

*TB or not TB?...that is the  
question!  
Genitourinary Tuberculosis*

Laura Chang Kit, MD  
May 7, 2008

*At the end of this talk, you  
should be able to*

- Understand the significance of GU TB today
- Understand why TB is so virulent
- Understand the pathogenesis of GU TB
- Diagnose GU TB
- Know the clinical manifestations of GU TB
- Manage GU TB including basic medical therapy

## *History*

### *5000 BC - 1800 AD*

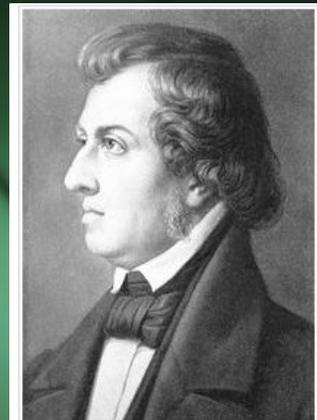
- "consumption"
- "phthisis"
- "scrofula" - King's evil
- vampirism

## *Industrial Revolution (1700-1900)*

- Endemic
- 1/4 deaths in England
- 1880's - contagious
- TB sanitoriums - rich and poor
  - 50% of all who entered died in 5 years
- "white plague"

Guess who???

- Born 1810, Poland
- Child piano prodigy
- Romantic period
- Affair with writer George Sand



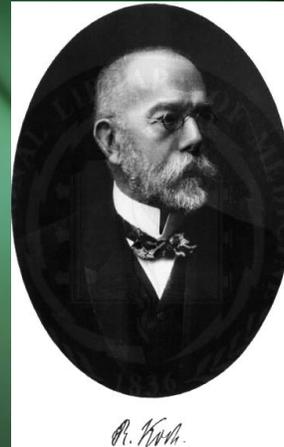
*Frederik Chopin  
died of TB 1849*

## *1882 Koch's postulates*

*Mycobacterium tuberculosis*

1. Present in every diseased case
2. Isolated and grown in pure culture
3. Reproduced in healthy susceptible host
4. Recoverable from experimentally infected host

Noble prize 1905



## *Genitourinary tuberculosis*

- Medlar 1926 pathologist
  - Microscopic bilateral lesions renal cortex
- Bryant 1870
  - Nephrectomy pyonephrosis
- Antituberculous drugs
  - Streptomycin 1944
  - Para-aminosalicylic acid 1946
  - Isoniazid 1952
  - Rifampicin 1966

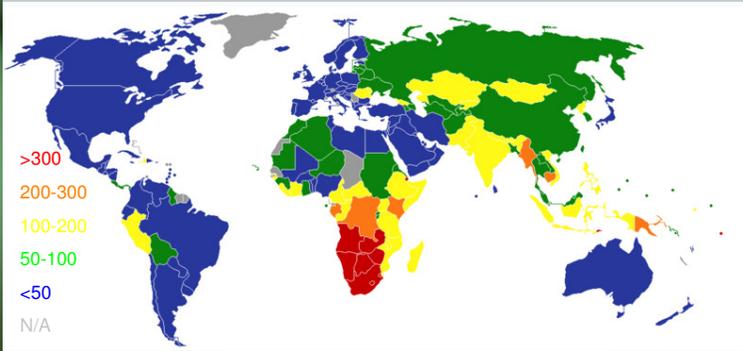
## *Epidemiology*

### *Worldwide*

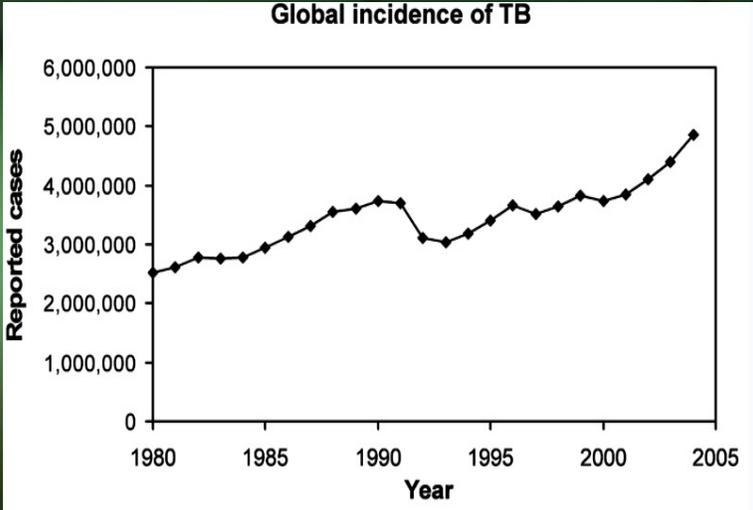
- 1/3 world population infected
  - 2 billion
- 8 million/year become ill
- 2 million/ year die
- >95% cases in developing world
- Single leading cause of death

WHO 2006

# Worldwide Incidence



Cases per 100,000. WHO 2006



Annual number of new reported TB cases. WHO2006.

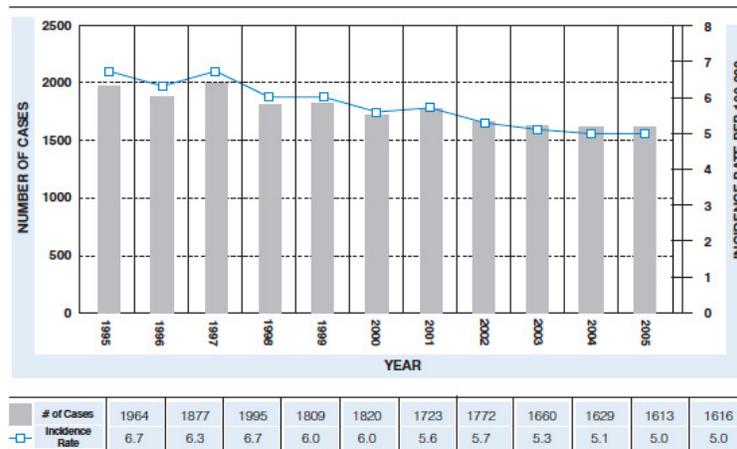
## Why increased incidence?

