

# **POCKET GUIDE TO UROLOGY**

**Fifth Edition**

Sample Pages

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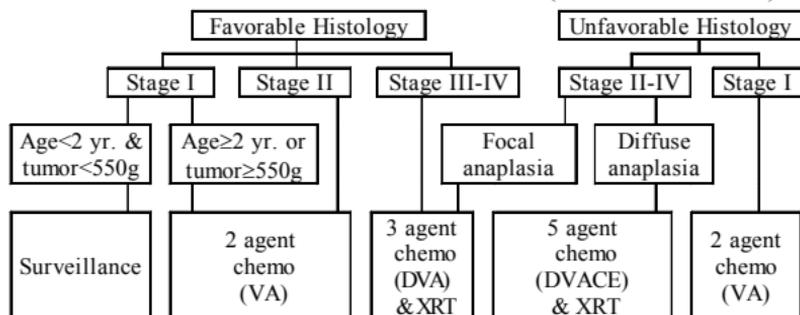
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**Treatment**

Treatment After Removal of Wilms' Tumor (based on NWTS V)



D = doxorubicin  
 V = vincristine  
 A = actinomycin D (dactinomycin)  
 NTWS V = National Wilms' Tumor Study 5

C = cyclophosphamide  
 E = etoposide  
 XRT = external beam radiation therapy

**Survival**

Tumor	Histology & Stage	4-Year Relapse-Free Survival*	4-Year Overall Survival*
Wilms' Tumor	FH	I	92%
		II	85%
		III	90%
		IV	80%
		V	65%
	UH	Any	56-87%†
Clear cell sarcoma	Any	Any	65%
Rhabdoid sarcoma	Any	Any	75%
			26%

FH = favorable histology; UH = unfavorable histology

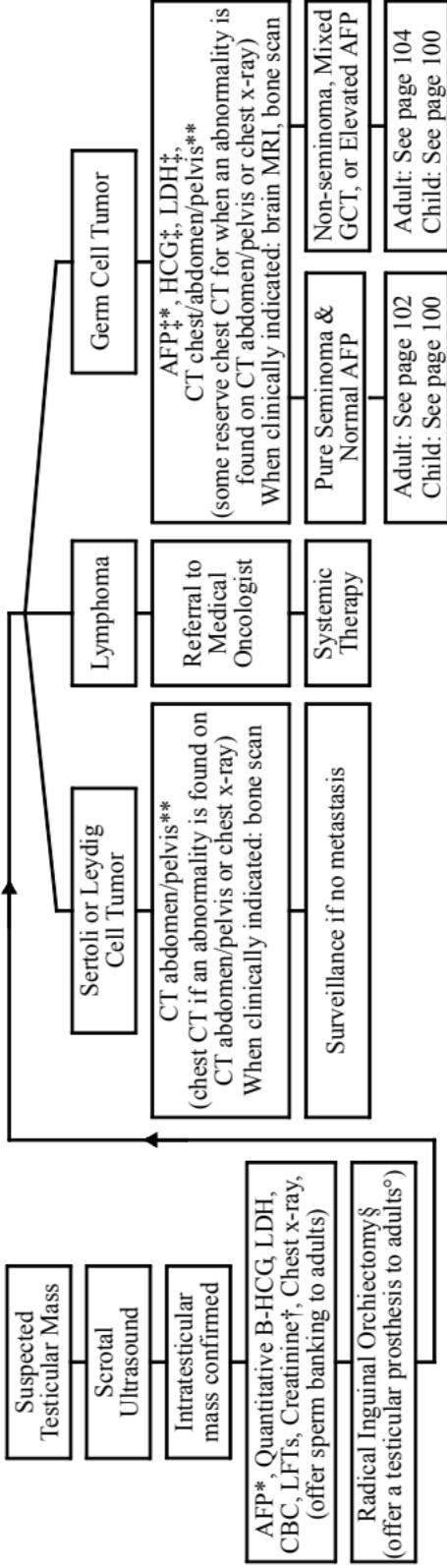
\* Data is from National Wilms' Tumor Studies 3-5.

† Survival is better in those with negative lymph nodes, favorable histology, younger age, and lower tumor stage of each kidney.

**Follow Up**

1. Initially, obtain follow up tests at least every 3 months.
  - a. History and physical (especially abdominal exam).
  - b. Serum BUN, creatinine, liver function tests, and urinalysis.
  - c. Abdominal ultrasound—every 3 months for any stage with unfavorable histology, stage III-IV with favorable histology, and any stage with nephrogenic rests. Favorable histology stage I-II without nephrogenic rests may be imaged less often.
  - d. Chest x-ray—every 3 months.
2. When nephrectomy is performed for a unilateral Wilms' tumor, the presence of an ipsilateral nephrogenic rest or nephroblastomatosis increases the patient's risk of developing a metachronous Wilms' tumor in the contralateral kidney. Therefore, these patients are followed more frequently regardless of histology and stage.
3. If metastases were present, the metastatic locations should be monitored with routine imaging.
4. In patients receiving radiation to bones, imaging studies of these areas should be conducted at least each year until bone growth is complete, and then at least every 5 years thereafter. Secondary malignancies (such as osteosarcomas) have been reported after radiation for Wilms' tumor.

