Adult Urological Disorders

Surgery Team
MED 433

MED 433

Objectives :

1. Assessment: General points , Investigation

2. Upper Urinary Tract (Kidney And Ureter)

- Anatomy
- Physiology
- Renal And Ureteric Calculi
- Upper Tract Obstruction
- Pelviureteric Junction Obstruction (Idiopathic Hydronephrosis)
- Retroperitoneal Fibrosis

3. Lower Urinary Tract (Bladder, Prostate And Urethra)

- Anatomy
- Physiology
- Benign prostatic hyperplasia

4. Disorders of micturition- incontinence

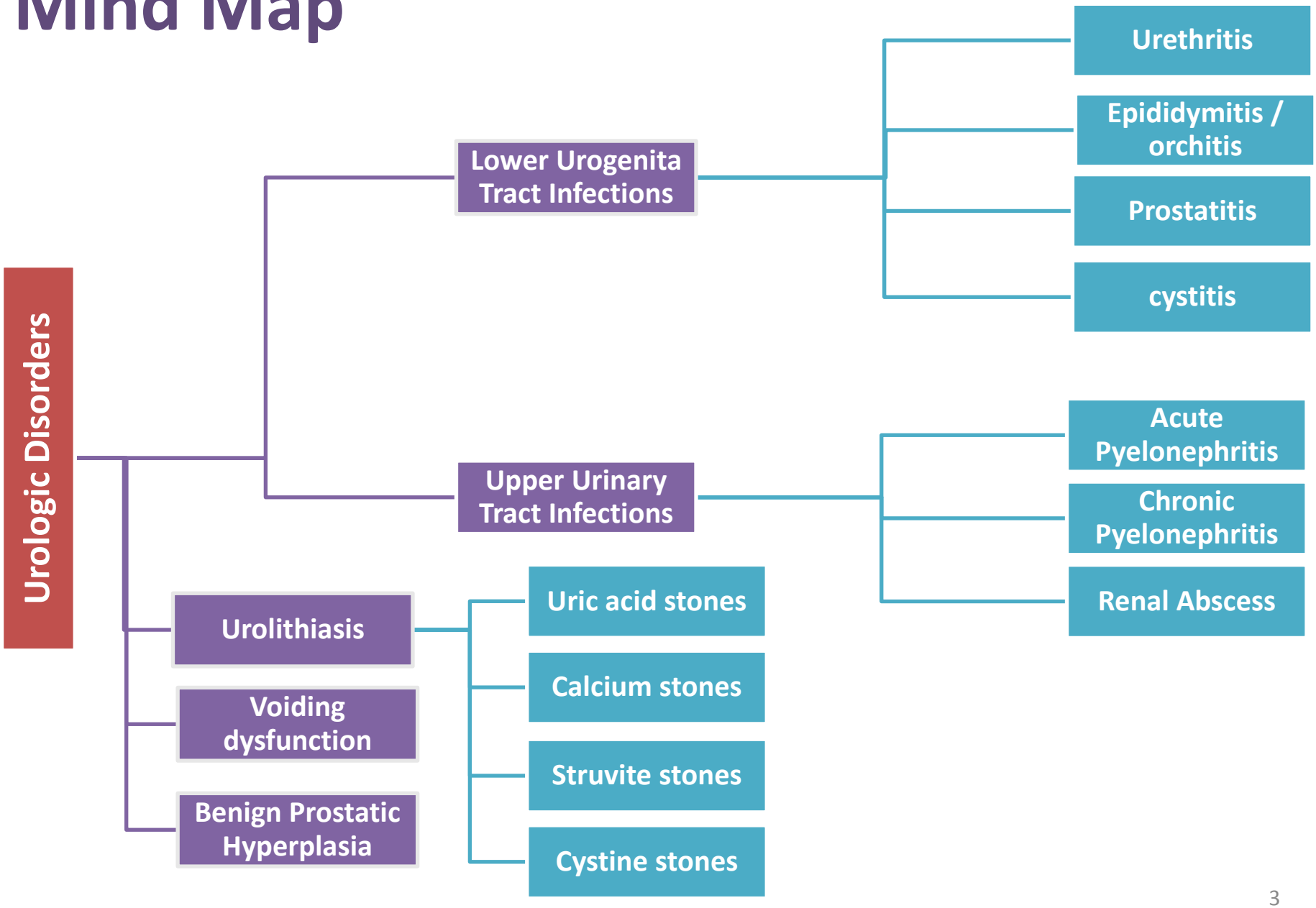
- **Structural Disorders**
- **Neurogenic Disorders**
- **Principles Of Management**

5. External Genitalia : Epididymo-orchitis

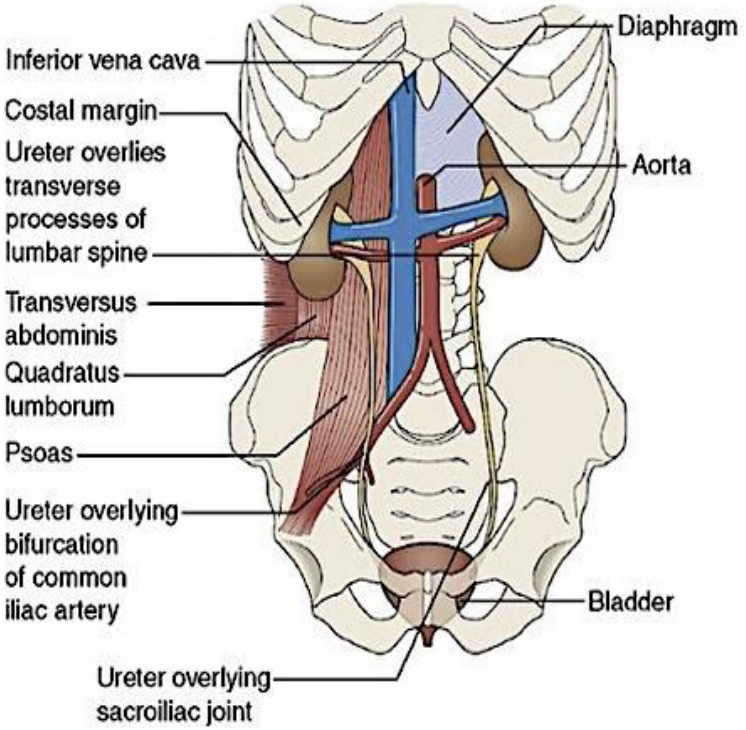
Sources : Slides, Raslan's Notebook and Principles & Practice of Surgery by: O. James Garden

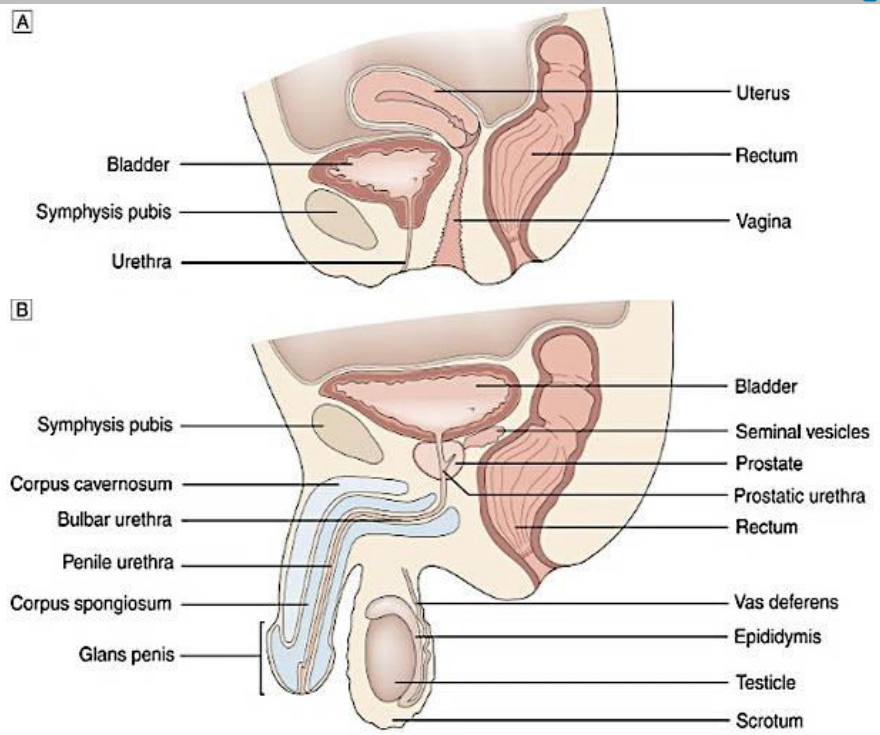
Color Index : Slides & Raslan's | Textbook | Doctor's Notes | important| Extra Explanation