- HIV/AIDS co-epidemic
- Increased immigration and travel
- Population growth in endemic areas
- Emergence of drug resistant strains
  - Prev tx, non-compliance, country of origin
- Neglect/breakdown of social and health infrastructure

## Canada - Incidence

Constant since 2004 ~5 per 100,000

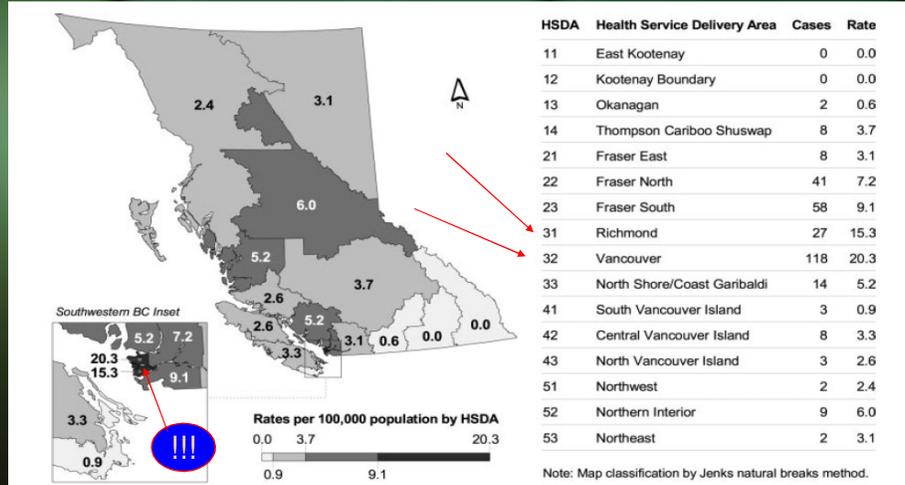
**Figure 11-1** Number of cases and incidence rate (per 100,000) of reported new active and relapsed tuberculosis cases, Canada, 1995-2005



Source: Tuberculosis Prevention and Control, Public Health Agency of Canada

# BC - Incidence

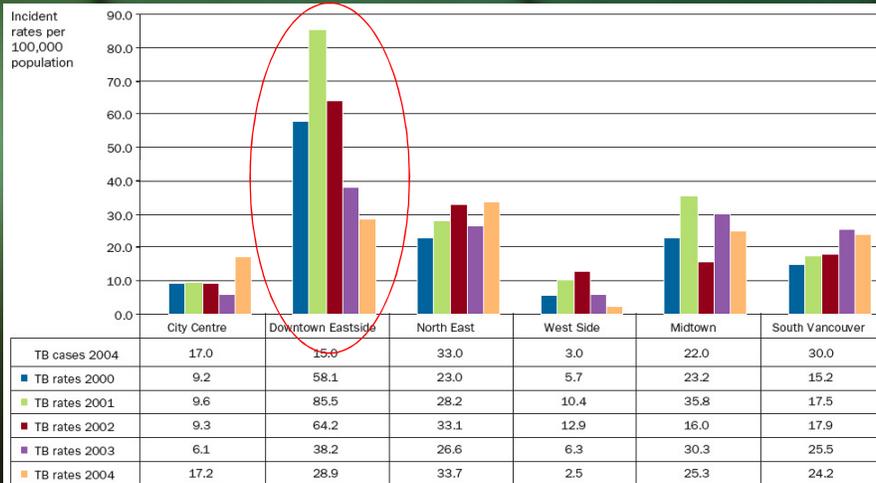
Higher than national average ~7.4 per 100,000 in 2004  
 3% overall decrease since 2003



BCCDC 04

# Sub-Vancouver - Incidence

Highest in Downtown Eastside  
 Increase in City Centre, North East

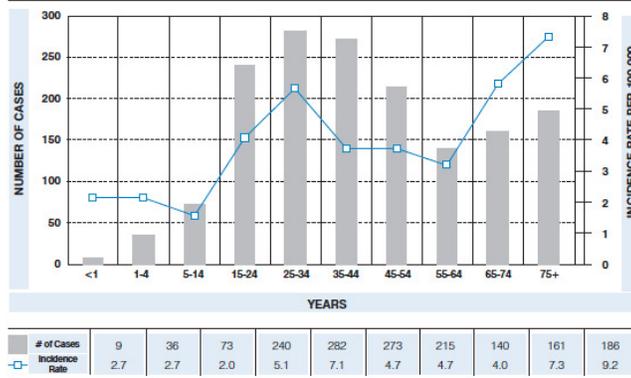


BCCDC 04

# Canada - Age group

Two peaks 25-34 and over 65

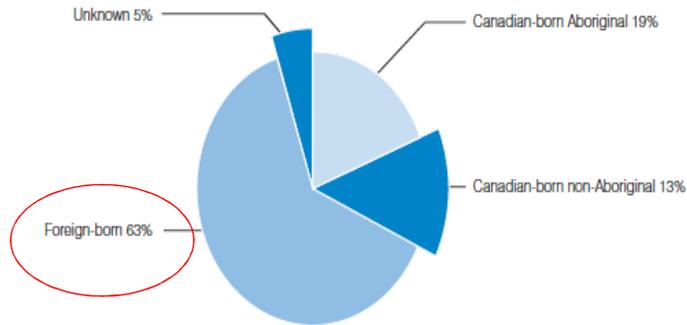
**Figure 11-2** Number of cases and incidence rate (per 100,000) of reported new active and relapsed tuberculosis cases by age group, Canada, 2005



Source: Tuberculosis Prevention and Control, Public Health Agency of Canada

# Canada - Birthplace

**Figure 11-3** Proportion of reported new active and relapsed tuberculosis cases by birthplace, Canada, 2005



Source: Tuberculosis Prevention and Control, Public Health Agency of Canada

## *Risk factors*

- Close contact with known/suspected case
- Immunocompromised
  - HIV/AIDS, steroids, DM, malignancy, renal failure
- Travel/immigration from endemic areas
- "Urban poor"
  - Aboriginal communities, homeless
- Crowded
  - Prisons, refugees, long term care facilities
- Persons who work with any of these groups

## *HIV and TB*

- 12-50% HIV deaths caused by TB
- 1/3 HIV co-infected
- 50x more likely to develop active TB in lifetime (10%/year)
  - Non-HIV 10% lifetime
- 90% die within 2-3 mos, if no tx
- "co-epidemic"

# Genitourinary TB

- 1.2% primary TB
- 6% extrapulmonary TB (US 2003)
- 15-20% extrapulmonary TB (worldwide 1999)

Table 14-1 -- New York City Department of Health: 1999 Tuberculosis Cases by Primary Site of Disease

	No. Cases	%
<i>Tuberculosis Cases by Primary Site of Disease</i>		
Pulmonary	1073	73.5
Lymphatic	152	10.4
Pleural	69	4.7
Miliary	38	2.6
Bone or joint	36	2.5
Meningeal	22	1.5
Genitourinary	17	1.2
Peritoneal	12	0.8
Other	41	2.8
Total	1460	100.0
<i>Tuberculosis Cases by All Sites of Disease</i>		
Only pulmonary disease	998	68.4
Only extrapulmonary disease	287	19.7
Both pulmonary and extrapulmonary	175	12.0
Total	1460	100.0

