AMSER Rad-Path Case of the Month:

A 61-year-old male presents to his PCP with painless hematuria

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Patient Presentation

- HPI: 61-year-old male presents to his primary care physician with three days of intermittent “pink urine.”
  - (+) increased urinary frequency
  - No dysuria
  - No urgency
  - Denies flank pain

- PMHx: Used to smoke for 10 years in his 20s
  - No history of kidney stones
  - No concern for STI/no prior history

Pertinent Labs

- Urinalysis
  - Positive for blood
  - Positive for ketones
  - Trace protein
- Vitals
  - Elevated Blood Pressure (144/102)

What Imaging Should We Order?

Select the applicable ACR Appropriateness Criteria

Variant 4: **Gross hematuria. Initial imaging.**

Procedure	Appropriateness Category	Relative Radiation Level
CTU without and with IV contrast	Usually Appropriate	☢☢☢☢
MRU without and with IV contrast	Usually Appropriate	O
CT abdomen and pelvis without and with IV contrast	May Be Appropriate	☢☢☢☢
MRI abdomen and pelvis without and with IV contrast	May Be Appropriate	O
MRI abdomen and pelvis without IV contrast	May Be Appropriate	O
US kidneys and bladder retroperitoneal	May Be Appropriate	O
CT abdomen and pelvis with IV contrast	May Be Appropriate	☢☢☢
CT abdomen and pelvis without IV contrast	May Be Appropriate	☢☢☢
Radiography abdomen and pelvis (KUB)	Usually Not Appropriate	☢☢
Arteriography kidney	Usually Not Appropriate	☢☢☢
Radiography intravenous urography	Usually Not Appropriate	☢☢☢

- This initial imaging modality was ordered by the PCP in conjunction with a referral to urology.
- If the patient had presented to the ED, CT may have been the initial imaging selection.

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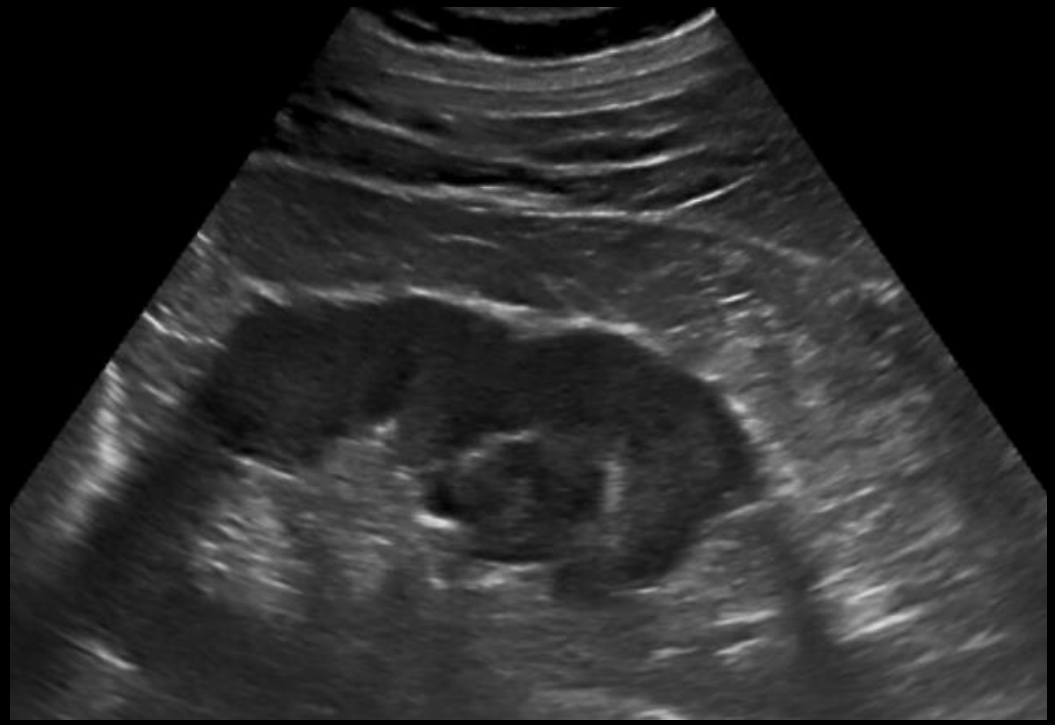
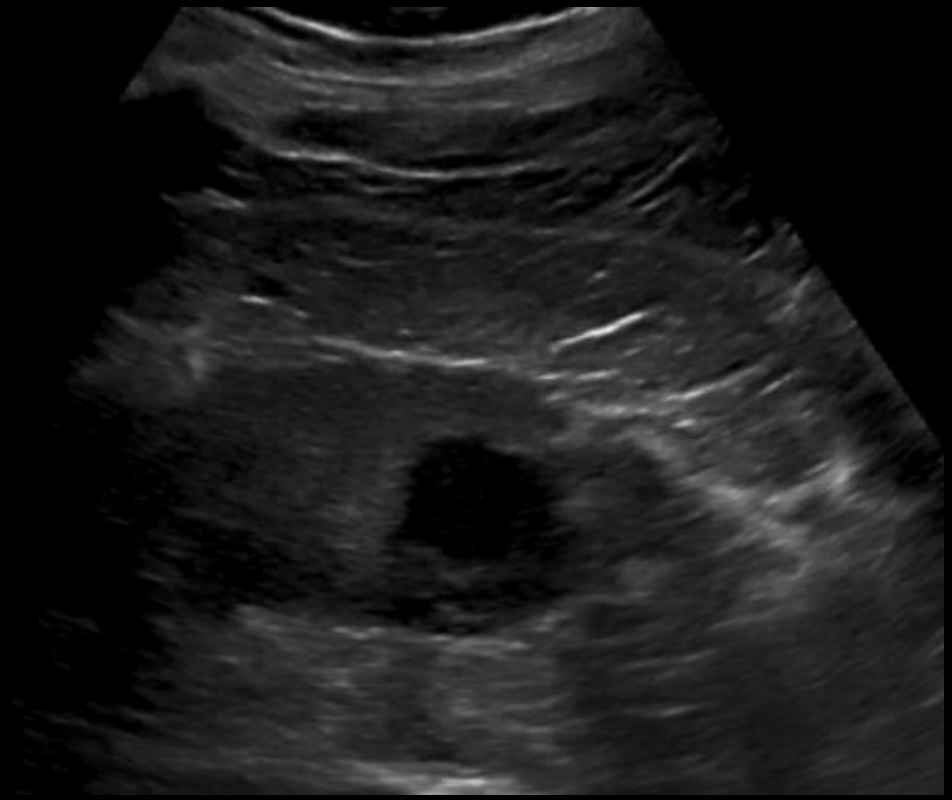
Initial Ultrasound Findings