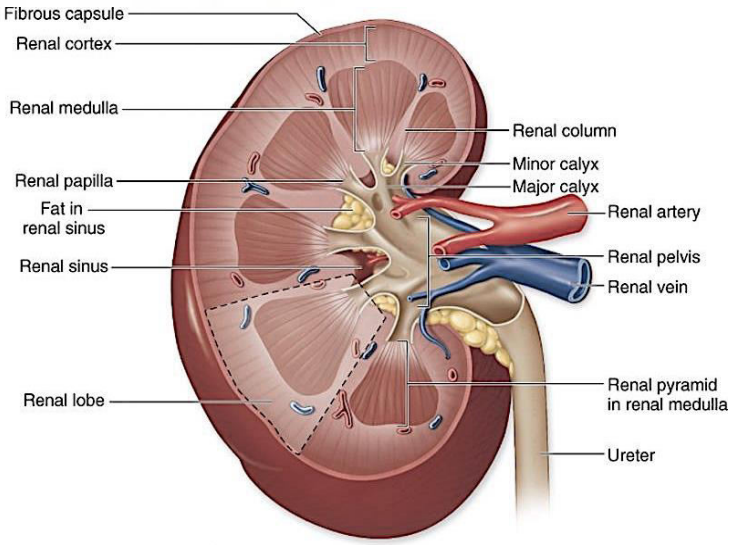
Mind Map

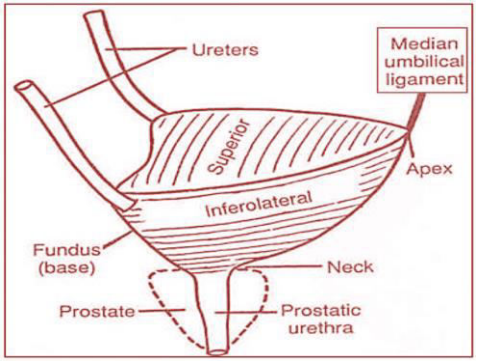

Urologic Disorders
Lower Urogenita Tract Infections
Urethritis
Epididymitis / orchitis
Prostatitis
cystitis
Upper Urinary Tract Infections
Acute Pyelonephritis
Chronic Pyelonephritis
Renal Abscess
Urolithiasis
Uric acid stones
Calcium stones
Struvite stones
Cystine stones
Voiding dysfunction
Benign Prostatic Hyperplasia

Anatomy of The Urinary System









[Urinary System Anatomy](#) (start at 01:51)

Physiology of Micturition

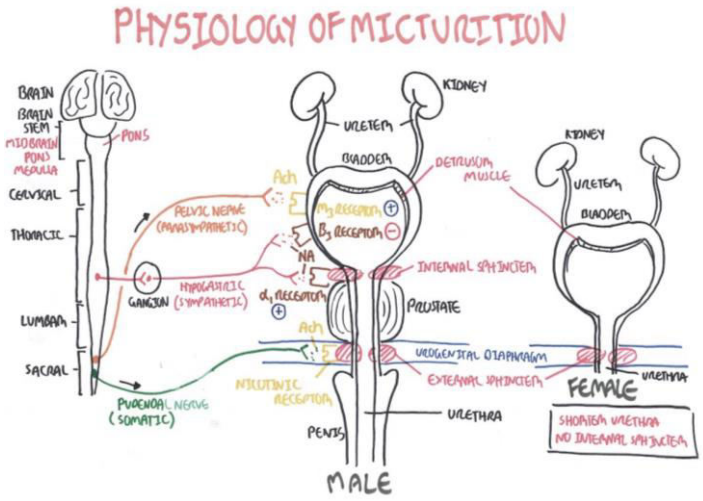
Phases 1 (storage phase)

the bladder fills steadily without a rise in intra-vesical* pressure → Stimulate stretch receptors in the wall of urinary bladder → -reflex bladder relaxation -reflex increased sphincter tone.

Increase urine volume

At three-quarters of bladder capacity, sensation produces a desire to void. → Increase urinary bladder capacity

Voluntary control



Phases 2 (emptying phase)

increasing bladder filling increases the afferent neuronal activity of the bladder → Activation of pontine micturition center in the brainstem → Inhibition of the spinal reflexes

This will cause :

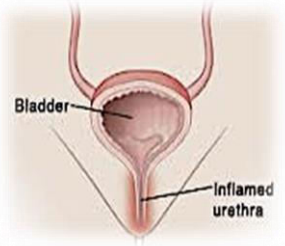
- ✓ contraction of the detrusor muscle
- ✓ Relaxation of the relaxation of the smooth muscle sphincter and opening of the bladder neck
- ✓ relaxation of the striated sphincter

Physiology of Maturation

***Intra-Vesical Pressure** = pressure Within the bladder

1st :Lower Urogenital Tract Infections

1- Urethritis



- It is an ascending root **bacterial infection.**
- **Common in men** more than women **(in young men the usual cause is STD due to unprotected intercourse).**
- Old men get urethritis because of urinary stasis and constipation.
- Women get urethritis because of their short urethra.
- Urethritis usually **occurs in cases of high residual urine** (urine stasis) : e.g. Old men who don't empty their bladder during micturition, soldiers and shop keepers who are forced to hold on their urine for a long time. ➔ this causes urine reflux which will in turn cause urethritis.
- Long-term use of a **self- retaining catheter** can cause an inflammatory reaction in the urethra.

✸ Symptoms:

1. **Pusy, Whitish** urethral discharge. (usually it's suggestive of Gonorrhea)
2. **Dysuria** (the chief complaint in men) (if Dysuria present alone it's more likely to be a Chlamydial infection)
3. Burning micturition.
4. **Asymptomatic in 25%** of females. and 10% of males.

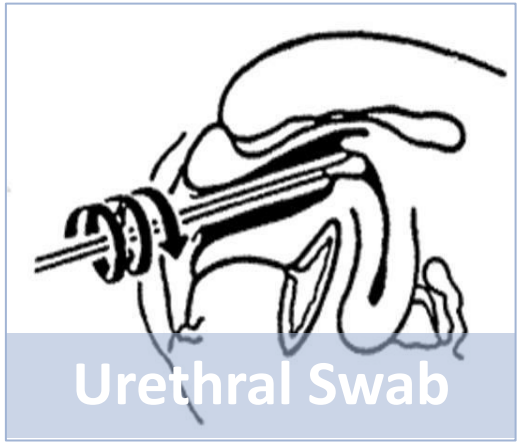
✸ Diagnosis:

1- Incubation Period:

- **Gonococcal infection: 3-10 days**
- **Non-Gonococcal infection (Chlamydia): 1-5 weeks**

2- Urethral Swab:

- We **culture** the urethral swab.
- **Goal:** to identify **the proper antibiotics** for the causative organism.



3- Serum Markers And Antigens:

- Chlamydia specific ribosomal RNA (Done in the ***Chronic*** forms of the disease).

Cont.. Diagnosis:

- *Neisseria Gonorrhoeae* and *Chlamydia Trachomatis* are **the most common organisms** identified in cases of urethritis.
- **The most common nonspecific urethritis is due to chlamydia.**

	Gonorrhea	Chlamydia
Organism	**Neisseria gonorrhea**	**Chlamydia trachomatis**
Organism Type	Gram (-) diplococci	Intracellular facultative organism
Incubation Period	3-10 days	1-5 weeks
Urethral Discharge	Usually profuse, purulent	Usually Scant
Asymptomatic Carriers	40%-60%	40%-60%
Diagnostic Test	Ligand chain reaction, Gram stain Culture	Polymerase/ligand chain reaction, Culture, Immunoassay
Treatment	Ceftriaxone + Azithromycin or Doxycycline	Ceftriaxone or Azithromycin

Urethritis Case Study: If a young guy came to the clinic complaining of pusy whitish urethral discharge accompanied with an irritating micturition, the physician must ask the patient about any history of recent unprotected intercourse ? If ***yes*** then we ask the patient when did this intercourse occurred?

- **3-10 days:** gonococcal infection
- **>1 month:** non gonococcal infection

2- Cystitis : (inflammation of the urinary bladder)

Signs and Symptoms	• Dysuria, frequency, urgency, voiding of small urine volumes. • Supra-pubic/lower abdominal pain. • ± Hematuria. • **No fever even if it's severe**
Investigation	1. **Dipstick:** When Nitrate is (+) ➔ it indicates an infection 2. **Urinalysis** 3. **Urine Culture**: is the **gold standard** , It takes 2 days (Start treatment before waiting for results because we know what are the commonest organisms)
Management	• In women, treatment of UTI is usually **just for 3 days** (to avoid any effect on normal bowel flora). • In men, the treatment is usually for **a week.** (See the table below)

Table 14–10. TREATMENT REGIMENS FOR ACUTE CYSTITIS

Circumstances	Route	Drug	Dosage (mg)	Frequency per Dose	Duration (days)
Women					
Healthy	Oral	Ciprofloxacin	500	Every 12 hr	3
		Enoxacin	400	Every 12 hr	
		Levofloxacin	500	Every day	
		Lomefloxacin	400	Every day	
		TMP-SMX	160–800	Every 12 hr	
		TMP	100	Every 12 hr	
		Microcrystalline nitrofurantoin	100	Four times a day	
		Norfloxacin	400	Every 12 hr	
Symptoms for >7 days, recent urinary tract infection, age >65 yr, diabetes, diaphragm use		TMP–SMX or Fluoroquinolone	160–800 As above	Every 12 hr As above	7
Pregnancy	Oral	Amoxicillin	250	Every 8 hr	7
		Cephalexin	500	Four times a day	
		Microcrystalline nitrofurantoin	100	Four times a day	
		TMP-SMX	160–800	Every 12 hr	
Men					
Healthy and <50 years old	Oral	TMP-SMX or Fluoroquinolone	160–800 As above	Every 12 hr As above	7

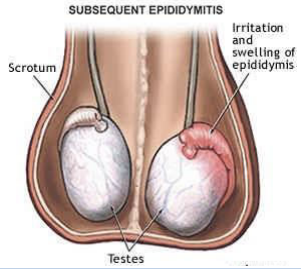
***Cystitis is more common in women than men, why?**
Because women have shorter urethras (4.5 cm). Some of them are genetically predisposed to bacteria as the lining of the bladder is more susceptible to E.coli.

