Renal Mass Pitfalls
Case Studies

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Renal Evaluation
- Plain Films
- Excretory Urography
- Ultrasound
- Computerized Tomography
- MRI
- Biopsy

Case 1/2
Diagnosis
A. RCC, RCC
B. RCC, Artifact
C. Artifact, RCC
D. Artifact, Artifact

Upper Pole of the Left Kidney
Case 3

Ultrasound
- Cyst vs. Solid
- RCC can be hypo, iso, or hyperechoic
- Misses 50% of solid masses 2.0 cm or less on routine scans
- Good for vascular invasion

Dromedary Hump

Simple Cyst ??
Case 4
Potential Pitfalls
- Base CT only
- No Base CT
- CM phase
- Pseudoenhancement Cysts
- Poor Enhancement RCC
- Bosniak III & IV
- Venous Streaming

NON CONTRAST CT
- Calculi
- Calcifications
- Baseline for renal mass densitometry
- Remember that 33% on non-Contrast CTs for Flank Pain have Stone Disease*
  
  *Rucker CM et al
  Radiographics 2004

NON-STONE CT FINDINGS
- Adnexal mass
- Appendicitis
- Diverticulitis
  - Pancreatitis
  - Aortic Disease
  - Biliary Disease
  - Renal Disease

Non Contrast CT – Renal Etiologies
- Pyelonephritis
- RCC
- TCC
- Renal Infarction
- Renal Vein Thrombus
- Renal Artery Aneurysm

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Diagnosis Case 5
A) Hydronephosis
B) Pyleonephritis
C) Renal Infarct
D) Renal Mass
E) Can’t tell
“Solid masses within the solid organs cannot be excluded without IV administration of contrast” or “Lack of IV contrast limits this scan”

Pyleonephritis-US
- Normal
- Enlarged Kidney
- Loss of Corticomedullary Differentiation
- Hypoechoic (?edema)
- Hyperechoic (?Hemmorhage)
- Poor Perfusion (Power Doppler)
- Poor Perfusion (CEUS)

Right Flank Pain Renal Abscess

Cystic or Solid? Case 6

Xanthogranulomatous Pyelonephritis

Potential Pitfalls
- Base CT only
- No Base CT
- CM phase
- Pseudoenhancement Cysts
- Poor Enhancement RCC
- Bosniak III & IV
- Venous Streaming
Most common phase to see kidneys in with MDCT

**CM**

Worst overall phase to evaluate kidneys

**CM**

**Corticomedullary Phase (CMP)**

- Cortex and medulla? 100 HU difference
- Pitfalls: Can miss hyperdense cortical masses and hypodense medullary masses, especially papillary renal cell.

<table>
<thead>
<tr>
<th>Histologic Subtype</th>
<th>Prevalence (%)</th>
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</thead>
<tbody>
<tr>
<td>Clear Cell RCC</td>
<td>71</td>
</tr>
<tr>
<td>Papillary RCC</td>
<td>10</td>
</tr>
<tr>
<td>Chromophobe RCC</td>
<td>5</td>
</tr>
<tr>
<td>Hereditary cancer syndromes</td>
<td>5</td>
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<tr>
<td>Multilocular cystic RCC</td>
<td>1</td>
</tr>
<tr>
<td>Collecting duct carcinoma</td>
<td>1</td>
</tr>
<tr>
<td>Mucinous tubular and spindle cell carcinoma</td>
<td>1</td>
</tr>
<tr>
<td>Neuroblastoma-associated RCC</td>
<td>1</td>
</tr>
<tr>
<td>Xp11.2translocation-TFE3 carcinoma</td>
<td>1</td>
</tr>
<tr>
<td>Unclassified lesions</td>
<td>4</td>
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</tbody>
</table>


**Cyst Psedoenhancement**

- Problem:

