

## UROLOGY

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### HISTORY

#### FEVER and Systemic Manifestations

FEMALE - fever uncommon with uncomplicated cystitis; high fevers suggest pyelonephritis

MALE: fever uncommon - implies more serious etiology

- **Pyelonephritis**
- Acute **prostatitis**
- Acute **epididymitis**
- Malignancy: kidney, bladder, testes
- CRF: weight loss and malaise

PAIN: usually associated with **distention**

- Hollow viscus:
  - Uretal **obstruction**
  - Urinary **retention**
- Capsule of an organ
  - Acute **prostatitis**
  - Acute **pyelonephritis**
- Pain w malignancy is late manifestation - advanced

#### Renal Pain

- Ipsilateral **costovertebral angle** (CVA)
- May radiate to umbilicus or referred to ipsilateral testicle or labium
- Constant in infection; Intermittent with obstruction
- Nausea/vomiting (N/V ) may result from reflex stimulation of celiac ganglion
- Position of patient is a clue
  - Intra peritoneal pathology: patient lies motionless to avoid pain
  - Renal disease: move about to find comfortable position

#### Uretal Pain:

- Usually acute and secondary to obstruction
- **Distention ureter** causes constant dull ache
- **Spasms** of ureter cause **colic**
- Site of obstruction may effect type of pain
  - Upper obstruction -> pain to scrotum/labia
  - Mid obstruction -> LQ and confused w AP (right) or diverticulitis (left)
- Lower -> uretal orifice inflammation -> s/s vesical irritability

### Vesical Pain

- Acute urinary retention -> severe **supra pubic area** (SPA) pain
- Chronic -> painless despite large vesical distention
- **Acute cystitis**: referred to distal urethra and associated with micturition

### Prostatic Pain:

- Associated with inflammation and located in perineum - **prostatitis**
- May radiate to lumbosacral spine, inguinal canals or lower extremities
- May result in irritative voiding complaints since location is near bladder neck

### Penile Pain:

- Flaccid penis: usually caused by inflammation
  - **STDs**
  - **Paraphimosis**: retracted foreskin is trapped behind glans -> congestion swelling
- Erect penis
  - **Peyronie's disease**:  
Fibrous plaque of tunica albuginea -> painful curvature of erect penis
  - **Priapism**: prolonged painful erection necessitating immediate intervention

### Testicular Pain

- Acute conditions:
  - Pain in scrotum with radiation to ipsilateral groin
  - **Trauma, torsion, epididymo-orchitis**
- Chronic pain:
  - **Epididymitis**: if acute -> pain may persist for months following successful tx
  - **Varicocele or hydrocele**: dull heaviness w/o radiation

## HEMATURIA

- Sign of **malignancy** until proven otherwise
- Timing of blood is important clue to site
  - Initial hematuria:
    - Blood which clears during stream of urine
    - Implies anterior (penile) urethral source
  - Terminal hematuria: implies bladder neck or prostatic urethral source
  - Total hematuria: bladder or upper tract source
- Associated symptoms important clue:
  - Hematuria with **renal colic**: suggest stone
  - Hematuria with severe dysuria
  - **Hemorrhagic cystitis** if young women
  - **Neoplasm** if older woman or in any male
- Less frequent causes: **staghorn calculi, glomerulonephropathies, polycystic kidneys**

## IRRITATIVE VOIDING SYMPTOMS:

**Urgency:** strong sudden desire to void

- Inflammatory conditions: cystitis
- Hyperreflexic neuropathic conditions - upper motor neuron lesions

**Dysuria** painful urination

- Associated with inflammation
- Tip of penis in men, urethra in women

**Frequency:** increased number of voids during daytime

**Nocturia:** increased nocturnal frequency (normal freq: 5-6 x per day and 0-1 per night)

## FREQUENCY:

- Increased urinary output

- DM, DI
- Excess fluid ingestion, diuretics (including caffeine and ETOH)

- Decreased functional bladder capacity

- **Bladder outlet obstruction:** increased residue urine volume
- **Neurogenic bladder:** spastic, reduced compliance
- **Extrinsic compression:** fibroids, radiation fibrosis, pelvic neoplasms
- Psychologic factors: anxiety

## OBSTRUCTIVE VOIDING SYMPTOMS

- **Hesitancy:** delay in initiation of micturition

Results from increased time required for bladder to attain pressure sufficient to exceed obstructed urethra

- **Decreased force of stream:**

- Results from high resistance to emptying bladder
- Associated with decrease in caliber of stream

- **Intermittency and postvoid dribbling:**

- Interruption of urinary stream
- Involuntary release of terminal few drops of urine

- Most common causes: **BPH, urethral stricture, neurogenic bladder**

- Less common causes: : CA (prostate or urethral), foreign body

**INCONTINENCE:** involuntary loss of urine

- **Total incontinence:** lose urine at all times and in all positions
- **Stress incontinence:**
  - Urine loss associated with increased intra-abdominal pressure
  - Coughing, sneezing, lifting, exercising
- **Urge incontinence:** uncontrolled loss of urine preceded by strong urge to void
- **Overflow incontinence:** results from chronic urinary retention

### MISCELLANEOUS URINARY SYMPTOMS

Hematospermia: blood in the ejaculate

- Usually from inflammation of prostate or seminal vesicles.
- Blood in initial portion of ejaculate suggests prostate
- Blood in terminal portion of ejaculate suggests seminal vesicle
- Low risk for malignancy with an isolated event given a normal U/A and DRE
- Workup:
  - U/A, DRE with prostate massage and microscopic evaluation of fluid
  - Cystoscopy, transrectal U/S, prostate biopsy if U/A DRE abnormal

Pneumaturia: gas in urine

- Almost always secondary to fistula bladder - GI tract
- Common causes: diverticulitis, CA bladder-sigmoid colon, regional enteritis

Urethral discharge: most common s/s STD

- D/C with dysuria-itching suggests STD
- Bloody d/c suggests urethral CA

Cloudy Urine:

- Urinary tract infection (UTI)
- Alkaline pH common in absence of UTI - precipitation of phosphate crystal
- Chyluria: lymph in urine (rare)
  - Fistula UT - lymphatic systems
  - Filariasis, TB, retroperitoneal tumors

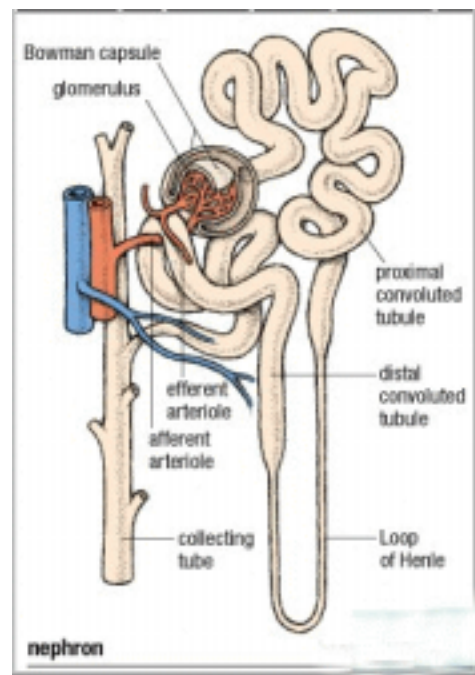
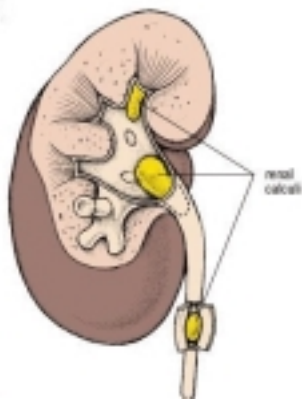
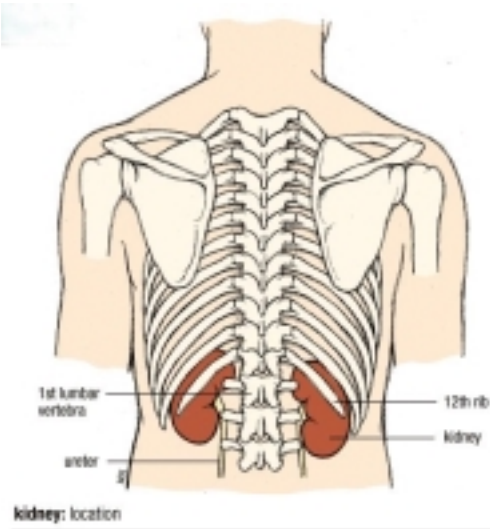
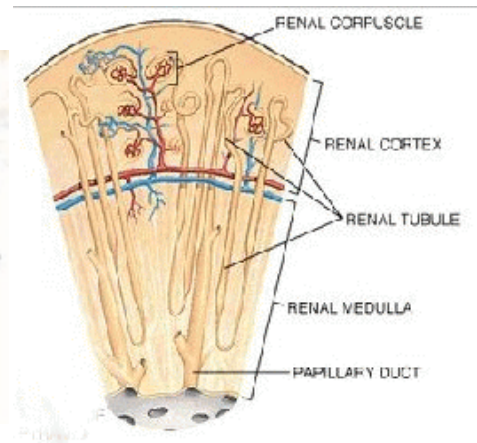
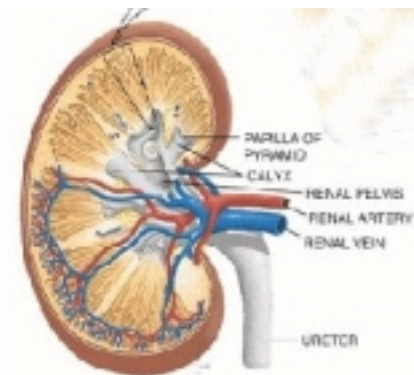
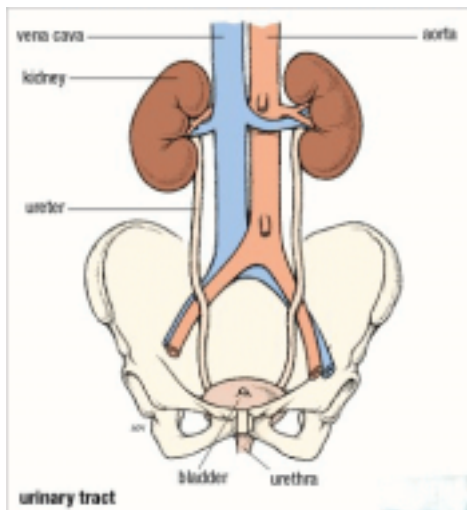
### PHYSICAL EXAM