Other DDx: **Interstitial Cystitis (Painful Bladder Syndrome):** is a chronic inflammatory condition that causes frequency and dysuria, may also cause urgency and urge incontinence. This is a diagnosis of exclusion in women with such symptoms but no evidence of infection or other identifiable cause.

- **E-coli**(27%) is **the most common** cause of UTI (in general)and the **2nd most** common organism is **Klebsiella**(11%) **Pseudomonas** (11%)
- The fungal pathogen **Candida Albicans** (9%) .
- UTI doesn't usually occur at normal and announced marriages in KSA, but it sometimes occur in **other ethnicities or religions** that perform **anal sex in married people and in the homosexuals too.** (the pathogenic organisms in these cases are anaerobes but not the Gonococcal bacteria)

3- Epididymitis and Orchitis:

- Inflammatory conditions are generally **more common in the epididymis** than in the testis. However, some infections may begin in the testis with secondary involvement of the epididymis.
- **The usual cause of epididymo-Orchitis:** bacterial spread, either from infected urine or from Gonococcal urethritis (**Retrograde Route**).
- **complication of epididymo-Orchitis:** Infertility, abscess formation (now rare).



✸ Types of Epididymitis:

- Infectious epididymitis can present as an acute (<6 weeks) or chronic (≥6 weeks) condition:

Type	Symptoms	Duration
Acute Epididymitis	Pain and swelling of the epididymis	Less than 6 weeks
Chronic Epididymitis	• Longstanding pain in the epididymis and testicles. • Usually, **No Swelling.**	≥6 weeks (Usually Months)

- Diagnosis of infectious epididymitis is generally made based on physical examination findings and may be confirmed with urine studies.
- In epididymitis we must ask the patient about short marriages or any secret marriages.

✸ Causes of Epididymitis:

1- Untreated Urethritis

Untreated Urithrits → Blood flows up to the urethra → Goes to the Ejaculatory duct → Goes to The Epididymis

2- Ascending Root Infection:

Urinary pathogens in the urethra & bladder → Ejaculatory duct → vas deferens → Epididymis

Young man present with bad testicular pain, It could be one of two conditions: 1-Testicular torsion 2-Epididymitis.

- **How can we differentiate between Epididymitis and Torsion?**

	Epididymitis	Torsion
Family History	Older patient Gradual onset With urinary symptoms like burning sensation – hematuria e.g patient may say doctor I had blood in urine for 2 weeks now.	Usually young boys, just reached adolescence Acute pain – sudden in onset Usually without urinary symptoms
Physical Examination	Inflammatory sign (redness-warmth and swelling of the scrotum)	High raiding testis, testis is kidney-shaped , bean-shape, Horizontal lie Loss of cremasteric reflex
U/S	Because of infection > Hyperemia	No blood flow
Testicular Scan	Increased radiotracer uptake; hyperscan photogenic (black)	Photopenia (white area)
Urine for Culture	Younger: N. gonorrhoeae or C. trachomatis Older: E. coli (gram -ve rods)	

In Torsion cases the testis should be saved within 3hrs; beyond 3 hours "spermatogenesis is lost" .If more than 3hrs the testis become destructed

✸ Treatment Of Acute Epididymo-Orchitis:

➥ **Epididymo-Orchitis Secondary to Bacteriuria:**

1. Do urine culture and sensitivity studies.
2. Promptly administer **Broad-Spectrum Antimicrobial Agent** (e.g., Tobramycin, Trimethoprim, Sulfamethoxazole, Quinolone antibiotic)
3. Prescribe bed rest and perform scrotal evaluation.
4. Strongly consider hospitalization.
5. Evaluate for underlying urinary tract disease.

PO = Oral administration
Q.I.D. = 4 times a day
B.I.D. = two times a day

➥ **Epididymo-Orchitis Secondary to Sexually Transmitted Urethritis:**

1. **Do Grain stain of urethral smear.**
2. Administer: **Ceftriaxone** (250 mg IM once) **then** **Tetracycline** (500 mg PO Q.I.D. for at least 10 days), or **Doxycycline** (100 mg PO B.I.D. for at least 10 days)
3. Prescribe bed rest and perform scrotal evaluation
4. Examine and treat sexual partners.

4- Prostatitis

- The **main function** of the prostate is producing **80% of the semen .**
- **Prostatitis:** It is a syndrome that presents with inflammation **with/without infection** of the prostate gland **.**
- Prostatitis is **common in elderly people** (urine will go back to the prostate and it may occur in young people because many of them do not go to the toilet regularly)
- On the other cause of prostatitis is due as the **same rout of epididymitis** due to that those patients **to STD** with epididymitis may have prostatitis since it have the same route.

If a male patient came to the clinic with symptoms of prostatitis and the dr. didn't find any pathogenic organisms(no infection) → a urine culture and a semen culture must be performed **Rx:** long term treatment of antibiotics minimum of 1 month ; **" *selective alpha-1 blocker and analgesics*".**

Symptoms:

- **Dysuria**
- **Frequency**
- **Dysfunctional voiding**
- **Perineal pain**
- **Painful ejaculation.**

Irritative Voiding Symptoms

- Prostatitis could be : Acute **Bacterial Prostatitis,** Chronic **Bacterial Prostatitis** and **chronic prostatitis**.

★ Acute Bacterial Prostatitis:

Symptoms:

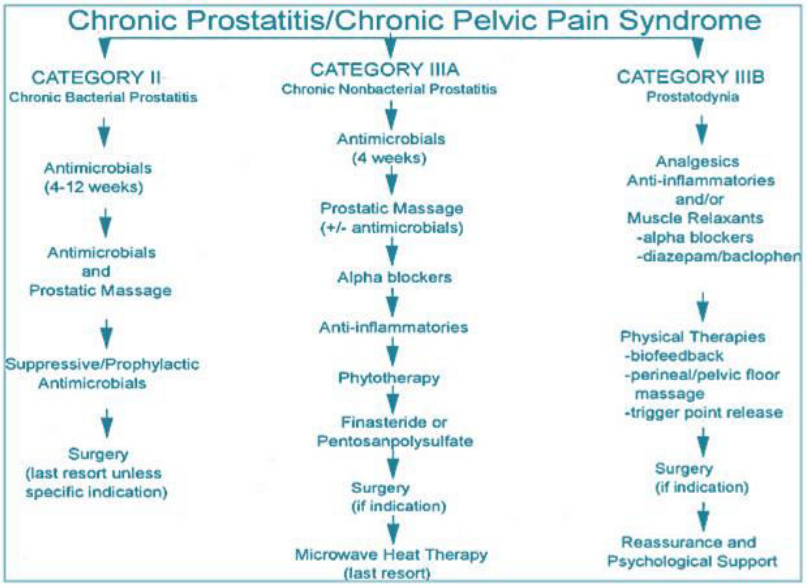
- **irritative and Obstructive voiding symptoms**
- **Acute pain**
- **Fever**
- **Chills, Malaise, Nausea/Vomiting**
- **Perineal and Supra-pubic pain.**
- **Tender, Swollen and Hot prostate**

Treatment:

- **Broad spectrum Antibiotics and urinary drainage.**

◎ Rarly, Acute bacterial prostatitis may lead to **Septic/Urosepsis shock**(characterized by hypotension 90/40) which could be life threatening.

★ Chronic Prostatitis:



2nd :Upper Urinary Tract Infections

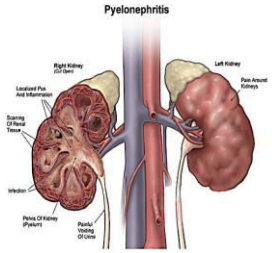
1- Pyelonephritis:

Definition

inflammation of the kidney and renal pelvis

Symptoms and Signs

- Sudden Fever with chills (because the bacteria has ascended andreached the kidney)
- unilateral or bilateral flank pain + Costo-Vertebral angle tenderness (Gram -ve sepsis)
- Abdominal pain, Nausa & vomiting , and diarrhea.
- Dysuria, frequency.



Investigation

Urine

1- Urine Culture & Sensitivity :

- Positive in most cases (80%).
- the most common organism in pyelonephritis is: gram (-) Rods **E.Coli** followed by **Enterococcus Species.**

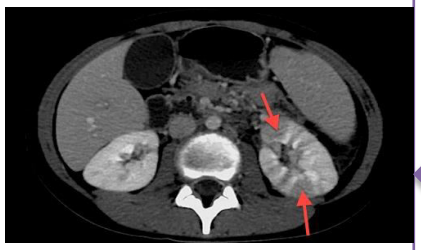
2- Urinalysis :

- High WBCs
- RBCs
- Bacteria
- **Pyuria:** large numbers of neutrophils in the urine

3- Urine Dipstick, Microscopy:
To get rapid results

Blood test

- **(±) ↑serum Creatinine:**
in case of obstruction
- Leukocytosis with predominance of leucocytosis



Imaging

To rule out any possible obstruction:

- **IVP** (IntraVenous Pyelogram)
- **UltraSound.**
- **CT scan.**

★ **Findings:**

- In **Acute Plyelonephritis,** CT or U/S may reveal the presence of an enlarged kidney on the affected side "hydroneohrosis".
- In **Chronic Plyelonephritis**, the imaging may show a small contracted and scared kidney that is poorly functioning.