From New York City Department of Health: Tuberculosis in New York

# Microbiology

## *Mycobacterium species*

5 closely related species causing TB:

*M. tuberculosis*

- No animal reservoirs
- Airborne

*M. bovis*

- GI via unpasteurized milk
- Can be airborne
- BCG, vaccine

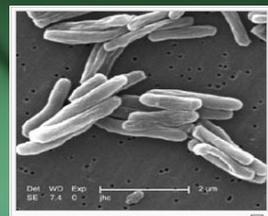
*M. africanum*

*M. canetti*

*M. microti*

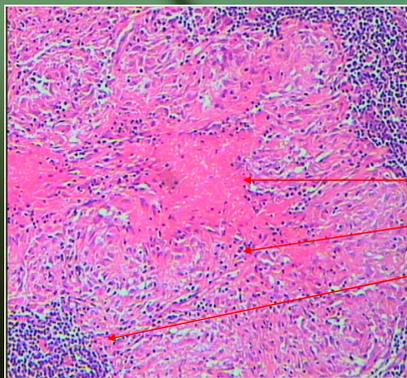
## *M. tuberculosis*

- Obligate anaerobe
- Gram-positive
- Thick, waxy cell wall
  - Acid-fast
  - **Survive alveolar mφ**
  - Caseous granuloma
- Divide q15-20 HRS
- 3-6 weeks culture



## *Caseous granuloma*

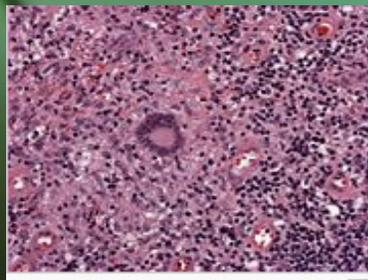
1° TB Ghon complex =  
granuloma + enlarged LN



Caseous necrosis, surrounding  
Epithelioid cells (mφ)  
Mature reactive T cells  
Langhan's giant cells

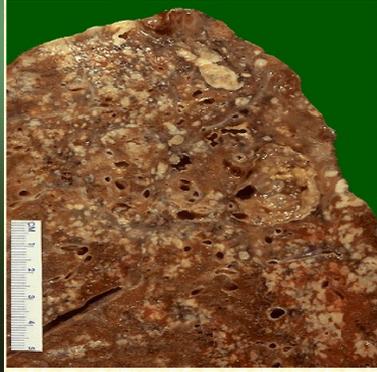
## *Langhan's giant cell*

- Mycobacterial infections
- Formed by fusion of macrophages (epithelioid cells)
- Multiple nuclei in horseshoe shape



## Miliary TB

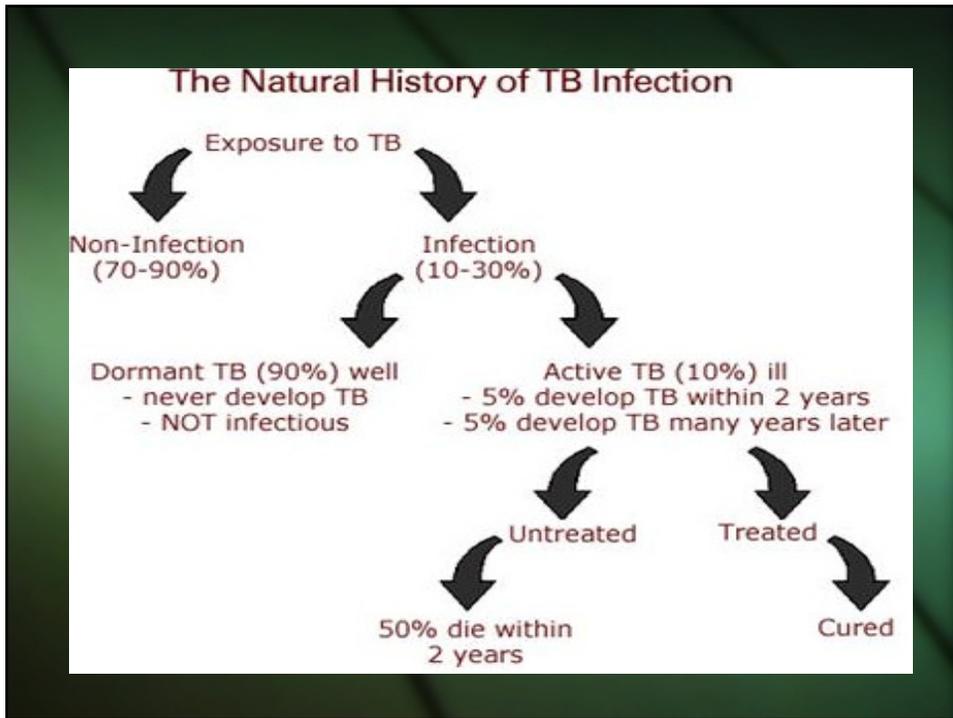
Erosion into lymphatic or blood vessel leads to lung dissemination



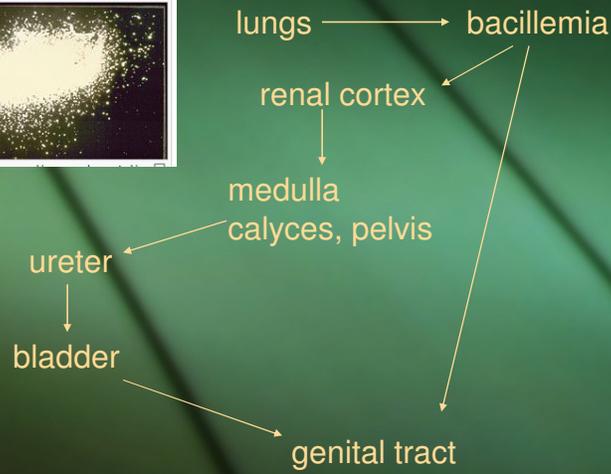
## Sneaky bugger...