GENERAL:

- Pallor: anemia
- Cachexia: malignancy
- Gynecomastia: testicular CA
- HTN: renovascular disease or adrenal CA

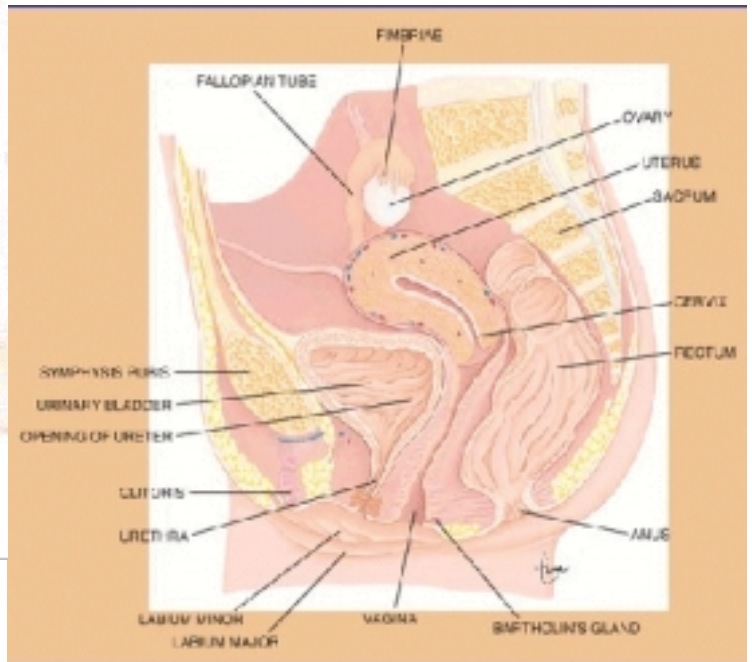
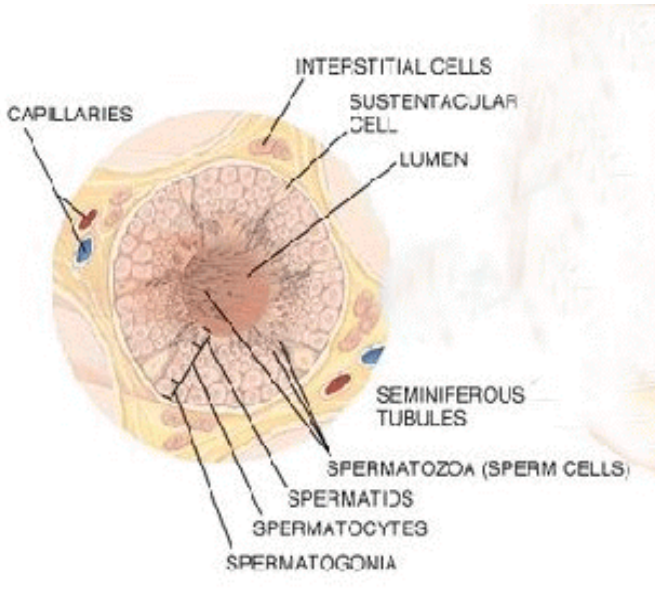
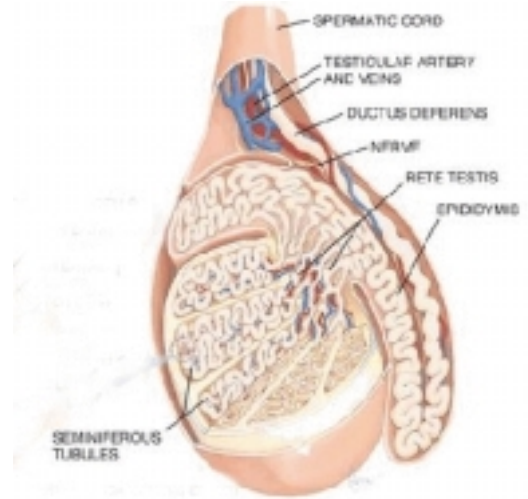
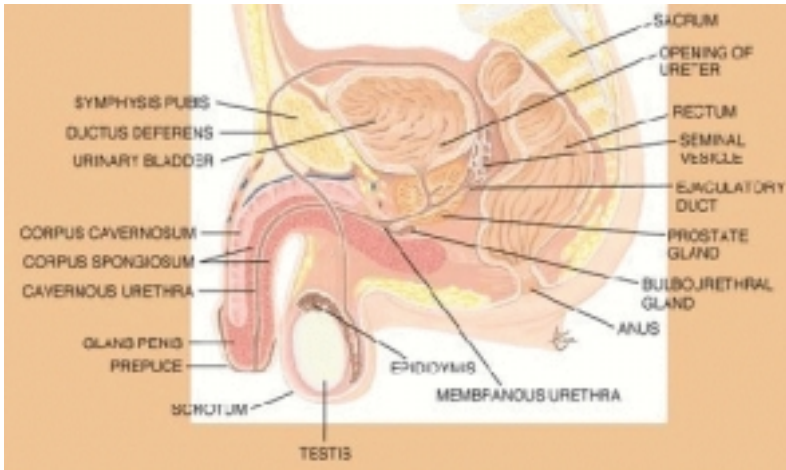
**KIDNEY:**

- Palpating kidneys
  - Right kidney lower than left due to liver
  - Right lower pole may be palpable in thin pts
  - Left kidney not usually palpable unless enlarged
  - Tap between hands to palpate on inspiration
- Systolic bruit of LUQ or RUQ in HTN
  - Etiology: **renal artery stenosis** or **arteriovenous malformation**
  - Pin-prick testing for hyperesthesia of overlying skin
    - Distinguishes nerve root irritation and radiculitis versus renal origin



**BLADDER:**

- Not palpable unless filled w 150 ml urine
- Percussion better than palpation: dullness (full bladder) vs tympany (air-filled bowel)
- Bimanual exam under anesthesia for bladder neoplasia
  - Best means to assess vesical mobility and resectability
  - Male: palpate between abdominal wall-rectum
  - Female: palpate between abdominal wall-vagina



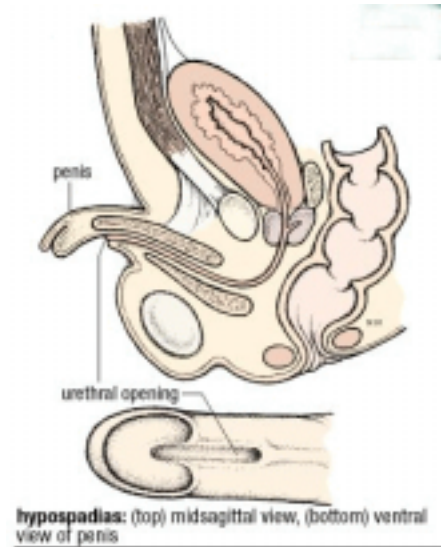


## PENIS

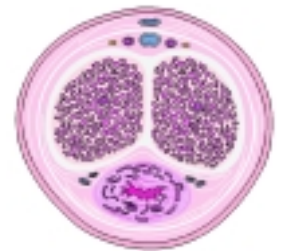
- Must retract foreskin to inspect meatus and glans
- Palpate shaft for abnormalities:
  - dorsal shaft: Peyronie's disease
  - ventral shaft: urethral tumors

## COMMON ABNORMALITIES

- **Phimosis**: foreskin cannot be retracted
- **Paraphimosis**:
  - Foreskin has been left behind the glans
  - Resulting in painful engorgement and edema of glans
  - Untreated may result in glandular ischemia
- **Hypospadias**:
  - Congenital anomaly where meatus is located on ventral aspect of penis
  - Can be as low as scrotum, perineum