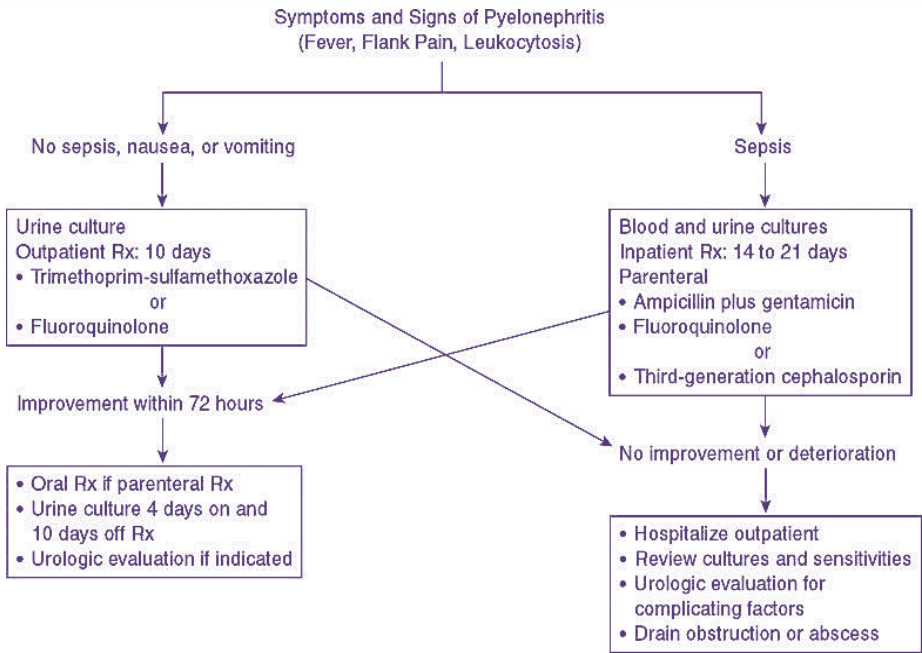
	Acute Pyelonephritis	Chronic Pyelonephritis
Types	It's a bacterial infection of the renal parenchyma and collecting system. **Causative Agent:** Gram Negative Enteric Organisms (are the same for UTI).	It is the process of scaring and atrophy of renal parenchyma, ultimately resulting in renal insufficiency. This condition is usually silent and **discovered incidentally** on investigation.
Management	**The treatment should be started immediately at clinical diagnosis, treat with :** **1-** if the patient doesn't have sepsis ➔ **give antibiotics for 2 weeks**. **2-** if the patient has sepsis ➔ Hospitalization and administration of **IV antibiotics** (if there is no response to treatment after 48-72 hours surgeons should be alert).	**The Mangement Aimed To**: prevent further damage to the kidneys by recurrent UTIs. End stage renal impairment requires ➔ **Renal Replacement Therapy.**

Pyelonephritis complicated by obstruction:

- Renal stones complicated by ovarine cancer that is blocking the kidney; in this case, we have to drain kidney. We don't only give antibiotics because there is a collection of pus by putting the tube in the kidney "Nephrostomy Tube", under local anesthesia> used in obstructive infective kidney especially if patient is very sick.
- **In U/S**, there will be **hydronephrosis** (dilated kidney).
- Another option: If patient is better than the first example, we can do "Double J", which is a tube placed inside the ureter during surgery to ensure drainage of urine from the kidney into the bladder. Stent is temporary treatment to bypass the blockage > b/c if we manipulate the stones, the patient may have bacteremia and die.

What is Double J ??

Guideline of Plyelonephritis Management

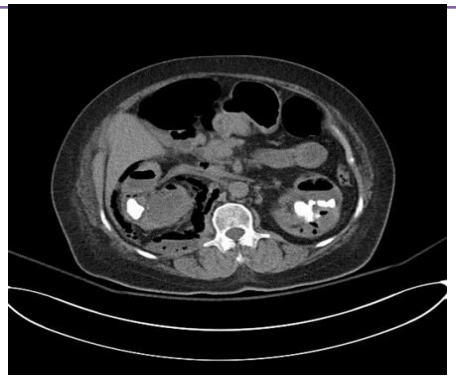


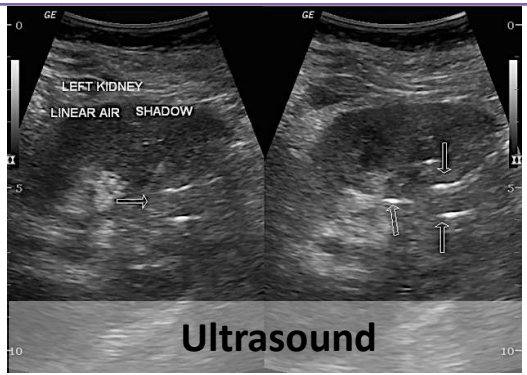
2- Emphysematous PyeloNephritis (EPN):

This wasn't mentioned in the slides, but it's **required from dr. Adnan's objectives.**

Definition	**Sever necrotizing infection of the renal parenchyma and it causes gas formation within collecting system, renal parenchyma or/and perirenal tissues.**
Causative Agent	**E.Colli** • **Klebsiella** •
Symptoms and Signs	• Fever. • Abdominal or flan pain. • Nausea and vomiting. • Altered sensorium and shock.
Risk Factors	• Uncontrolled Diabetes. • Women six tomes **more common** to have this condition than men.
Management	★ The disease course can be sever and **life threatening** if not treated. 1. Prompt surgical intervention. 2. Initial resuscitation with fluid 3. Control of diabetes. **4. IV antibiotics**. 5. Nephrectomy **(the treatment of choice)** ★ **Percutaneous Drainage With Antibiotics:** useful in early cases associated with gas in the collecting system alone. and when the patient otherwise in stable condition **.**

CT scan film Air pockets in right renal fossa.





Ultrasound

3rd :Urolithiasis

Intro

- Prevalence of 2% to 3%,
- Recurrence rate 50% at 10 years
- Common disease in Saudi Arabia

Risk Factors

Intrinsic Factors:-

1. **Genetics.**
2. **Age:** young people (20-40)
3. **Sex: Male > Female, ratio of 3:1** (**Life time risk:** Male: 20%, Female: 5-10%)

Extrinsic Factors:-

1. **Geography** (mountainous, desert, tropics).
2. **Climate** (July - October).
3. **Water Intake.**
4. **Diet** (Purines, Oxalates, Na).
5. **Occupation** (sedentary occupations)

Mechanism of Stone Formation

★ **What is a calculi ?**

A solute dissolve in a solvent to form solution but when the concentration of solute in solution reaches a certain level the compound precipitate out to form crystals. May progress such that crystals clump together ***"Aggregation"*** to form calculi.

★ **How do calculus form?**

Any of those three happen :

- **Decreasing in the amount of solvent** "supersaturated" (ex: dehydration, or if the patient doesn't drink water).
- **Increasing of the amount of solute** (ex: Hypercalcuria).
- **Decreasing of concentration of inhibitors*** (ex: decreased Citrate excretion).

→ **Crystal Growth** (This initial crystals formation called ***Nucleation***) → **Aggrega-tion of crystals** → **Stones (calculus)**

*There are substances in urine that act to keep compounds in solution by inhibiting nucleation ***"inhibitors".*** but, above a certain concentration of solute, nucleation will occur despite their presence.

★ **Most people have crystals in their urine, so why doesn't everyone get stones?**

1. **Anatomic abnormalitie** (Presence of certain abnormalities of the urinary tract like **Hydronephrosis** or **Obstruction In The Urinary Tract** leads to stasis (stoppage) of the urine and then the supersaturation of minerals that eventually leads to formation of stones)
2. **Modifiers of crystal formation:** inhibitors/promoters.

See this Digram for further explaination

Substances Affecting Stone Formation

- **Stone Formation Inhibitors:-**
  1. **Citrate, (Such as lemon).**
  2. **Mg.**
  3. **Urinary proteins (Nephrocalcin).**
- **Stone Formation Promoters :**

  Oxalate (such as: coffee and chocolate)

***Cystinuria** is an inherited autosomal recessive disease that is characterized by the formation of Cystine stones in the kidneys, ureter, and bladder. And, in general, if not treated, it can lead to death because of the complications like renal failure. When they undergo renal transplantation the disease is gone.

