Kidney cases

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Case 1: 50 year old with hematuria

► What is the most likely diagnosis?
  ▪ A: Angiomyolipoma
  ▪ B: Renal lymphoma
  ▪ C: Oncocytoma
  ▪ D: Renal cell carcinoma
Case 1: RCC- clear cell

With respect to the renal vein and IVC findings, what is the minimum tumor stage?
- Stage 1
- Stage 2
- Stage 3
- Stage 4

Accounts for 65% of RCC cases
- Defects in the VHL tumor suppressor gene account for 60% of sporadic cases (even without in patients without VHL).
- Peak age: 60-70yrs
- 15% multicentric

Typically heterogeneous mass with avid enhancement
- 15% with cystic component
- Frequent necrosis
- 30% with calcification, typically dense or amorphous Lipid rich cytoplasm may results in signal loss on out of phase MRI imaging

Renal vein and/or IVC invasion is considered stage 3 disease (Robson and TNM systems)
Case 2: 55 y/o with incidental renal lesion

► What is the most likely diagnosis?
  ▪ A: Hemorrhagic renal cyst
  ▪ B: Lipid poor angiomyolipoma
  ▪ C: Renal cell carcinoma
  ▪ D: Transitional cell carcinoma

Case 2: 55 y/o with incidental renal lesion

► Which type of renal cell carcinoma is most likely?
  ▪ A: Chromophobe RCC
  ▪ B: Clear cell RCC
  ▪ C: Papillary RCC
  ▪ D: Medullary RCC
Case 2: Papillary RCC

- Second most common subtype of RCC (10-15%)
- Least enhancing type of renal neoplasm
  - Cyst should not increase more than 10HU post contrast
  - 10-20HU increase is suspicious
  - Ultrasound may be helpful to distinguish a cyst from a solid mass in equivocal cases
- Homogeneous relatively low signal on T1 and T2 compared to Clear cell RCC.

Case 3: 30 year old male recently immigrated from Nigeria now with weight loss and low grade fever.

- What is the most likely diagnosis?
  - A: Renal cell carcinoma
  - B: Transitional cell carcinoma
  - C: Renal tuberculosis
  - D: Papillary necrosis due to sickle cell disease.
Case 3: 30 year old male recently immigrated from Nigeria now with weight loss and low grade fever.

Two months later, the previously normal liver now has this appearance and there are several new lung nodules. Now what is the most likely diagnosis?

- A: Renal cell carcinoma
- B: Transitional cell carcinoma
- C: Renal tuberculosis
- D: Papillary necrosis due to sickle cell disease.

Case 3: Medullary renal cell carcinoma

- Arises from proliferating cells of the collecting duct epithelium near the papilla
  - Infiltrative mass
  - Hemorrhage, necrosis, lymphadenopathy are common

- Occurs almost exclusively in young adult patients with sickle cell trait
  - More common on right (70%)
  - M > F
  - Extremely aggressive
  - Median survival: 3 months
Case 4: 42 year old female with incidental renal lesion

Which of the following are true of this type of lesion?

- A: Communicates with collecting system
- B: Also found in male children
- C: Readily distinguished from RCC by thin septations
- D: Associated with development of CNS subcortical tubers.

3 year follow-up ultrasound: The lesion is unchanged.
Case 4: Multilocular cystic nephroma

► Benign neoplasm
  ▪ Bimodal age distribution
    ▪ Male children < 4 yrs old
    ▪ Female adults > 40 yrs old

► Well defined multilocular cystic mass
  ▪ Cysts of variable size
  ▪ Enhancing septations
  ▪ Nodularity and calcifications are uncommon
  ▪ May herniate into the renal pelvis
  ▪ Cysts may be hemorrhagic or proteinaceous

► Difficult to reliably differentiate from cystic RCC
  ▪ Consider patient demographic
  ▪ Absence of nodularity, coarse calcifications, or irregular septations
    may allow for close imaging surveillance to ensure stability