(Unlabeled)



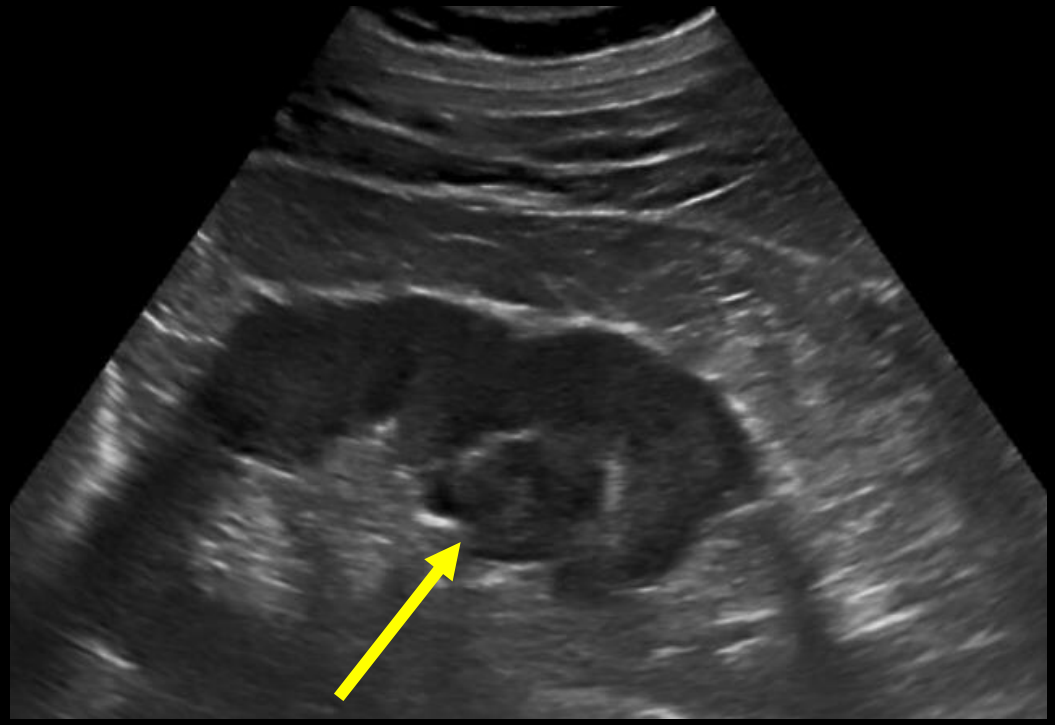
Sagittal ultrasound of left kidney



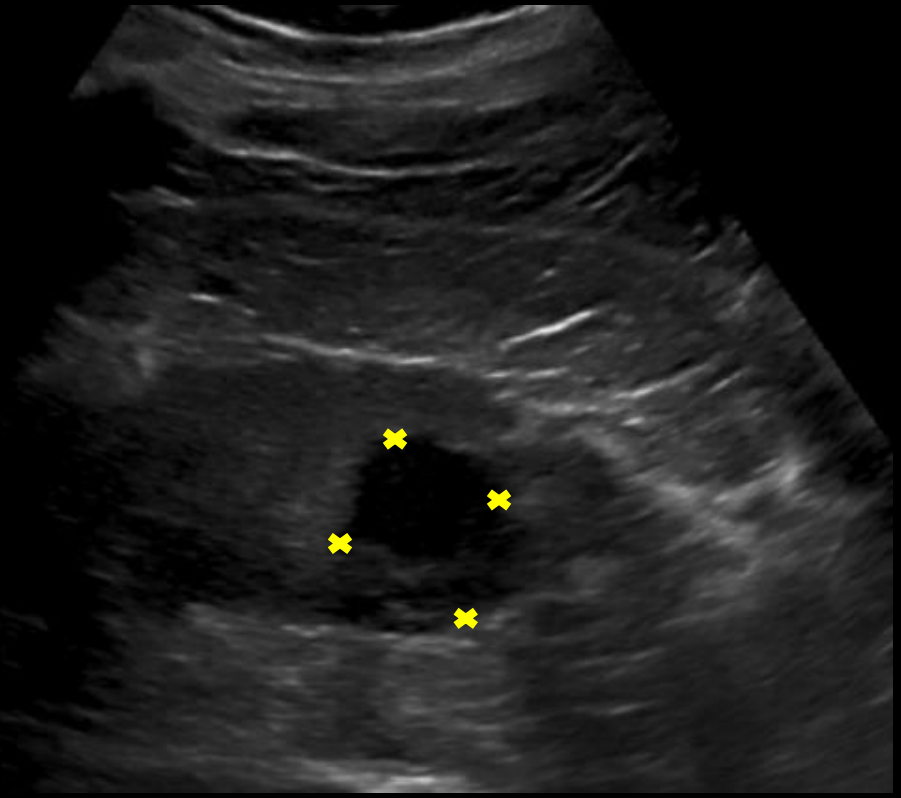
Sagittal ultrasound of inferior pole of left kidney

Initial Ultrasound Findings

(Labeled)



"Nonvascular cystic structure in lower pole of left kidney"



"Hypoechoic, septated cystic lesion measuring 3.0 x 3.0 x 3.2 cm"