Common Stones Types

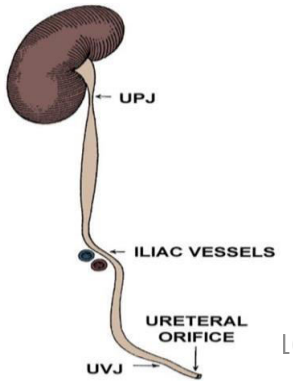
1. **Calcium Stones (85%): ex: Calcium Oxalate:** it's the commonest stone type
2. **Uric Acid Stones (10%) :** uric acid is found in animal proteins & it's the commonest cause of radiolucent stones(will not show up on x-ray, but are visible on non-contrast CT). Uric acid stones are formed due to increase in uric acid formation either through **Gout or Myeloproliferative** disorder. "approximately 50% of patients with this kind of stones have gout but only 20% of gout patients have this kind of stones."
3. **Mixed Calcium Phosphate And Calcium Oxalate (10%).**
4. **Struvite "Magnesium Ammonium Phosphate Stones" (5-15%):** are usually seen in UTI, with pathogen that can break urea down into Co2 and ammonia (urea-splitting bacteria) thereby **alkalinizing** the urine (Ex: Proteus Mirabilis). May cause **Staghorn calculi.** (see the picture).
5. **Cystine Stones (Less than 1%): Cystine** is an amino acid, Associated with Cystinuria* or genetically determined Aminoaciduria (usually secondary to an inborn error of metabolism).
6. **Indinivir Stones:** are not visible on CT scan or plain films.

Stag-Horn Stone

Normal Narrowing's In The Ureter

During passage of a stone, there are sites where the passage is likely to become arrested. These are narrowest points of the urinary system:

- The ureteropelvic junction (UPJ)
- Pelvic brim
- The ureteral crossing of the iliac vessels
- The ureterovesical junction (UVJ): which is the tightest one.
- Vesicle orifice



Symptoms and Signs

1. **Renal Or Ureteric Colic :**

A) **Renal Calculi:** cause flank pain (**Colicky** ➔ arising from renal pelvis, **Non-Colicky** ➔ arising from renal capsule).

B) **Ureteric Calculi:** cause colicky pain and the site of stone in the ureter determines the site of the pain. **Upper ureteric calculi** causes Costo-Vertebral Angle (flank) pain, **mid ureteric calculi** cause pain radiating from loin to groin and in **lower ureteric calculi** it radiates to the testicle in males and labia majora in females.

2. **Frequency, dysuria.**
3. **Haematuria:** could be gross or microscopic (when **RBCs < 3)**
4. **GI Symptoms:** N/V, Ileus (a painful obstruction of the ileum or other part of the intestine.), or Diarrhea.
5. **Restless.**

★ **Signs** :↑HR, ↑BP. Fever (If UTI) and Tender costo-vertebral angle

The renal angle is very tender in pyelonephritis, less tender in renal stones and not tender in appendicitis

Differential Diagnosis (DDx): Gastroenteritis, Acute appendicitis, Colitis and Salpingitis

Type of Haematuria	Site of Origin
Total/Complete	At or above the level of bladder
Initial	Prostate/anterior urethra
Midstream	At or above the level of bladder
Terminal	Posterior urethra, bladder neck, trigon

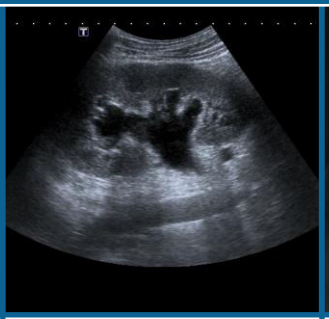
Investigations

Urinalysis & Culture

- **Findings:**
- **RBCs, WBCs**
- **Bacteria**
- **Crystals**
- **Culture:** to determine whether there is infection.

Hematological And Biochemical Tests

- to asses renal function.
- to exclude metabolic causes.



Ultrasound

- shows hyperechoic stones + acoustic shadow.
- useful in patients who should avoid radiation, such as **pregnant women.**

IntraVenous Pyloogram

- shows radiolucent (uric acid stone) & radiopaque stones (calcium stones).

CT Scan

- **The gold standard;** most sensitive and specific.
- shows the radiolucent stones. So it's the first step.

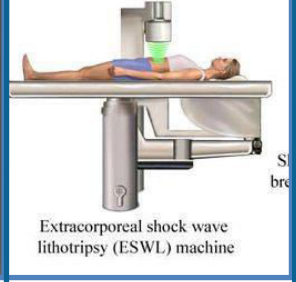
KUB X-ray

- (**KUB**=**K**idney-**U**reter-**B**ladder).
- shows only radiopaque stones >3 cm.

Management

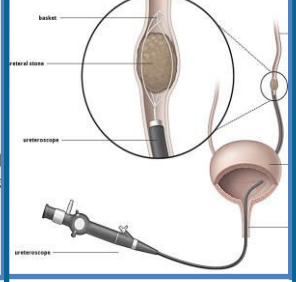
1-Conservative until the stone pass:

- **Hydration** (IV or PO)
- **Analgesia** (IM Diclofenac)
- **Antiemetics**



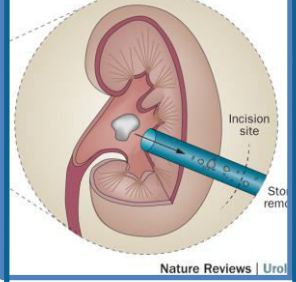
2-Extracorporeal Shock Wave Lithotripsy (ESWL):

- Good for kidney stones and small stones and it is used with stones that can be seen on x-ray and ultrasound,
- **Risks**: potential injury to ovary.



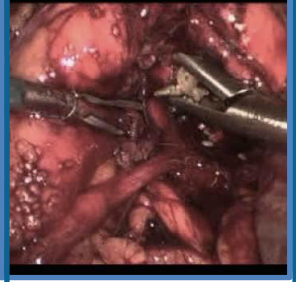
3-Ureteroscopy:

- Breaks up large stones by laser.



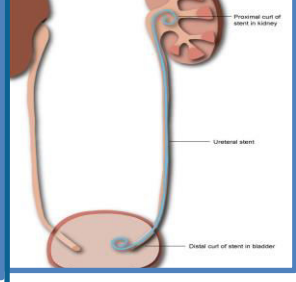
4-Percutaneous Nephroltlhotripsy (PNL):

- For huge stone (stones that are unlikely to pass even if broken up)



5-Open Surgery:

- Not used anymore.



6-Ureteric Stent Placement or Percutaneous Nephrostomy

- To decompress the kidney
- In cases of acute obstruction leading to sepsis (infected obstructed kidney) or renal impairment

☛ more than 90% of the Stones that are **<5mm in size** undergo spontaneous passage.

★ **Indications for hospital admission:**

- **Renal Impairment**
- **Refractory Pain**
- **Pyelonephritis:** patient has 3 mm stones with fever and chills = pyelonephritis.
- **Intractable Nausea and Vomiting :** can't take oral analgesia.

Recurrent urinary tract calculi should raise the suspicion of hyperparathyroidism, renal tubular acidosis or medullary sponge kidney.

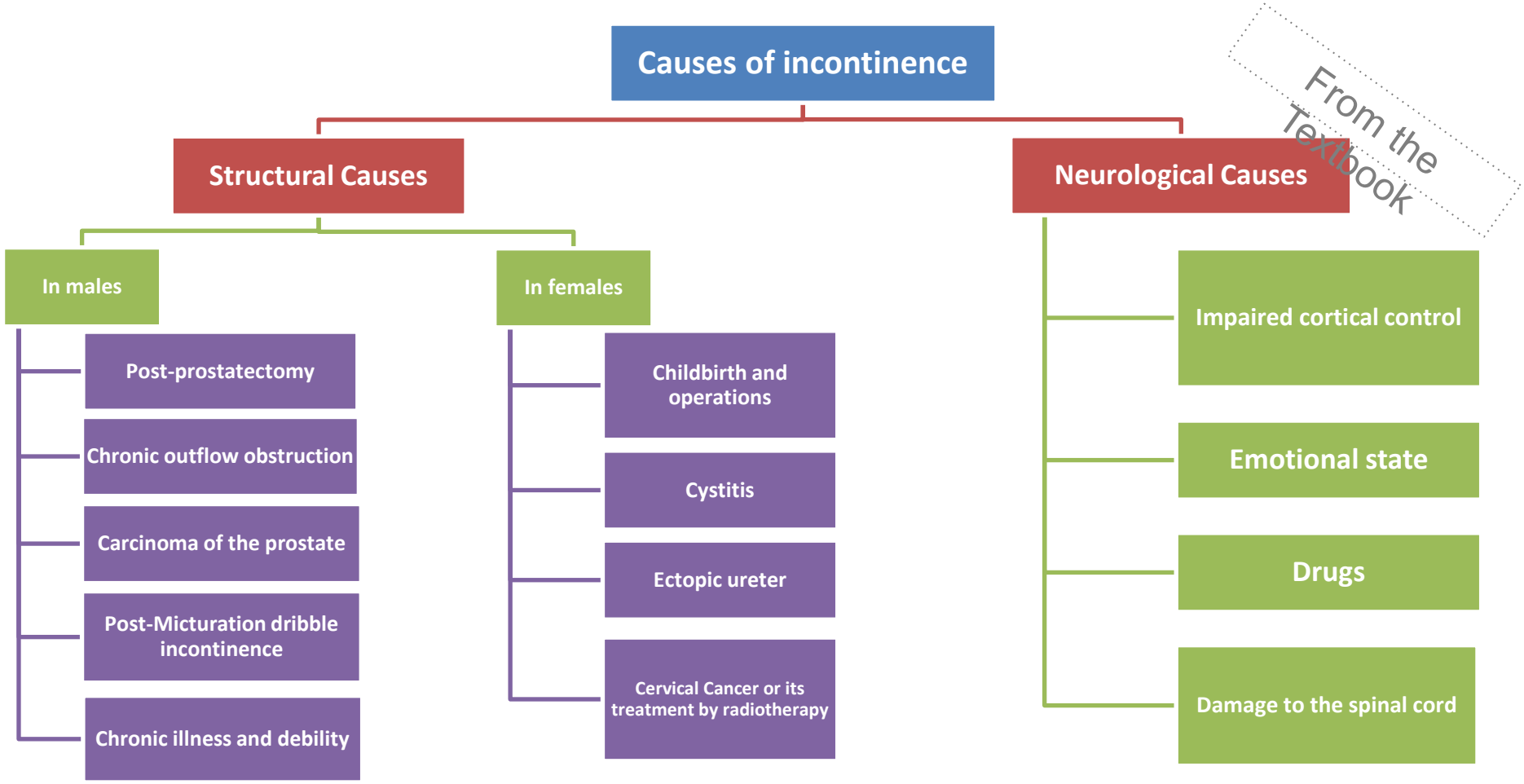
★ Stones and infection within a kidney can be the cause of renal destruction and if the kidney contributes less than 10% of total renal function, then a **Nephrectomy** is recommended.