## Part 1 - Initial Management of a Testicular Mass



CT = computerized tomography; MRI = magnetic resonance imaging; T<sub>1/2</sub> = half life; GCT = Germ cell tumor

CBC = complete blood count; LFTs = liver function tests; AFP = alpha-fetoprotein; B-HCG = beta-human chorionic gonadotropin; LDH = lactate dehydrogenase;

\* Elevation of AFP can occur in infants less than one year of age, liver dysfunction, and other cancers (e.g. liver, pancreatic, gastric, and lung).

\*\* CT should be performed with oral and intravenous contrast (if there is no contraindication).

† Creatinine may be elevated when bulky retroperitoneal metastases obstruct the ureter.

‡ Postoperatively, wait 5 weeks before checking AFP (T<sub>1/2</sub> = 5-7 days), 1-2 weeks before checking B-HCG (T<sub>1/2</sub> = 1-3 days), and 3 weeks before checking LDH (T<sub>1/2</sub> = 4-4.5 days). Measurements are made until the nadir values are reached. S stage is determined using the nadir value of the post-orchiectomy markers.

§ Radical inguinal orchiectomy is generally preferred; thus, testis sparing is seldom performed. Testis sparing may be offered to patients with a tumor in a solitary testicle, to patients with synchronous bilateral testis tumors, or to patients with a testis lesion that is likely benign (e.g. teratoma in children).

° For children, a testicular prosthesis can be placed after the child completes puberty.

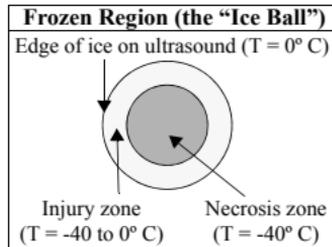
## Cryotherapy

### General Information

1. Freezing of tissue creates a region of *coagulative necrosis*.
2. Freezing achieves cell kill (necrosis) by the following methods.
  - a. Cell rupture—occurs when intracellular ice formation generates shear forces that tear the cell membrane. Cell rupture occurs during freezing.
  - b. Apoptosis (genetically regulated cell death)—apoptosis is stimulated by extreme local conditions that occur after freezing (pH, osmolarity, etc.). Apoptosis usually occurs 6-12 hours after freezing.
  - c. Ischemia—freezing induces thrombosis in small vessels, leading to local hypoxia. Cell death from ischemia occurs 24-48 hours after freezing.

### Technique

1. Using transrectal ultrasound guidance and a brachytherapy template, cryoprobes are inserted through the perineum and into the prostate.
2. A catheter-like urethral warming device helps prevent freezing injury to the urethra and reduces postoperative urethral sloughing.
3. The freezing process is monitored by transrectal ultrasound and by percutaneous thermocouples (needle-like probes that monitor tissue temperature in real time).
  - a. Ice reflects sound waves; therefore, the edge of the ice ball appears as a hyperechoic line on ultrasound and the tissue beyond this line cannot be visualized sonographically. If freezing is started at the posterior prostate, then transrectal ultrasound cannot visualize the unfrozen anterior prostate. Thus, *the prostate is frozen from anterior to posterior to permit optimal visualization of the prostate during freezing.*
  - b. The AUA Best Practice Policy 2008 recommends using thermocouples. These probes are usually placed in critical structures (such as the rectal wall and the urinary sphincter). The use of thermocouples may help prevent freezing injury to these critical structures.
4. Freezing
  - a. Rapid freezing is more destructive than slow freezing.
  - b. The optimum freezing temperature is unknown, but recent data suggests that human cells cannot survive below  $-40^{\circ}\text{C}$  (even with slow freezing). *To ensure cell death, urologists often freeze to a temperature of  $-40^{\circ}\text{C}$ .*
  - c. Two freeze-thaw cycles are recommended because 2 cycles achieve greater cell destruction than a single cycle.
  - d. Prostate freezing is conducted from anterior to posterior.
  - e. The temperature at the center of the ice ball is  $-40^{\circ}\text{C}$ , which ensures necrosis in this region. Between the necrosis zone and the edge of the ice ball, the temperature is  $-40^{\circ}$  to  $0^{\circ}\text{C}$ , thus, cells may survive (albeit injured) in this region. Notice that the necrosis zone is smaller than the frozen region revealed by ultrasound. In order to account for this, the hyperechoic edge of the ice ball is often allowed to extend outside the prostate capsule to ensure adequate cell kill at the periphery of the prostate. Thermocouples can be placed at the prostate capsule to ensure that this location reaches  $-40^{\circ}\text{C}$ . The width of the injury zone is dependant on the properties of the cryotherapy probe (know the properties of your probe!).



5. In most cases, the entire prostate is frozen. Partial (focal) cryotherapy is still considered investigational because long term data are lacking.
6. Cryotherapy can be performed in a minor surgical procedure in which the patient goes home within 24 hours.

### Screening Studies

ERSPC—Beemsterboer PMM, et al: Prostate specific antigen testing and digital rectal examination before and during a randomized trial of screening for prostate cancer. *J Urol*, 164: 1216, 2000.

ERSPC—Bokhorst LP, et al: Prostate specific antigen based prostate cancer screening: reduction of prostate cancer mortality after correction for nonattendance and contamination in the Rotterdam section of the European randomized study of screening for prostate cancer. *Eur Urol*, 65: 329, 2014.

ERSPC—Roobol MJ, et al: Prostate cancer mortality reduction by prostate specific antigen based screening adjusted for non-attendance and contamination in the ERSPC. *Eur Urol*, 56: 584, 2009.

ERSPC—Schroder FH, et al: Screening for prostate cancer decreases the risk of developing metastatic disease: findings from the ERSPC. *Eur Urol*, 62: 745, 2012 [update of *Eur Urol*, 51(3): 659, 2007].