- Thick cell wall
  - Multiplies in macrophages, not digested
- No known endotoxins or exotoxin
  - No immediate host response to infection
  - 2-12 wks before  $10^3$  activates cellular immunity
- Travels via lymphatics to hilar LN -> bloodstream -> distant sites (before cellular immunity develops)
  - Bone, brain, kidney, upper lung - fertile land!!!
  - Liver, spleen, bone marrow - seeded but resistant to multiplication

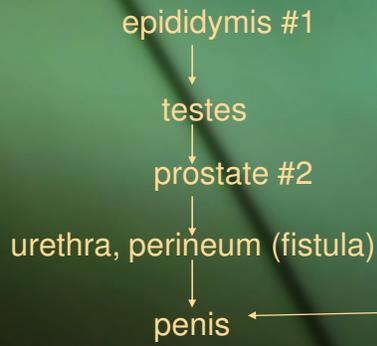
# Pathogenesis



# Pathogenesis of GU TB



# Pathogenesis of GU TB



penis ← rare → cervix

## *GU TB principles*

- Incubation period 13-30 years
- Only 50-70% GU TB have history of TB
- ~25% GU TB have N CXR
- Local, not systemic symptoms
- Clinically unilateral but pathologically bilateral
- Spread by contiguity
- Uncommon in children (long latency)

## *Clinical Presentation*

## *Clinical Presentation*

### History - key

- Male (5:3)
- 20-45 yrs, >60yrs
- Intermittent
- Painless frequency, nocturia
- Ureteral colic (flake of Ca or clot)
- Hematuria 10% gross, 50% microscopic
- Females: pelvic pain, infertility, irregular menses

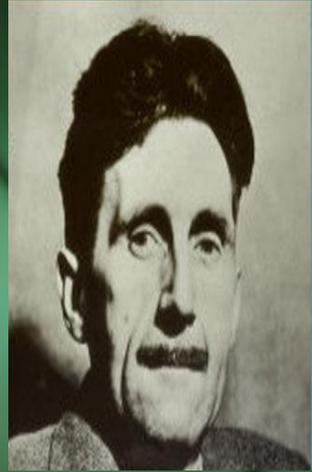
## *Clinical Presentation*

### Physical exam

- Usually NO systemic sx
- Chest sx
- Flank mass
- Testicular/epididymal swelling
- Hydrocele
- Perineal sinus
- Beading of spermatic cord

Guess who?

- Born 1903, India
- Aka Eric Arthur Blair
- Author "1984" and "Animal Farm"



*George Orwell  
died of TB 1950*

*Diagnosis*

## *Diagnosis*

- Hx - symptoms, TB history
- PE
- PPD skin test
- Urinalysis
- Serial AM urine -> AFB, culture
- Urine PCR
- CXR
- Imaging - IVU, CT

## *Purified Protein Derivative Test*

- Mantoux, Pirquet, tuberculin sensitivity test
- Delayed hypersensitivity reaction
- Glycerine extract of tuberculin (Ag)
- Intradermal injection
- Measure induration 48-72hrs later
- 3 cut points to improve specificity

### GUIDELINES FOR DETERMINING A POSITIVE TUBERCULIN SKIN TEST REACTION

Induration $\geq$ 5 mm	Induration $\geq$ 10 mm	Induration $\geq$ 15 mm
HIV-positive persons	Recent arrivals (< 5 yr) from high-prevalence countries	Persons with no risk factors for TB
Recent contacts of TB case	Injection drug users Residents and employees* of high-risk congregate settings: prisons and jails nursing homes and other health care facilities, residential facilities for AIDS patients, and homeless shelters Mycobacteriology laboratory personnel	
Fibrotic changes on chest radiograph consistent with old TB	Persons with clinical conditions that make them high-risk: silicosis diabetes mellitus, chronic renal failure, some hematologic disorders (e.g., leukemias and lymphomas), other specific malignancies (e.g., carcinoma of the head or neck and lung), weight loss of > 10% of ideal body weight, gastrectomy, jejunioileal bypass	
Patients with organ transplants and other immunosuppressed patients (receiving the equivalent of > 15 mg/d Prednisone for > 1 mo)	Children < 4 yr of age or infants, children, and adolescents exposed to adults in high-risk categories	

\* For persons who are otherwise at low risk and are tested at entry into employment, a reaction of > 15 mm induration is considered positive.

## PPD test

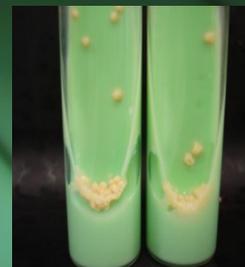
- Positive test means TB infection NOT necessarily TB disease
- Negative skin test does NOT r/o TB (88% sens)
- BCG vaccine does NOT make test positive except when administered <5yrs

## *BCG Vaccine*

- Live attenuated strain of *M. bovis*
- Bacille Calmette - Guerin
  - Albert Calmette and Camille Guerin 1919
- 80% effective, lasts 15 years\*
- Deltoid IM injection
  - Local skin reaction, keloid scar, poss abcess

## *Urine exam*

- Urinalysis
  - Microscopic hematuria 50%
  - Sterile pyuria classic
- Urine culture and smear
  - 3 to 5 early AM samples
    - Intermittently excreted
  - AFB smear often negative (50% sn, 89% sp)
  - ~20% - 2° bacterial infection (coliforms)
  - Culture (65-85% sn, 100% sp)
    - 6-8 wk on solid medium Lowenstein-Jensen
    - 1-3 wk on liquid medium Middlebrook
  - **Seminal fluid, vaginal cultures usually negative - unreliable**



## *Urine PCR*

- High sn (96%), sp (98%)
- 6 hours
- Highest sensitivity
  - cultures (37%)
  - bladder biopsies (46%)
  - intravenous pyelography (IVP) (88%)
  - PCR (95%)

Hemal et al, Oct 00

## *Imaging*

- High dose IVU - traditional gold standard
- CT - new standard
- Pyelography ante/retrograde - limited use
- Plain Radiographs - important
  - CXR, spine XR, KUB XR
- US - limited value
  - Monitor size of lesions/bladder capacity
  - Scrotum
- Nuclear perfusion scans - function
- MRI, arteriography - little application

## *IVU*

- Advantage over CT
  - More sens for urothelial mucosal changes
- Fibrosis/length of stricture
- Ureteral peristalsis, kidney function
- Calyceal distortion
- Calcifications
- Collecting system dilatation
- Bladder volume, filling defects, wall
  
- Findings NOT specific - "clinical correlation required"

## *CT*

- Advantage over IVU
  - identify extrapulmonary manifestations
    - adrenal, prostatic, SV necrosis or caseation
  - More sensitive for calcifications

## *Retrograde Pyelography*

### Indications

1. Stricture at lower end of ureter
  - Length/amt of obstruction/dilatation
  - Can place stent at same time prn
2. Ureteral catheterization for selective renal urine cultures

## *Antegrade Pyelography*

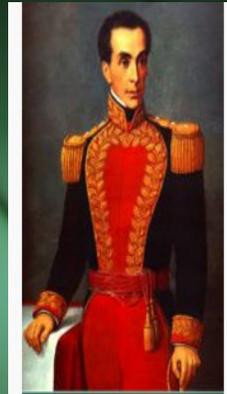
- Retrograde access not possible
- Aspirate pelvic urine, cavities
- Placement of nephrostomy tube

## *Endoscopy*

- Rarely indicated
- Monitor response to treatment
- GA w/ muscle relaxant -risk of hemorrhage
- Bx to r/o malignancy
  - not advised prior to medical tx
  - contraindicated in acute TB cystitis
- Ureteroscopy to assess ureteral anatomy

Guess who???

