CSYTIC DISEASE OF THE KIDNEY

- Epithelium-lined cavities filled with fluid
- Single-or multiple
- Inherited or acquired
- Occuring in infancy or older age
- Clinically silent or symptomatic
- Simple cyst:
  - 50% of the population over 50 yrs
  - asymptomatic, incidental finding
  - should be differentiated from other solid lesions (US, rarely CT needed)
Polycystic kidney disease: ADPKD, ARPKD

- **ADPKD Autosomal Dominant (Adult) Polycystic Kidney Disease I**

- **Prevalence of 1 in 1000** and accounting for about 10% of cases of chronic renal failure requiring transplantation or dialysis

- **Gene defect on chr.16 causes systemic disease as cysts all over, most commonly in the kidney, liver, ovary, pancreas, structural anomalies in the GI, vascular tree and cardiac valves**

  - the kidney appears to be composed solely of a mass of cysts, up to 3 to 4 cm in diameter, with no intervening parenchyma... kidneys are enlarged and the **numerous small cysts in the cortex and medulla** give the **kidney a spongelike appearance**

  - the cysts have a uniform lining of cuboidal cells, reflecting their **origin from the collecting tubules**...

  - the disease is invariably **bilateral**
Autosomal Dominant Polycystic Kidney Disease II

- Clinical manifestations: family history, flank pain, hematuria, complications: UTI, renal calculi, retroperitoneal bleeding
- Early in the course: normal kidney size, some cysts only eventually, kidneys are enlarged and the parenchyma replaced by cysts.
- Extrarenal manifestations: cysts elsewhere, hypertension, mitral valve prolapse and/or myxoedematous degeneration require valve replacement, renal cell cc., renal failure (rarely before age 40)
- Diagnosis: US, CT
- Treatment: aimed at preventing complications, preserving renal function; family education
- Episodes of gross haematuria should be conservatively managed: bed-rest, analgesics, hydration
- In the case of UTI selection of antibiotic therapy, in the failure to respond: trimetoprim-sulfamethoxazole, ciprofloxacin should be given (they enter the cyst fluid), the therapy of hypertension
- Se creatinine should be followed yearly
- In end stage: renal replacement therapy
• **ARPKD**

  Prevalence: rare, juvenile onset  
  Clinical symptoms: abdominal mass, UTI, failure to thrive  
  Findings: kidney is large, hepatic fibrosis is present,  
  Outcome: end-stage renal disease before adolescence

• **ACKD Acquired cystic kidney disease**

  Develops almost only among end-stage renal disease patients under dialysis therapy.  
  Renal tumors used to complicate the disease
<table>
<thead>
<tr>
<th>Category</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I. Genitourinary</strong></td>
<td>Polycystic kidney</td>
</tr>
<tr>
<td></td>
<td>Renal adenoma/hypernephroma</td>
</tr>
<tr>
<td></td>
<td>Renal calculi</td>
</tr>
<tr>
<td></td>
<td>Ovarian cysts</td>
</tr>
<tr>
<td><strong>II. Gastrointestinal</strong></td>
<td>Hepatic cysts</td>
</tr>
<tr>
<td></td>
<td>Pancreatic cysts</td>
</tr>
<tr>
<td></td>
<td>Diverticula</td>
</tr>
<tr>
<td><strong>III. Cardiovascular</strong></td>
<td>Hypertension</td>
</tr>
<tr>
<td></td>
<td>Cardiac valvular abnormalities</td>
</tr>
<tr>
<td></td>
<td>Intracranial aneurysms</td>
</tr>
<tr>
<td><strong>IV. Musculoskeletal</strong></td>
<td>Hernia formation</td>
</tr>
<tr>
<td>Method</td>
<td>Limitation</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Renal concentrating ability</td>
<td>Untested in children</td>
</tr>
<tr>
<td>in algorithm</td>
<td>No anatomic information</td>
</tr>
<tr>
<td>Ultrasonography</td>
<td>May miss 2–6% of patients with cysts</td>
</tr>
<tr>
<td></td>
<td>Highly operator and reader dependent</td>
</tr>
<tr>
<td></td>
<td>Will not identify precystic gene carriers</td>
</tr>
<tr>
<td>CT scan</td>
<td>May miss rare patient with small cysts</td>
</tr>
<tr>
<td></td>
<td>Radiation and contrast exposure</td>
</tr>
<tr>
<td></td>
<td>Difficult to perform in children</td>
</tr>
<tr>
<td></td>
<td>Expense</td>
</tr>
<tr>
<td></td>
<td>Will not identify precystic gene carriers</td>
</tr>
<tr>
<td>Gene linkage analysis</td>
<td>Requires other family members to participate</td>
</tr>
<tr>
<td></td>
<td>Requires that physician understand interpretation of results</td>
</tr>
<tr>
<td></td>
<td>Expense</td>
</tr>
<tr>
<td></td>
<td>Provides no anatomic information on organs involved</td>
</tr>
</tbody>
</table>

