Urinary Tract Infections
Interstitial Cystitis
Pyelonephritis
Nephrolithiasis

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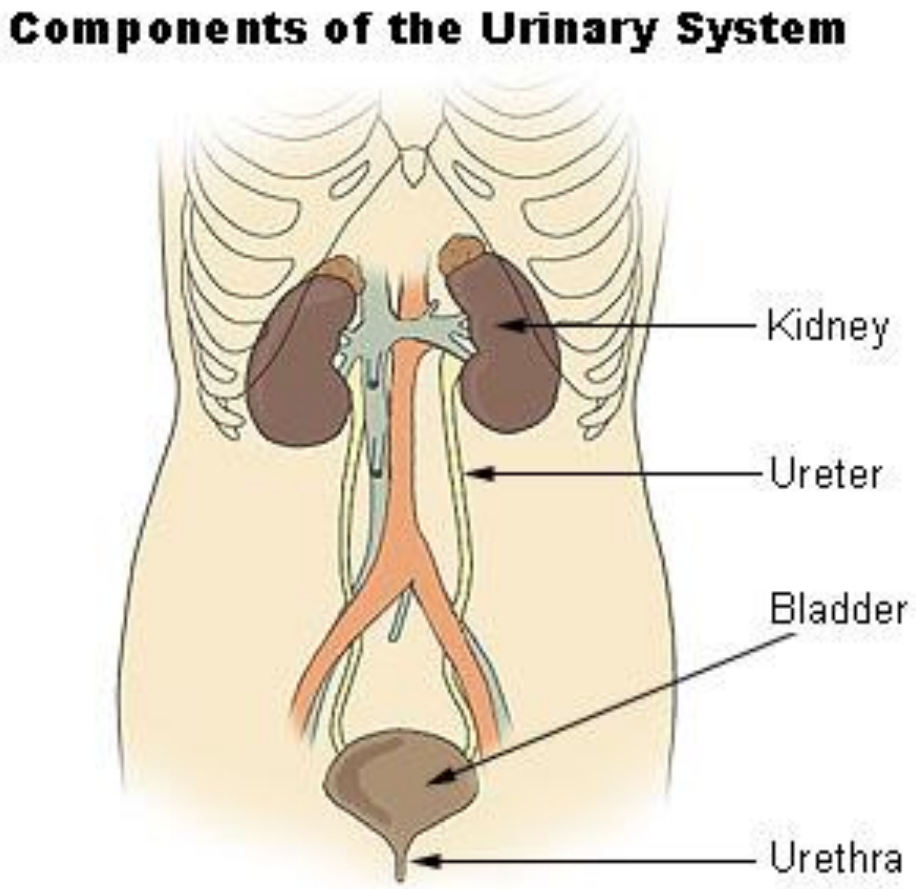
Anatomy Review



Acute Cystitis

- Infection of the bladder
  - Aka: urinary tract infection (UTI) , bladder infection
- E. Coli most common pathogen
  - Enterococci also normal pathogen
- Women more common than men
  - 6 million visits per year
  - 1 in 5 women will be diagnosed with acute cystitis
  - Female pelvic anatomy allows for easy introduction of vaginal or rectal bacteria to the urethral meatus

Acute Cystitis– Definitions

- First infections: uncomplicated, typically young women
- Unresolved: not sterilized during therapy (may be secondary to bacterial resistance, non-adherence, mixed infection, renal insufficiency)
- Persistent: tract is sterilized but bacterial source persists (kidney stones, chronic pyelonephritis, prostatitis, fistulas)
- Reinfection: new infection with new pathogen after successful treatment

Acute Cystitis– Complicated Infections

- Male: Rare, more common if uncircumcised
  - Implies underlying pathology: STI, infected stones, prostatitis, S/P catheterization, urinary retention/BPH
- Pregnancy: increased risk for progression, fetal injury
- Immunocompromised: risk for progression
- Underlying pathology: may need to treat longer and/or correct problem
- Nosocomial: more complex pathogens, drug resistance

Acute Cystitis– H&P

- History
  - Dysuria, frequency, urgency
  - Suprapubic discomfort
  - Hematuria (maybe)
- PE
  - Often unremarkable
  - May have suprapubic tenderness on abdominal exam

Acute Cystitis—Lab findings

- Urinalysis
  - Dipstick used in office
    - + leukocytes
    - + nitrites (bacteria byproduct)
    - + blood
  - Clean catch method
- Urine culture & sensitivity
  - ID's organism and appropriate treatment
- Imaging—Not usually necessary for uncomplicated infections; may be needed if advanced infection or complicating factors