- Born 1783, Caracas
- "El Libertador"
- President of Gran Colombia including Peru, **Bolivia**



*Simón Bolívar  
died of TB 1830*

## Clinical Manifestations

*G.J. Wise, V.K. Marella / Urol Clin N Am 30 (2003) 111–121*

113

Table 1  
Urologic manifestations of tuberculosis

Organ site	Clinical manifestations
Adrenal glands	Adrenal insufficiency
Kidneys	Persistent hematuria and pyuria, colic, calcifications, caliectasia, renal failure
Ureters	Scarring, strictures
Urinary bladder	Ureteral meatal stenosis, lower urinary tract symptoms, contracted bladder
Prostate and urethra	Urethritis with ulcers, urethral stricture, prostatitis
Reproductive system	Epididymis and ejaculatory duct scarring, seminal vesicle atrophy
Penis	Penile ulcers (sexually transmitted)
Scrotum	Painful scrotal mass with granulomatous epididymitis
Perineum	Abscess, fistula

## Adrenal TB

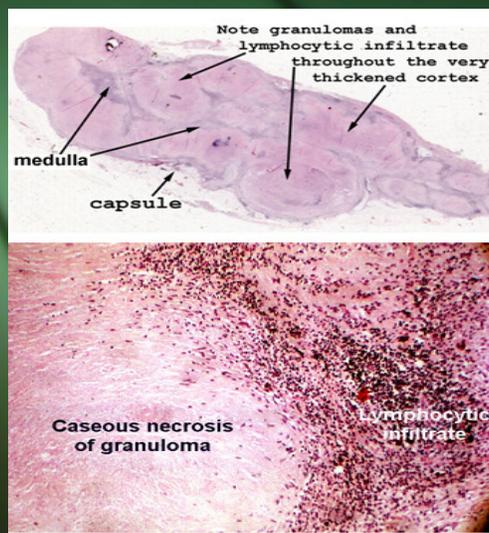
### Clinical

- Adrenal insufficiency (Addison's diz)

### Imaging

- Bilateral and asymmetrical
- Non-specific appearance
- Necrosis of gland
- Calcification, atrophy late

## Adrenal TB

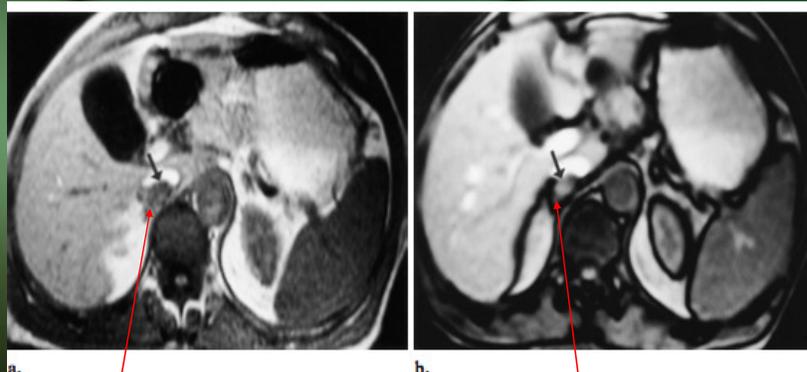


# Adrenal TB



Figure 14. Adrenal tuberculosis in a 57-year-old

# Adrenal TB



a. R adrenal mass  
In phase

b. Maintains signal intensity  
Out of phase (non sp)

## *Upper Tract TB*

Kidney  
Ureter

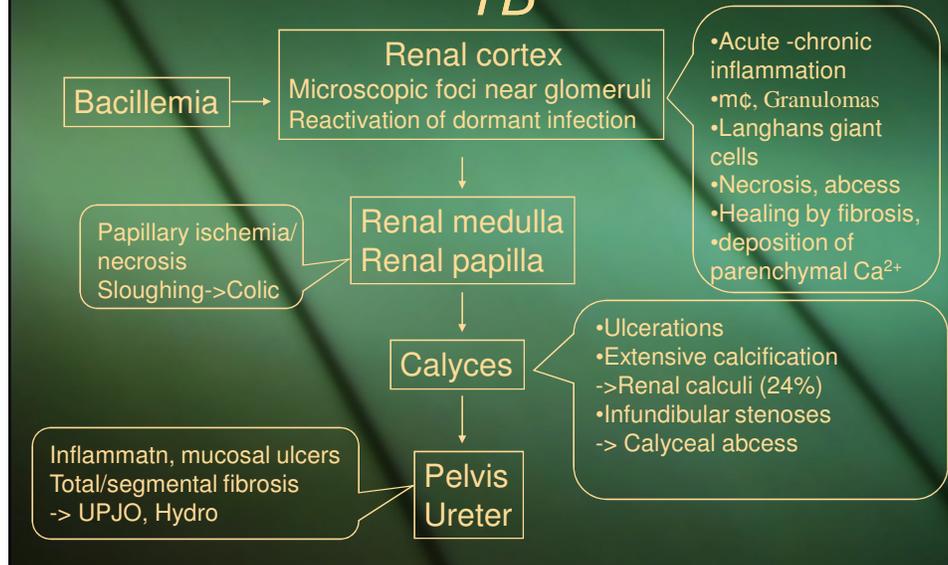
## *Upper Tract TB*

### Clinical

- Hematuria, pyuria
- Colic
- Renal failure
  - Obstructive uropathy
  - Intrinsic parenchymal infection

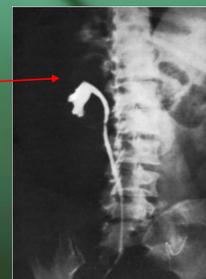
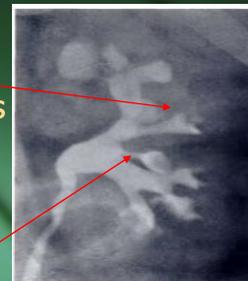