★ **Large Vesical calculi** ➔ open supra-pubic Cystolithotomy

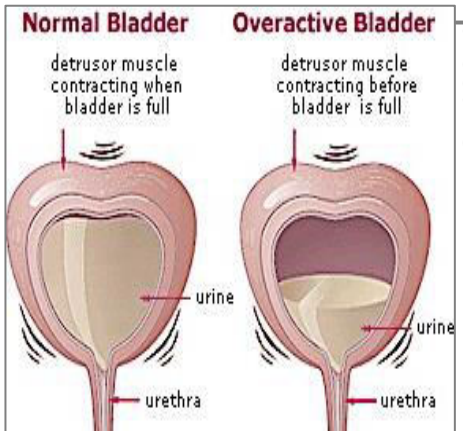
Percutaneous Nephrolithotripsy start at 1:01
How ESWL is used to treat kidney stones? (1:28)

4th :Disorders of Micturition- Incontinence

- **Incontinence** is defined as the involuntary leakage of urine.
- In **Urge Incontinence**: leakage usually occurs because detrusor over-activity produces an increase in bladder pressure that overcomes the urethral sphincter)
- Incontinence in an elderly man may be due to cerebral cortical degeneration, but could also be due to chronic outflow tract obstruction resulting from prostatic hyperplasia.)
- **The history is important.** structural causes should be separated from neurological ones.



It may be due to:	Failure To Store	Failure To Empty
resulting in	urge and stress incontinence or continual incontinence with fistula.	chronic retention with overflow incontinence.
Bladder Problems	• **Over-Activity:** common in women or because of spinal cord injury, stroke ➔ **loss of control** by causing damage to micturition inhibitory center) (see picture 1) • **Hypersensitive Bladder (sensory urgency):** resulting from urinary tract infection (UTI) or bladder stone may also drive urgency.	• **Neurologic** • Myogenic • Idiopathic
Outlet problem	• **Stress Incontinence:** With pregnancies and deliveries, the pelvic wall muscles is gone the support is gone so with a little increase in abdominal pressure leakage will happen. (leakage occurs because passive bladder pressure exceeds normal urethral pressure. This may be because of poor pelvic floor support, because of a weak urethral sphincter or an element of both) • **Sphincter Deficiency**	• **BPH: B**enign **P**rostatic **H**yperplasia • Urethral Stricture. • Sphincter Dyssynergia.
Combination		



picture 1

Extra Information, but Important For OSCE exam

	Storage or Irritative Symptoms	Voiding or Obstructive Symptoms
Definition	Storage symptoms or overactive bladder: defined as urgency, with or without urge incontinence, usually with frequency and nocturia.	Voiding symptoms are usually due to a blockage of the outlet of the bladder making it more difficult to pass urine.
Causes	• Obesity. • Diabetes (high glucose levels in the blood), • High blood pressure. • Obstructive sleep apnoea. • Smoking. • **Lifestyle factors including:** drinking fluids late at night, too much alcohol or caffeine, or low levels of physical activity can make storage symptoms worse.	• **Enlarged prostate gland** (Enlargement of the prostate gland can lead to **both** storage and voiding symptoms). • **Urethral stricture** (scarring of the urethra).
Symptoms	**Over-Activity of the bladder will cause :** • **Urgency:** an urgent feeling of needing to urinate, • **Frequency:** a short time between needing to urinate, • **Nocturia:** a need to pass urine two or more times during the night, • **Urge incontinence:** a sudden, intense urge to urinate followed by an uncontrolled loss of urine	• **Hesitancy:** a longer than usual wait for the stream of urine to begin • **Weak and poorly directed stream of urine** • **Straining to urinate** • **Dribbling after urination has finished or an irregular stream** • **Chronic Urinary Retention:** not all the urine is passed from the bladder causing a need to urinate more often • **Overflow Or Paradoxical Incontinence:** urine overflows from a full bladder uncontrollably even though normal urination can be difficult to start

- Other causes include some medicines and neurological diseases such as stroke and Parkinson's disease.
- It is common for there to be several factors acting at the same time to cause LUTS and the exact cause is not always easy to find.

5th :Benign Prostatic Hyperplasia

Pathology

- From about the age of 40 years, the prostate undergoes enlargement as the result of hyperplasia of periurethral tissue, which forms adenomas in the transitional zone of the prostate.
- **Incidence is directly proportional to age, affecting approximately 90% of men > 80**
- **There are 3 main complications of urinary stasis:** infection, stones and tumor. The residual urine may exceed 1 L resulting in progressive obstruction and dilatation of the ureters (hydroureter) and pelvicalyceal system (hydronephrosis) this ultimately leads to obstructive renal failure.

Clinical Features

- Frequency, urgency, dysuria and poor stream.
- Lower Urinary Track Symptoms (Irritative/Obstructive)
- Poor bladder emptying
- Urinary retention
- Urinary tract infection
- Hematuria (straining may cause vessels at the bladder neck to bleed).
- Renal insufficiency
- Frequency may progress to continual dribbling incontinence leading over time to signs and symptoms of obstructive uraemia (drowsiness, anorexia and personality change).

Typical scenario: A 65-year-old male who complains of frequent urination at night with difficulty starting the urine stream. Once starting the urine stream, he states he has difficulty stopping the stream. Think: Prostatic hyperplasia.

Physical Examination

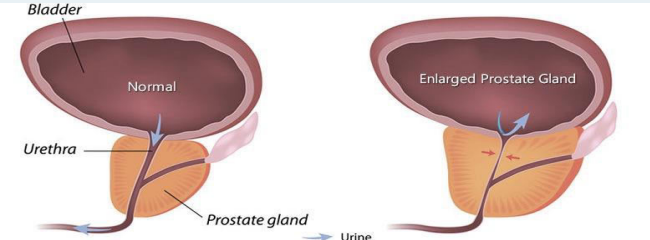
1. DRE (Digital Rectal Examination):

- If the nodules are hard to palpable, it means Cancer.
- If DRE raise suspicions **needle biopsy** is indicated.

2. Focused Neurologic Exam:

- Prostate Cancer
- Rectal Cancer
- Anal tone
- Neurologic problems

3. Abdomen: Distended bladder.



Investigations

1. Urinalysis + Culture :

- Could be UTI and we might find bacteria.
- There might be microscopic Hematuria.

2. Serum Creatinine

3. Serum Prostate-Specific Antigen (PSA): Cancer, BPH, Prostatitis, TURP, Prostatic biopsy, Urethral catheterization, or even simple increase in age could cause elevated levels of PSA, so carful interpretation is required.

4. Urine Flow Rate: assessed by uroflowmetry, will quantify a reduction in urinary stream and the need for intervention.

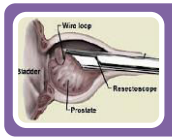
5. Ultrasound (Kidney, Bladder And Prostate)

Management

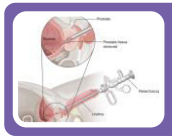
1. Medical Therapy:

Drugs	Selective α1-Adrenergic Blockers	Androgen Suppression: 5α Reductase Inhibitor
Mechanism Of Action	opens the neck of the bladder and relaxes the prostate	shrinks prostate 60% in 6 months. "prevent testosterone conversion into dihydrotestosterone which is responsible for the growth and enlargement of the prostate.
Examples	▸ **Tamsulosin.** ▸ **Alfuzosin.** ▸ **Terazosin.** ▸ **Duxazocine.**	▸ **Finasteride.** ▸ **Dutasteride.**
	A combination of both classes may be needed.	
Preferable In Which Cases	with small prostate	With large prostate.