ERSPC—Schroder FH, et al: Screening and prostate cancer mortality: results of the European Randomised Study of Screening for Prostate Cancer (ERSPC) at 13 years of follow up. *Lancet*, 2014. Electronically published ahead of print. [http://dx.doi.org/10.1016/S0140-6736\(14\)60525-0](http://dx.doi.org/10.1016/S0140-6736(14)60525-0) [update of *N Engl J Med*, 366: 981, 2012 and *N Engl J Med*, 360: 1320, 2009].

Goteborg—Hugosson J, et al: Mortality results from the Goteborg randomised population based prostate cancer screening trial. *Lancet Oncol*, 11(8): 725, 2010.

Labrie F, et al: Screening decreases prostate cancer mortality: 11-year follow-up of the 1988 Quebec prospective randomized controlled trial. *Prostate*, 59: 311, 2004. [update of *Prostate*, 38: 83, 1999].

PLCO—Andriole GL, et al: Prostate cancer screening in the randomized prostate, lung, colorectal, and ovarian cancer screening trial: mortality results after 13 years of follow up. *J Natl Cancer Inst*, 104: 125, 2012.

PLCO—Crawford ED, et al: Comorbidity and mortality results from a randomized prostate cancer screening trial. *J Clin Oncol*, 29:355, 2011.

### PCA3

Aubin SMJ, et al: Prostate cancer gene 3 score predicts prostate biopsy outcome in men receiving dutasteride for prevention of cancer: results from the REDUCE trial. *Urology*, 78(2): 380, 2011.

Gen-Probe®, Inc.: PROGENSA® PCA3 Assay package insert. (accessed 1/2013): <http://gen-probe.com/pdfs/pi/501377RevB.pdf>

Haese A, et al: Clinical utility of the PCA3 urine assay in European men scheduled for repeat biopsy. *Eur Urol*, 54(5): 1081, 2008.

Marks LS, et al: PCA3 molecular urine assay for prostate cancer in men undergoing repeat biopsy. *Urology*, 69: 532, 2007.

Nakanishi H, et al: PCA3 molecular urine assay correlates with prostate cancer tumor volume: implication in selecting candidates for active surveillance. *J Urol*, 179(5): 1804, 2008.

Ploussard G, et al: Prostate cancer antigen 3 score accurately predicts tumor volume and might help in selecting prostate cancer patients for active surveillance. *Eur Urol*, 59(3): 422, 2011.

Tosoian JJ, et al: Accuracy of PCA3 measurement in predicting short term biopsy progression in an active surveillance program. *J Urol*, 183(2): 534, 2010.

van Poppel H, et al: The relationship between Prostate Cancer gene 3 (PCA3) and prostate cancer significance. *BJU Int*, 109(3): 360, 2012.

Whitman EJ, et al: PCA3 score before radical prostatectomy predicts extracapsular extension and tumor volume. *J Urol*, 180: 1975, 2008.

### Percutaneous Tibial Nerve Stimulation (PTNS)

1. A percutaneous needle electrode is inserted 5 cm cephalad to the medial malleolus and 2 cm posterior to the tibia of the leg. *When the needle is in proper position, applying current to the needle will usually cause flexion or fanning out of the ipsilateral toes.* The patient may feel tingling across the heel or bottom of the foot during stimulation.
2. Electrical impulses delivered through the needle are transmitted along the tibial nerve to the S3 segment of the sacral plexus, ultimately leading to modification of the voiding reflex. *The S3 peripheral nerves (including the tibial nerve) must be intact for PTNS to be effective.*
3. PTNS significantly improves urgency, frequency, and UII in 60% of patients. *Randomized trials indicate that PTNS and anticholinergic medications are equally effective for OAB after 3 months of treatment.*
4. Initial treatment is 30 minutes each week for 12 weeks. Additional “maintenance” treatments are usually required (e.g. after the initial 12 weeks of therapy, a treatment is administered at 2, 4, 7, 10, and 14 weeks later, and then the treatment interval is customized for each patient thereafter; on average 1 maintenance treatment per month is necessary). When maintenance treatments are administered, studies show that the efficacy of PTNS is sustained with up to 3 years of follow up.
5. The Urgent<sup>®</sup> PC Neuromodulation System is FDA approved for OAB.
6. Contraindications include indwelling pacemaker or defibrillator, risk of excessive bleeding, and pregnancy.

### Sacral Neuromodulation (Interstim<sup>®</sup>)

1. Sacral neuromodulation modifies the voiding reflex using direct electrical stimulation of the S3 afferent nerve. *It is ineffective when the S3 nerves are damaged (e.g. from sacral spinal cord injury or pelvic surgery).*
2. Sacral neuromodulation is accomplished by a two stage procedure.
  - a. First stage—a percutaneous electrode is placed through the sacral foramen and positioned next to the S3 nerve root. The electrode is connected to a generator that controls stimulation. The patient undergoes a test period of 2-4 weeks. If the urinary symptoms do not improve, the electrode is removed. If the urinary symptoms do improve (i.e. > 50% reduction in symptoms), the second stage is performed.
  - b. Second stage—the percutaneous lead is connected to a subcutaneous generator and the entire system is internalized.
3. Positioning the electrode—*when the electrode is in proper position at S3, applying current to the electrode causes plantar flexion of the ipsilateral great toe and bellows motion of perineum.*

Electrode Location	Response to Electrode Stimulation		Corrective Action
	Pelvic Floor	Ipsilateral Lower Extremity	
S2	<i>anus contraction (anal wink)</i>	Plantar flexion of <i>foot</i> , external rotation of leg/hip, contraction of calf	Move inferior one foramen
S3	<i>Bellows*</i>	Plantar flexion of <i>great toe</i>	None
S4	<i>Bellows*</i>	None	Move superior one foramen

\* *Levator ani contraction causing pulling inward of anus and perineum.*

4. Interstim<sup>®</sup> is indicated for patients who fail or cannot tolerate conservative treatments and who have one or more of the following conditions: UII, urinary urgency and frequency, or non-obstructive urinary retention.
5. After Interstim<sup>®</sup> for UII, up to 50% of patients are dry and 60-90% are dry or improved. The efficacy in men has not been well studied.