Given the above findings, patient underwent CT imaging

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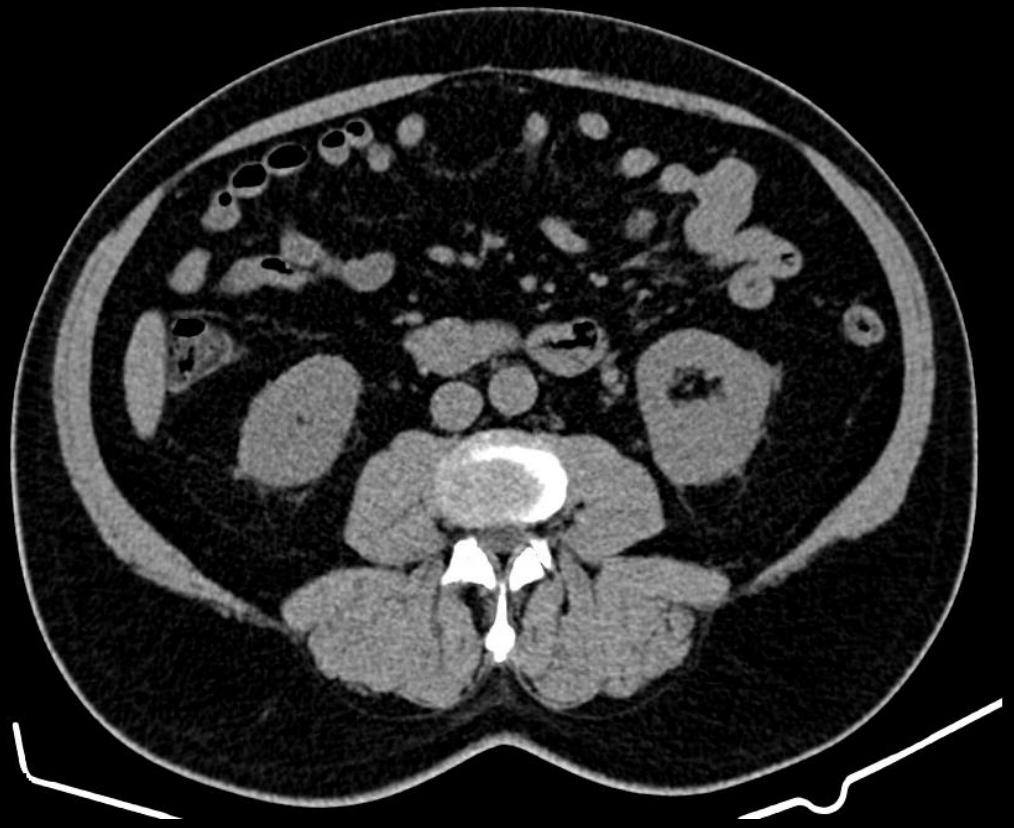
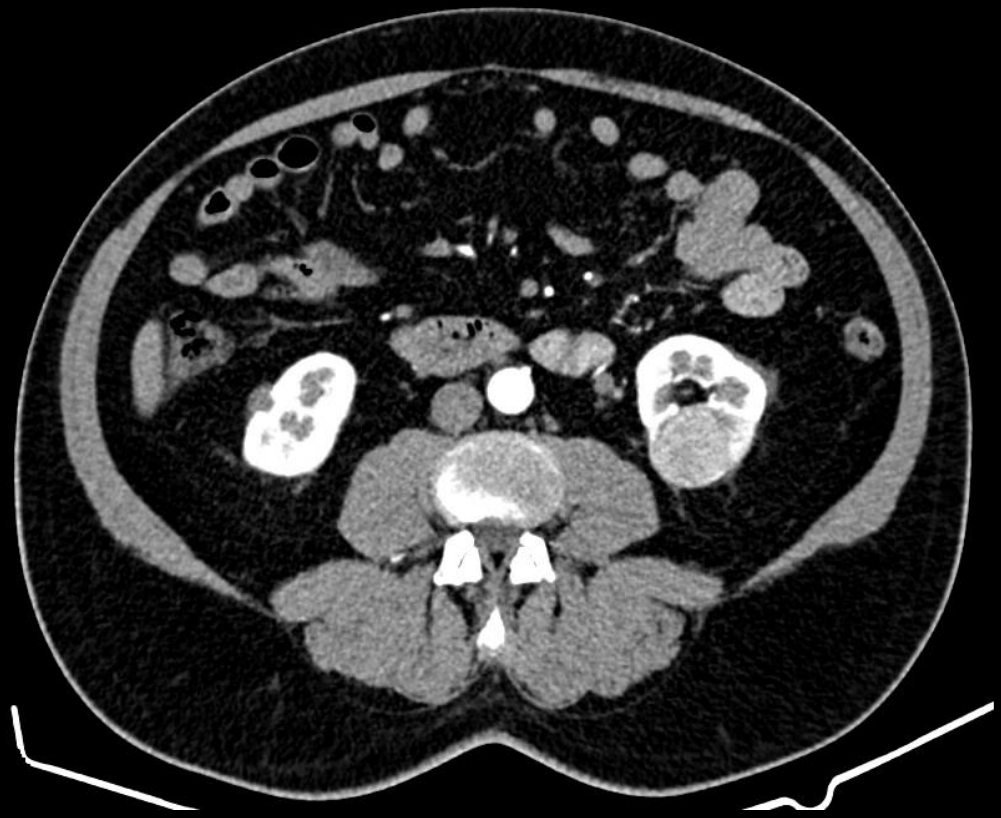
Axial CT Findings