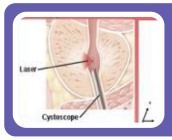
2. Surgical Treatment:



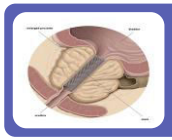
Endoscopic



TransUrethral Resection of the Prostate (**TURP**)



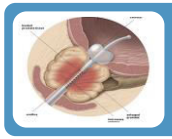
Laser Ablation



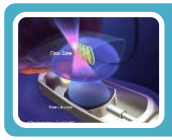
Prostatic Stenting

Open Prostatectomy

TransUrethral Radio Frequency Needle Ablation (**TUNA**)



TransUrethral Microwave Thermotherapy (**TUMT**)



Transurethral High Intensity Focused Ultrasound (**HIFU**).

Recent Techniques

Some of the topic in the upcoming slides were NOT mentioned in the lecture, yet they are required according to Dr. Adnan's objectives

6th :PelviUreteric Junction Obstruction

Pathology

- **Narrowing of the junction between the renal pelvis and the ureter is a common cause of hydronephrosis**. As the etiology is obscure, the term 'idiopathic' hydronephrosis is appropriate.
- This condition is seen in **very young children**. It is likely to be congenital and can be bilateral, but gross hydronephrosis may present at any age.

Clinical Features

1. **Large Painless Mass In The Loin ;**(in its grossest form, the volume of urine in the hydronephrotic sac may simulate free fluid in the peritoneal cavity)
2. **Ill-defined Renal Pain or Ache**: that may be exacerbated by drinking large volumes of liquid "**Dietls' Crisis**". The patient may regard these symptoms as 'indigestion' .

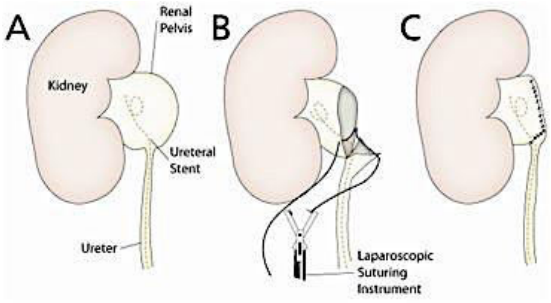
★ Rarely, there may be no symptoms.

Investigations

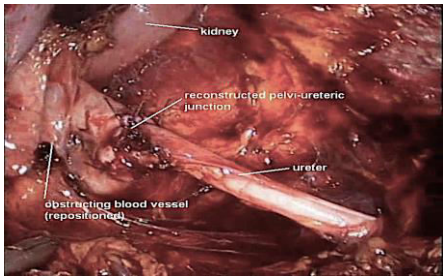
1- IVU or CT Urogram (CTU): provides sufficient information in many cases. The calibre of the ureter is normal.

2- MAG-3 Renogram: in patients whom there is doubt whether the dilatation of the pelvis and calyces is truly obstructive in nature.

Management



1- Laparoscopic Pyeloplasty:



2- Open Pyeloplasty:

Any of these two is performed to remove the obstructing tissue and refashion the pelviureteric junction (PUJ) so that the lower part of the renal pelvis drains freely into the ureter

7th :Retroperitoneal Fibrosis

Pathology

Fibrosis of the retroperitoneal connective tissues may encircle and compress the ureter(s), causing hydroureter and hydronephrosis. **Fibrosis occurs in three groups of conditions**:

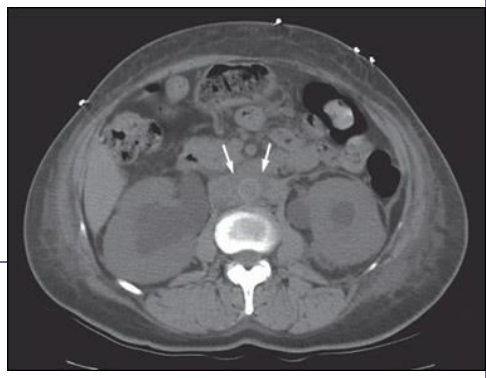
1. **Idiopathic:** it may be associated with methysergide or analgesic abuse Mediastinal fibrosis and Dupuytren's contracture may coexist.
2. **Malignant infiltration:** The fibrosis contains malignant cells that have metastasized from primary sites such as the breast, stomach, pancreas and colon.
3. **Reactive Fibrosis:** Radiotherapy, resolving blood clot, or extravasation of sclerosants can lead to fibrotic change in the retroperitoneum.

Clinical Features

1. **Ureteric Obstruction:** may cause symptoms similar to idiopathic hydronephrosis.
2. ill-defined renal pain or ache.
3. Low backache.

Investigations

1- IVU or CTU: shows hydronephrosis and usually hydroureter down to the level of the obstruction. The ureter is often difficult to define, but it is usually pulled medially.



2- A markedly raised ESR: in > 50% of cases with **idiopathic fibrosis.**

3-Biopsy of The Tissue: is essential **for diagnosis**.

Management

- Relief of obstruction may be difficult.
- uretrolysis can be performed (Where ureteric stenting fails to give adequate drainage) the ureter is dissected out of the fibrous sheet of tissue (ureterolysis) and wrapped in omentum to prevent further involvement.

Urological Disorders Investigations

1 Urine Examination

Exam	Finding	Interpretation
1) Dipstix	Proteinuria (>150mg/24 hrs)	Mandates further investigations
	Glycosuria	Diabetes
	UT Infections	
2) Urine Specific Gravity	Isothenuria	**Chronic Renal Failure** (kidney medulla is diseased)
3) Microscopic Examination	Casts or tubular epithelial cells	Renal parenchyma disease
	Crystals	Renal calculi
	Ova	Schistosomiasis
4) Cytology And Urinary Cellular Markers	Dx and follow up of Bladder and urothelial cancers	
5) Microbiological Examination	• Stored at $4^{o}C$ • **In ADULTS:** Midstream Urine (MSU) . • **In KIDS:** Fine Needle Supra-pubic Aspiration of a "**Full Bladder**" " to exclude urine contamination	

NB + In the absence of infection urine is normally **proteinfree**

+ **Urine specific gravity measures the concentrating ability of the kidney**

2 Blood Examination

Type Of Examination	Function
Creatinine*	To estimate **G**lomerular **F**iltration **R**ate (**GFR**)
Disordered Erythropoieses (Normocytic, normochromic anaemea, and disordered Calcium metabolism)	Chronic renal diseases
ESR (Erythrocyte Sedimentation Rate)	**Raised** in idiopathic retroperitoneal fibrosis (a cause of **uretric obstruction**)
Serum Markers: 1. **H**uman **C**horionic **G**onadotropins (HCG) 2. **A**lpha **P**heto **P**rotein (AFP) 3. **P**rostatic **S**erum **A**ntigen (PSA)	Tumor markers

***Creatinine:** is the breakdown product of the skeletal muscles and **its serum levels don't begin to rise until the GFR is halved**

3 Plain X-Ray Examination

- It's a plain film of KUB (Kidney- Ureter- Bladder).
- It is the **simplest and the first imaging investigation** usually.

★ **Function:**

1- It gives many information about **the size, site, shape and position of the kidneys**
2- Shows the associated soft tissue shadows
3- Shows **calcifications** in the urinary tract region

4 Intravenous Urography (IVU)

- A plain x-ray of ***the abdomen and pelvis***.
- **It shows the following organs:** Kidney, ureter, bladder, **lumbar spine, pelvis** and any obstruction in the region of the urinary tract
- **Contrast:** Intravenous iodine is injected intravenously **(It is an invasive procedure)**

★ **Function:**

1- It demonstrates the renal pelvis and calyces
2- The **rate of kidney emptying**,
3- The caliber of the ureters and the bladder outline

5	**Ultrasonography**	• It gives **superior information about the renal parenchyma but less about the collecting system** • **It shows the following organs:** liver, spleen, gynecological organs, kidney, bladder, prostate, testis and epidymis ★ **Function:** 1. Evaluating the bladder, prostate, testis, and epidymis 2. Gives information about **the renal parenchyma** **TRUS** (**T**rans**R**ectal **U**ltra**S**onography): for evaluating the prostatic disease ◎
6	**Retrograde Pyelograph**	**Function:** ★ special investigation for outlining the collecting systems and ureters. **Disadvantages:** ➳ 1- Invasive 2- Causes Infections Radio-opaque dye is injected to outline the collecting system. •
7	**CT Urogram**	• **No contrast** is needed ★ **Functions**: 1- **Higher specificity and sensitivity for the detection of the renal and uretric calculi than IVU** 2- Other structures in the abdomen can be assesed too. 3- Evaluation of the **retroperitoneum**
8	**Magnetic Resonance Urography (MRU)**	• **Useful in patients with known hypersensitivity to iodinated radiological contrast** • **No contrast** is needed • The water content of the urine itself acts as a contrast for outlining the urinary tract ★ **Function**: It provides excellent anatomical and soft tissue detail
9	**Nuclear Imaging**	★ **Function**: 1. Detecting bony metastases from carcinoma of the prostate (bone scan). 99mTc-Labelled Methylene Diphosphonate (MDP) is the **most reliable method**. 2. Measurement of renal function (scintigraphic renography).