Case 5: Incidental finding on CT for blunt abdominal trauma

► What is the diagnosis?
  ▪ A: Oncocytoma
  ▪ B: Lipid poor angiomyolipoma
  ▪ C: Hyperdense cyst
  ▪ D: Cortical nephrocalcinosis
Case 5: Hyperdense cyst

What is the diagnosis?
- A: Hemorrhagic cyst
- B: Hyperdense proteinaceous cyst
- C: Lipid poor AML
- D: Indeterminate

Case 5: Hyperdense cyst pitfall

- 53 HU
- 95 HU
Case 5: Hyperdense cyst

- Bosniak 2 cyst: Benign, no follow-up
  - Typically contain proteinaceous material
  - > 20 HU
    - > 70 HU on non con CT: 99.9% benign.
    - 20-70 HU on non con CT is indeterminate
  - < 3 cm
  - Homogeneous.
  - Non enhancing (20 HU threshold)
  - Portal venous phase contrast-enhanced CT: > 70 HU or internal heterogeneity favor renal cell carcinoma.

Case 6: History of frequent renal stone passage

- What is the diagnosis?
  - A: Medullary nephrocalcinosis
  - B: Acute tubular necrosis
  - C: Balkan nephropathy
  - D: lithium nephropathy
Case 6: Medullary nephrocalcinosis

► What is a potential etiology?
  ▪ A: Prior tuberculosis infection
  ▪ B: Recent episode of profound hypotension requiring pressor support
  ▪ C: Urinary stasis due to bladder outlet obstruction.
  ▪ D: Patient lives in Seattle and supplements Vitamin D at 60,000 IU/day through the winter.

► Imaging features
  ▪ Central in location- spares the cortex.
  ▪ Bilateral with stippled calcifications in medullary distribution.
  ▪ Echogenic pyramids on ultrasound.

► Common etiologies
  ▪ Hyperparathyroidism (40%)
  ▪ Renal tubular acidosis type 1 (20%)
  ▪ Medullar sponge kidney (20%)
  ▪ Other
    ▪ Milk alkali syndrome
    ▪ Hypervitaminosis D

► Prone to collecting system stone formation.
Case 7: Recurrent UTIs

What is the diagnosis?
- A: Bosniak 3 cyst with coarse nodular calcifications
- B: Renal abscess
- C: Calyceal diverticulum
- D: Bosniak 2 cyst with milk of calcium

Case 7: Calyceal diverticulum

- Urine containing cystic cavity connected to intrarenal collecting system.
  - Lined by transitional cell epithelium
  - Type I: Communicates with minor calyx
  - Type II: Communicated with major calyx/renal pelvis
- 50% contain milk of calcium or calcified stones.
  - May be mistaken for calcified cystic renal mass.
- Patient at increased risk for recurrent infection due to urinary stasis and stone formation.
- Diverticulum typically fills with contrast on delayed phase CT imaging.
  - In some cases the neck of the diverticulum may be small or compressed, preventing filling except during retrograde evaluation.
Case 8: 20 year old with seizures

What hereditary syndrome does this patient have?

- A: Birt Hogg Dube
- B: von Hippel Lindau
- C: Tuberous Sclerosis
- D: Osler Webber Rendu

Case 8: Tuberous sclerosis

What is the primary clinical concern for these lesions?

- A: Malignant degeneration
- B: Infection
- C: Hemorrhage
- D: End stage renal failure.
Case 8: Tuberous sclerosis/Angiomyolipoma

► Autosomal dominant neurocutaneous syndrome
  ▪ Hamartoma formation
    ► Cortical tubers, subependymal nodules, lung cysts, renal and hepatic angiomyolipomas, renal cysts
    ▪ Increased risk for clear cell type RCC (2-4% of TS patients)

► Renal angiomyolipomas (AMLs) present in 80%
  ▪ Hamartoma containing varying amounts of fat, smooth muscle, and abnormal blood vessels.
    ▪ Macroscopic fat is a hallmark imaging feature. Microscopic fat is less reliable- clear cell RCC can have signal loss on out of phase MRI.