Acute Cystitis– Treatment

- Uncomplicated infections
  - Short duration therapy usually adequate
    - 3-7 days
  - **Fluoroquinolones** and **nitrofurantoin** are drugs of choice
    - Ciprofloxacin 250-500 mg bid x 3-5 days
    - Nitrofurantoin (Macrobid) 100 mg bid x 7 days
  - **Trimethoprim-sulfamethoxazole (Bactrim)**
    - 160/800 mg 2 tablets x 1 dose
      - Seeing significant resistance to single dose option
      - Can be effective if used for 5-7 days
  - **Phenazopyridine (Pyridium)**
    - Bladder analgesic
    - 200 mg tid x 2 days
    - Will turn urine orange
      - Can also stain contact lenses

Acute Cystitis– Treatment

- Complicated infections
  - W/U to try to ID cause of persisting infection
    - Culture and sensitivity to r/o resistance
    - CT scan or u/s to evaluate kidneys
    - Cystoscopy for persistent hematuria
  - May need longer course of treatment
- Recurrent infections
  - In female patients who experience more than 3 episodes per year, consider using post-coital antibiotic use to prevent infection
    - Can use ciprofloxacin 250 mg or TMP-SMZ 160/800 mg after intercourse

Acute Cystitis– Prevention

- In women with frequent UTIs, consider prevention prophylactic probiotic therapy with Lactobacillus
  - NAPRUTI study
    - 252 women
    - Half treated with BID TMP-SMZ, half given BID lactobacillus
    - Abx group reduced infection rate from 7 per year to 2.9 and lactobacillus group reduced infection rate from 6.8 per year to 3.3
    - Lactobacillus group was not determined to be “non-inferior” but antibiotic resistance was completely absent from that group

Acute Cystitis—Follow Up

- Test of Cure
  - Repeat UA C&S after completion of antibiotics it ensure that infection has been completely cleared

Acute Cystitis—Men

- Anatomical factors
  - Men do not have the tendency toward vaginal or rectal bacterial seeding to the urethra that is possible in females
  - Longer urethra means that ascending bacteria are often flushed by urination before reaching the bladder
- Urinary tract infections in men are always considered “complicated”
- Irritative voiding and bacteriuria in males should prompt w/u for underlying problem

Acute Cystitis– Men

- Acute prostatitis
- Acute epididymitis
- Urethritis (especially Gonorrhea or Chlamydia)
- Pyelonephritis
- Catherization

Interstitial Cystitis– Definition

- Pain with a full bladder that is relieved by emptying; often associated with urgency and frequency
- Society for Urodynamics and Female Urology definition
  - An unpleasant sensation (pain, pressure, discomfort) perceived to be related to the urinary bladder, associated with lower urinary tract symptoms of more than 6 weeks' duration, in the absence of infection or other identifiable causes.
- Diagnosis of exclusion—R/O infection, radiation cystitis, chemical cystitis, STIs, gynecological problems (vaginitis, PID, endometriosis, etc)

Interstitial Cystitis

- Women > men
  - Average age of onset – 40
- 50% experience remission without treatment
  - Average duration of symptoms – 8 months
- Associated with bladder problems in childhood, severe allergies, irritable bowel disease, irritable bowel syndrome
- Etiology—not clear
  - Increased epithelial permeability, sensory nervous system abnormalities, autoimmunity

Interstitial Cystitis– H&P

- History
  - Pain with bladder filling that is relieved with urination
  - Urgency, Frequency, Nocturia
  - Inquire about pelvic radiation or cyclophosphamide exposure to r/o radiation and chemical cystitis
- Physical exam
  - Often normal
  - Examination should include evaluation for genital herpes and vaginitis

Interstitial Cystitis—Work-Up

- UA C&S to r/o infection
- Urine cytology to evaluate for bladder carcinoma
- CT or MRI of abdomen and pelvis to r/o pelvic mass or proximal inflammatory process (ie: diverticulitis)
- Urodynamic testing to assess bladder sensation and compliance
- Cystoscopy to r/o carcinoma

Interstitial Cystitis– Treatment

- Patient education
  - http://www.ichelp.org
- Lifestyle changes
  - Dietary changes to manage triggers
    - http://www.ichelp.org/Page.aspx?pid=389
  - Fluid management
  - Timed voiding
  - Stress management
- Pelvic floor therapy