Polycystic disease of the kidney
Medullary cystic disease:

- uncommon, familiarity both autosomal dominant and recessive way of inheritance occur
- Pathogenesis and pathology:
- Small kidneys, cysts at the corticomedullary junctions and in the medulla. The glomeruli are hyalinized, tubular base membrane is irregular, tubules vary in appearance from atrophic to tortuous, interstitium reveals fibrosis and mononuclear cell infiltrates. (suspected to be end-stage of an other tubulointestinal disease)
- Clinical manifestations: early adolescence polyuria, polydypsia, enuresis, defect in urinary concentrating ability, growth retardation, anaemia
- No specific therapy exists
Medullary sponge kidney

• Common: 1 in 5000 to 1 in 20000
• Pathogenesis: tubular dilatation within the medullary collecting ducts
• Signs: recurrent hematuria, UTI, renal calculi
• Diagnosis: IVP reveals normal size kidneys with medullary ductal ectasias
• Coincident hyperparathyreoidism is common, se Calcium should be tested
• Consequences: decreased renal concentrating ability, impaired acidification, incomplete renal tubular acidosis, impairment in renal potassium excretion, acute potassium loading.
• Treatment: management of UTI and renal calculi
FIGURE 89-3. Schematic drawing of a cut section of (a) a normal kidney, measuring 12 cm with normal papilla, cortex, medulla, and corticomedullary junction, and (b) a kidney from a patient with ADPKD. The kidney is large, measuring 29 cm, and contains cysts throughout the cortex and medulla, which vary in size from 1 mm to 5 cm. (c) A kidney from a patient with medullary cystic disease. The kidney is small, measuring 8 cm with a scarred surface. The cysts are at the corticomedullary junction (CMJ) and are small, measuring 1 to 5 mm across. (d) A kidney from a patient with medullary sponge kidney; these are multiple ductal dilations measuring 1 to 5 mm in diameter, giving the medulla (M) a porous appearance. Some dilations contain calculi (CAL). (c and d from Spence HM, Singleton R: What is sponge kidney disease and where does it fit in the spectrum of cystic disorders? J Urol 107:176, © by Williams & Wilkins, 1972.)
<table>
<thead>
<tr>
<th>SIMPLE CYSTS</th>
<th>ADPKD</th>
<th>ARPKD</th>
<th>MCD</th>
<th>MSK</th>
</tr>
</thead>
</table>