## Pathophysiology of Upper Tract TB



## Renal TB

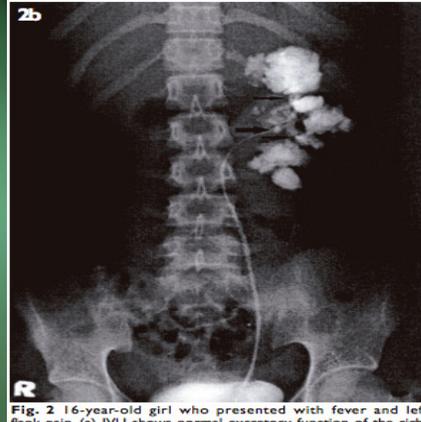
- Early **“moth-eaten” calyces**
- Cavitations of papillary necrosis
- Filling defects (calcified)
- Hydro/pyonephrosis
  - Papillary necrosis ->Debris in collecting system
- Calyceal dilatation, infundibular stricture/stenosis
  - **“phantom calyx”**  
total calyceal stricture



## Renal TB



IVU faint outline of enlarged kidney  
**L autonephrectomy!**

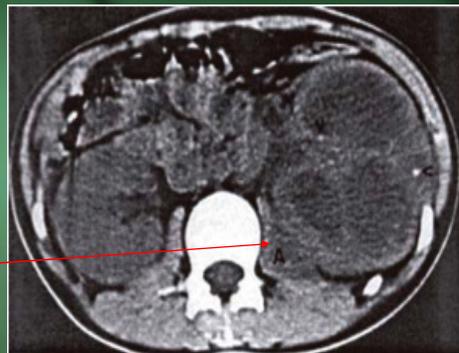


**Fig. 2** 16-year-old girl who presented with fever and left flank pain. (a) IVU shows normal excretory function of the right

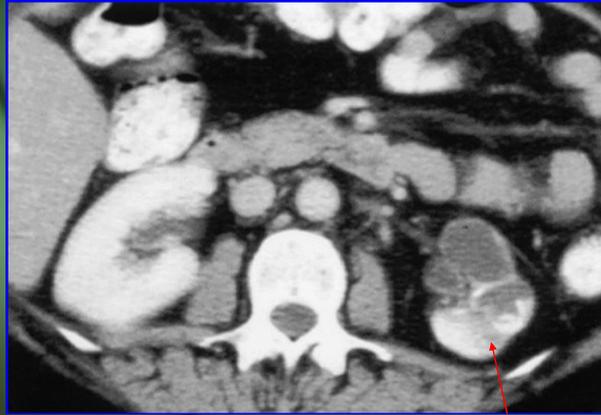
RP: calyceal dilatation, infundibular stenoses, contracted pelvis

## Renal TB

- CT of same pt
- Calyceal dilatation
  - Marked cortical thinning
  - L psoas abscess
  - Multiple  $\text{Ca}^{2+}$



## Renal TB



Late atrophic, dystrophic calcification - **putty kidney**

## Ureteral TB

- Extension from kidney
- Fibrosis, stricture
- Most common site UVJ then distal ureter
- UVJ stricture usually <5cm
- Rare UPJ, midureter



## Ureteral TB

- Initial dilatation and ragged irregularity of lumen
- “sawtooth appearance”
- Mucosal erosions, ulcers



- Later, ureter may become straight rigid tube
- “pipestem ureter”
- Fibrosis, calcification wall (rare)
- shortens

## Ureteral TB

- Healing with associated fibrosis may produce a “**beaded**” or “**corkscrew**” ureter

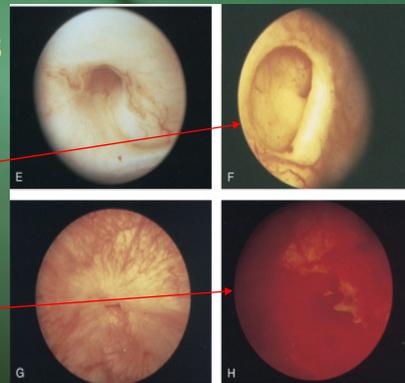


## *Lower Tract TB*

Bladder  
Urethra

## *Bladder TB*

- Starts around orifice (descending infection)
- Inflammatory bullous edema
- Foll by granulation
- "Golf-hole orifice"
  - Withdrawn, fibrotic, dilated
- Ulcers rare

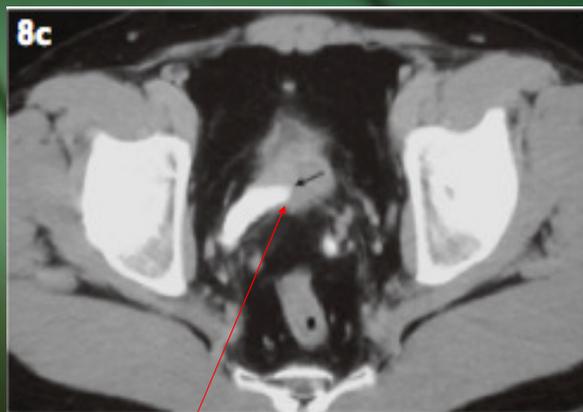


## *Bladder TB*

- Calcification in wall
- Thick, reduced capacity bladder
- "thimble bladder"**



## *Bladder TB*



R U/O stricture  
Thimble bladder

## *Urethral TB*

- Rare despite constant exposure to infected urine
- Usu from *prostate*
- Initial urethral discharge
- Beefy redness of inflamed urethra
- Superficial ulcerations
- Dilatation of prostatic urethra
- Urethral strictures

## *Male Genital TB*

Epididymis  
Testis  
Prostate  
Penis

## *Epididymal TB*

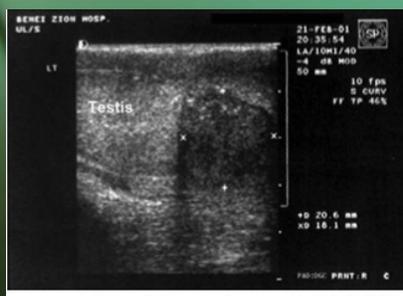
- Rare but #1 site of genital TB
- May be first and only site of GU TB
- 50-75% genital TB will have abnormal urinary tract - MUST INVESTIGATE!
  