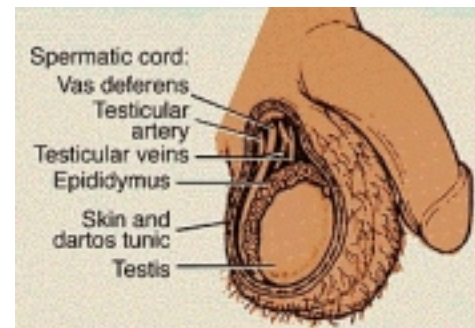
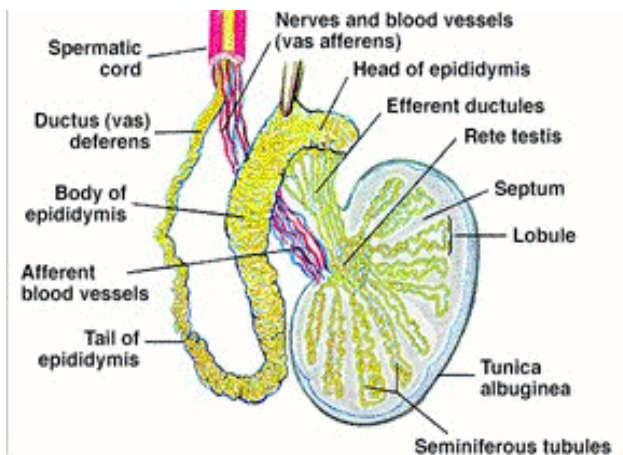


- **Epispadia**: congenital anomaly where meatus is located on dorsal aspect of penis
- **Peyronie's disease**: hardening of the corpus cavernosa -> pain, distortion/curvature of penis
- **Abnormal discharge**:
  - **Gonorrhea (GC)**: thick yellow urethral d/c
  - **Non-specific urethritis**: clear or white d/c



## SCROTUM AND ITS CONTENTS

- Scrotal mass is most common urology referral
- Determine if mass in testicle or related to epididymis or cord structures
- Normal testes 6 x 4 cm: rubbery
- **Epididymis** rests posterolateral to testis and varies in its degree of testicular attachment.
- Masses within testes are usually malignant
- Masses within epididymis and spermatic cord usually benign
- Transillumination is critical to any scrotal mass
  - Distinguishes solid (do not transilluminate) and cystic lesions (transilluminate)
  - Tumors of testes usually painless, firm, solid lesions within substance of testes



## COMMON TESTICULAR ABNORMALITIES

### **Acute Epididymitis:** acute infectious process of epididymis

- Painful enlargement of epididymis
- Fever and irritative voiding common
- Advanced states -> spread to testes making distinction difficult on exam
- Entire scrotal contents painful
- **Preh's sign:** relief to supine patient by elevating scrotum above pubic symphysis

### **Hydrocele:** collection of fluid between 2 layers of tunica vaginalis

- Dx via translumination
- 10% of testicular tumors have hydrocele

### **Variocoele:** engorgement of internal spermatic veins above testes

- Almost always on left side
  - Left spermatic vein empties into left renal vein
  - Right spermatic vein empties into inferior vena cava
- Diminish or decrease with supine position
- Sudden onset of right varicocele suggests malignancy  
Raises issue of retroperitoneal malignancy from obstruction to right spermatic vein



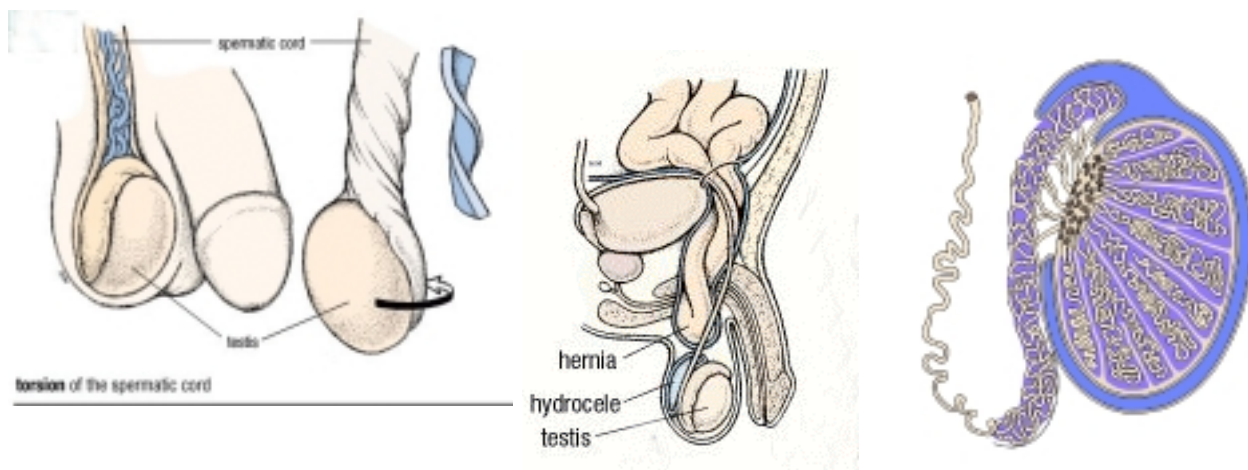
Spermatocele

### **Testicular Torsion:**

- Medical emergency
- 10-20 year old age group typical
- Acute onset of pain and swelling testicle
- Affected testicle may have "high lie" relative to the other
- Lack of voiding symptoms and age group may help to distinguish from epididymitis

### **Torsion of appendices of testes or epididymis**

- May be indistinguishable from torsion of testis
- Affects similar age group as torsion of testes
- Occasionally small palpable lump on superior pole of testis or epididymitis discernible
- **Blue dot sign:** Small lump on superior pole may appear blue when skin pulled tautly.

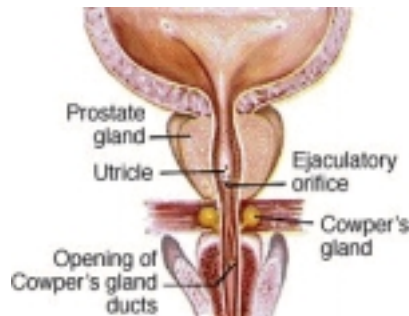
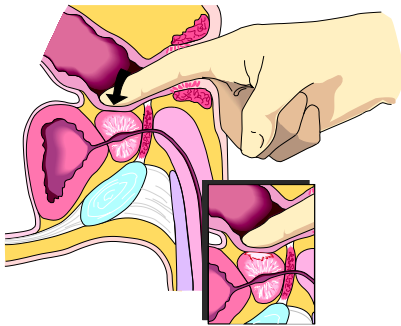




## RECTAL EXAMINATION IN THE MALE

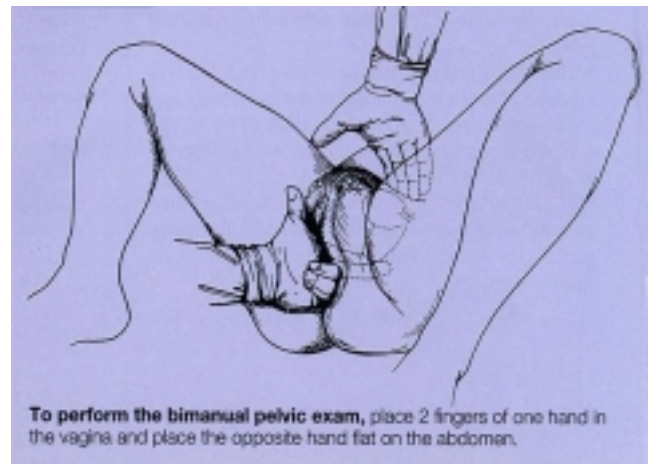
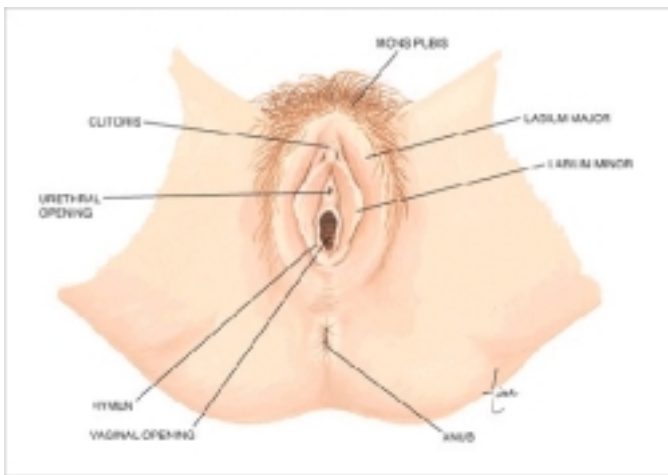
- Performed with patient bent over table or knee-chest position
- Inspect for anal pathology (fissures, warts, carcinoma, hemorrhoids)
- Insert finger to estimate tone and bulbocavernous reflex  
Anal and urinary sphincter common innervation
- Examine entire prostate: size and consistency - norm is 4x4 cm and 25 g
  - **Normal:** consistency of a contracted thenar eminence w thumb opposed to little finger \*
  - **BPH:** rubbery with enlargement
  - **Prostatic CA** (also with chronic inflammation): hard as with induration
- Examine rest of rectum to exclude primary rectal disease

