



Emergency in Urology

Objectives: (pathophysiology, etiology, clinical manifestations, complications, Guide line of managements)

- Discuss testicular torsion presentation, workup and management
- Discuss hematuria presentation, workup and management
- Discuss Renal colic presentation, workup and management
- Discuss Genitourinary trauma presentation, workup and management
- Discuss Priapism
- Recognize Fournier's gangrene

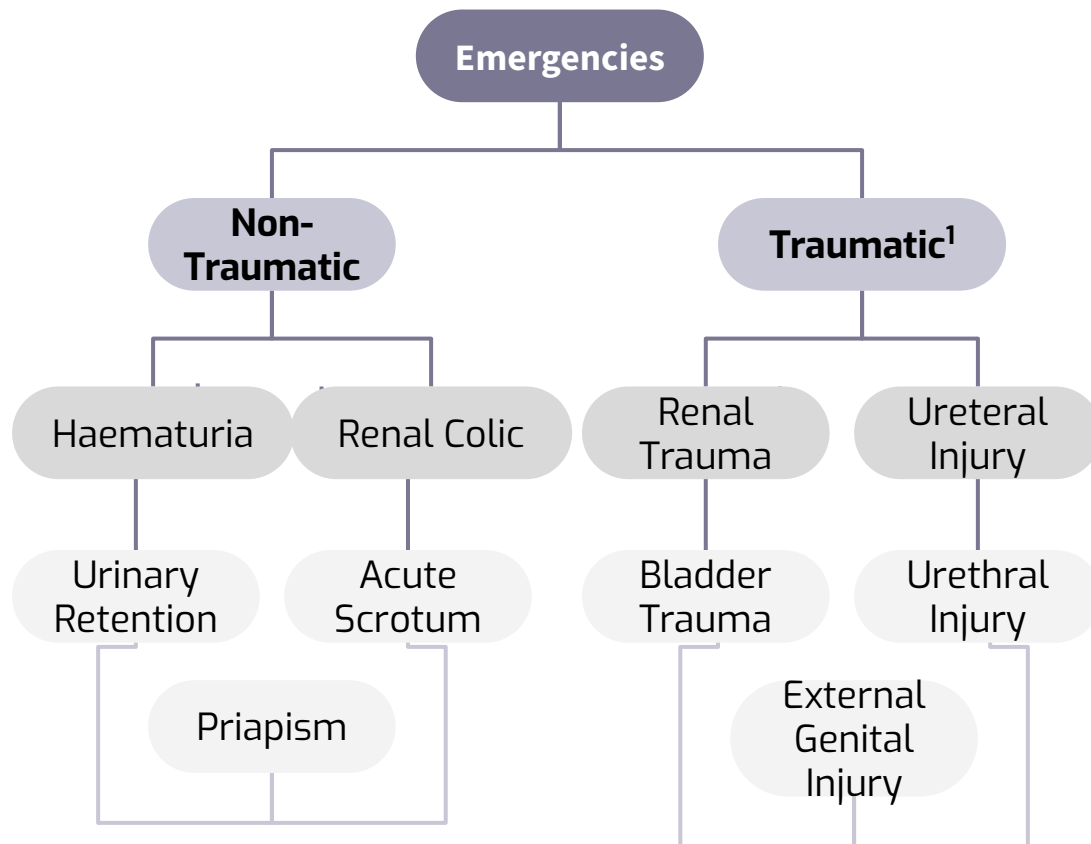
Color index:

Main Text	Textbook
Males slides	Important
Females slides	Golden notes
Past notes	Extra
442 notes	

[Editing file](#)

Introduction

Compared to other surgical fields, there are relatively few urological emergencies. However, they require rapid diagnosis and immediate treatment.



Non traumatic Urological Emergencies



Haematuria:

Types of haematuria	
Gross (Macroscopic, Visible, Clinical)	Microscopic (Non visible, Not clinical)
1 ml of blood in 1 liter of urine (visible for the patients).	3 or more RBCS/High power , in 2 out of 3 properly collected samples (AUA). (Blood isn't visible to the patient)
Emergency or urgency	Not an emergency or urgency
Susceptibility to develop a cancer is >40%	Susceptibility to develop a cancer is 1-3%

- Usually traumatic injuries are present in more than one organ.
 - Haematuria is the most important symptom that need immediate medical help.
 - Pain is the most important symptom that brings the patients to the emergency.