(Unlabeled)



Axial CT – Non-contrast phase



Axial CT – Arterial phase

Coronal CT Findings

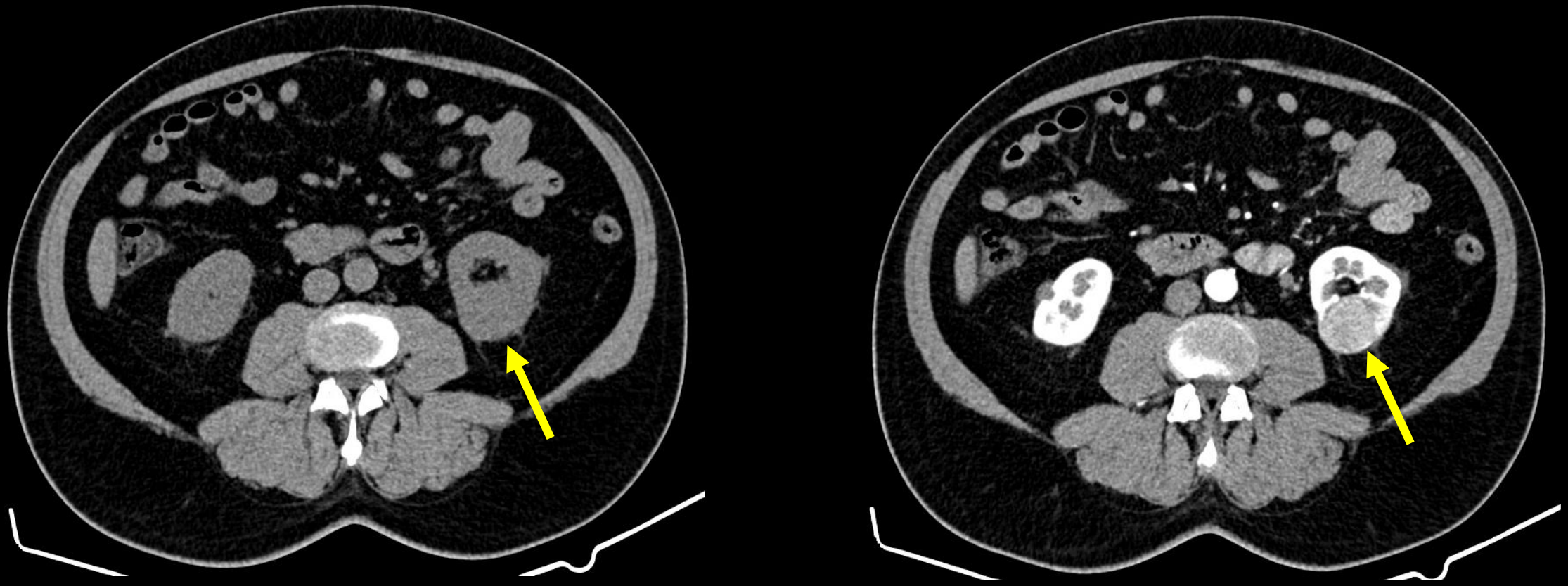
(Unlabeled)

Coronal CT – Non-contrast phase

Coronal CT – Arterial phase

Axial CT Findings

(Labeled)



- *3.3 x 3.4 x 4.2 cm enhancing mass in the posterior pole of the left kidney*
- *The mass extends into the lower renal pelvis*

Coronal CT Findings

(Labeled)

- *Coronal view demonstrating enhancement of mass in arterial phase*
- *Note 40 HU during non-contrast phase and elevation to 91 HU during arterial phase*

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Differential Diagnosis?