\* Another analogy is to compare normal prostate to the tip of the nose (which also simulates the median sulcus, the boggy prostate to the lips and the cancerous prostate to the forehead)



## PELVIC EXAMINATION IN FEMALE

- Inspect introits for atrophic changes, ulcers, d/c, warts
- Urethral meatus: inspect for caruncles and palpated for tumors or diverticula
- Bimanual exam: bladder, uterus, adnexa



## URINALYSIS

### Specimen Collection

- Male: clean-catch in separate aliquots
  - First 5-10 ml: urethral
  - Midstream: bladder and upper urinary tracts
  - Next 2-3 ml urine after prostate massage reflects prostate status
    - Preferable to obtain prostrate secretions; urine useful if none obtained
  - If suspect STD - swab urethra before clean catch urine
- Female: midstream specimen after cleansing labia

### Dipstick of Urine

#### pH:

- No role in screen asymptomatic adults except for pregnant women
- Range 5.0-9.0
- Alkaline urine with UTI suggests urea-splitting organism
  - P mirabilis is most common
  - Klebsiella, pseudomonas, providencia species, staphylococcus
- Acid in pt with stones - calculi: uric acid or cystine stones
- Failure to acidify below 5.5 with metabolic acidosis: suggests renal tubular acidosis.

#### PROTEIN

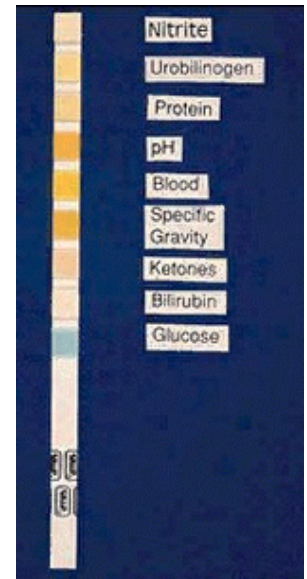
- Bromphenol blue detects concentration > 10 mg/dl
- Measures albumin
- Not sensitive for lt chain immunoglobulins (Bence Jones)
- False positive if numerous leukocytes and epithelial cells

#### UROBILINOGEN

- From catabolism of conjugated bilirubin in gut by bacteria
- Most urobilinogen is cleared by liver
- Increased with hemolytic processes or hepatocellular disease
- Decreased
  - Broad spectrum antibiotics (alter flora of gut)
  - Complete biliary obstruction

#### BILIRUBIN

- Normally no bilirubin is detected
- Unconjugated bilirubin not filtered, 1% conjugated is filtered
- Elevated conjugated bilirubin -> higher urinary levels
- False negative with ascorbic acid; false positive with phenazopyridine



## GLUCOSE

- Normally small amounts; below sensitivity of dipstick
- Any positive test mandates the need to R/O DM
- Test is spec for glucose; does not cross-react with any other sugars
- Ascorbic acid or elevated ketones -> false negative

## KETONES

- Not normally found in urine
- Elevated: fasting, post-exercise states, pregnancy
- May elevate in DM prior to serum elevation
- False positive with dehydration or certain drugs
  - Levodopa metabolites
  - Mesa and other sulfhydryl-containing compounds

## NITRITES

- Normally none in urine
- Gram negative bacteria can reduce nitrate -> nitrite thus indicator of bacteriuria
- Low sensitivity
  - Need at least 100,000 organisms/ml
  - Nitrates must be available
  - Urine must contact bacteria for > 4h
- First am best
- False negative
  - Non-nitrate-reducing organism
  - Frequency urination
  - Dilute or acidic urine pH > 6.0
  - Presence of urobilinogen
- False positive from contaminated specimens

## LEUKOCYTE ESTERASE:

- Enzyme produced by WBC; positive suggests bacteriuria
- False positive from specimen contamination
- False negative:
  - High specific gravity (SG), glycosuria, urobilinogen
  - Medications: rifampin, phenazopyridine, ascorbic acid

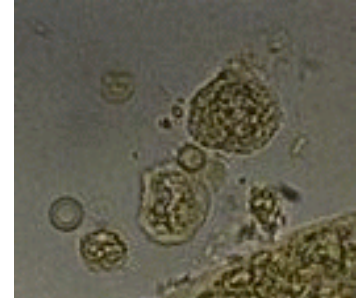
## BLOOD

- Measures intact RBCs, free Hgb, myoglobin
- False positive: menstrual blood
- False positive
  - Concentrated urine as 1000 RBC/ml is normal excretion
  - Vigorous exercise and vitamins or foods with high oxidant levels
- False negative: high ascorbic acid

## MICROSCOPIC URINALYSIS:

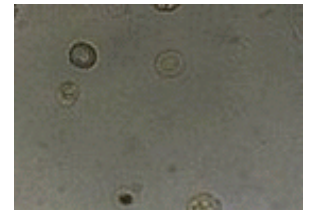
### LEUKOCYTES

- **Greater than 5 per high power** field (hpf) considered significant **pyuria**
- Indicative of injury to urinary tract which may or may not be due to infection
- Non-infectious causes of pyuria
  - Calculous disease, stricture disease, neoplasm, glomerulonephropathy, interstitial cystitis
- Factors affecting count
  - Method of collection
  - State of hydration; degree of injury to urinary tract



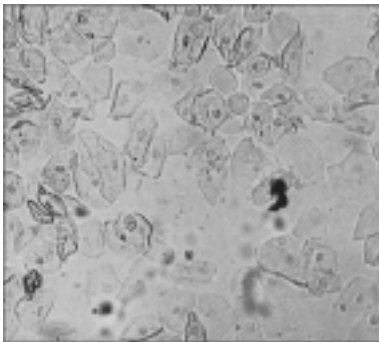
### ERYTHROCYTES

- **Greater than 5 per hpf** is significant and further investigation
- Appearance may provide clue to origin
  - Dysmorphic (irregularly shaped) favor glomerular origin
    - Distorted shape is a consequence of passage thru nephron
    - Uneven distribution hemoglobin (Hgb) and cytoplasm
  - Round
    - Suggests disease along lining of tract
    - Even distribution of Hgb



### EPITHELIAL CELLS

- **Squamous epithelial cells:** numerous suggests contamination - repeat collection
- **Transitional epithelial** occasionally noted - large numbers/clumps suggest neoplasm



### EPITHELIAL CELLS

Right: vaginal squamous  
Left: Transitional

### BACTERIA AND YEAST

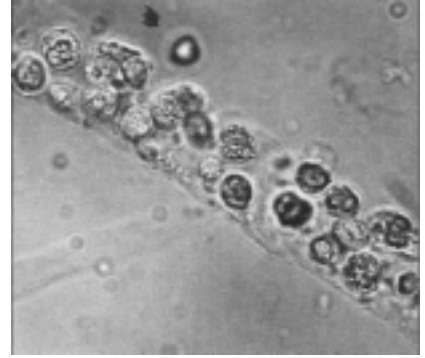
- Must be confirmed via culture; gram stain may be helpful
- Several organisms per hpf correlates w culture count of 100,000
- **Candida albicans** most common yeast



Candida

## CASTS

- Formed in distal tubules and collecting ducts
- Results from Tamm-Horsfall mucoprotein precipitation
- Tend to congregate near edges of coverslip
- Detected in fresh specimen under low power

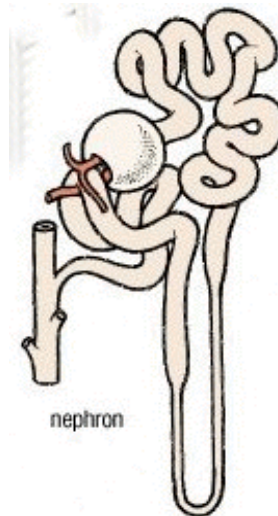


## TYPES OF URINARY CASTS

- **Hyaline casts:** devoid of cells
- **RBC casts:** glomerulonephritis or vasculitis
- **Leukocyte casts:** pyelonephritis
- **Epithelial casts:** small numbers are normal; numerous suggest intrinsic renal disease
- **Granular casts:** degeneration of other cellular casts; suggests intrinsic renal disease



**urinary casts:** (1) coarse granular casts, (2) epithelial cell casts, (3) red blood cell casts, (4) waxy casts, (5) hyaline casts, (6) casts with pyocytes

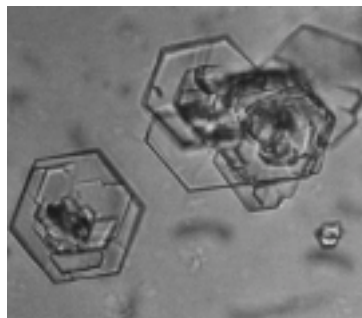
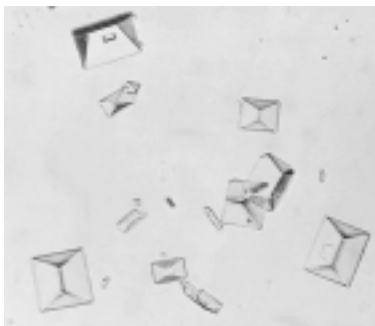


