Nonneoplastic Kidney Diseases
Agenda

• abnormalities in form and position, obstruction, and reflux
• cysts and cystic kidney diseases
• nonneoplastic mass forming lesions
congenital abnormalities of kidney or lower urinary tract (CAKUT)

- frequent (0.5-1% of live births)
- 25% of patients with end-stage renal disease have CAKUT
- multiple sequelae (e.g. oligohydramnios, intra-uterine growth retardation, urinary tract infections, obstruction, reflux, stones, renal failure, hypertension)

Diagnostic Pathology: Kidney Diseases
Impediments to urine flow

causes:

✓ reflux (retrograde urine flow from bladder to kidney)

✓ hydronephrosis (dilatation of renal pelvis)

✓ obstructive nephropathy (damage to kidney)

✓ reflux nephropathy (damage to kidney due to urine reflux)

Diagnostic Pathology: Kidney Diseases
Obstructive nephropathy

- dilatation of pelvis and calyces
- loss of medullary pyramids
- secondary thinning of renal cortex

→ macroscopic evaluation is key!
Obstructive/reflux nephropathy

Diagnostic Pathology: Kidney Diseases
Further complications ...

- kidney stones
- acute and chronic pyelonephritis
- papillary necrosis
complex pathologies with multiple players
macroscopic evaluation and clinicopathological correlation most often key to correct diagnosis
Agenda

- abnormalities in form and position, obstruction, and reflux
- cysts and cystic kidney diseases
- nonneoplastic mass forming lesions
### Cysts and Cystic Kidney Disease

- Closed cavity in a previously noncystic structure, lined by cells
- No universally accepted classification scheme
- Features: genetic basis?, cystic anatomic structures (tubules, glomeruli, other)?, distribution?
- Non-nephron cysts: pyelocalcycal diverticulum, perinephric pseudocyst, lymphangiectasis

<table>
<thead>
<tr>
<th>Cyst Type</th>
<th>Genetic Basis</th>
<th>Clinical Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autosomal dominant polycystic kidney disease</td>
<td>Autosomal dominant, PKD1 (85%), PKD2 (15%)</td>
<td>Large multicystic kidneys, liver cysts</td>
</tr>
<tr>
<td>Autosomal recessive polycystic kidney disease</td>
<td>Autosomal recessive, PKHD1</td>
<td>Large cystic kidneys at birth</td>
</tr>
<tr>
<td>Nephronophthisis</td>
<td>Autosomal recessive, NPHP genes</td>
<td>Cortical oder corticomedullary cysts</td>
</tr>
<tr>
<td>Medullary sponge kidney</td>
<td>Malformation</td>
<td>Medullary cysts, ectasia of terminal collecting ducts</td>
</tr>
<tr>
<td>Acquired cystic kidney disease</td>
<td>None</td>
<td>&gt;3 cysts in the context of chronic renal insufficiency and dialysis</td>
</tr>
<tr>
<td>Simple cysts</td>
<td>None</td>
<td>Single cysts in otherwise normal kidneys</td>
</tr>
</tbody>
</table>
Ciliopathies

(1.)

(2.)

(3.)


Nephrology 2007;12:559-564
Polycystic kidney disease, adult type

- frequent genetic disease (1:400-1000 live births)
- 7-10% of dialysis population
- PKD1 with more cysts and earlier chronic renal insufficiency
- complications: infection, stones, bleeding
Polycystic kidney disease, adult type
Polycystic kidney disease, adult type

Diagnostic Pathology: Kidney Diseases
medullary sponge kidney  
aquired cystic kidney disease
«Simple» kidney cysts
Bosniak classification of renal cysts

1. ~0% are malignant
2. ~0% are malignant
3. ~50% are malignant
4. ~100% are malignant

Case courtesy of Dr Roberto Schubert, Radiopaedia.org, rID: 17536

Case courtesy of Radswiki, Radiopaedia.org, rID: 11931

Case courtesy of Dr Matt Skalski, Radiopaedia.org, rID: 20989

Case courtesy of Dr Roberto Schubert, Radiopaedia.org, rID: 17536
### Bosniak classification of renal cysts