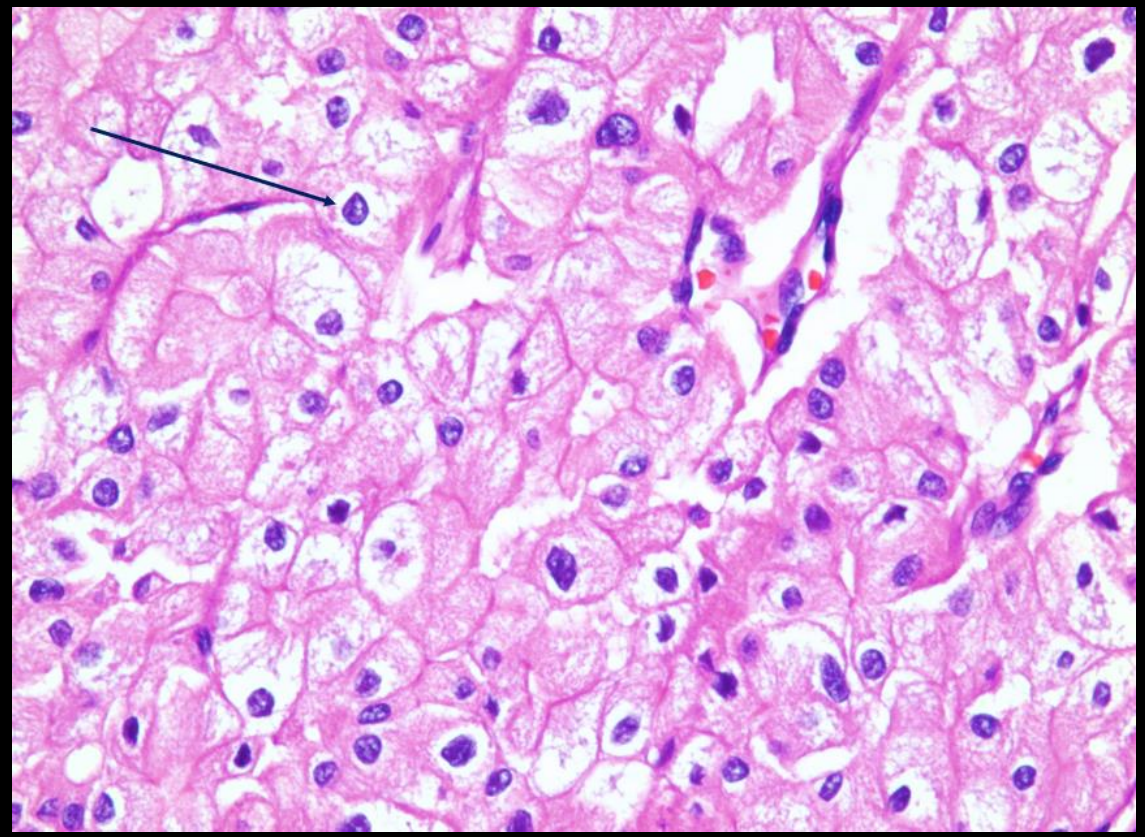
1. Renal Cell Carcinoma
2. Complex Renal Cyst
3. Oncocytoma

Gross Images

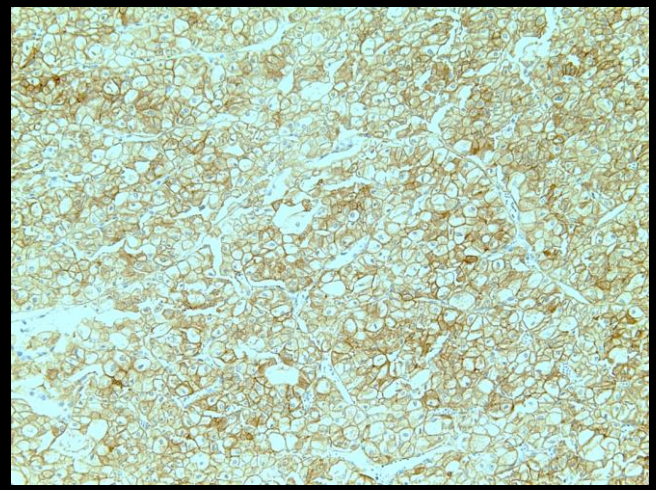
Sagittal section of left kidney

- Given the imaging findings, patient elected to undergo a left radical nephrectomy
- Gross specimen demonstrates a solid mass in the inferior pole of the left kidney that invades the renal hilum (★)