**CASTS**  
Upper: WBC cast  
Lower: Hyaline cast



## CRYSTALS

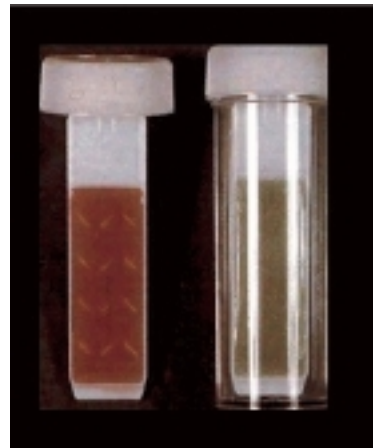
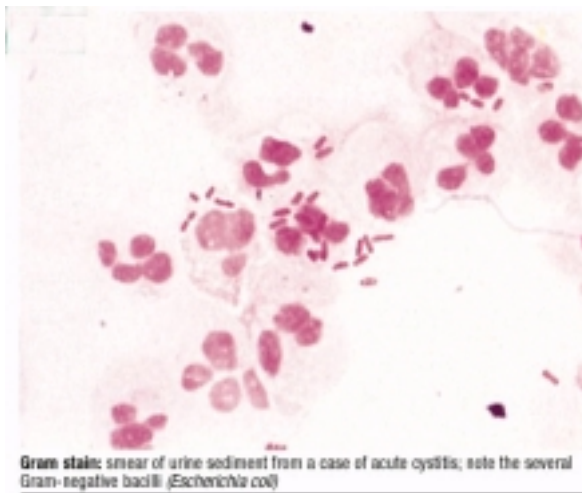
- Acid urine: **uric acid, oxalate, cystine crystals**
- Alkaline urine: **phosphate crystals**
- Seen in normal pts as well as stone-formers: uric acid, oxalate, phosphate
- Cystine crystals are pathologic: seen only with cystinuria



**CRYSTALS**  
Right: Cystine  
Left: Mg Ammonium Phosphate

## GENITOURINARY TRACT INFECTIONS - URINARY TRACT INFECTIONS (UTI)

- Among most common clinical entities
- Acute infection: usually single organism
- Chronic infection: 2 or more pathogens often seen
  
- **Coliform** usual etiologic agent for uncomplicated nosocomial UTI - **E coli** most common
- Nosocomial often due to more resistant organisms - may require IV therapy
- Renal infections may result in loss of renal function if untreated
- Colony count
  - Previously thought that 100,000 was required to treat for infection
  - Studies have shown that 50% symptomatic women have lower counts
- Absence of pyuria correlates poorly w UTI
- U/A alone is not adequate for diagnosis - need culture
- Length of treatment: soft tissue vs mucosal
  - Soft tissue - 3-4 weeks intensive therapy - **pyelonephritis, prostaticitis**
  - Mucosal: 1-3 days therapy - **cystitis**



### Classification and Pathogenesis:

- First Infections: tend to be uncomplicated in **young women**
- Unresolved bacteriuria: occurs when urinary tract is never adequately sterilized
  - Bacterial resistance to therapy
  - Non-compliance with therapy
  - Mixed infections with organisms having different susceptibilities
  - Renal insufficiency
  - Rapid emergence of resistance from initially sensitive organism

Persistent bacteriuria: occurs when tract is sterilized but persistent source of infection remains

- Stones, chronic pyelonephritis, prostatitis, vesicoenteric or vesicovaginal fistulas
- Obstructive uropathy, foreign bodies, urethral diverticula.

Reinfection: new infection with new pathogens occur following successful treatment



### Ascending infection:

- Ascending from urethra is most common route
- Women at particularly at risk (short urethra and vagina is colonized with bacteria)
- Use of diaphragms and spermicidal creams increases risk via altering vaginal flora
- **Pyelonephritis:** most commonly results from ascent of infection up ureter

Hematogenous spread to urinary tract is uncommon (**TB, cortical renal abscesses**).

Lymphogenous spread is rare

Direct extension from other organs may occur - esp **intra-abdominal abscesses in IBD or PID**

### Susceptibility Factors:

Bacterial Virulence Factors - **E coli** accounts for over 90% of first infections

- Greater than 150 strains - most by 5 serogroups (01, 04, 06, 018, 075)
- Implicated strains: have greater bacterial adherence
  - Bacterial fimbriae or pili
  - Strains with pili-fimbriae associated with **pyelonephritis**
  - Strains without w/o pili-fimbriae cause pyelonephritis only with reflux

### Susceptibility Factors

#### Bladder and upper tract factors

- Intrinsic defense mechanisms bladder
  - Efficient emptying with voiding (decreases colony count)
  - Protective glycosaminoglycan layer - interferes w bacterial adherence
  - Antimicrobial properties urine - high osmolarity and extremes pH
- Factors which predispose to UTI
  - vesicoureteral reflux - decrease renal blood flow
  - intrinsic renal disease

#### Female-specific factors

- Short urethra: facilitates ascent from introitus to bladder
- Recurrent UTI common:
  - More bacterial adhesin receptors in mucosa
  - More binding sites for pathogens
- More prone are mucosal "non-secretor" women
  - Mucosal secretions lack fucosyltransferase activity
  - Lack of enzyme causes lack of expression of A, B, H group antigen
  - These antigens normally mask some of bacterial adhesin receptors
  - Result is increased availability of sites for pathogen binding

#### Male-specific factors:

- Higher incidence in uncircumcised males
  - Mucosal surface propensity to colonize with pili-fimbriated bacteria
  - Similar to female introitus
- Prostate secretes zinc (antibacterial properties)
  - Zinc is potent antibacterial - prevents ascending infection
  - Lower zinc levels found in men prone to bacterial prostatitis

### Prevention of Reinfections:

- Prophylactic antibiotic treatment continues after episodic treating UTI
  - Women with greater than 3 UTI per year are considered candidates
  - First do thorough evaluation to r/o anatomic abnormality - stones, reflux, fistula, etc.
- Only selected antibiotics are effective
  - Eliminate pathogenic bacteria: fecal/introital reservoirs
  - Not susceptible to bacterial resistance
- Dosing regimens: dose HS or after each intercourse dosing recommended
  - **Bactrim (TMP/SMX)** single strength: 40mg/200mg
  - **Macrodantin (nitrofurantoin)** 100 mg
  - **Keflex (cephalexin)** 250 mg

### **ACUTE CYSTITIS**

#### Essentials of Diagnosis

- Irritative voiding
- Patient usually afebrile
- Positive urine culture

#### General Considerations

- Coliforms most common causative organism
  - **E coli**
  - Occasionally gram positive bacteria **enterococci (S saprophyticus, S fecalis)**
  - Viral cystitis (adenovirus) - occasional in children; rare in adults

#### Clinical Findings

##### Symptoms and Signs

- Irritative voiding common (frequency, urgency, dysuria)
- Women: gross hematuria; S/S frequently follow intercourse (“honeymoon cystitis”)
- P/E: often unremarkable

##### Laboratory Findings

- UA: pyuria, bacteriuria and varying hematuria
- Severity may not correlate w degree pyuria and bacteriuria
- Positive **urine culture** but count need not be > 100,000 (as was previous thinking)

#### Imaging

Warranted only if pyelonephritis, recurrent infections or anatomic abnormalities suspected.

Differential Diagnosis:

- Vulvovaginitis, PID (distinguished via pelvic exam and U/A)
- Prostatitis and urethritis men (distinguished via urethral d/c - prostatic tenderness)
- Cystitis in men is rare (suggests infected stones, prostatitis, chronic urinary retention)
- Non-infectious cystitis-like syndrome
  - Pelvic irradiation and chemotherapy (cyclophosphamide)
  - Bladder carcinoma
  - Interstitial cystitis, voiding dysfunction disorders, psychosomatic disorders

Treatment

- Uncomplicated in women: short term antimicrobial therapy
  - Single dose or 1-3 days therapy
  - TMP-SMX or cephalexin often effective:
- Must ID underlying pathology in men as uncomplicated cystitis is rare
- Symptomatic relief: hot sitz baths, **phenazopyridine (Pyridium)** 200 mg PO tid

Prognosis:

- Infections typically respond rapidly to therapy
- Treatment failure: drug resistance or anatomic abnormalities

<b>TREATMENT GUIDELINES</b>
No quinolones in pregnancy; use as first line agents may promote resistance
3 day regimen appropriate for uncomplicated UTI
Patients may remain symptomatic x 2d Pregnant w simple UTI - 7d
Complicated UTI 10-14 days; occasionally 4-6 weeks
Fluoroquinolones drug of choice for complicated UTIs
<b>Phenazopyridine (Pyridium)</b> - azo dye - serves as topical anesthetic 200 mg tid

