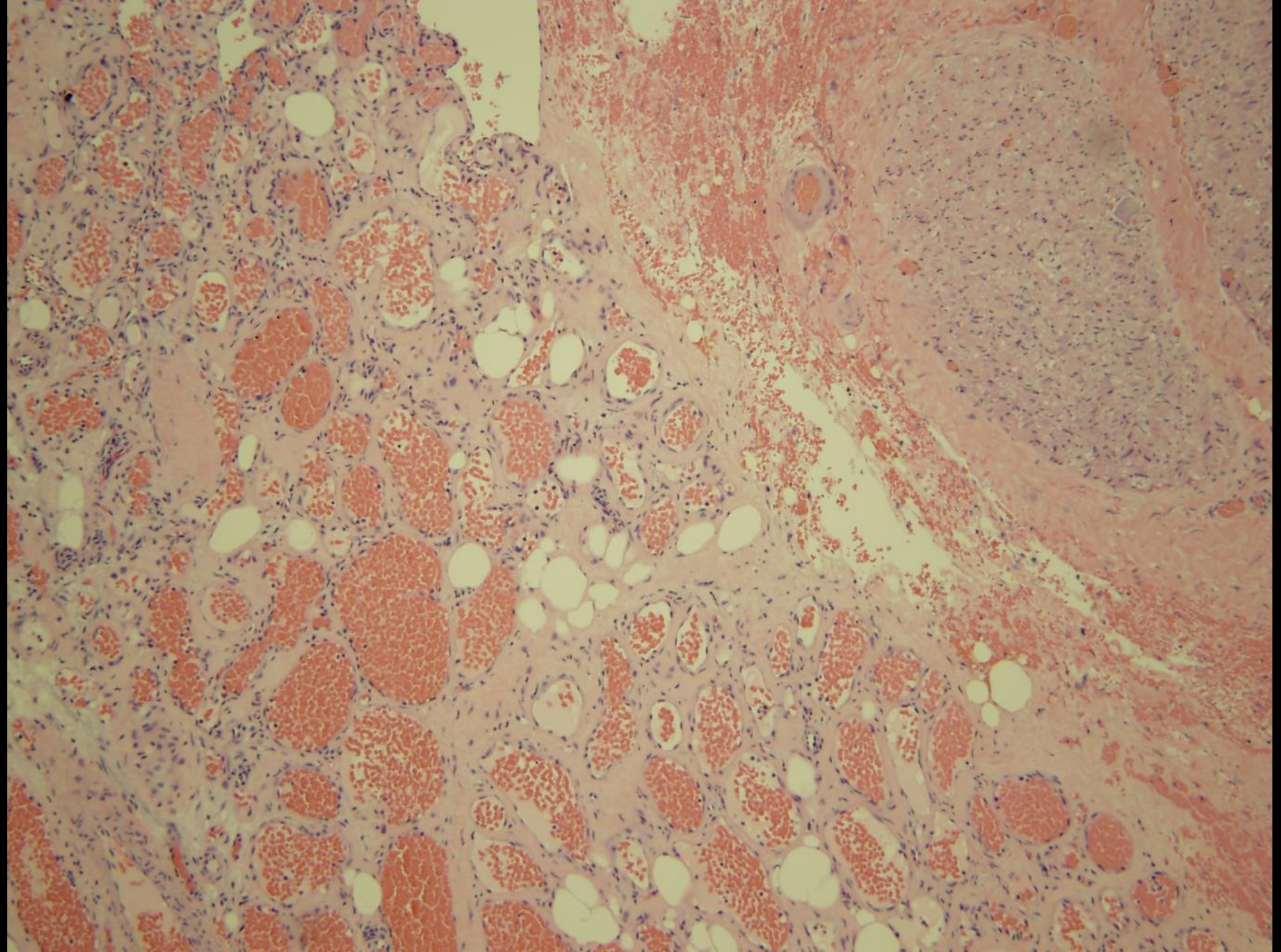
Atypical hemangioma



Vertebral hemangioma

- Most common benign vertebral neoplasms, usually asymptomatic and incidentally detected.
- Incidence: 10% at autopsy. F>M, more symptomatic in 4th decade of life.
- Causes of pain:
  - Collapse of the vertebral body or encroachment into the neural canal
  - Increase in activity causes axial loading through the body of the vertebra.
- Composed of vascular spaces which displace bone.
- Capillary types can cause lytic erosion into the epidural space.
- Only 3.7 % may become active and symptomatic, and 1 % may invade the spinal canal and/or paravertebral space.