10	Special radiological investigations	Renal Angiography	Abnormalities of the renal vessels
		Computed Tomography (CT)	Imaging renal tumours.
		Micturating Cystourethrogram (MCU)	Outline the bladder, detect ureterovesical reflux and examine the bladder neck and urethra.
		X-ray Screening	To study the emptying of the bladder
		Ascending Urethrogram	To define strictures in the urethra
		Descending Urethrogram	Its obtained when the ascending urethrogram is used in conjunction with MCU

11 Urodynamic studies

- The maximum urinary flow rate during micturition can be measured using a flow meter. This method is used when the voided volume is at least 150 ml or the values may be misleadingly low.
- The normal in **M =** 15–30 ml/s , **F=** 20–40 ml/s. a flow rate of less than 10 ml/s **is abnormal**.
- The flow rate pattern can help to determine the **cause of obstruction.** Measurements of flow rate can be combined with cytometer to provide a measure of residual urine, bladder capacity, the capacity at which a desire to void occurs, and the detrusor pressures when the bladder is full and during maximum flow.
- Spontaneous detrusor contractions during bladder filling may indicate an unstable bladder, a cause of urgency and urge incontinence.

12 Semen Analysis

- **Procedure:** The sample is collected following a period of abstinence of at least 3 days and must be examined within 2 hours
- Normal semen volume: >2ml and a sperm concentration of > 20×10^6/ml.
- More than 50% of the sperm should be motile at 2 hours.

★ **Function:**
1-Microscopic examination of the semen is the basic examination in infertile men

13 Biochemical Screening For Stones

- **Recurrent urinary tract calculi should raise the suspicion of :**

Hyperparathyroidism, idiopathic hypercalciuria, hyperoxaluria, cystinuria, renal tubular acidosis or medullary sponge kidney.

- Serum calcium, phosphate, oxalate and uric acid should be measured
- The composition of any passed or removed stones should be analyzed to determine their metabolic type

Summary of Urinary Tract Obstruction

SUMMARY BOX **23.2**

Urinary tract obstruction

Common causes of obstruction of the lower outflow tract

- Benign prostatic hyperplasia
- Prostatic cancer
- Bladder cancer involving the bladder neck
- Bladder-neck obstruction (dyssynergia, infection, neurological disorders)
- Urethral obstruction (congenital posterior urethral valves, blocked urinary catheter, trauma, infection, stricture).

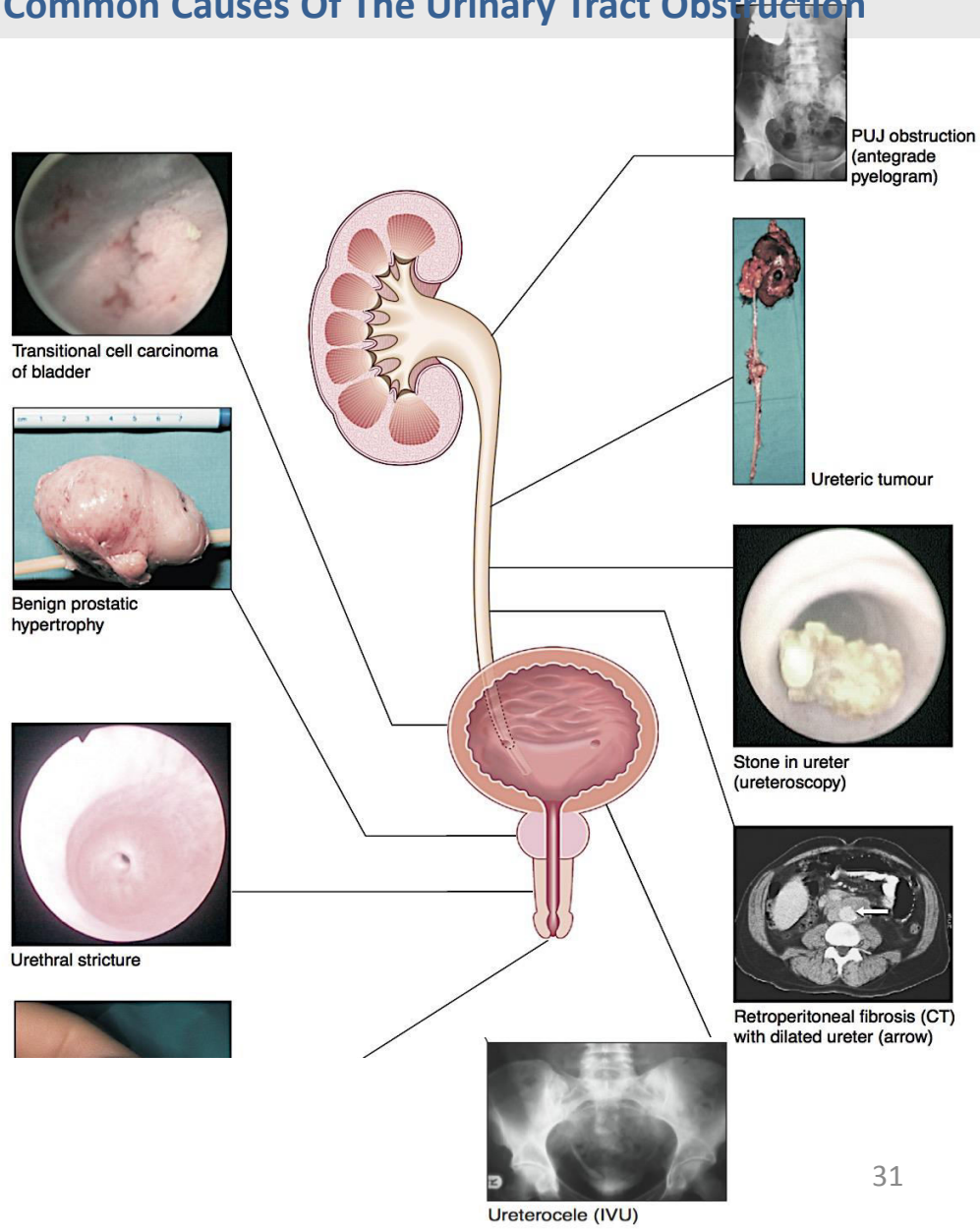
Common causes of obstruction of the upper urinary tract

- Renal and ureteric calculi (80% are calcium oxalate/phosphate stones)
- Pelviureteric junction obstruction (idiopathic hydronephrosis)
- Retroperitoneal fibrosis (idiopathic/malignant infiltration/radiotherapy)
- Transitional cell carcinoma (with or without bleeding and clot)
- Congenital abnormalities (e.g. ectopic ureter, ureterocoele)
- Infections (notably schistosomiasis and tuberculosis).

Table 23.1 Causes of urinary tract obstruction

Extrinsic	
	• Retroperitoneal fibrosis
	• External pressure (e.g. carcinoma of the cervix, prostate)
Intrinsic	
	• Transitional cell tumours
	• Tuberculosis / schistosomiasis
	• Ureterocoele
	• Ectopic ureter
Intraluminal	
	• Calculi

Common Causes Of The Urinary Tract Obstruction



Summary

✓ Urolithiasis:

- **4 Types Of Stones:** Calcium stones, Uric acid stones, Cystine stones, Struvite stones.
- **Signs And Symptoms:** Renal or ureteric colic, frequency, hematuria, dysuria, GI symptoms, restless.
- **Investigation:** urinalysis, imaging.
- **Management**: Hydration, Analgesia, Antiemetic. If the stone didn't pass or there was an indication for surgery than we do surgery, either SWL, Ureteroscopy, PNL, Open surgery.

✓ Benign Prostatic Hypertrophy:

- **Clinical Features:** Frequency, urgency, dysuria and poor stream, hematuria.
- **Examination:** DRE, abdomen: distended bladder.
- **Investigation:** Blood and biochemical tests, Ultrasound.
- **Management:** medical or surgical therapy.

✓ Voiding Dysfunction:

are either due to failure to store or failure to empty which in turn are either due to bladder problems or outlet problems.

Taking History of Renal Colic:

You have to memorize the signs and symptoms. Renal colic comes with flank pain. So you should ask about PAIN which has 8-10 questions that you should cover. And when you take History of renal colic, you should form some differentials for flank pain such as:

- If pain is worse with bowing and improves by lying down = MSK pain.
- If the pain radiates to right or left lower quadrant = Renal stone.
- Radiates to labia in women and to scrotum in men = Renal stone.
- Pain when coughing = Cholecystitis.
- Pain with movement and goes to leg = Prolapsed disk.
- If the pain comes after eating = Cholecystitis (and may also vomit).
- The pain is in the preumbilicus then goes to the right lower quadrant = Appendicitis.
- Young married female with History of no period for 2 months = Ectopic pregnancy.

MCQs

Q1: which one of the following is the narrowest part in the ureter ?

A. The ureteropelvic junction (UPJ)
B. The ureterovesical junction (UVJ)
C. The ureteral crossing of the iliac vessels

Q2: which one of the following is the most common type of stones?

A. Calcium oxalate stones.
B. Uric acid stones.
C. Struvite stones.
D. Cystine stones

Q3: which one of the following used in diagnosis of uric acid stones?

A. Hematuria
B. Intravenous Pyelogram (IVP)
C. Plain Abdominal Films
D. Percutaneous Nephrolithotripsy

Answers: Q1:B Q2:A Q3:B

Thank You..

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