## **Metabolic Evaluation**

1. Patients with any of the following characteristics are at “high risk” for developing recurrent stones or complications from stones.
  - a. Large stone burden (large or multiple stones)
  - b. Recurrent stone formers
  - c. Nephrocalcinosis
  - d. Pediatric stone formers
  - e. Uncommon stone composition (e.g. cystine, uric acid, etc.)
  - f. Stones arising from urinary infection (e.g. struvite)
  - g. Family history of stones
  - h. Medical, genetic, or anatomic conditions that increase stone risk (e.g. gout, Crohn’s, cystinuria, hyperparathyroidism, sarcoidosis, polycystic kidney disease, renal tubular acidosis, medullary sponge kidney, etc.)
  - i. Solitary kidney
  - j. Professions such as pilots, bus drivers, truck drivers, etc. (stone pain while these people are working can cause danger to others).
2. Perform the metabolic work up at least one month after obstruction has resolved, stents have been removed, and infection has been treated.
3. Initial basic metabolic work up—all patients with urolithiasis should have an initial basic metabolic work up, which includes
  - a. History and physical exam—ask about diet, fluid consumption, urinary infections, medications, prior urolithiasis, family history of urolithiasis.
  - b. Analyze the composition of any recovered stones.
  - c. Urinalysis including pH (urine culture as indicated).
  - d. Serum chemistries including sodium, potassium, chloride, bicarbonate, uric acid, calcium, and creatinine. If serum calcium is elevated or stone composition is predominantly calcium phosphate, obtain a serum intact parathyroid hormone (PTH) level.
4. If the initial basic evaluation shows normal serum chemistries and the patient is not “high risk,” suggest dietary modifications (see page 279).
5. If the initial basic evaluation shows abnormal serum chemistries, the patient is “high risk,” or the patient desires evaluation, obtain one or two 24-hour urine tests on a *random diet*. Then, obtain a 24-hour urine after the patient has been on a *stone prevention diet* for at least one week. If the prevention diet does not resolve the metabolic stone risks, medications may be required.
6. Follow up—obtain a 24 hour urine 2-6 months after starting dietary or pharmacologic prevention. When metabolic stone risks are controlled, consider monitoring 24 hour urine every 12 months.
7. 24-hour urine should include (at a minimum) measurement of pH, total volume, calcium, oxalate, citrate, uric acid, sodium, potassium, and creatinine. Other analyses may be obtained at the clinicians discretion.
  - a. If the qualitative cystine is normal on the first 24-hour urine, further cystine testing is not necessary.
  - b. Incomplete collection of urine is probably present when the 24 hour urinary creatinine excretion is abnormally low. If the urine collection appears incomplete, repeat the 24 hour urine and instruct the patient on proper collection.

<b>Normal Urinary Creatinine Excretion per 24 hours (mg/kg/day)</b>	
Male	14-26
Female	11-20

## Imaging of Urolithiasis

### General Information

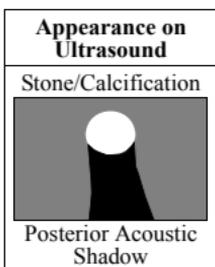
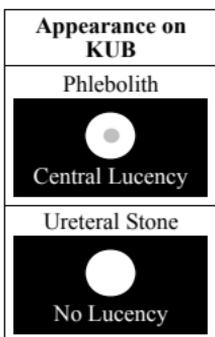
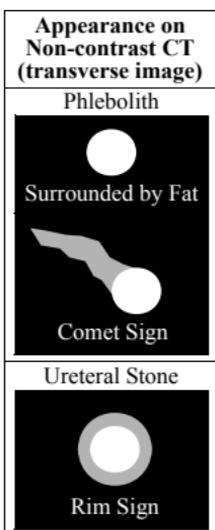
- 90% of ureteral stones are radio-opaque (i.e. they are visible on plain x-rays).
- Non-contrast CT scan is the best test to evaluate for the presence of urolithiasis.* It is more accurate than IVU, KUB, ultrasound, and MRI.
  - Radiolucent stones are not visible on plain x-rays, but all stones (except protease inhibitor stones) are visible on CT.
  - Stones are not well-visualized on MRI, but they are very well-visualized on non-contrast CT.
  - Iodine contrast and stones look similar on CT; thus, iodine in the collecting system can obscure a stone. This is why a non-contrast CT is best for evaluating the presence of urolithiasis.
- On ultrasound, stones are highly echogenic and they cast an acoustic shadow on the side opposite to the transducer (“posterior acoustic shadow”).
- A bladder stone can be differentiated from a ureterovesical junction stone by placing the patient lateral or prone and re-imaging. A bladder stone will move to the most dependant portion of the bladder.