Histological Micrographs

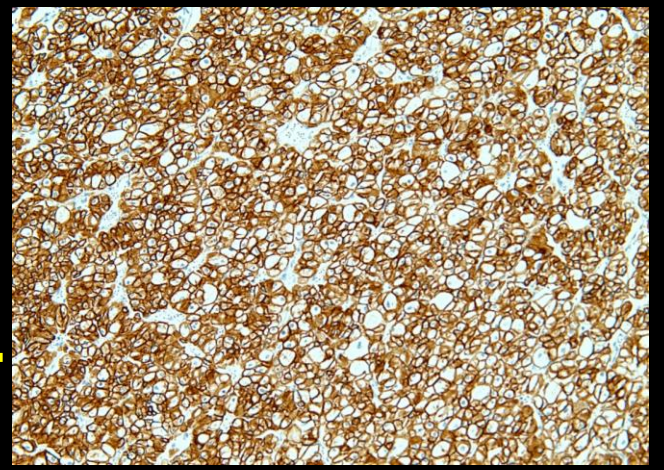


40x micrograph displaying hyperchromatic, “raisinoid nuclei”
The arrow identifies a perinuclear halo



CD117 (+)

CK7 (+)



Final Dx:

Renal Cell Carcinoma - Chromophobe Type

Renal Cell Carcinoma

- Basics
  - RCC originates from the renal tubular epithelium and is the most common renal malignancy in adults
  - Most cases are sporadic, some hereditary disorders are associated (VHL)

- Risk Factors
  - Smoking and Obesity
  - Sickle cell disease, Hypertension, HCV
  - Von Hippel-Lindau, Tuberous Sclerosis

- Clinical Features
  - Hematuria, flank pain, palpable renal mass (Classical triad, present in ~15% of patients)

Renal Cell Carcinoma Subtypes

- Two main categories:
  - Clear Cell Carcinoma (~70 of all RCC)
  - Non-Clear Cell Carcinoma

- Non-Clear Cell Carcinoma Subtypes
  - Papillary (chromophilic) (~10-15%)
  - *Chromophobe (5%)*
  - Oncocytic (1%)
  - Collecting duct carcinoma (1%)

Chromophobe Renal Cell Carcinoma

- Origin
  - Intercalated cells of the cortical collecting duct
- Etiology
  - Hypodiploidy/Sporadic/Unknown
- Prognosis
  - Excellent

- Microscopic appearance
  - Large polygonal cells with a prominent cell membrane
  - Eosinophilic cytoplasm
  - Perinuclear halo
- Immunohistochemistry
  - Most cases of Chromophobe RCC will stain diffuse and strong with CD117/KIT and CK7
    - Useful for differentiating subtypes
  - For reference:
    - Clear Cell RCC: (-) CD117, (-) CK7
    - Papillary RCC: (-) CD117, (+) CK7
    - Oncocytoma: (+) CD117, (rare) CK7

Note: Other stains are used for differentiation aside from the two listed above

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References:

- ACR Appropriateness Criteria® | American College of Radiology (2022)
  - https://www.acr.org/Clinical-Resources/ACR-Appropriateness-Criteria
- Cheng G, Xie L. Alcohol intake and risk of renal cell carcinoma: a meta-analysis of published case-control studies. Arch Med Sci. 2011 Aug;7(4):648-57. doi: 10.5114/aoms.2011.24135. Epub 2011 Sep 2. PMID: 22291801; PMCID: PMC3258765.
- Campbell SC, Clark PE, Chang SS, Karam JA, Souter L, Uzzo RG. Renal Mass and Localized Renal Cancer: Evaluation, Management, and Follow-Up: AUA Guideline: Part I. J Urol. 2021 Aug;206(2):199-208. doi: 10.1097/JU.0000000000001911. Epub 2021 Jul 11. PMID: 34115547.
- Prasad SR, Humphrey PA, Catena JR, Narra VR, Srigley JR, Cortez AD, Dalrymple NC, Chintapalli KN. Common and uncommon histologic subtypes of renal cell carcinoma: imaging spectrum with pathologic correlation. Radiographics. 2006 Nov-Dec;26(6):1795-806; discussion 1806-10. doi: 10.1148/rg.266065010. PMID: 17102051.
- Vera-Badillo FE, Conde E, Duran I. Chromophobe renal cell carcinoma: a review of an uncommon entity. Int J Urol. 2012 Oct;19(10):894-900. doi: 10.1111/j.1442-2042.2012.03079.x. Epub 2012 Jun 21. PMID: 22715810.

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