Interstitial Cystitis—Treatment

- Pharmacologic Treatment
  - Elmiron (pentosan polysulfate sodium)
    - Only FDA approved IC treatment
    - Thought to provide protective lining to the bladder preventing potentially irritating solutes in the urine from reaching the bladder wall
    - 100 mg tid
    - May take 4-6 months for effect to be seen
    - Side affects: Rare and mild
      - Nausea, abdominal pain, alopecia (reversible with discontinuation), HA, rash and dizziness

Interstitial Cystitis—Treatment

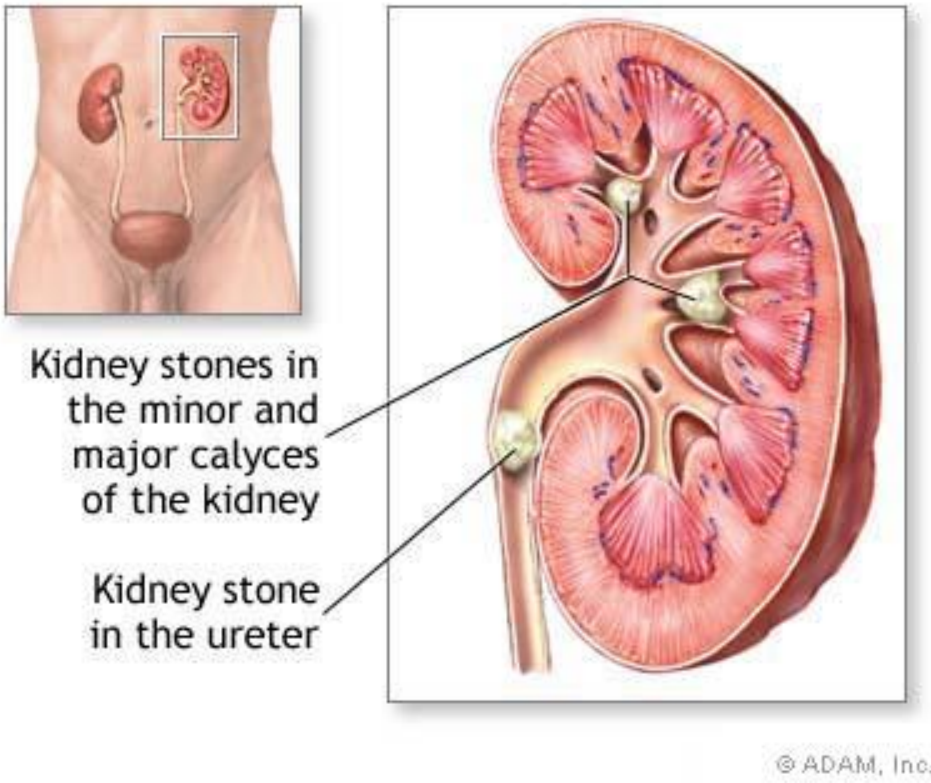
- Pharmacologic Treatment—off label medications
  - Hydroxyzine
    - Histamine 1 blocker
    - Drying effect makes if most effective for urgency and frequency symptoms
  - Amitriptyline
    - Tricyclic antidepressant
    - Exhibits analgesic effect in various pain syndromes
    - Anticholinergic effect can aid in decreasing urgency and frequency
  - Gabapentin (Neurontin)
    - Seizure medication with some analgesic properties
  - SSRIs
    - Various antidepressants in this category have been used
    - Good option in patients with comorbid depression/anxiety

Interstitial Cystitis—Treatment

- Non-pharmacological treatment options
  - Hydrodistention
    - Stretching of the bladder to increase capacity
    - Often done during cystoscopy as part if diagnostic w/u
    - Can be repeated if efficacious
  - Intravesicular therapy
    - Medication instilled directly to the bladder via urinary catheter
  - TENS therapy
    - Electrical stimulation of nerves innervating the bladder

Nephrolithiasis (kidney stones)

- Lifetime prevalence in U.S. is 10%
- Men > women
  - 3:1 ratio
  - Chance of white male experiencing a kidney stone by age 70 is 1 in 8
- First episode usually age 30-40s
- $2.1 billion per year



Nephrolithiasis

- Geographic factors
  - More common areas of high humidity and high temperature
  - More common during summer months
- Dietary factors
  - High salt/ low water intake
  - High protein intake
- Genetics
  - Cystinuria
  - Distal renal tubular acidosis