- Hematogenous primarily
- Globus minor alone affected in 40%
  - Most blood supply

## *Epididymal TB*

- Young, sexually active males (infertile)
- 70% have previous TB history
- Infertility
- Hematospermia
- Painless epididymal nodule or thickening
- Painful swelling of scrotum
  - Acutely usually epididymorchitis

## *Epididymal TB*

- Diffusely/nodularly enlarged hetero/homogeneously hypoechoic lesions (granulomas)



## *Testicular/Scrotal TB*

- Usually assoc with TB epididymitis
- Direct extension from epididymis
- Sinuses/fistulae to scrotum
  - “watering can” scrotum
  - Abscesses
  - Thickened skin
- Calcifications
- Hydrocele

## *TB Epididymo-orchitis*

Nodular enlargement  
head, tail epididymis  
Caseous granulomas

Heterogeneously  
hypoechoic lesions  
in testis

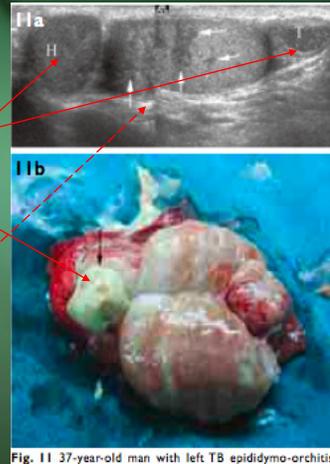


Fig. 11 37-year-old man with left TB epididymo-orchitis.

## *Epididymal TB & Infertility*

- Obstructive azospermia
  - Epididymal scarring
  - Multiple vasal obstructions
- Not amenable to surgery
- IVF/ICSI required
- Sperm retrieval and ICSI in non-TB vs TB obstructive azospermia similar outcomes:
  - Embryo quality, pregnancy (Moon et al 99)

## *Prostatic TB*

- Uncommon
  - Incidental finding post TURP
- Hematogenous primarily
- “Golf hole” dilatation of prostatic duct
- Nodular prostate - mimic ca
  - Disappears after adequate tx
- Cavitation -> perineal sinus, fistulae

## *Penile TB*

- Uncommon
- Routes
  - Hematogenous
  - Ritual circumcision (pulm)!
  - Conjugal spread
- Superficial ulcer of glans
- Solid nodule
- Can cause cavernositis with urethral involvement
- R/o ca, other infections



## *Female Genital TB*

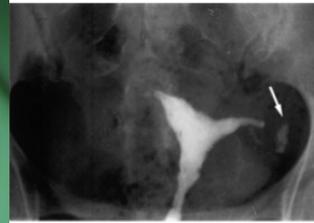
Fallopian tubes  
Ovaries  
Uterus  
Cervix

## *Female Genital TB*

- Amenorrhea
- Menstrual irregularities
- Pelvic pain
- infertility

## *Female Genital TB*

- Hydro/pyosalpinx
- Tuboovarian abscess
- Hysterosalpingogram
  - Ca<sup>2+</sup> tubes, ovaries
  - “beaded” and “rigid pipe” tubes
  - Tubal obstruction
    - most common
  - Tubal dilatation
  - Peritubular adhesions
  - Endometrial adhesions



## *Management*

Medical  
Surgical

## Medical

- MULTI-DRUG therapy!!
  - Decrease length of course
  - Decrease drug resistance
- Treatment as for pulmonary TB and other extrapulmonary TB
- 6-9 months of therapy
- 6 month = 9 month except for TB osteomyelitis, TB meningitis, disseminated TB

## Medical

- ACTIVE TB - standard "short course"
- 3-4 drugs for 2 months (RIPE); foll by 2 drugs for 4 months

**Rifampin**

**Isoniazid (INH)**

**Pyrazinamide**

**Ethambutol or Streptomycin**

Daily x 2mos

- Foll by INH and Rifampin - 2-3x/wk

- LATENT TB - 6-9 mos isoniazid only

Drug/Formulation	Adult Dosage (Daily)	Main Adverse Effects
<b>First-Line Drugs</b>		
Isoniazid (INH)*	5 mg/kg (max 300 mg) PO, IM, IV	Hepatic toxicity, peripheral neuropathy
100, 300 mg tabs		
50 mg/5 mL syrup		
100 mg/mL injection		
Rifampin (Rifadin, Rimactane)	10 mg/kg (max 600 mg) PO, IV	Hepatic toxicity, flu-like syndrome, pruritus
150, 300 mg caps		
600 mg injection powder		
Rifabutin(†) (Mycobutin) 150 mg caps	5 mg/kg (max 300 mg) PO	Hepatic toxicity, flu-like syndrome, uveitis, neutropenia
Pyrazinamide 500 mg tabs	20-25 mg/kg PO	Arthralgias, hepatic toxicity, hyperuricemia, gastrointestinal upset
Ethambutol(‡) (Myambutol) 100, 400 mg tabs	15-25 mg/kg PO	Decreased red-green color discrimination, decreased visual acuity
<b>Second-Line Drugs</b>		
Streptomycin[§]	15 mg/kg IM (max 1 g)	Vestibular and auditory toxicity, renal damage
Capreomycin (Capastat)	15 mg/kg IM (max 1 g)	Auditory and vestibular toxicity, renal damage
Kanamycin (Kantrex and others)	15 mg/kg IM, IV (max 1 g)	Auditory toxicity, renal damage
Amikacin (Amikin)	15 mg/kg IM, IV (max 1 g)	Auditory toxicity, renal damage
Cycloserine[¶] (Seromycin and others)	10-15 mg/kg in two doses (max 500 mg bid) PO	Psychiatric symptoms, seizures
Ethionamide (Trecator-SC)	15-20 mg/kg in two doses (max 500 mg bid) PO	Gastrointestinal and hepatic toxicity, hypothyroidism
Ciprofloxacin (Cipro and others)	750-1500 mg PO, IV	Nausea, abdominal pain, restlessness, confusion
Ofloxacin (Floxin)	600-800 mg PO, IV	Nausea, abdominal pain, restlessness, confusion
Levofloxacin (Levaquin)	500-1000 mg PO, IV	Nausea, abdominal pain, restlessness, confusion
Gatifloxacin[††] (Tequin)	400 mg PO, IV	Nausea, abdominal pain, restlessness, confusion
Moxifloxacin[†††] (Avelox)	400 mg PO, IV	Nausea, abdominal pain, restlessness, confusion
Aminosalicylic acid (PAS; Paser)	8-12 g in 2-3 doses PO	Gastrointestinal disturbance

From The Medical Letter: Drugs for Tuberculosis. Treatment Guidelines from The Medical Letter, 2004 ;28:83-88.