Amoxicillin	250 mg q8h x 7d
Cefpodoxime (Vantin)	100 mg q 12h x 7d
Ciprofloxacin (Cipro)	250 mg q 12h x 3 d 250 mg q 12h x 7d
Lomefloxacin (Maxaquin)	400 mg qd x 3d 400 mg qd x 7d
Nitrofurantoin (Macrochantin) Nitrofurantoin (Macrobid)	100 mg qid x 7d 100 mg bid x 7d
Ofloxacin (Floxin)	200 mg q 12h x 3h 200 mg q 12h x 7d
Trimethoprim/ Sulfamethoxazole (Bactrim DS, Septra DS)	160/800 q 12h x 3d 160/800 q12h x 7d

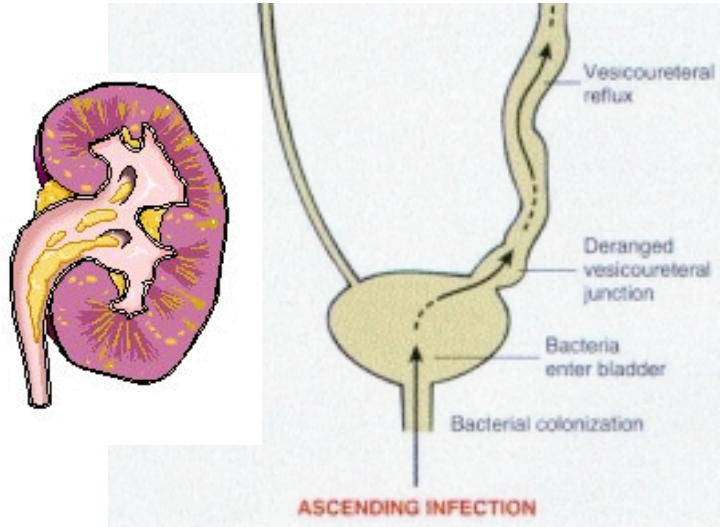
## ACUTE PYELONEPHRITIS

### Essentials of Diagnosis

- Fever
- Flank pain
- Irritative voiding symptoms
- Positive urine culture

### General Considerations:

- Infectious inflammatory disease - kidney parenchyma and renal pelvis
- Organisms
  - Gm negative most common (E coli, proteus, klebsiella, enterobacter, pseudomonas)
  - Gm positive less common (Enterococcus faecalis, Staphylococcus aureus)
- Usually ascends from lower urinary tract - exception is S aureus (hematogenous route)



### Clinical Findings

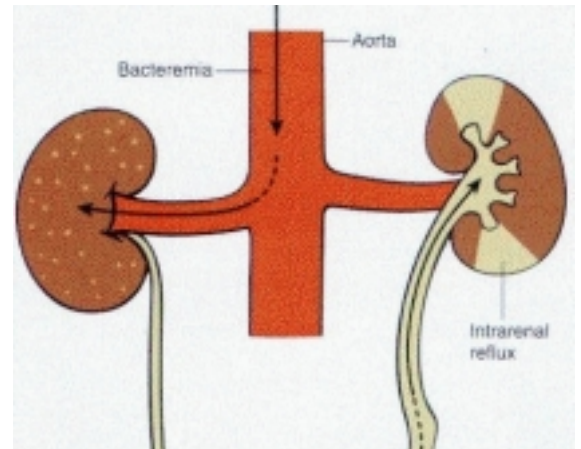
#### Signs and Symptoms:

- Fever, flank pain, shaking chills, irritating voiding
- N/V, diarrhea not uncommon
- Fever, tachycardia, CVA tenderness-pronounced

#### Laboratory Findings:

- CBC with leukocytosis and left shift
- U/A: (pyuria, bacteriuria, hematuria (variable), white cell casts possible)
- Culture: heavy growth of offending organism

Imaging: hydronephrosis: stone or obstruction if complicated



### Differential Diagnosis

- Acute intra-abdominal disease (cholecystitis, pancreatitis, diverticulitis)
  - Normal U/A with GI disorders
  - Pyuria/hematuria can result from adjacent bowel inflammation (A/P, diverticulitis)
- Liver function testing (LFT) or amylase may assist in D/Dx
- CXR: identifies lower lobe pneumonia
- Males: D/Dx for febrile UTI (**acute epididymitis, acute prostatitis, acute pyelonephritis**)

### Complications:

- Sepsis with shock
- DM: fatal emphysematous pyelonephritis - gas-prod organisms
- Healthy adults -> recover complete renal function
- Coexisting renal disease -> scarring or chronic pyelonephritis
- Abscess formation possible if inadequate therapy

### Treatment:

- Hospitalize if severe or complicating factors
- C/S urine: adjust therapy pending culture results
- IV ampicillin or aminoglycoside used prior to C/S results
- Out-patient therapy: TMP-SMX or fluoroquinolone x 3 weeks
- Fever may persist 72 hours - radiographic imaging if failure to respond within 72h
- Catheter drainage for urinary retention
- Nephrostomy drainage for ureteral obstruction
- IV antibiotics for 24h post defervesce -> switch to PO antibiotics ( 3 weeks duration)
- Mandatory C/S following treatment

### Prognosis:

- Good w prompt treatment
- Complicating factors -> unfavorable outcome (underlying renal disease, advanced age)

## PROSTATE ABNORMALITIES

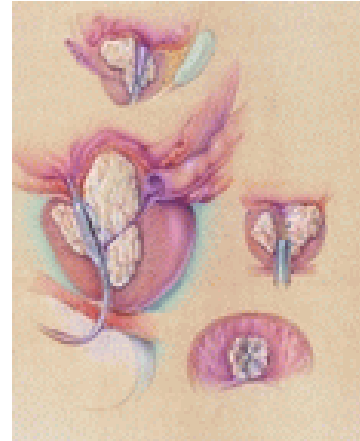
### BENIGN PROSTATIC HYPERPLASIA (BPH)

#### Essentials of Diagnosis:

- Decreased force and caliber of urinary stream
- Nocturia
- High post-void residue volume
- Azotemia and urinary retention

#### Symptoms and Signs:

- Obstructive symptoms
  - Decreased force and caliber of stream
  - Intermittent stream
  - Urinary hesitancy
- Irritative (may be function bladder dysfunction)
  - Frequency
  - Nocturia
  - Urgency
- Quantitation of symptoms via various scoring classifications
  - Select patients for various forms of treatment
  - Assess response to treatment
- DRE: reveals either focal or uniform enlargement of prostate
- Focal areas of induration suggests malignant vs BPH
- Focal induration indicates transrectal U/S and biopsy to diagnose CA
- Volume of enlargement should not direct therapy - size does not correlate w s/s or need for tx
- Examine lower abdomen to assess for distended bladder
  - Urinary retention may occur in absence of symptoms
- Neuro exam to assess sacral nerve roots helpful



#### Laboratory Findings:

- BUN and creatinine may be elevated (high post-void volumes, impaired renal function)
- U/A to exclude associated infection or hematuria
- **PSA:** to increase sensitivity of CA detection (elevated in BPH as well as CA)

#### Diagnostics

- Intravenous urography
  - May aid in detection of the following
  - Elevation bladder base; trabeculation and thickening of bladder
    - Diverticular formation, elevation of distal ureters
    - Poor emptying, Hydronephrosis (less commonly seen)
  - Normal in majority of pts
    - Once routinely ordered for all pts with s/s BPH
    - Currently ordered only with hematuria or suspicion of upper UT disease



- Plain film will reveal calculi
- Ultrasound (U/S): assess bladder, upper tract changes; determines prostate volume

Routine imaging not necessary with mild to moderate signs and symptoms and normal U/A, creatinine, P/E

#### Urodynamic Evaluation:

- Uroflowmetry most useful for BPH
  - Records maximum flow rate; reliable only if total volume voided > 150 ml
  - Peak flow rate < 10 ml/sec suggests infravesical obstruction
- More detailed urodynamic evaluation indicated for younger patients or
  - S/S hyperplasia and known neurologic disorders
  - Primary irritative vs obstructive symptoms

#### Cystourethroscopy: - invasive procedure

- Used where dx is uncertain or to evaluate pts for newer forms of tx
- Immediately before prostatectomy

#### Differential Diagnosis

- Other bladder outlet obstruction
  - Urethral stricture
  - Bladder neck contracture
  - Bladder calculi
  - Cancers of prostate or bladder
- UTI may lead to irritative voiding S/S
- Must R/O neurologic diseases

#### Diagnostic Evaluation and Treatment

- Guidelines
  - Covers most patients
  - Does not cover patients with medical problems resulting in an increased surgical risk
- Detailed Hx, P/E with DRE and a focused neurological exam
- U/A and creatinine
- PSA is optional
  - Increase detection of prostate CA
  - Overlap between BPH and prostate CA
- Rarely indicated
  - Imaging upper UT
  - Cystometry
  - Cystourethroscopy

- Optional and indicated for select cases
  - Pressure-flow studies
  - Uroflowmetry
  - Measurement of post-void volumes
- Good candidates for prostatic surgery
  - Refractory urinary retention
  - Recurrent UTI
  - Recurrent/persistent hematuria
  - Bladder calculi
  - Renal insufficiency
- American Urological Association Symptom Index
  - Mild symptoms (0-7): watchful waiting with re-evaluation
  - Moderate (8-19) to severe (20-35): offer treatment options