Nephrolithiasis– Types of Stones

- Calcium oxalate
- Calcium phosphate

} Most common (85%)

- Struvite—women with recurrent UTIs

- Uric acid
- Cystine—may be genetic; difficult to treat

Nephrolithiasis- History

- Acute onset of unilateral, colicky flank pain
  - May radiate to labia/teste
  - May awaken pt from sleep
- May have nausea and vomiting
- Possible urinary changes (urgency, frequency)
- **Stone size does not correlate to severity of symptoms**

Nephrolithiasis—Physical Exam

- General: Pt may appear uncomfortable depending on pain severity. Pts many times are constantly moving trying to find comfortable position
- Abdominal: Dramatic costovertebral angle tenderness; abdominal tenderness, peritoneal signs absent—key in distinguishing from acute abdomen

Nephrolithiasis—Lab Findings

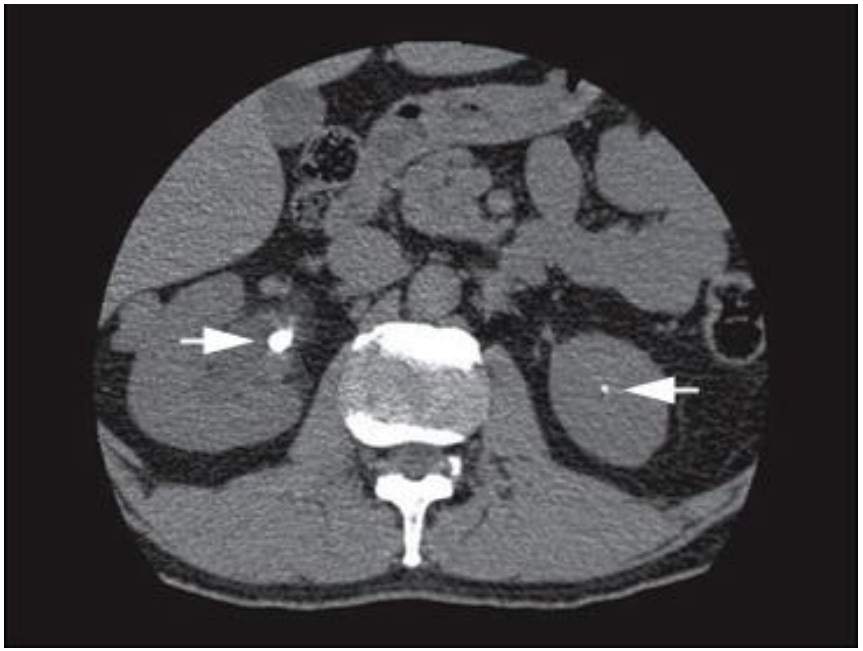
- Urinalysis
  - Microscopic or gross hematuria
  - pH can be helpful in determining what type of stone
    - Normal pH is 5.85
    - Less than 5.5 suggests uric acid or cystine which will not show up on regular x-ray
    - Over 7.2 suggests struvite stone which should show up on x-ray

Nephrolithiasis—Imaging

- **Spiral CT of abdomen and pelvis**
  - First line, gold standard
  - Non-contrast
  - Will show radiopaque and radiolucent stones
- KUB w/ renal u/s
  - Kidney, ureter bladder
  - Plain film x-ray plus ultrasound
  - Will show most stones

Nephrolithiasis

KUB



Spiral CT Scan

Nephrolithiasis– Treatment

- Medication
  - Pain medication- narcotic/acetaminophen combination q 4-6 hours
  - Anti-inflammatories- ie: ibuprofen 600-800 mg q 8 hour
  - Medical expulsion therapy—relaxes ureter to ease stone passage
    - Nifedipine XR 30 QD
    - Tamsulosin 0.4 mg QD
  - Anti-emetics if needed

Nephrolithiasis– Treatment

- Most stones less than 5-6 mm will spontaneously resolve with medical management
  - Double fluid intake
  - Sleep stone-side down
  - Observation x 6 weeks
- Stone capture
  - Urine should be strained to catch stone for evaluation if possible
- F/U lab work up
  - Check serum calcium, phosphate, uric acid, and electrolytes

Nephrolithiasis—Treatment

- Surgical intervention indications
  - Stones larger than 6mm
  - Those that do not pass and continue to cause pain after 6 weeks
  - Obvious obstruction
  - Severe pain unresponsive to analgesics
  - Nausea and vomiting requiring IV fluids