<table>
<thead>
<tr>
<th>Class</th>
<th>Description</th>
<th>Work-up</th>
<th>% Malignant</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Simple cyst; imperceptible wall, rounded</td>
<td>nil</td>
<td>0%</td>
</tr>
<tr>
<td>2</td>
<td>Minimally complex cyst; a few thin &lt;1 mm septa or thin calcifications (thickness not measurable); non-enhancing high-attenuation (due to proteinaceous or haemorrhagic contents) renal lesions of less than 3 cm are also included in this category; these lesions are generally well marginated</td>
<td>nil</td>
<td>0%</td>
</tr>
<tr>
<td>2F</td>
<td>Minimally complex cyst; increased number of septa, minimally thickened with nodular or thick calcifications; there may be perceived (but not measurable) enhancement of a hairline-thin smooth septa; hyperdense cyst &gt;3 cm diameter, mostly intrarenal (less than 25% of wall visible); no enhancement</td>
<td>Needs ultrasound/CT follow up</td>
<td>Up to 5%</td>
</tr>
<tr>
<td>3</td>
<td>Indeterminate cyst; thick, nodular multiple septa or wall with measurable enhancement, hyperdense on CT (see 2F)</td>
<td>Partial nephrectomy or radiofrequency ablation in elderly or poor surgical candidates</td>
<td>Up to 55%</td>
</tr>
<tr>
<td>4</td>
<td>Clearly malignant cyst; solid mass with a large cystic or a necrotic component</td>
<td>Partial or total nephrectomy</td>
<td>100%</td>
</tr>
</tbody>
</table>

radiopaedia.org/articles/bosniak-classification-system-of-renal-cystic-masses
Summary

- diagnosis straightforward in most (urological) cases
- sampling of septated cysts key → search for possible carcinoma
Agenda

• abnormalities in form and position, obstruction, and reflux
• cysts and cystic kidney diseases
• nonneoplastic mass forming lesions
  ✓ xanthogranulomatous pyelonephritis
  ✓ malakoplakia
  ✓ IgG4-related tubulointerstitial nephritis
Xanthogranulomatous pyelonephritis

- variant of chronic pyelonephritis with mass lesion and abundant foamy macrophages
- Proteus mirabilis (>50%), E. coli, Pseudomonas sp., Klebsiella sp.
- male:female 1:4
- often unilateral

DD: renal cell carcinoma, renal medullary tuberculosis
Xanthogranulomatous pyelonephritis

Diagnostic Pathology: Kidney Diseases
Xanthogranulomatous pyelonephritis
Mimicker: ccRCC
Malakoplakia

- chronic bacterial infection with abundant granular macrophages, PAS+
- Michaelis-Gutmann bodies: cytoplasmic inclusions, basophilic, PAS+, calcium+, iron+
- bilateral involvement (30-50%)
- E. coli infection
- urinary bladder is most common site, others include skin, gastrointestinal tract, prostate, testis

DD: RCC, xanthogranulomatous PN
Malakoplakia

Diagnostic Pathology: Kidney Diseases
Malakoplakia: Michaelis-Gutmann bodies

Diagnostic Pathology: Kidney Diseases
IgG4-related tubulointerstitial nephritis

- acute on chronic renal failure
- renal mass lesions frequent
- previous involvement of other sites (e.g. IgG4-related autoimmune pancreatitis, retroperitoneal fibrosis)
Kidney

IgG4-related sclerosing disease

Inflammatory pseudotumors
Other candidate diseases

Sclerosing sialadenitis and dacyroadenitis

Retroperitoneal fibrosis

Autoimmune pancreatitis

Sclerosing cholangitis and cholecystitis

Figure 4 | Schematic illustration of the concept of IgG4-related sclerosing disease, which is a systemic disease in which IgG4-positive plasma cells and T lymphocytes extensively infiltrate various organs. Autoimmune pancreatitis may be one manifestation of this disease; other organs with tissue fibrosis and obliterative phlebitis also show clinical manifestations.
IgG4-related tubulointerstitial nephritis

• extrarenal manifestations (22/23)
  – sialadenitis (19/23)
  – lymphadenitis (10/23)
  – autoimmune sclerosing pancreatitis (9/23)
  – dacryxoadenitis (7/23)
  – interstitial pneumonia (6/23)
  – other (3/23)
• extrarenal manifestation prior to kidney manifestation (8/23)
• mass lesion on CT (16/23)

Saeki T. et al., Kidney Int. 78:1016-1023, 2010
Summary

• looking at the macroscopic specimen is a very good idea in many nonneoplastic kidney diseases
• renal cell carcinoma is an important differential diagnosis in many of these specimen
• in doubt, ask a person experienced in renal pathology