**FIGURE 89-1.** Ages of renal cystic disease patients.
<table>
<thead>
<tr>
<th>Feature</th>
<th>Simple Cysts</th>
<th>ADPKD</th>
<th>ARPKD</th>
<th>ACKD</th>
<th>MCD</th>
<th>MSK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inheritance pattern</td>
<td>None</td>
<td>Autosomal dominant</td>
<td>Autosomal recessive</td>
<td>None</td>
<td>Often present, variable pattern</td>
<td>None</td>
</tr>
<tr>
<td>Incidence or prevalence</td>
<td>Common, increasing with age</td>
<td>1/200 to 1/1000</td>
<td>Rare</td>
<td>40% in dialysis patients</td>
<td>Rare</td>
<td>Common</td>
</tr>
<tr>
<td>Age of onset</td>
<td>Adult</td>
<td>Usually adults</td>
<td>Neonates, children</td>
<td>Older adults</td>
<td>Adolescents, young adults</td>
<td>Adults</td>
</tr>
<tr>
<td>Presenting symptom</td>
<td>Incidental finding, hematuria</td>
<td>Pain, hematuria, infection, family screening</td>
<td>Abdominal mass, renal failure, failure to thrive</td>
<td>Hematuria</td>
<td>Polyuria, polydipsia, enuresis, renal failure, failure to thrive</td>
<td>Incidental, urinary tract infections, hematuria, renal calculi</td>
</tr>
<tr>
<td>Hematuria</td>
<td>Occurs</td>
<td>Common</td>
<td>Occurs</td>
<td>Occurs</td>
<td>Occurs</td>
<td>Common</td>
</tr>
<tr>
<td>Recurrent infections</td>
<td>Rare</td>
<td>Common</td>
<td>Occurs</td>
<td>Rare</td>
<td>Rare</td>
<td>Common</td>
</tr>
<tr>
<td>Renal calculi</td>
<td>No</td>
<td>Common</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Common</td>
</tr>
<tr>
<td>Hypertension</td>
<td>Rare</td>
<td>Common</td>
<td>Common</td>
<td>Present from underlying disease</td>
<td>Rare</td>
<td>No</td>
</tr>
<tr>
<td>Method of diagnosis</td>
<td>Ultrasound</td>
<td>Ultrasound, gene linkage analysis</td>
<td>Ultrasound</td>
<td>CT scan</td>
<td>None reliable</td>
<td>Excretory urogram</td>
</tr>
<tr>
<td>Renal size</td>
<td>Normal</td>
<td>Normal to very large</td>
<td>Large initially</td>
<td>Small to normal, occasionally large</td>
<td>Small</td>
<td>Normal</td>
</tr>
</tbody>
</table>

ADPKD = autosomal dominant polycystic kidney disease; ARPKD = autosomal recessive polycystic kidney disease; ACKD = acquired cystic kidney disease; MCD = medullary cystic disease; MSK = medullary sponge kidney.
"Mass Effect" on Intravenous Pyelogram (IVP) with Nephrotomogram
(Criteria for IVP simple cyst: avascular with paper thin wall; homogeneous and radiolucent; sharp interface with adjacent nephrogram)

Ultrasonography (US)

Simple Sonographic Cyst by Strict Criteria (i.e., lack of internal echoes, smooth borders, through transmission)

Dx: Probable Benign Cyst; Cyst Puncture not Necessary in Asymptomatic Patients without Hematuria; Periodic Repeat of IVP/US Suggested; If Change Occurs, Consider Cyst Puncture or CT Scan

Criteria for Simple Sonographic Cyst Not Met

CT Scan (Criteria for cyst: smooth with no discernible wall; water density; no enhancement with intravascular contrast)

Equivocal

Lesion Compatible with Renal Neoplasm (localized)

Additional Distant Metastatic Evaluation (see text)

Negative

Positive (patient asymptomatic)

Radical Nephrectomy with Regional Lymphadenectomy

Biopsy for Tissue Dx; if RCC:
? Observe
? Investigational drugs

Positive (patient symptomatic from primary renal cell cancer) (RCC)

Consider Palliative Nephrectomy or Angio-Infarction if Nephrectomy Contraindicated

FIGURE 234-1 Diagnostic evaluation for renal mass.
TUMORS OF THE KIDNEY, URETER AND BLADDER

• Classification: benign and malignant, primary or secondary tumors

• Presenting symptoms, lab. findings (table)

The major task is to differentiate cystic lesions from renal neoplasms:
• IVP with nephrotomography (75% accuracy): renal mass
• Distortion or nonvisualization of the collecting system, and distorted renal outlines suggest cancer
• US: cystic or solid (95% accuracy)
• CT: in any doubt. Or MRI useful for staging: to determine renal vein and/or v.cava thrombus
• Common sites of metastases: ipsilateral adrenal, local lymphnode, lung, long bones. Therefore chest CT and radionuclide bone scan are routinely required
• Arteriography is needed in the suspicion of haemangioma before biopsy: Needle aspiration
• Surgery for final definition and therapy
CLASSIFICATION OF RENAL TUMORS

Benign Tumors
Adenoma
Oncocytoma
Mesoblastic nephroma
Hamartoma-angiomyolipoma
Leiomyoma
Hemangioma