Nephrolithiasis—Surgical Options

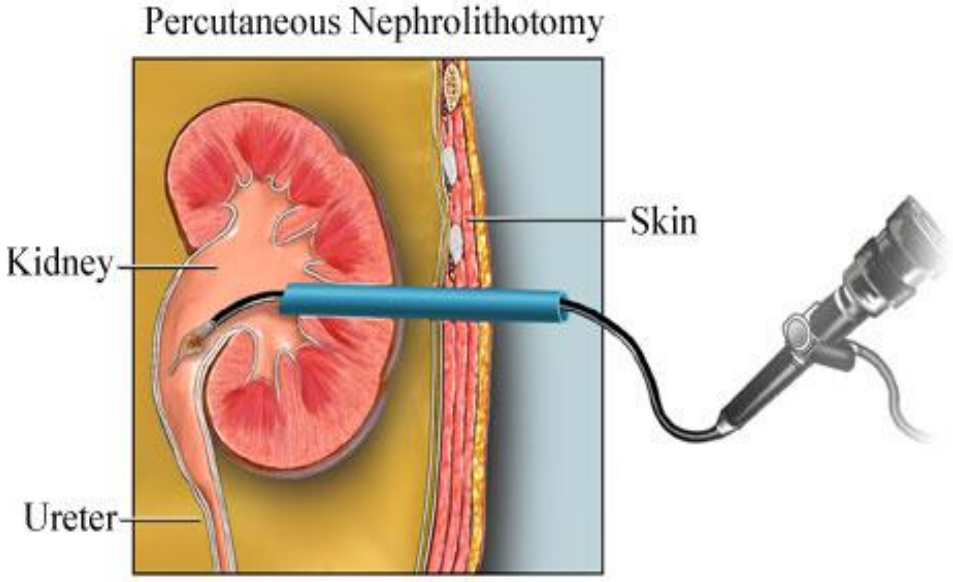
- Extracorporeal shockwave lithotripsy
  - Most common; least invasive
  - Stone is broken for subsequent passage

Nephrolithiasis—Surgical Options

- Ureterscopy
  - Small endoscope inserted from urethra through bladder to ureter for direct visualization of the stone
  - Basket extraction or direct fragmentation can be performed via the endoscope

Nephrolithiasis—Surgical Options

- Percutaneous nephrolithotomy
  - Wire and tubing inserted into the kidney directly through the flank
  - Useful for removing large stone from the kidney and proximal ureter



Acute Pyelonephritis

- Infection of kidney parenchyma and renal pelvis
- Most commonly gram-negative bacteria
  - *E. Coli, Proteus, Klebsiella, Enterobacter, Pseudomonas*
- Usually ascend from lower urinary tract

Acute Pyelonephritis—History

- Symptoms typically develop over a few hours or over the day
- May or may not have symptoms of urinary tract infection: urinary urgency, frequency, dysuria
  - Possible gross hematuria
- Unilateral (less likely, bilateral) flank pain
- Fever
- Anorexia
- Nausea
- Vomiting

Acute Pyelonephritis– Physical Exam

- Vital Signs
  - Fever, possible tachycardia, normotensive
- General
  - Ill appearing, uncomfortable
- Abdomen
  - Unilateral CVA tenderness over involved kidney
  - BS normoactive
  - Mild to moderate suprapubic tenderness

Acute Pyelonephritis—Lab W/U

- Urinalysis
  - Pyuria, bacteriuria, hematuria
- Urine culture
  - Grows out causative agent
- CBC
  - Leukocytosis
- Blood culture
  - May be positive depending on agent and severity

Acute Pyelonephritis– Treatment

- Uncomplicated infections; outpatient treatment
  - Ciprofloxacin 750 mg bid for 14-21 days
  - TMP-SMZ 160-800 bid for 14-21 days
  - Nitrofurantoin 100 mg bid for 14-21 days
- Severe or complicated infections; inpatient tx
  - Ampicillin 1 g q 6 hours + gentamicin 1 mg/kg q 8 hours IV until C&S back then tailor tx according to sensitivity
  - Treat with IV abx until afebrile for 24 hours then change to oral abx to complete 21 day course

Acute Pyelonephritis

- Follow up urine cultures are necessary several weeks following treatment completion
- Prognosis is good if diagnosis is made and treatment initiated promptly however late diagnosis or inadequate treatment can lead to sepsis, renal scarring, chronic pyelonephritis, or abscess formation