### Pelvic Phlebolith or Distal Ureter Stone?

- A phlebolith is a focal calcification in a vein. They are usually in the pelvis near the distal ureter.
- On KUB—phleboliths often have a central lucency (a grey center). Ureter stones usually do not have a central lucency.
- On non-contrast CT—a phlebolith is often completely surrounded by fat (encircled by black) or is partially surrounded by fat with a vein emanating from it (*comet sign*: a grey, often tapering, streamer). A ureter stone is usually surrounded by edematous ureteral tissue (*rim sign*: a grey rim encircles the stone). The rim may be indistinct for large stones because they stretch the ureteral wall and thin the rim. This sign may also be indistinct when edema is minimal.
- Tests that can definitively differentiate a phlebolith from a ureter stone include: pyelogram with oblique films, CT urogram, and ureteroscopy. When the diagnosis is in question, obtain one of these tests.

### Things That Mimic Urolithiasis on Imaging

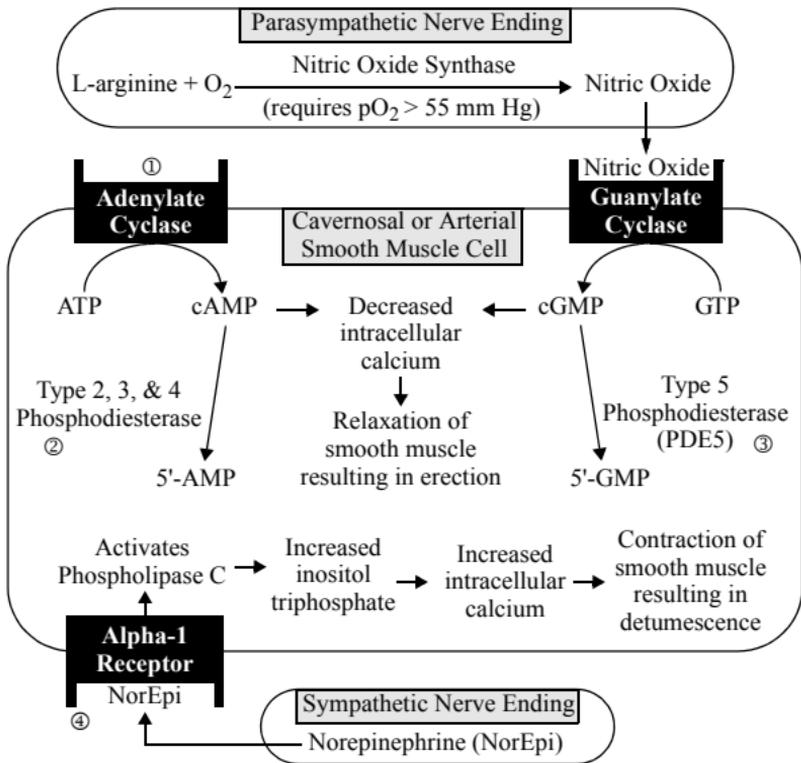
- Phleboliths—see above.
- Deflux<sup>®</sup> (dextranomer-hyaluronic acid)—Deflux<sup>®</sup>, which is injected near the intramural ureter to treat vesicoureteral reflux, calcifies in 2% of cases by 4 years after injection. Calcified Deflux<sup>®</sup> mimics a distal ureteral stone.
- Parenchymal calcification—parenchymal calcification in the prostate or kidney may be mistaken for stones in the urinary drainage system.
- Bowel contents—on KUB, bowel content (e.g. pills, oral contrast) may mimic the appearance of stones when they overlie the urinary system.



# ERECTILE DYSFUNCTION

## Physiology of Erections

1. Erections require two main processes
  - a. *Cavernosal artery smooth muscle relaxation*—an *active* process that is *the initial event of an erection*. Parasympathetic nerves release nitric oxide, leading to increased cyclic GMP (cGMP), decreased intracellular calcium, and greater smooth muscle relaxation. Smooth muscle relaxation leads to arterial dilation, increased penile blood flow, increased intracavernosal pressure, and cavernosal expansion.
  - b. *Increased venous outflow resistance*—a *passive* process occurring when the cavernosa expand and compress sub-tunic venous sinuses.
2. High arterial inflow and low venous outflow sustains the pressure required to maintain an erection. The intracavernosal pressure during a normal erection is equal to the systemic *mean arterial pressure* (MAP).
3. Sympathetic nerves release norepinephrine, which stimulates  $\alpha$ -adrenergic receptors, resulting in smooth muscle contraction and detumescence.
4. See page 203 for the neural pathways that control erection and ejaculation.



- ① Alprostadil (prostaglandin E1) stimulates this receptor.
- ② & ③ Papaverine inhibits phosphodiesterases.
- ③ Sildenafil, tadalafil, vardenafil, and avanafil inhibit PDE5.
- ④ Phentolamine and other  $\alpha$ -adrenergic antagonists inhibit this receptor.