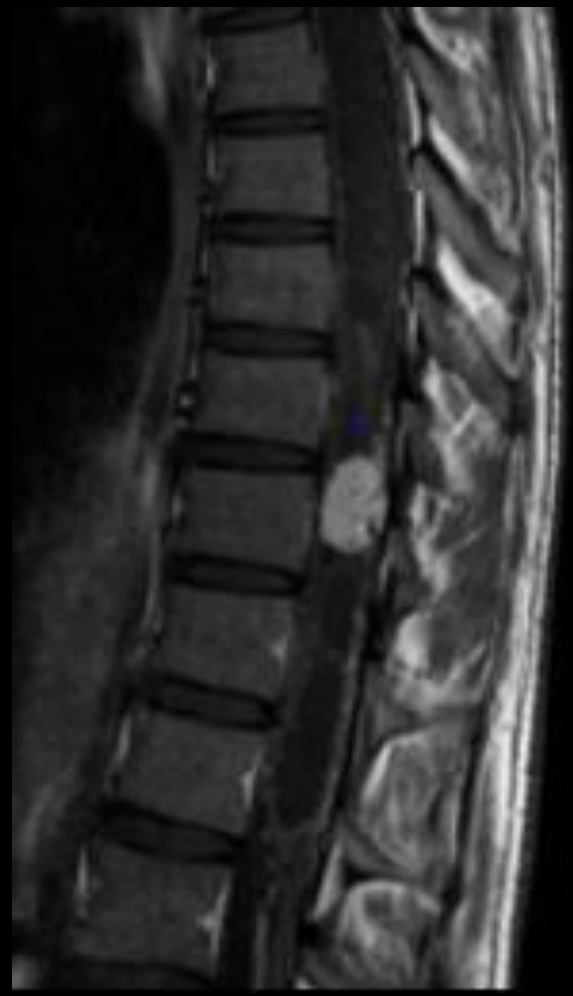
Dang L et al. “Aggressive vertebral hemangioma of the thoracic spine without typical radiological appearance.” Eur Spine J. 2012 Oct; 21(10): 1994–1999.

Imaging findings

- CT: polka dot on axial, corduroy trabeculated appearance on coronal/sagittal
- MR: Thickened trabeculae appear as low signal areas in both T1 and T2 images.
  - **T1 hyperintense** due to fat component
  - **T2 hyperintense** due to its high water content
  - **T1 C+ enhancement** due to high vascularity
  - Typical hemangioma: salt and pepper appearance with hyperintense areas represent fat and degenerated marrow, hypointense areas represent flow voids.
  - Atypical/aggressive: usually contains less fat tissue -> T1 hypointense and T2 hyperintense

Current case

Hemangioblastoma



https://radiopaedia.org/articles/spinal-haemangioblastoma

Current case

Hemangiopericytoma

Jayashankar E, Prabhala S, Raju S, Tanikella R. Recurrent extradural hemangiopericytoma of thoracic spine: A case report . Indian J Pathol Microbiol [serial online] 2014 [cited 2017 Sep 15];57:603-5.

Treatment

- Radiotherapy
- Vertebroplasty
- Direct alcohol injection
- Embolization
- Surgery: Bony decompression and excision of soft tissue components

References

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2. Brufau BP1, Cerqueda CS, Villalba LB, Izquierdo RS, González BM, Molina CN. “Metastatic renal cell carcinoma: radiologic findings and assessment of response to targeted antiangiogenic therapy by using multidetector CT.” *Radiographics*. 2013 Oct;33(6):1691-716.
3. Yu et al. " MR Imaging Features of Small Solid Pseudopapillary Tumors: Retrospective Differentiation From Other Small Solid Pancreatic Tumors." *American Journal of Roentgenology*. 2010;195: 1324-1332
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8. Jayashankar E, Prabhala S, Raju S, Tanikella R. Recurrent extradural hemangiopericytoma of thoracic spine: A case report . Indian J Pathol Microbiol [serial online] 2014 [cited 2017 Sep 15];57:603-5.