Gerota’s space

- A cone with its apex in the iliac fossa
- Communicates across the midline plane
- Contents: Adrenal gland, kidney, renal vessels, fat, collecting system
Renal enhancement patterns
Renal CT [ reconstruction, angiography ]
Normal renal MRI.
Normal renal MRI.
Kidneys

- CT density 30-50HU
- Cortex and medulla are not differentiated without contrast
- Anatomic location from xiphoid to umbilicus
Kidneys  CT Techniques

- Pre contrast scans 1cm intervals
- Post contrast scans conventional, dynamic 1cm intervals
- Reconstructed images (sagittal, coronal)
Renal pathology

- Masses
- Trauma
- Obstruction
- Congenital lesions
Renal masses

- Cystic lesions
- Solid masses
- Mixed lesions
Solid renal masses

Renal cell carcinoma

- The most common lesion
- 1-3% of all visceral neoplasms
- About 90% of all renal tumors in adults
- Male: female 3:1
The classical clinical triad of hematuria, abdominal mass, and pain is an uncommon presentation of RCC and in fact a late one. Micro-hematuria may exist but hematuria can be absent in up to 40% of cases. A much more common clinical scenario includes, fever, malaise, anemia, weight loss, or a paraneoplastic syndrome.
Initial imaging of renal cell carcinoma is often by intravenous urography with tomography or ultrasonography.

The urographic appearance of a renal mass includes:

- Renal axis rotation by a large lesion
- Focal contour bulge
- Displacement or amputation of a part of the collecting system
- Focal or global hydronephrosis
Indications for imaging of suspected RCC include:

- Incidental detection of renal mass, presumed to be solid.
- Suspicious or positive excretory urogram for tumor.
- Persistent hematuria after normal excretory urography.
- Possible para-neoplastic syndrome, e.g., hypercalcemia, erythrocytosis.
- Evaluation for unknown primary neoplasm.
- Patients with conditions known to be associated with renal neoplasia, as Von Hippel-Lindau disease, etc.
- Previous known renal neoplasm.
Diagnosis of renal cell carcinoma by CT or MR depends on the distortion of the collecting system and change in the attenuation or signal intensity and contour of renal parenchyma.
The features of renal cell carcinoma on CT are:

- Mass with attenuation similar to or less than renal parenchyma
- Irregular parenchymal interface or margins (pseudo capsule)
- Contour deformity (mass effect)
- Enhancement with contrast media
- Calcification either central, peripheral, or both

Secondary features such as:
- Renal vein invasion
- IVC invasion
- Perinephric invasion
- Lymph node enlargement
- Adrenal metastasis

A patient with pulmonary metastases.
Renal cell carcinoma with venous invasion
Is no longer part of the initial imaging and staging evaluation of patients with renal cell carcinoma being totally replaced by CT or MR angiograms. These angiograms are specially needed when nephron sparing surgery is contemplated especially in the solitary kidneys, or patients with polycystic kidney disease, or Von-Hippel Lindau disease. Venograms are needed to define the cephalic extent of an inferior vena cava thrombus. The need for conventional angiography is only for embolization of large hyper vascular tumors.
Evaluation of tumor size and shape
Perinephric extension
Tumor vascularity [CT angiography]
Lymph node enlargement
Major vascular (venous) involvement
Contiguous organ spread [adrenal]
Local or distant Metastatic spread.
RCC with local invasion of the adrenal gland and IVC as well as metastatic extension to liver, other kidney and adrenal gland.
Solitary kidney
Synchronously in both kidneys
Poor renal function

Rates of local tumor recurrence ranged from 4% to 10%.
The overall patient survival has not significantly differed from that of patients with similar stage disease who have undergone radical nephrectomy.
Imaging parameters for **partial nephrectomy**

- Peripheral location of the tumor
- Lack of invasion of
  - The renal sinus or perinephric fat
  - The renal collecting system
  - Renal vein
- Absence of lymphadenopathy or distant metastases.

Small tumor less than 3 cm
Renal cell carcinoma  Staging

I  Tumor within the renal capsule
II  Tumor invaded the capsule but not the Gerota’s fascia
III  Renal vein or lymph node invasion
IV  Beyond the Gerota’s fascia or metastases
Stage I RCC [ Tumor within the renal capsule ]
Progression of RCC over 2 years
Stage I RCC [ Tumor within the renal capsule ]
Stage II RCC [ Tumor invading perinephric fat ]

A 7.2-cm heterogeneously enhancing mass with invasion of the perinephric fat
Stage III RCC [ Tumor with lymphadenopathy ]
Stage III RCC [ Tumor invading the liver ]
Renal cell carcinoma Stage ONE
Renal cell carcinoma Stage ONE
Pelvic filling defect was seen on a urogram in this patient with hematuria; post contrast CT shows a mass protruding into the pelvis and involves the lower pole parenchyma.
Renal cell carcinoma Stage II by pathology
Stage I RCC [ Tumor within the renal capsule ]
Stage I RCC [Tumor within the renal capsule]
Renal cell carcinoma Stage Four
Patient presented with pulmonary metastases, a 3.5 tumor is shown on post contrast CT.
Renal cell carcinoma Stage Three

Invasion of the renal vein and IVC
Renal cell carcinoma with renal vein and IVC invasion
Cystic renal cell carcinoma
Cystic renal cell carcinoma
Cystic renal cell carcinoma
Two different patients
Cystic renal cell carcinoma
Two different patients
Contrast enhanced CT abdominal scan showing a large well marginated soft tissue mass lesion of heterogeneous texture and dense matrix calcifications seen arising from the ventral aspect of the left kidney.