### Type 5 Phosphodiesterase Inhibitors for Erectile Dysfunction

PDE5 Inhibitor Name		Fatty Food Significantly Impairs Absorption	Median T <sub>max</sub> (hours) ‡‡	T <sub>1/2</sub> (hours)	Duration of Action (hours)	QT Interval Warning	Also Has Substantial Affinity For	FDA Approved Oral Dosing Options	Method of Oral Administration	Usual Starting Dose (mg)	Dose Range** (mg)
Generic Name	US Brand Name										
Avanafil	Stendra™	No	0.5-0.75	5	6	No	§	PRN	Swallow	100	50-200
Sildenafil	Viagra®	Yes	1	4	6-8	No	PDE-6 *	PRN	Swallow	50	25-100
Vardenafil	Levitra®	Yes	1	4-5	6-8	Yes‡	PDE-6 *	PRN	Swallow	10	5-20
	Staxyn™	No††	1.5	4-6	6-8	Yes‡	PDE-6 *	PRN	Dissolve on tongue	10	10
Tadalafil	Cialis®	No	2	17.5	24-36	No	PDE-11†	PRN or Daily	Swallow	PRN: 10 Daily: 2.5	PRN: 5-20 Daily: 2.5-5

PDE = phosphodiesterase; PDE5 = PDE type 5; N/A = not applicable; FDA = U.S. Food and Drug Administration; PRN = as needed

T<sub>max</sub> = time to maximum serum concentration; T<sub>1/2</sub> = half life; US = United States of America

\* PDE-6 is in the retina and is responsible for some visual side effects, such as diplopia, blurry vision, and impaired color vision (chromatopsia).

† PDE-11 is in the muscle, testicles, prostate, and kidney. The clinical impact of PDE-11 inhibition is unclear. Testosterone, LH, FSH, and semen analysis are not affected after 6-9 months of tadalafil use.

‡ Vardenafil should not be used by men on drugs that prolong the QT interval or in men with congenital prolonged QT interval because of the theoretical risk of torsades de pointes and sudden cardiac death.

§ Compared to other PDE5 inhibitors, avanafil has a much lower affinity for non-type 5 phosphodiesterases.

\*\* Titrate from the initial dose based on tolerability and efficacy. Dose reduction may be required in men with age >65 years, hepatic dysfunction, renal dysfunction, or men taking cytochrome P450 3A4 inhibitors (e.g. grapefruit juice, ritonavir, indinavir, erythromycin, ketoconazole).

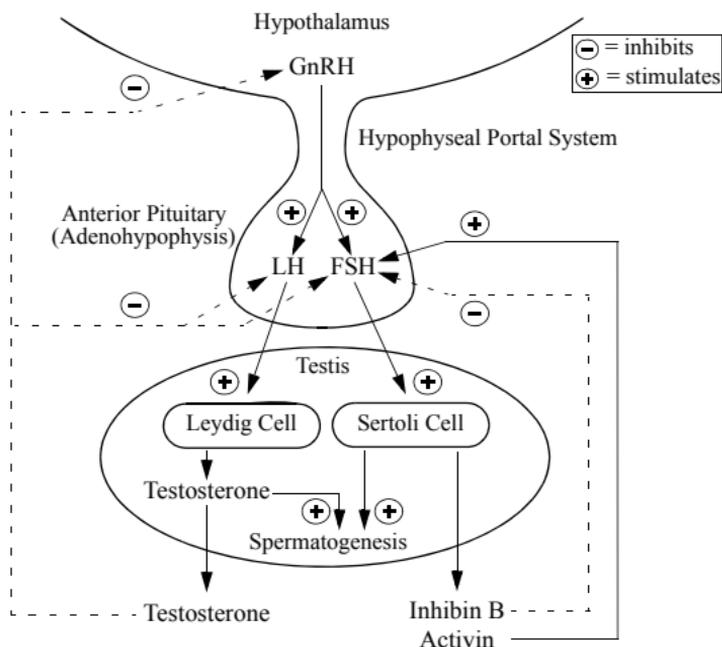
‡‡ Initiation of sexual activity is recommended 30 minutes after avanafil and 60 minutes after other PDE5 inhibitors.

†† Absorption is not impaired by fatty food because Staxyn™ is absorbed in the mouth and not in the intestine.

# MALE HYPOGONADISM

## Hypothalamic-Pituitary-Gonadal Axis

1. The hypothalamus in the brain secretes gonadotropin releasing hormone (GnRH). GnRH travels down the hypophyseal portal system to the anterior pituitary (adenohypophysis), where it stimulates the release of gonadotropins (luteinizing hormone and follicle stimulating hormone). Luteinizing hormone (LH) and follicle stimulating hormone (FSH) travel through the blood stream to the testes.
2. LH causes the testicular Leydig cells to produce testosterone (T). FSH causes the testicular Sertoli cells to produce sperm, inhibin B, and activin.
3. Testosterone generates negative feedback by inhibiting GnRH and gonadotropin release. Inhibin B generates negative feedback by inhibiting the release of FSH from the pituitary, whereas activin generates positive feedback by stimulating the release of FSH from the pituitary.



## Clinical Presentation

1. Symptoms associated with hypogonadism include erectile dysfunction, low libido, infertility, fatigue, altered masculine features (gynecomastia, reduced facial and body hair, reduced muscle mass), increased body fat, decreased bone mineral density (i.e. osteopenia or osteoporosis), and mood disturbances (increased levels of anger, confusion, and depression).
2. When hypogonadism presents early in life, the patient may have undescended testes, micropenis, and absent puberty.
3. In teens and adults, *the most common symptom associated with hypogonadism is low libido.*