## TREATMENT OPTIONS

- Give pt literature: benefits risk each option
- Considerable uncertainty re outcome some options

### Medical Treatment

- BPH may be stromal or epithelial hyperplasia
- Medical treatment targets either or both
- Prostatic androgen levels play permissive role BPH
- Reduce androgen -> reduce BPH -> reduce obstruction
- Androgen deprivation possible at various sites HPT\*
  - \* hypophyseal-pituitary-testicular axis:
- Decreasing circulating androgens -> loss libido and loss sexual function
- Prostate and bladder have both alpha 1 and alpha 2 receptors
- Alpha blockade improve s/s BPH
  - **Prazosin (Minipress)**
  - **Terazosin (Hytrin)**
  - **Doxazosin (Cardura)**
  - **Tamsulosin (Flomax)**
- **Finasteride (Proscar)** has limited efficacy compared with alpha1 blockers
  - Prostatic enlargement was not entrance criteria to study
  - Current views tend to favor alpha1 blockers
- Effectiveness of finasteride and alpha blockade
  - Benefit small to moderate no pts
    - Symptom score
    - Urinary flow rates
    - Residual urine volume
  - Long term benefit unknown at present

## Surgical Treatment

- Removal of obstructive adenomatous prostatic tissue (transurethral incision)
- **TURP**: transurethral resection
  - Low mortality rate (0.1%)
  - Moderate morbidity (18%)
  - High probability of improvement BPH
    - Objective findings
    - Symptomatic improvement
  - **Retrograde ejaculation** occurs with 90% pts
  - Complications uncommon
    - Bladder neck contracture: 2.7%
    - Urethral stricture 2.5%
    - Incontinence 1.7%
  - Repeat resection needed in < 10%
- TURP undergoing scrutiny recently
  - Second most common procedure in men >60 yrs
  - Costs escalated in recent years
  - Relative risk death higher vs open prostatectomy (reasons unclear)
  - Other tx options available with less morbidity (long term outcome is unknown)
- Alternatives to TURP
  - TUIP: transurethral incision of prostate
    - Younger men
    - Men w smaller glands associated with BPH
    - No tissue is resected
    - Antegrade ejaculation maintained
    - Out patient procedure
  - Balloon dilation: easy but results transitory

### INVESTIGATIONAL TREATMENTS

- Neodymium-YAG laser under visual or U/S guidance
  - more dramatic improvement vs TURP
  - higher morbidity and longer hosp stays
- Transurethral or transrectal microwave hyperthermia
  - Desiccates prostatic tissue
- Self-retaining intraurethral stents

## PROSTATIC CANCER

### Essentials of Diagnosis

- Prostatic induration on DRE or elevation of PSA
- Most often symptomatic
- Systemic symptoms (wt loss, bone pain) in 20%

### General Considerations

- Most common Ca in American men
- 300,000 new cases per year (1996) -> 41,000 deaths
- Incidence of disease not equal prevalence on autopsy
  - 40% men >50 have prostatic CA
  - Most are small and contained w prostate
  - Few associated w regional or distant disease
- Incidence increases w age
  - 30% men 60-69 yrs
  - 67% in men 80-89 yrs on autopsy
- Autopsy incidence same - clinical incidence varies geographically
  - Suggests environmental or dietary factors
  - High: N America and Europe
  - Intermediate: S. America
  - Low in Far East
- Risk for developing disease: 50 yr old man
  - 40% lifetime risk for latent Ca
  - 9.5% for clinically apparent Ca
  - 2.9% risk death due to prostatic Ca

### Clinical Findings

#### Symptoms and signs:

- Most detected w focal nodules or areas of induration on DRE
- Rarely present w
  - Urinary retention (palpable bladder)
  - Neurological symptoms
    - Epidural mets
    - Cord compression
- Obstructive S/S most often BPH (same age group)
- Large or local extensive Ca -> obstruction
- Lymph node mets -> lower extremity edema
- Axial skeleton common site of mets (back pain, pathological fx)

#### Serum tumor markers:

## PSA

- PSA produced only in cytoplasm of benign and malignant prostate cells (glycoprotein)
- Level correlates w volume of benign and malignant prostatic tissue
- Useful
  - To detect and stage CA
  - Monitor response tx
  - Detecting recurrence
- Screening: normal < 4 ng/ml
  - elevated in 10-15% men for self refer screening
  - 20-25% men with intermediate elevation ( 4-10) have CA
    - usually localized and curable
  - 2/3 w >10 ng/ml have prostatic CA
  - 20% pts with radical prostatectomy for localized Ca will have normal PSA
- In untreated pts: level of PSA correlates with level and stage of disease
- 98% metastatic disease have elevated PSA
- Most organ confined CA: PSA < 10 ng/ml
- Advanced Ca > 40 ng/ml
- Occasional localized Ca has substantial elevation -
  - Can't make tx decisions based on PSA alone
- Rising PSA consistent with progressive disease

## Alkaline phosphatase - used before PSA

- PSA is more sensitive
- More predictive of metastatic disease
- Normal in 25% pt w metastatic disease

## Miscellaneous laboratory testing:

- BUN/creatinine: urinary retention/obstruction
- Elevated alk phos- elevated calcium suggests bone mets
- DIC with advanced prostatic Ca

## Imaging

- Transrectal U/S: high definition images
- Transrectal U/S-guided bx (vs digital Bx)
- MRI: prostate plus regional node evaluation - positive predictive value similar to U/S
- CT scanning plays little or no role - can't ID or stage
- Radionuclide bone scan superior to XRAY for bone metastasis
- Confusion with imaging due to high incidence D-J bone disease in this age group
- XRAYs useful if indeterminate on nuclear scan
- IVP an cystoscopy not routinely used to evaluate
- Under-staging is common with all imaging techniques

## SCREENING FOR PROSTATE CANCER

- Incidence rising due to wider detection
  - PSA
  - Transrectal U/S
- Goal to detect and tx only those prostatic CA -> M/M
- Detection of latent, non-progressive
  - Unnecessary treatment
  - Attendant complications and costs
- Much debate if screening -> decrease yearly mortality
- DRE as screening detects 1.5% to 7% - most CA so detected are advanced
- Transrectal U/S not appropriate screening
  - Expense
  - Lw specificity -> high bx rate
  - Increased detection little vs DRE and PSA
- PSA increases rate detection vs DRE alone
  - PSA and DRE: detects 2-2.5% men > 50 w CA
  - DRE alone: detects 1.5% men > 50 w CA
- Serial PSA may increase specificity - rate change > 0.75 ng/ml per year increase detection
- PSA density (serum PSA/vol prostate as meas U/S)
  - Useful to determine need for biopsy
  - Where elevated PSA w normal DRE and normal transrectal U/S
- Free serum vs protein bound PSA
  - CA have lower free serum
  - Currently under analysis to define parameters.

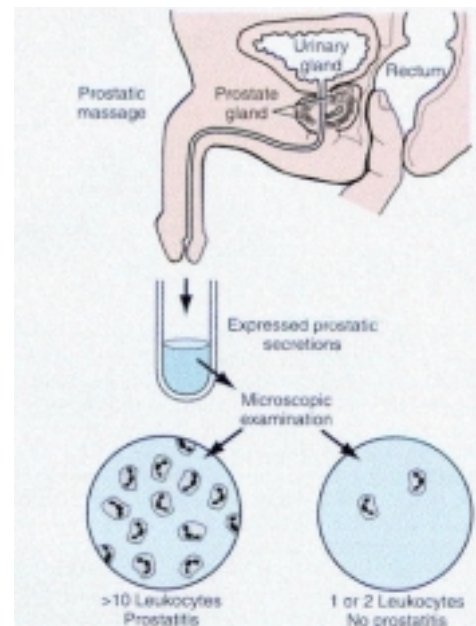
## ACUTE BACTERIAL PROSTATITIS

### Essentials of Diagnosis:

- Fever
- Irritative voiding symptoms
- Perineal or SP pain - exquisite tenderness on DRE
- Positive urine culture

### General Considerations:

- Usually caused by gram negative rods esp **E coli** and **pseudomonas**
- Less common organisms: gm-positive (enterococcus)
- Most likely routes: ascent up urethra, reflux infected urine into prostatic ducts
- Rare routes (lymphatic, hematogenous)





## Clinical Findings

### Symptoms and Signs

- Perineal, sacral or suprapubic pain
- Fever and irritative voiding common
- Varies with degree of obstructive symptoms
- Urinary retention as acutely inflamed prostate swells
- High fevers - warm and tender prostate on digital rectal exam (DRE)
- **Perform DRE gently to avoid septicemia** - vigorous massage is contraindicated

### Laboratory Findings

- Leukocytosis and shift left
- U/A: pyuria, bacteriuria, hematuria - positive urine cultures

## Differential Diagnosis:

- Acute pyelonephritis and epididymitis - distinguishable via location of pain and P/E
- Acute diverticulitis (occasionally confused) - distinguish history and U/A
- Urinary retention: BPH or prostatic CA - distinguish by initial or f/u DRE