Primary Malignant Tumors
Renal cell carcinoma (adenocarcinoma)
Nephroblastoma (Wilms’ tumor)
Urothelial carcinoma (renal collecting system and pelvis)
Sarcoma

Secondary Malignant Tumors (Direct Extension or Metastatic)
Adrenal carcinoma
Retroperitoneal sarcoma, pancreas, colon
Lung, stomach, breast
Reticuloendothelial—lymphoma and Hodgkin’s disease, and hematologic—leukemia and multiple myeloma
**TABLE 91–2. PRESENTING SYMPTOMS, LABORATORY FEATURES, OR PHYSICAL FINDINGS IN PATIENTS WITH RENAL CELL CARCINOMA**

<table>
<thead>
<tr>
<th>Finding</th>
<th>Occurrence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hematuria</td>
<td>50–60</td>
</tr>
<tr>
<td>Elevated erythrocyte sedimentation rate (ESR)</td>
<td>50–60</td>
</tr>
<tr>
<td>Abdominal mass</td>
<td>24–45</td>
</tr>
<tr>
<td>Anemia</td>
<td>21–41</td>
</tr>
<tr>
<td>Flank pain</td>
<td>35–40</td>
</tr>
<tr>
<td>Hypertension</td>
<td>22–38</td>
</tr>
<tr>
<td>Weight loss</td>
<td>28–36</td>
</tr>
<tr>
<td>Pyrexia</td>
<td>7–17</td>
</tr>
<tr>
<td>Hepatic dysfunction</td>
<td>10–15</td>
</tr>
<tr>
<td>Classic triad (gross hematuria, flank pain, and palpable abdominal mass)</td>
<td>7–10</td>
</tr>
<tr>
<td>Hypercalcemia</td>
<td>3–6</td>
</tr>
<tr>
<td>Erythrocytosis</td>
<td>3–4</td>
</tr>
<tr>
<td>Acute varicocele</td>
<td>2–3</td>
</tr>
</tbody>
</table>

• **Benign renal tumors:**
  • Renal adenoma benign solid parenchymal lesion under 3 cm in size
  • All others are suspected to be malignant (those larger than 3 cm) and radical nephrectomy recommended
  • In acquired renal cystic disease in end-stage under dialysis therapy multiple bilateral renal tumors develop in 10% of the patients
  • Hamartoma-angiomyolipoma, fibroma, lipoma, leiomyoma, hemangioma are rare benign tumors. In the case of hesitation between malignant and benign process, surgery is recommended
• **Primary malignant tumors**
• **Renal cell carcinoma** (adenocarcinoma, hypernephroma) **RCC**
• Pathology: arise from cells of the proximal convoluted tubules
• Risk: male preponderance, cigarette smoking, HLA BW44 and DR8
• Oncogenes on chr. 3p
• Histologic appearance: 1/clear cell type: uniformly large, cholesterol laden cells, small nuclei, rare mitoses 2/ granular cell type containing numerous mitochondria, more numerous mitoses 3/ spindle cell variety: fusiform cells in variable size
• Clinical manifestations (classic triad) hematuria, flank pain, abdominal mass
• paraneoplastic syndromes (table)
<table>
<thead>
<tr>
<th>TABLE 91-3. SOME UNUSUAL OR SYSTEMIC MANIFESTATIONS OF RENAL CELL CARCINOMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever</td>
</tr>
<tr>
<td>Weight loss, inanition</td>
</tr>
<tr>
<td>Anemia</td>
</tr>
<tr>
<td>Erythrocytosis</td>
</tr>
<tr>
<td>Leukemoid reaction, eosinophilia</td>
</tr>
<tr>
<td>Thrombocytosis</td>
</tr>
<tr>
<td>Hypercalcemia</td>
</tr>
<tr>
<td>Hypertension (with or without renin ↑)</td>
</tr>
<tr>
<td>Cushing's syndrome (ACTH)</td>
</tr>
<tr>
<td>Stauffer's syndrome (hepatopathy)</td>
</tr>
<tr>
<td>Galactorrhea (prolactin)</td>
</tr>
<tr>
<td>Amyloidosis</td>
</tr>
<tr>
<td>Congestive heart failure (AV fistula)</td>
</tr>
<tr>
<td>Thrombophlebitis</td>
</tr>
<tr>
<td>Inferior vena cava obstruction</td>
</tr>
<tr>
<td>Left varicocele</td>
</tr>
<tr>
<td>Budd-Chiari syndrome</td>
</tr>
<tr>
<td>von Hippel-Lindau disease</td>
</tr>
</tbody>
</table>