  ▪ Lipid poor AMLs are difficult to distinguish from RCC.
    ► Calcification is atypical: consider RCC.

  ▪ Size >4cm or internal aneurysm >5mm associated with increased risk of hemorrhage (can be life threatening).

  ▪ Significant minority of lesions affected by estrogen/progesterone and may grow during pregnancy.

Case 9: 63 year old homeless male with low GFR

► What is the most likely etiology for the renal findings?
  ▪ A: ESRD on dialysis
  ▪ B: Chronic consumption of alkali metal salt
  ▪ C: Autosomal recessive polycystic kidney disease
  ▪ D: Autosomal dominant polycystic kidney disease
Case 9: Lithium nephropathy

► Develops in 33-62% of patients undergoing long-term (10-20yrs) treatment with lithium salts.
  - Lithium damages renal tubuli resulting in chronic interstitial nephritis, cortical and medullary fibrosis, tubular dilatation, and cyst formation.

► Cysts are located in both the cortex and the medulla.
  - Uniform, symmetric distribution.
  - Numerous. The number of cysts not clearly correlated with GFR impairment.

► Small, simple appearing. Usually 1-2mm.

► Normal size kidneys

Case 10:

► What hereditary syndrome does this patient have?
  - A: Birt Hogg Dube
  - B: von Hippel Lindau
  - C: Tuberous Sclerosis
  - Osler Webber Rendu
Case 10: von Hippel Lindau (VHL)

► With respect to the kidneys, what are these patients most at risk of developing?
- A: Chromophobe RCC
- B: Papillary RCC.
- C: Clear cell RCC
- D: Oncocytoma

► The most common cause of hereditary RCC
  - Autosomal dominant.
  - Often multiple and bilateral RCCs.

► Approximately 50% of deaths due to RCC.
  - Annual ultrasound screening recommended beginning at age 10.

► Multiple cysts develop in the kidneys lined with hyperplastic or metaplastic clear cells.
  - Most cysts have thin walls with possible thin septations and no enhancement.
  - Developing RCC will manifest as septal thickening, enhancement, and/or small mural nodularity.
**Case 11: 65 year old male diabetic with hematuria**

**What is the most likely diagnosis?**
- A: Chromophobic RCC
- B: Papillary necrosis
- C: Transitional cell carcinoma
- D: Collecting duct carcinoma

**Case 11: Transitional cell carcinoma**

- Most common urothelial neoplasm, 2nd most common renal malignancy
  - Majority (85%) are low grade, superficial, papillary tumors
  - 15% are more aggressive tumors that may spread by mucosal extension, hematogenous or lymphatic invasion
  - Upper tract TCC develops in 2-4% of bladder cancer patients

- Hypoenhancing to renal parenchyma
  - May be difficult to differentiate from medullar on corticomedullary contrast phase
  - Ill defined interface with surrounding renal parenchyma on nephrographic phase
  - Sessile filling defect in the excretory phase
  - Focal calyceal dilation

- MR imaging is uncommonly used for the primary assessment of upper tract TCC
  - May be nearly isointense to renal parenchyma on T1 and T2 weighted sequences
  - Lower signal intensity than urine on T2-weighted images (static MR urography)
Case 12: 45 year old female with anemia, fever, and malaise.