Multidetector CTs have more *psuedoenhancement* than prior CTs

**Papillary** subtype of RCC with little enhancement.

8 month follow-up

20 month follow-up
Clear Cell RCC

Papillary RCC

Nephrographic Phase—The Star of Renal Mass Imaging

Solid Renal Mass (Adult)
Common
- RCC
- Abscess, Focal Pyleonephritis
- Angiomyolipoma
- Oncocytoma
- Cyst, Infected or Hemorrhagic
- Hematoma
- Infarct
- Metastasis
- Hypertrophied column of Bertin; dromedary hump
- Lymphoma

VON HIPPEL-LINDAU
- HEMANGIOBLASTOMA CEREBELLUM
- HEMANGIOMAS OF RETINA
- HYPERNEPHROMA
- HEMANGIOMA OF LIVER
- PHEOCHROMOCYTOMAS
- PANCREATIC TUMORS-CYSTADENOMA
- PANC. CYSTS, CYSTS AND CYSTS
**Another Case on US Diagnosis**

**TUBEROUS SCLEROSIS**
- **TUBERS**
- CNS → NODULES → GIANT CELL ASTROCYTOMA
- RENAL - ANGIOMYOLIPOMA
  - LYMPHANGIOMA, RCCs 1-2%
  - CYSTS (MULTIPLE)
- EYE – RETINAL HAMARTOMA
- HEART – RHABDOMYOMA
- LUNGS - LYMPHANGIOLEIOMYOMATOSIS

**Think of Thin Reconstructions or Reformatted Images**

**Dx: AML**

**“Pixel Distribution Analysis: Clear Cell RCC. vs. AML...?”**
- Only visible fat on CT can reliably classify as AML
- Pixel analysis with commercially available software, not able to distinguish CCRCC from AML.

Catalano OA et al
Rad vol 247(3):738-746, June 2008
Dx? Case 12
- A) RCC
- B) Angiomyolipoma
- C) Post RFA
- D) Liposarcoma
- E) Met

Renal Lymphoma
- Common in widespread disease
- Primary lymphoma very rare
- Hematogenous spread or direct invasion
- 50-70% bilateral
  - Multiple masses: 50%
  - Hilar mass infiltrating kidney: 25%
  - Renal enlargement: 10%
  - Perirenal: 10%
  - Solitary mass: 5%

Is Segmental Enhancement Inversion...a reliable sign for..Oncocytoma."
- Inversion 1
- Segments no Inversion 1
- Central Scar 2
- Central Necrosis 4
- No segments 11

CT-guided biopsy of Renal Masses before RFA

- 88.8% diagnostic
- 95% malignant
- 19 gauge co-axial system
- 22 FNA - min 2 samples
- 20 core-min 2 samples

Heilbrun ME et al
AJR 2007;188:1500-1505

Biopsy Technique

<table>
<thead>
<tr>
<th>Technique</th>
<th>Dx</th>
<th>Non</th>
<th>T</th>
<th>Dx%</th>
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<tbody>
<tr>
<td>Fine-needle aspiration</td>
<td>73</td>
<td>18</td>
<td>91</td>
<td>80.2</td>
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<tr>
<td>Core</td>
<td>60</td>
<td>29</td>
<td>89</td>
<td>67.4</td>
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<td>0</td>
<td>4</td>
<td>100.0</td>
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<tr>
<td>Core sample only</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>50.0</td>
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<tr>
<td>Both fine-needle aspiration and core</td>
<td>51</td>
<td>10</td>
<td>87</td>
<td>58.6</td>
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<tr>
<td>FNA diagnostic and core nondiagnostic</td>
<td>18</td>
<td>NA</td>
<td>87</td>
<td>20.7</td>
</tr>
<tr>
<td>FNA nondiagnostic and core diagnostic</td>
<td>8</td>
<td>NA</td>
<td>87</td>
<td>9.2</td>
</tr>
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</table>

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Conclusion

- US Blind Spots – LUP
- Compare Echo Texture of Mass with Kidney
- Utilize Power/Color Doppler
- Pitfalls of Non Contrast CT
- CM phase of CT – Miss Mass in Medulla
- Minimal Enhancement of P-RCC
- Use U/S Guided Renal Biopsy