• **Nephroblastoma (Wilm's tumor)**

• Childhood < 4yrs

• Treatment: surgical removal

• Chemotherapy: actinomycin D, VCR, doxorubicin

• Radiotherapy
• Staging: to determine size of tumor, the presence of thrombus and the metastases before plan therapy. Staging system (table)

• **Treatment modalities**

  • Radical surgery  
  • Radiotherapy  
  • Chemotherapy  
  • IF  
  • IL2
<table>
<thead>
<tr>
<th>Conventional Stage</th>
<th>TNM Stage</th>
<th>5-Year Survival (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Tumor confined to renal parenchyma</td>
<td>T&lt;sub&gt;1&lt;/sub&gt; (small tumor with minimal calyceal distortion) T&lt;sub&gt;2&lt;/sub&gt; (large tumor with calyceal deformity)</td>
<td>60–70</td>
</tr>
<tr>
<td>II. Tumor extension to perirenal fat or ipsilateral adrenal, but confined within Gerota's fascia</td>
<td>T&lt;sub&gt;3&lt;/sub&gt;</td>
<td>50–65</td>
</tr>
<tr>
<td>IIIa. Tumor thrombus in renal vein or vena cava</td>
<td>T&lt;sub&gt;4&lt;/sub&gt; (renal vein involvement) T&lt;sub&gt;5&lt;/sub&gt; (renal vein and caval involvement below the diaphragm) T&lt;sub&gt;6&lt;/sub&gt; (caval involvement above the diaphragm)</td>
<td>N&lt;sub&gt;1&lt;/sub&gt; (nodes negative) M&lt;sub&gt;0&lt;/sub&gt; (lack of distant metastases)</td>
</tr>
<tr>
<td>IIIb. Regional nodal involvement</td>
<td>T&lt;sub&gt;1&lt;/sub&gt;–T&lt;sub&gt;3&lt;/sub&gt;</td>
<td>N&lt;sub&gt;1&lt;/sub&gt; (single homolateral regional node involved) N&lt;sub&gt;2&lt;/sub&gt; (multiple regional, contralateral, or bilateral nodes involved) N&lt;sub&gt;3&lt;/sub&gt; (fixed regional nodes involved) N&lt;sub&gt;4&lt;/sub&gt; (juxtaregional nodes involved)</td>
</tr>
<tr>
<td>IIIc. Combination of IIIa and IIIb</td>
<td>T&lt;sub&gt;3&lt;/sub&gt;–T&lt;sub&gt;4&lt;/sub&gt;</td>
<td>N&lt;sub&gt;1&lt;/sub&gt;–N&lt;sub&gt;3&lt;/sub&gt;</td>
</tr>
<tr>
<td>IVAa. Spread to contiguous organs except ipsilateral adrenal</td>
<td>T&lt;sub&gt;4&lt;/sub&gt;</td>
<td>N&lt;sub&gt;0&lt;/sub&gt;–N&lt;sub&gt;4&lt;/sub&gt;</td>
</tr>
<tr>
<td>IVB. Distant metastases</td>
<td>T&lt;sub&gt;1&lt;/sub&gt;–T&lt;sub&gt;4&lt;/sub&gt;</td>
<td>N&lt;sub&gt;0&lt;/sub&gt;–N&lt;sub&gt;4&lt;/sub&gt; M&lt;sub&gt;1&lt;/sub&gt;</td>
</tr>
</tbody>
</table>