## Follow-up

- Considered cured by 6 mos
  - ~ 2-3% relapse rate
- F/U 3, 6, 12 mos AFTER chemotx
  - 3 consecutive AM samples cultured at EACH visit
  - LFTs
  - IVP

## *Corticosteroids*

- Use anecdotal
- ↓ inflammation, stricture formation
- Only proven for TB meningitis, TB pericarditis
- Prednisolone 20mg tid,taper 4-8 wks

## *Response*

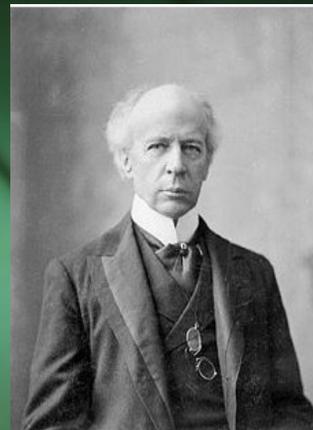
- Sterile urine after 2 wks chemotx for renal TB
- But 50% show active TB on histology
- High response to short course 2°
  1. Fewer bugs in renal TB than pulmonary
  2. High concentrations RIPS urine
  3. INH, rifampin pass freely into renal cavities in high concentrations
  4. All first-line drugs reach adequate levels in kidneys, ureters, bladder, prostate

## *Drug resistance*

- MDR-TB - resistant to INH AND rifampin
- XDR-TB "extensively" DR=MDR-TB + quinolone resistance + resistance to kanamycin, capreomycin, amikacin (HIV)
- Mortality 80%
- 2% (97 WHO), 1.6% (05 Canada)

Guess who???

- Born 1841
- 7th prime minister (1896-1911) \$5 bill
- Quebec born
- Longest consecutive tenure as PM 15yrs



*Sir Wilfred Laurier  
died of TB 1919*

## *Rifampin*

- Bactericidal
- Inhibits RNA transcription (blocks RNA polymerase)

### Side effects

- Significant drug interactions (CYP450)
  - ↑ metabolism OCP, warfarin, cyclosporine, tacrolimus
  - Anti-retroviral interactions
- Hepatotoxic, flu-like sx
- CNS effects - headache, fever, ataxia
- Orange bodily fluids (stain contacts)

## *Isoniazid*

- Isonicotinic acid hydrazide (INH)
- Bactericidal
- Inhibits mycolic acid synthesis

### Side effects

- 10-20% hepatitis in 6-8 wks tx
  - transaminases prior to chemotx
- Peripheral neuropathy, encephalopathy
  - Pyridoxine supplementation

## *Pyrazinamide*

- Bactericidal
- Inhibits fatty acid synthesis

### Side effects

- Hepatotoxic #1 culprit in cocktail
- Arthralgia - most common
- Hyperuricemia - gout

## *Ethambutol*

- Bacteriostatic - (the only one)
- Inhibits cell wall synthesis

### Side effects

- Optic neuritis - colour blindness, blurred vision (reversible early)
- Hyperuricemia (like P) - gout

## *Streptomycin*

- Aminoglycoside (like gentamicin)
- Bacteriocidal
- Inhibits protein synthesis

### Side effects

- Ototoxic - vestibular
- Nephrotoxic

## *Surgical*

- **Adjuvant** to medical therapy
- Organ preservation and reconstruction rather than excision
- Only after 4-6 wks chemotx

## *Excisional techniques*

- Nephrectomy
- Partial nephrectomy
- Abscess drainage
- Epididymectomy

## *Nephrectomy*

### Indications

1. Extensive disease in whole kidney, with HTN and UPJO
2. Coexisting renal carcinoma
3. Non-functioning kidney +/- calcification

50% of nephrectomy specimens show active TB despite sterile urine after chemotx (Osterhage et al, 1980)

## *Nephrectomy*

- Open approach most common
  - Inflammation, scarring
  - Increased perihilar LN and abnormal hilum 55% (Manohar et al, 07)
- Laparoscopy possible in experienced hands (Hemal et al, 00)
  - Comparable OR time, blood loss, convalescence to other simple lap nx (Chibber et al, 05)

## *Partial Nephrectomy*

### Indications

1. Localized polar lesion with calcification which fails to respond after 6 wks intensive chemotx
2. Area of calcification slowly increasing in size and threatening to destroy whole kidney

Not justified in absence of calcification - can treat effectively with chemotx

## *Abscess Drainage*

- Open drainage not necessary
- Percutaneous drainage adequate with medical therapy

## *Epididymectomy*

Indications for scrotal exploration:

1. Caseating abscess not responding to chemotx
2. Firm swelling unchanged or slowly increased in size despite antibiotic or anti-TB chemotx

6% risk of testicular atrophy

5% risk of orchiectomy

Scrotal approach

## *Reconstructive Surgery*

- Ureteral strictures
- Augmentation cystoplasty
- Urinary conduit diversion
- Orthotopic neobladder

## *Ureteral Strictures*

- Decompress acutely and during medical therapy
  - Stent/PCN
- Recur often
  - Regular imaging f/u
- UPJ
- Mid - rare
- Distal #2
- UVJ #1

## *Ureteral Strictures*

Stent/PCN during medical rx

↓ renal loss, ↑ chance of reconstruction

- Ureteral strictures in 84 renal units (Shin et al 02)
  - Meds alone (37 RU)
  - Meds + stent (28 RU)
  - Meds + PCN (19 RU)
- Nephrectomy rate
  - 73% meds alone vs 34% stent/PCN
- Reconstruction rate
  - 8% meds alone vs 49% stent/PCN
- Spontaneous resolution of stricture ~19% both

## *UPJ strictures*

- Perc NT advantage - can irrigate meds into pelvis
  - Rarely necessary since UPJ stricture associated with complete kidney destruction
- Endopyelotomy/dilatation
- Pyeloplasty

## *Mid/distal strictures*

- Edema -can resolve with chemotx alone
- Monitor with IVU or CT during tx
- No change
  - after 3 wk chemo -> try steroids
  - after 6wks chemo-> dilatation or reimplantation

## *Distal ureter/UVJ*

- UVJ obstruction - 9% GU TB
- <5cm starting at UO
- Excise entire stricture
- Reimplantation
  - Non-refluxing technique
  - Submucosal tunnel >2cm
  - Difficult in TB cystitis bladder (contracted)
- >5cm ->psoas hitch, boari flap
- Avoid diseased bladder (usu periorifice)

## *Bladder augmentation*

- Indications
  - Intolerable frequency with pain, urgency, hematuria
  - Capacity < 100cc
  - Creatinine clearance > 15ml/min

## *Urinary Diversion*

- Indications for permanent conduit diversion
  - Intolerable diurnal sx with incontinence not responsive to chemotx or bladder dilatation
  - Psychiatric disturbance or obvious subnormal intelligence (precludes augment)
  - Enuresis not related to small capacity
- Orthotopic diversion possible in select population

## *Take home messages*

TB or not TB?

## *The answers...*

- High incidence, prevalence TB
- GU TB uncommon, 1° immigrants
- "The Great Pretender"
- Serial am urine samples x 3
- Granulomas, calcification, fibrosis
- Can't go wrong with CT (except testes)
- Medical Rx (RIPES) #1 - good response
- Surgery adjunct

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