Renal cell carcinoma with matrix calcification
Wilms’ tumor is the most common primary malignant renal tumor of childhood, accounting for about 7% of all childhood cancers. The mean age at diagnosis is 3.5 years. Clinical presentation: abdominal mass with abdominal pain, fever, and hematuria. About 10% of children have metastases, at presentation. Bilateral tumors occur in 5% to 10%
Wilm’s Tumor
Wilm’s Tumor

Male 6Y
Renal lymphoma

Multiple parenchymal renal masses 60%

Helpful diagnostic criteria

- Known patient with lymphoma
- Immune compromised patient
- Other lesions specially in the spleen
- Retroperitoneal bulky nodes
Lymphoma

liver, spleen, kidneys, nodes, stomach
Post contrast CT Chest and abdominal scans showing a large infiltrative heterogenously enhancing mass lesion involving the wall of the left ventricle. Other lesions are seen in the spleen as well as both kidneys appearing as hypodense focal lesions. Cardiac and abdominal lymphoma.
Renal lymphoma
Renal lymphoma in an AIDS patient
Renal lymphoma
Fat containing renal masses

- Angiomyolipoma
- Simple lipoma
- Teratoma
- Liposarcoma
- Xanthogranulomatous pyelonephritis
Renal Angiomyolipoma

- Common benign renal mass
- Formed of blood vessels, smooth muscles, fat
- 40-80% of patients with tuberous sclerosis have AML
- Usually small, bilateral, multiple, asymptomatic, M=F
Tuberous sclerosis: Contrast-enhanced CT shows numerous small, fat-density lesions scattered throughout both kidneys, all are angiomyolipomas.
Tuberous sclerosis

- Autosomal dominated disorder **male= female**
- Pulmonary changes are seen almost only in females in 3rd - 4th decades
- Changes are similar to lymphangioleiomyomatosis
- Except chylous effusion (rare in T. sclerosis)
- Angiomyolipomas of the kidney and liver help in diagnosis
Renal Angiomyolipoma

- Large, single, unilateral, symptomatic
- Middle age M:F = 1:4
- Heterogeneously enhancing,
- Fat containing renal mass
- Do not obstruct or destruct the calyces
- US, MRI, Angiography
Renal Angiomyolipoma
Renal Angiomyolipoma
Angiomyolipoma, growth on follow up
Transitional cell carcinoma

- The most common tumor of the renal pelvis
- Multiple lesions in about 30% of cases
- M:F = 4:1 above 60 years
- Diagnosed by IVP, CTU
- Filling defect in the pelvis

CT Urogram
Transitional Cell Carcinoma
Transitional Cell Carcinoma
Transitional Cell Carcinoma
Transitional Cell Carcinoma
Transitional Cell Carcinoma
Transitional Cell Carcinoma
Transitional cell carcinoma extending along the upper ureter
Transitional Cell Carcinoma

Transitional cell carcinoma filling the renal pelvis
Transitional Cell Carcinoma
Renal pelvic filling defect

- Non opaque stones
- Blood clots
- Polyps
- Hypertrophied renal papilla
- Vascular impression
- Inflammatory conditions

Transitional cell carcinoma.
Oncocytoma

- Rare, benign, solid renal tumor
- Usually asymptomatic
- Single, multiple
- Usually larger than 2cm

3–5% of renal parenchymal tumors
Oncocytoma

- Differentiation from RCC is difficult
- Helpful diagnostic criteria
  - Homogenous solid lesion
  - Sharply hypodense star-shaped scar 33%
  - Large size may reach 4kg
Oncocytoma.
Oncocytoma.
Oncocytoma.
Multilocular cystic neophroma

Unknown origin

- Multilocular cystic lesion
- Occurs in children (<5 years) and adults (40–70Y)
- Well defined lesion with thick internal septations
- Calcium 10–50%
Multilocular cystic neophroma
Multilocular cystic neoproma
Thank you

سبحانك الهم و بحمدك نشهد ان لا اله الا انت نستغفرك و نتوب اليك
hemangioma

TCC, 2 CASES
Angiomyolipoma 2 cases

RCC
CYSTIC RCC
<table>
<thead>
<tr>
<th>Robson Stage</th>
<th>Description</th>
<th>TNM</th>
<th>TNM Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Tumor confined to renal capsule</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Small tumor (&lt; 2.5 cm)</td>
<td>T1</td>
<td>I</td>
</tr>
<tr>
<td></td>
<td>Large tumor (&gt; 2.5 cm)</td>
<td>T2</td>
<td>II</td>
</tr>
<tr>
<td>II</td>
<td>Tumor spread to perinephric fat or adrenal gland</td>
<td></td>
<td>III</td>
</tr>
<tr>
<td>III A</td>
<td>Venous tumor thrombus</td>
<td>T3b</td>
<td>III</td>
</tr>
<tr>
<td></td>
<td>Renal vein thrombus only</td>
<td>T3c</td>
<td>III</td>
</tr>
<tr>
<td></td>
<td>IVC thrombus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>III B</td>
<td>Regional lymph node metastases</td>
<td>N1-N3</td>
<td>III/IV</td>
</tr>
<tr>
<td>III C</td>
<td>Venous tumor thrombus and regional nodes</td>
<td>T3b/c, N1-N3</td>
<td>III/IV</td>
</tr>
<tr>
<td>IV A</td>
<td>Direct invasion of adjacent organs outside Gerota’s fascia</td>
<td>T4</td>
<td>IV</td>
</tr>
<tr>
<td>IV B</td>
<td>Distant metastases</td>
<td>M1</td>
<td>IV</td>
</tr>
</tbody>
</table>
Tuberous sclerosis. Both kidneys contain many cysts. More inferiorly, an angiomyolipoma is present (arrow).
Wilm’s tumor
Angiomyolipoma.
Angiomyolipoma with hemorrhage.