FIGURE 91-1. Algorithm for the workup of a renal mass.
• **UROTHELIAL TUMORS**
  • Tumors of the urothelial lining of the urinary tract: transitional cell cancers (TCC)
  • Often multifocal and bilateral
  • TCC of the renal pelvis and calicies
  • Analgesic: aspirin/phenacetin abuse
  • Filling defect on IVP
  • Cystoscopy, retrograde pyelography in combination with ureteral wash and brush cytology would localize the lesion
  • CT: determine local extent of tumor
  • Treatment: radical nephroureterectomy, with removal of the entire ureter, regular postoperative cystourethroscopy quarterly in the first year, and twice in the second.
  • (reason: 50% recurrence of the tumor elsewhere in the urinary tract)
  • 5yr DFS 90%
  • postop chemotherapy: doxorubicin, MM-C, alpha IF, VBL, MTX, Cisplatin
• **TCC of the ureter**
• Symptomes: hematuria and renal colic
• IVP: ureteral filling defect in the case of total obstruction: lack of contrast excretion
• Cystoscopy with retrograde ureterography or ureteroscopy is required to demonstrate the lesion (brush cytology)
• CT for staging
• Therapy: segmental resection in the case of solitary kidney and low grade lesions, otherwise nephroureterectomy is needed to avoid recurrence of the disease
• (post.op. like for TCC located elsewhere)
TCC of the bladder

- Incidence: 40000 new cases and 10000 deaths / year in USA
- Male:female = 3:1 > 40 yrs
- cigarette smokers, workers in the dye, chemical and certain rubber industries
- Clinical manifestations
  - Haematuria is total (throughout the stream as tested by a three glass test)
  - The degree of haematuria is not parallel the size of the lesion
  - Bladder irritability (frequency and dysuria) in the absence of infection
- Diagnosis:
  - on IVP unilateral or bilateral ureteral obstruction with hydronephrosis, filling defect or lack of distensibility of the bladder
  - cystoscopy and transurethral bladder biopsy
  - For determining the extent of the disease: CT (pelvic and chest) and bone scanning
- Staging and therapy:
  - Superficial cc: cc in situ, mucosal involvement (stage 0) or submucosal involvement
  - (stage A) Th: endoscopic resection, repeated cystoscopic evaluation thereafter in every 3 to 6 months. In the case of superficial recurrence intravesical therapy (thiotepa, doxorubicin, MM-C, BCG, aIF) recommended in addition to cystoscopic resection
  - With progressive/invasive disease to the bladder muscularis (stage B) perivesical fat (stage C) or metastatic disease to lymph nodes (stage D1), bone or other viscera (stage D2) radical cystectomy, pre or postoperative radiation therapy. 5 yr survival appr. 45%
  - Surgical techniques, utilizing portions of the small bowel as bladder reservoirs, have enhanced the quality of life in individuals undergoing radical cystectomy.
  - In metastatic disease: systemic chemotherapy: Vbl, cisplatin, MTX, doxorubicin. They die within 2 yrs
• **Secondary malignant tumors**
• Tumors of the lung, stomach, breast commonly metastasize to the kidney
• Adjacent tumors of the adrenal, colon, pancreas may spread continuously into the kidney
• Lymphoma, leukemia and myeloma may infiltrate the kidney
History

Stemmedowny (multinodular goiter)
Asthma bronchiale

In 1995, thrombocytopenia (incidental) n 66,000
Bone marrow: metatastes
originated from: left kidney

WBCs/ RBCs

1st 2-3 RBCs
2-8 WBCs/ 1-2 WBCs

ESR: 15 mm/1h
No fever, body weight stable
level creatinin 55 mmol/l

U/H:

\[ \begin{array}{c}
8 \times 6 \text{ cm} \\
6 \text{ cm} \phi \text{ inhomogenet} \\
\text{necrotic T2 homo}
\end{array} \]

CT:

Th: Nephrectomy

2003. 11. Still alive, well
(84 yr) Thrombocyte count. n 100,000

Diagnoses: CML, ITP

The patient's urine sediment: 100-120 RBC

She was followed as an outpatient in an urologic department for years (2001-03) documented.

UT: negative. CT: negative.
Cystoscopy: negative.
Renal function: normal.

2003: Ur.: 5.6: pyelechuria, stone, 0.1.
IV. pyelo: negative.
Retrospective pyelography: Mph. renal tubule on the borders of pyeloureteral transmucosal.
Th.: Nephrectomy + chemotherapy.
Nephrectomy.
Histology: cc. transitionalcellular pelvic urothelium.
ct ureters.

Diagram of kidneys and ureters.