## **Acute Bacterial Nephritis (Acute Lobar Nephronia)**

### **General Information**

1. Acute bacterial nephritis (ABN) is an uncommon interstitial nephritis caused by bacterial infection of the renal cortex, which results in an inflammatory mass or masses without liquefaction.
2. ABN may be focal or multifocal. Acute focal bacterial nephritis (AFBN) is present when there is a single inflammatory mass within the kidney. Acute multifocal bacterial nephritis (AMBN) is present when there is multiple inflammatory masses within the kidney.
3. *E. coli* is the most common causative organism.
4. ABN usually occurs by ascending infection from the bladder, but can also occur by hematogenous spread to the kidney. Suspect hematogenous spread (usually of gram positive organisms) in intravenous drug abusers and patients with cutaneous infections. In cases of hematogenous spread, signs and symptoms of cystitis may be absent (e.g. no pyuria, no bacteriuria, no growth on urine culture).
5. ABN probably represents a middle ground between uncomplicated pyelonephritis and renal abscess. In other words, renal infection tends to progress from uncomplicated pyelonephritis to ABN to renal or perirenal abscess. 25% of patients with ABN progress to abscess.
6. Up to 50% of patients with ABN have vesicoureteral reflux.

### **Presentation**

1. Clinical and laboratory manifestations are similar to pyelonephritis except patients with ABN are more severely ill than patients with pyelonephritis and 50% have positive blood cultures.
2. Imaging—the affected kidney is usually enlarged (nephromegally). *The affected area within the kidney is solid and shows no liquefaction.*
  - a. CT is the best study for diagnosing ABN. CT shows nephromegally, diminished nephrogram, and *a solid, poorly defined, enhancing mass (focal) or masses (multifocal) that may be misinterpreted as neoplasm.* Enhancement of the affected area is often patchy and/or striated.
  - b. Ultrasound shows nephromegally and a poorly marginated sonolucent mass with internal echoes that disrupt the corticomedullary junction.

### **Work Up**

1. In most cases, these patients are initially diagnosed with pyelonephritis. The severity of their condition or inadequate response to antibiotics (febrile > 72 hours) prompts renal imaging, which reveals ABN.
2. If ultrasound raises the suspicion of ABN, CT with and without intravenous contrast should be performed.
3. Consider obtaining a voiding cystourethrogram (VCUG) after the infection has been completely treated (up to 50% of patients with ABN have reflux).

### **Treatment**

1. Admit the patient to the hospital, obtain blood and urine cultures, and start intravenous fluids.
2. Start broad spectrum intravenous antibiotics. Treat with intravenous antibiotics until the patient is afebrile for 24–48 hours, then change to oral antibiotics and continue oral antibiotics for at least 2 weeks. Adjust the antibiotics based on culture results.
3. *After starting antibiotics, patients with pyelonephritis are usually afebrile within 72 hours, whereas patients with ABN usually remain febrile for more than 72 hours.*

### Classification of Prostatitis

NIH Category	NIH Classification <sup>†</sup>	Classification by Drach, Fair, Meares, & Stamey <sup>‡</sup>	Description	Symptomatic*	Bacteria Cultured From Prostatic Fluid	WBC in Prostatic Fluid
<b>I</b>	Acute bacterial prostatitis	Acute bacterial prostatitis	Acute prostate infection	Yes (local & systemic)	**	**
<b>II</b>	Chronic bacterial prostatitis	Chronic bacterial prostatitis	Recurrent prostate infection	Yes (local only)	Yes	Yes
<b>IIIa</b>	Chronic pelvic pain syndrome: Inflammatory	Chronic nonbacterial prostatitis	Prostate inflammation without infection	Yes (local only)	No	Yes
<b>IIIb</b>	Chronic pelvic pain syndrome: Noninflammatory	Prostodynia	Prostate/pelvic symptoms without infection and without inflammation	Yes (local only)	No	No
<b>IV</b>	Asymptomatic inflammatory prostatitis	—	Incidentally detected on prostate biopsy or other test	No	Maybe	Maybe

WBC = white blood cell

<sup>†</sup> See Urology, 54: 229, 1999.

<sup>‡</sup> See J Urol, 120: 266, 1978.

\* Systemic symptoms include fever and chills. Local symptoms include suprapubic pain, perineal pain, dysuria, urinary frequency, urinary urgency, etc.

\*\* Prostate massage is contraindicated in acute bacterial prostatitis. However, voided urine shows WBCs and positive bacterial culture.

# MALACOPLAKIA & TUBERCULOSIS

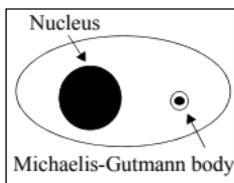
## Malacoplakia

### General Information

1. Malacoplakia means “soft plaque” in greek.
2. The monocyte lysosome helps fight infection by phagocytosis, killing, and degradation of bacteria. Microtubule assembly is essential for proper lysosome function.
3. A current theory suggests that malacoplakia is caused by abnormal microtubule assembly. This impairs the function of monocyte lysosomes, which leads to inefficient killing and degradation of bacteria. Thus, *malacoplakia arises from incomplete eradication of a bacterial infection.*
4. Mortality approaches 100% within 6 months of diagnosis when both kidneys are involved.