## Treatment:

- Hospitalization usually required - IV antibiotics till C/S (amino glycosides, ampicillin)
- PO p afebrile for 24-48 hrs for 4-6 weeks total (TMP-SMX, fluoroquinolone)
- Suprapubic tap vs catheterization for urinary retention  
Catheterization or instrumentation is contraindicated
- F/u U/A and prostatic secretion exam after therapy

## **CHRONIC BACTERIAL PROSTATITIS**

### Essentials of Diagnosis

- Irritative voiding symptoms
- Perineal or SP discomfort - dull and poorly localized
- Positive expressed prostatic secretions and culture

### General considerations

- Chronic may evolve from acute but many have no acute infection
- Gram negative rods most common
- Enterococcus is only gram positive organism with chronic disease

## Clinical Findings:

### Symptoms and Signs:

- Variable: some are asymptomatic - most have some degree of irritative voiding
- Low back pain common
- Hx UTI
- P/E unremarkable - **prostate may feel normal, boggy or indurated**

#### Laboratory findings

- U/A normal unless secondary cystitis present
- Expressed prostatic secretions -> increased leukocytes
  - Greater than 10 per hpf
  - Especially lipid-laden macrophages
- Culture is necessary to make diagnosis
  - Increased leukocytes not diagnostic
  - Can also suggest inflammation vs infection

Imaging: not necessary, however, pelvic xray or transrectal U/S may detect prostatic calculi

#### Differential Diagnosis:

- Chronic urethritis - cultures of fractionated urine may localize source
- Cystitis may be secondary to chronic prostatitis - fractionalized urine will localize
- Anal disease (distinguishable on P/E)

#### Treatment:

- Few antimicrobial agents achieve intraprostatic levels in absence of acute inflammation
- TMP does diffuse into prostate thus has best cure rates
- Other effective agents: carbenicillin, erythromycin, cephalexin, quinolones
- Optimum duration of therapy is controversial: ranges from 6-12 wks
- NSAIDs and sitz: provide symptomatic relief

#### Prognosis:

- Difficult to cure - tends to cause recurrent UTI
- Symptoms and precipitation of recurrent UTI best controlled with suppressive antibiotic therapy

## TESTICULAR ABNORMALITIES

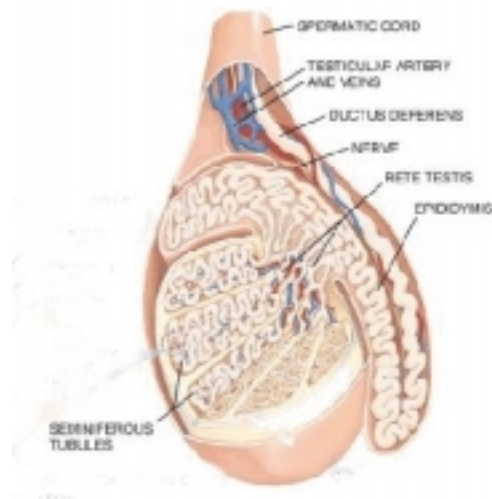
### ACUTE EPIDIDYMITIS

#### Essentials of Diagnosis

- Fever
- Irritative Voiding
- Painful enlargement of epididymis

#### General Considerations:

- Two (2) categories for acute: STDs and NON-STDs
- Sexually transmitted disease (STD)
  - Typically men under 40
  - Associated w urethritis
  - **C trachomatis or N gonorrhoeae**
- Non-STD
  - Typically in older men
  - Associated with UTI and prostatitis
  - Etiology: gram negative rods
- Route of Infection: urethra -> ejaculatory duct -> vas deferens -> epididymis
- Amiodarone: associated with self-limiting epididymitis



#### Clinical Findings

##### Symptoms and Signs:

- Symptoms may follow acute physical strain (heavy lifting), trauma, sexual activity
- Associated symptoms
  - Urethritis (pain at tip of penis, urethral d/c)
  - Cystitis: irritative voiding symptoms
- **Pain develops in scrotum, may radiate along spermatic cord to flank**
- Fever and scrotal swelling usually apparent
- Early disease: epididymis distinguishable from testis
- Late disease: testes and epididymis may appear as one enlarged tender mass
- Prostate may be tender

##### Laboratory Findings:

- CBC: leukocytosis and left shift
- Intracellular gram-negative diplococci if gonorrhea (GC)
- WBC without organisms on urethral smear for nongonococcal urethritis (NGU)
- Chlamydia trachomatis most likely organism for NGU
- Non-sexually transmitted variety:
  - Pyuria on U/A, bacteriuria, varying degrees of hematuria
  - Urine culture reveals causative organism

Imaging: Scrotal U/S may aid if P/E difficult (hydrocele) or with questionable diagnosis

### Differential Diagnosis:

- Tumors
  - Cause painless enlargement of testis with normal epididymis on P/E
  - U/A negative; scrotal ultrasound (U/S) useful
- Testicular torsion ages 10-20
  - Prepubertal males and occasionally in young adults
  - Acute onset; negative U/A
- **Prehn's sign**
  - Helpful but not completely reliable
  - Elevation of scrotum above symphysis pubis improves pain with epididymitis

### Treatment

- Bedrest with scrotal elevation for acute phase
- Identify pathogen
- STD: treat patient and partner for 10-21 days
- Non-STD: treat for 21-28 days - refer for urologic evaluation for underlying cause

### Prognosis:

- Prompt treatment results in favorable outcome
- Delayed treatment -> epididymo-orchitis, decreased fertility, abscess

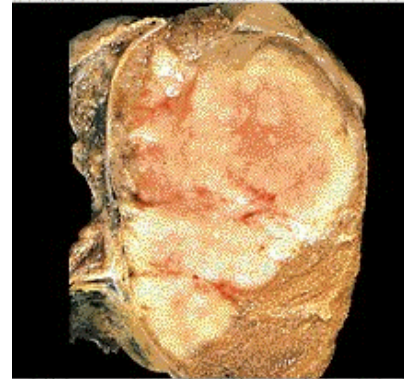
## **PRIMARY TUMORS OF THE TESTES**

### Essentials of Diagnosis

- Commonest neoplasm in men 20-35 yrs
- Typical presentation is pt ID painless nodule
- Orchiectomy necessary for dx

### General Considerations

- Rare w 2-3 cases per 100,000 males
- 95% are germ cell tumors (seminoma, nonseminoma)
- Lifetime probability is 0.2% for American white male
- Slightly more common on right than left
- 2% are bilateral
  - Up to 50% have hx of unilateral or bilateral cryptorchism
  - May occur synchronously or asynchronously
- Cause unknown but congenital and acquired factors implicated
- 5% develop in pt w hx of cryptorchism - 5-10% develop in contralateral descended testis
- Relative risk malignancy with undescended
  - Intraabdominal: 1:20
  - Intra inguinal: 1:80



Seminoma

- Placement of cryptorchid testis into scrotum (orchiope xy)
  - Does not altered malignant potential
  - Does make exam and screening of testes easier
- Exogenous estrogen during pregnancy increases risk 2.8-5.3%
- Other acquired factors: causal relationship not established
  - Trauma
  - Infection related atrophy

#### Histopathology and Clinical Staging

- T: Primary tumor
- N: Regional lymph nodes
- D: Distant metastasis

#### Clinical Findings:

- Painless enlargement of testes
- Sensation of heaviness not usual
- Pts first to notice but delay 3-6 months
- 10% pain from intratesticular hemorrhage
- 10% are asymptomatic at presentation
- 10 % manifest metastatic disease
  - Back pain: retroperitoneal mets
  - Cough: pulmonary mets
  - Lower extremity obstruction: vena cava obstruction
- Testicular mass or diffuse enlargement on P/E
- 5-10% secondary hydroceles
- Advanced disease
  - Supraclavicular adenopathy
  - Abdominal retroperitoneal mass on palpation
  - Gynecomastia: 5%

#### Laboratory Diagnosis:

- HCG - alpha feto protein - LDD
- LFTs with hepatic metastasis
- Anemia w advanced disease
- Renal function with chemotherapy (24h creatinine clearance)

#### Imaging:

- Readily determined via U/S
- Dx established by inguinal orchiectomy
- Clinical staging via CXR and pelvic CT

### Differential DX

- Incorrect diagnosis at initial exam in up to 25%
- D/Dx discussed previously
  
- Scrotal U/S if question of DX
- Most intratesticular masses are malignant - epidermoidal cyst rare benign lesion

### Treatment:

- Inguinal exploration w early vascular control of spermatic cord structures is initial intervention
- If CA cannot be excluded by exam of testes -> radical orchiectomy
- Scrotal approaches and open biopsy to be avoided
  
- Further therapy (f) histology and clinical stage
- 5 yr survival rate w radiation and radical orchiectomy
  - 98% for stage I
  - 92-94% for IIa
  
- Chemotherapy for high stage seminomas - 95% complete response w chemo and orchiectomy
- Surgical resection of residual retroperitoneal masses warranted under some circumstances
  
- 75% stage A nonseminomas cured by orchiectomy alone
  - Tx by modified node resection to preserve ejaculation
  - Surveillance treatment for pts who meet criteria
  
- Pts with bulky retroperitoneal disease - 55-80% disease free 5 yr survival rate