► What is the most likely diagnosis
  ▪ A: Acute pyelonephritis
  ▪ B: Multiple renal abscesses
  ▪ C: Xanthogranulomatous pyelonephritis
  ▪ D: Polycystic kidney disease

Case 12: Xanthogranulomatous pyelonephritis (XGP)

► How is this condition usually definitively managed?
  ▪ A: Extracorporeal shock wave lithotripsy (ESWL)
  ▪ B: 3-6 months antibiotics
  ▪ C: Nephrectomy
  ▪ D: Percutaneous nephroureterostomy.
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Case 12: Xanthogranulomatous pyelonephritis (XGP)

► Chronic suppurative infection
  - Most common in females age 45-65
  - Characterized by renal parenchyma destruction
    ► Replacement of parenchyma with lipid laden macrophages
    ► Enlarged, poorly functioning kidney
    ► Multiple roughly fluid attenuation regions-“xanthomatous masses”.
  - Staghorn calculus common- causes obstruction and inflammatory response
    ► Congenital UPJ obstruction or ureteral tumors are less common.
  - Definitive treatment is nephrectomy
    ► Antibiosis not typically effective in isolation
Case 13: 25 year old presenting with flank pain and fever

► What is the diagnosis?
  - A: Pyelonephritis
  - B: Collecting duct carcinoma
  - C: Lymphoma
  - D: Embolic renal infarction

Case 13: Pyelonephritis progressing to renal abscess

► Pyelonephritis may progress to renal abscess
  - Clinical presentation may be difficult to distinguish from uncomplicated infection
  - Frank pyuria may be present but if abscess is walled off, urinalysis may be normal.
Case 13: Pyelonephritis progressing to renal abscess

- Note small amount of macroscopic fat along posterior margin of the lesion in this case.
  - Likely related to fat necrosis or displaced sinus fat
- The lesion is not consistent with AML
- RCC with displaced sinus fat is a consideration
- Clinical presentation important for prioritizing differential diagnosis

Case 13: Acute pyelonephritis/renal abscess

- Pyelonephritis is the most common bacterial infection of the kidneys
  - Typically does not lead to morphologic damage
  - Imaging normal in up to 75% of cases.
  - Imaging findings:
    - Diffuse renal enlargement
    - Delayed contrast uptake and excretion
      - Striated nephrogram
    - Perinephric stranding
- Abscess usually results from coalescence of micro abscesses in acute pyelonephritis
  - Gram negative is most common
  - Vasospasm and inflammation in pyelonephritis may result in liquefactive necrosis.
  - Risk factors include:
    - Diabetes
    - IVDA
    - Vesicoureteral reflux
    - Renal calculi
  - Presence of gas is essentially pathognomonic
Case 14: 70 year old presenting with weight loss

► What is the most likely diagnosis?
  - A: Metastatic melanoma
  - B: Transitional cell carcinoma
  - C: Lymphoma
  - D: Renal cell carcinoma

Case 14: Lymphoma

► What is most common imaging manifestation of renal lymphoma
  - A: Multiple masses
  - B: Diffuse infiltration
  - C: Isolated mass
  - D: Direct extension from retroperitoneal disease
Case 14: Lymphoma

► Kidneys lack lymphoid tissue
  ▪ Primary renal lymphoma is rare
  ▪ Typically found in the setting of systemic disease
    ► 30-60% autopsy
    ► 5% at imaging
  ▪ Non Hodgkin's is much more common than Hodgkin's lymphoma
  ▪ Renal lymphoma is particularly common in GVHD, renal transplantation (350 x baseline risk)

► Imaging features:
  ▪ Multiple cortical nodules (most common - 50% of cases)
  ▪ Diffuse infiltration
  ▪ Contiguous extension of retroperitoneal disease
  ▪ Perirenal disease - surrounds kidney without infiltration
    ► Essentially pathognomonic

Kidney disease cases: Summary

► Clear cell RCC
► Papillary RCC
► Medullary RCC
► Multilocular cystic nephroma
► Hyperdense cysts
► Medullary nephrocalcinosis
► Calyceal diverticulum
► Angiomyolipoma and tuberous sclerosis
► Lithium nephropathy
► von Hippel Lindau
► Transitional cell carcinoma
► Xanthogranulomatous pyelonephritis
► Acute pyelonephritis and renal abscess
► Renal lymphoma
Thank you!

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