### Presentation and Diagnosis

1. Malacoplakia is rare. It usually presents at age > 50 years.
2. Most patients with malacoplakia have a chronic genitourinary infection, usually with *E. coli*. Urine culture is positive in 90% of patients.
3. *Malacoplakia can occur in any part of the genitourinary tract, but it usually occurs in the bladder.*
4. Malacoplakia often presents as a solid mass; therefore, it is often treated as malignancy (i.e. surgical removal).
5. Signs and symptoms depend on the organ involved.
  - a. Bladder malacoplakia—often presents with irritative voiding symptoms and hematuria. Cystoscopy may show a soft yellow or brown plaque.
  - b. Renal malacoplakia—often presents with fever, flank pain, or flank mass. Imaging usually reveals a solid mass, but it may be cystic if necrosis is present. Multifocal or diffuse renal involvement may enlarge the kidney and impair renal function. Additional imaging characteristics:
    - i. Renal ultrasound—hypoechoic or hyperechoic lesion.
    - ii. IVU—mass effect which may displace the calyces.
    - iii. CT scan—low attenuation lesion.
    - iv. Arteriography—hypovascular lesion with peripheral neovascularity.
6. Gross appearance—soft yellow or brown plaques may be present.
7. Histological appearance
  - a. *Michaelis-Gutmann bodies are pathognomonic for malacoplakia.* These lesions may range in appearance from a dot to a *targetoid “owl’s eye”* and may be intracellular or extracellular. The exact etiology of these lesions is unclear; however, they may represent mineralized residual bacterial fragments.
  - b. von Hansemann cells—large mononuclear cells with foamy cytoplasm.
8. Diagnosis requires biopsy (malacoplakia is a pathologic diagnosis).



- Gelnique™ 10% gel packet (oxybutynin gel)—apply one packet of gel topically to dry, intact skin of the abdomen, upper arms, shoulders, or thighs q day (avoid applying to the same site on consecutive days). [gel packet: 1 gram (dispensed in a carton of 30 packets)].
- Gelnique™ 3% gel pump (oxybutynin gel)—apply 3 pumps (84 mg) of gel topically to dry, intact skin of the abdomen, upper arms, shoulders, or thighs q day (avoid applying to the same site on consecutive days). [Metered dose pump bottle: 100 ml (each bottle can dispense 90 pump actuations; each actuation delivers 28 mg; one bottle is a 30 days supply)].
- Goserelin acetate (Zoladex®)—3.6 mg SC q month or 10.8 mg SC q 3 months.
- Histrelin—see Vantas™.
- Hydrochlorothiazide—25-50 mg po q day or BID (for renal leak hypercalciuria or type 1 absorptive hypercalciuria). [Tabs: 25, 50, 100 mg].
- Hyoscyamine (Levsin, Cystospaz, Anaspaz)—0.125-0.375 mg po/sl q 4 hours prn (maximum dose = 1.5 mg/day). [Tabs: 0.125 mg].
- Hyoscyamine extended release (Levsinex Timecaps, Levbid)—0.375-0.750 mg po q 12 hours. [Tabs/Caps: 0.375 mg].
- Hytrin® (terazosin)—start at 1 mg po qHS and slowly titrate up as needed to a maximum dose of 10 mg po qHS. [Tabs: 1, 2, 5, 10 mg].
- Imiquimod (Aldara™)—see Condyloma Acuminatum, page 558.
- Jalyn™—one capsule po q day after a meal [Caps: combination of 0.5 mg dutasteride and 0.4 mg tamsulosin].
- Ketoconazole (Nizoral®)—200-400 mg po TID (androgen deprivation for prostate cancer). [Tabs: 200 mg].
- Leuprolide acetate—see Lupron® (IM injections) and Eligard™ (SC injections).
- Levitra® (vardenafil)—5-20 mg po prn approximately 60 minutes before sexual activity (no more than one dose per day). [Tabs: 2.5, 5, 10, 20 mg].
- Lithostat® (acetohydroxamic acid)—10-15 mg/kg/day divided TID or QID taken po on an empty stomach. [Tabs: 250 mg]. The maximum daily dose is 1.5 grams/day for normal renal function. When the serum creatinine is 1.8-2.4 mg/dl, doses should be given q 12 hours with a maximum dose of 1.0 gram/day. Do not use Lithostat® in patients with a creatinine > 2.5 mg/ml.
- Lupron® (leuprolide acetate)—7.5 mg IM q month or 22.5 mg IM q 3 months or 30 mg IM q 4 months or 45 mg IM q 6 months.
- Magnesium gluconate—500 mg po BID (for hypomagnesiuria). [Tabs: 500 mg]
- Magnesium oxide—140 mg po QID or 400-500 mg po BID (for hypomagnesiuria). [Caps: 140, 250, 400, 420, 500 mg].
- Megace®—see megestrol acetate.
- Megestrol acetate (Megace®)—20 mg po bid (for hot flashes). [Tabs: 20, 40 mg].
- Methenamine—see page 504.
- Mirabegron (Myrbetriq™)—25 mg or 50 mg po q day [Tabs: 25, 50 mg].
- Mitomycin C—40 mg in 20 cc sterile water instilled intravesically (for urothelial carcinoma of bladder; see page 50). [Vials: 40 mg].
- MUSE® (alprostadil)—see page 396 [urethral suppository: 125, 250, 500, 1000 mcg]
- Myrbetriq™ (mirabegron)—25 mg or 50 mg po q day [Tabs: 25 mg, 50 mg].
- Nilandron™—see nilutamide.
- Nilutamide (Nilandron™)—300 mg po q day for 30 days, then 150 mg po q day (for prostate cancer). [Tabs: 50 mg].
- Oxybutynin—see Ditropan® (oral), Oxytrol™ (patch), and Gelnique™ (gel).
- Oxytrol™ (oxybutynin)—one patch applied to dry, intact skin of the abdomen, hip, or buttock every 3 to 4 days (avoid re-application to the same skin site within 7 days). [Patch: 3.9 mg/day].