Haematuria

Case 1:

A 60-year-old male presented to the emergency room with **red urine** for 2 days. **Next?**



01 General urological history

- ❖ LUTS (frequency, urgency, nocturia, dysuria, incomplete emptying, post-void dribbling)
- ❖ Pain → (clot or pathology) **Why is it IMP?** to exclude malignancy (Painless hematuria = bladder cancer until proven otherwise).
- ❖ Fever → (infectious process)
- ❖ Timing of hematuria → (origin or cause, Triangone or prostate f the blood was at the end. Bladder or the kidney if it was kidney) (terminal hematuria may indicate Schistosomiasis)
- ❖ Clots → (severity of bleeding) (it means hematuria is significant)
- ❖ Color → (severity or cause)
- ❖ Shape of clot → (location) (gives idea about the site of bleeding)
- ❖ Similar episodes → (chronic)

02 Eliminate DDx

- ❖ Beet → Urine discoloration
- ❖ Trauma → Urological trauma, Myoglobinuria
- ❖ Swimming → Schistosoma (Especially in open water)
- ❖ Family history → Nephrological (Nephrotic or Nephritic syndromes), hematological or neoplasm
- ❖ Drugs → Discoloration (rifampin) or Bleeding (warfarin)
- ❖ Smoking → Cancer (bladder)
- ❖ Occupation → Cancer (dye work)
- ❖ Bleeding disorders → Hematological disorder (coagulation factor deficiency)
- ❖ Bleeding from other site → Generalized cause
- ❖ Post exercise → Exercise induced hematuria

Glomerular causes	Metabolic causes	Tubulointerstitial cause
Familial causes	Polycystic kidney disease	Vascular cause
Fabry disease	Renal artery embolism	Urologic causes
Hereditary nephritis (Alport syndrome)	Renal papillary necrosis	Benign prostatic hyperplasia
Nail-patella syndrome	Renal vein thrombosis	Cancer (kidney, ureteral, bladder, prostate, or urethral)
Thin basement membrane nephropathy	Sickle cell disease or trait	Cystitis/pyelonephritis
Primary glomerulonephritis	Renal causes	Nephritis/nephrosis
Focal segmental glomerulosclerosis	Acromegaly/malformation	Prostatitis
Goodpasture syndrome	Hypercalcemia	Schistosoma haematobium infection
Henoch-Schönlein purpura	Hypertension	Other causes
Immunoglobulin A nephropathy (Berger disease)	Loxin pain-hematuria syndrome	Drugs (e.g., nonsteroidal anti-inflammatory drugs, rifampin, warfarin [Coumadin], cyclophosphamide)
Mesangial proliferative glomerulonephritis	Multiple myeloma	Trauma (e.g., contact sports, running, Foley catheter)
Postinfectious glomerulonephritis	Medullary sponge kidney	
Rapidly progressive glomerulonephritis		
Secondary glomerulonephritis		
Henoch-Schönlein syndrome		
Systemic lupus nephritis		
Thrombotic thrombocytopenic purpura		
Vasculitis		

Adapted with permission from Ahmed Z, Lee J. Asymptomatic urinary abnormalities. Hematuria and proteinuria. Med Clin North Am. 1997;81(1):644

03 Severity of hematuria

- ❖ Sometimes Color of urine could be misleading, Patient comes with red urine doesn't necessarily mean that's blood, it may be dye. While other may have normal color but have microscopic hematuria
- ❖ Make sure that urine contain RBCs, not hemoglobin.
- ❖ Rosy = mild
- ❖ Dark = severe





Haematuria cont.:

Case 1:

A 60-year-old male presented to the emergency room with **red urine** for 2 days.

- No pain or fever. Total hematuria with rounds clots. Other history is unremarkable **Next? Physical examination, managements (Investigation and treatment Together)**



04

Physical Examination, Investigations & Management:

Physical Examination

- Usually no much signs (Normal).
- General Examination (vitals, appearance- pale or not?).
- Abdominal Examination (Bilateral balloting of the kidney, palpation of the bladder- is palpable or not?).
- Urine (either by sample or by fully catheter)
- Digital Rectal exam is an **obligatory step** in physical examination.

Management

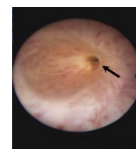
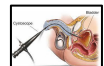
- **Any hematuria case:**
 - Treat the cause.
- **If bleeding is significant (clots dropping, & cannot be resolved):**
 - Admit and monitor
 - IV line and hydration
 - Cross match
 - 3 way catheter (1 for ballon, 1 for drainage bag and 1 to insert fluid and dilute urine and blood to prevent clots) (used to preparation for bladder irrigation)
 - Bladder irrigation (in severe bleeding, as temporary management → need to treat the underlying cause)



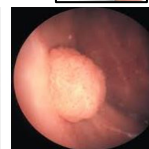
Investigation

- **Any hematuria case: mandatory for all cases of hematuria**
 - UA(3>= RBCs in the urine) and CS (to detect UTI)
 - Urine cytology (to detect malignancy)
 - Imaging (Gold standard imaging modality is CTU (CT Urography) with contrast.) (is there a filling defect?)
 - Cystoscopy (to look for urethral strictures or tumors, usually done for painless hematuria, but can be done for painful hematuria if the other causes were ruled out)
- **If bleeding significant:**
 - CBC
 - Coagulation Profile
 - ★ The presence of WBC casts and RBC casts is strongly indicative of glomerulonephritis.

Cystoscopy

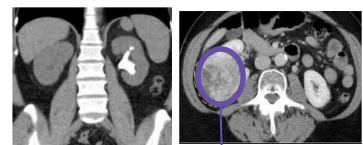


Urethral Stricture



Bladder tumor

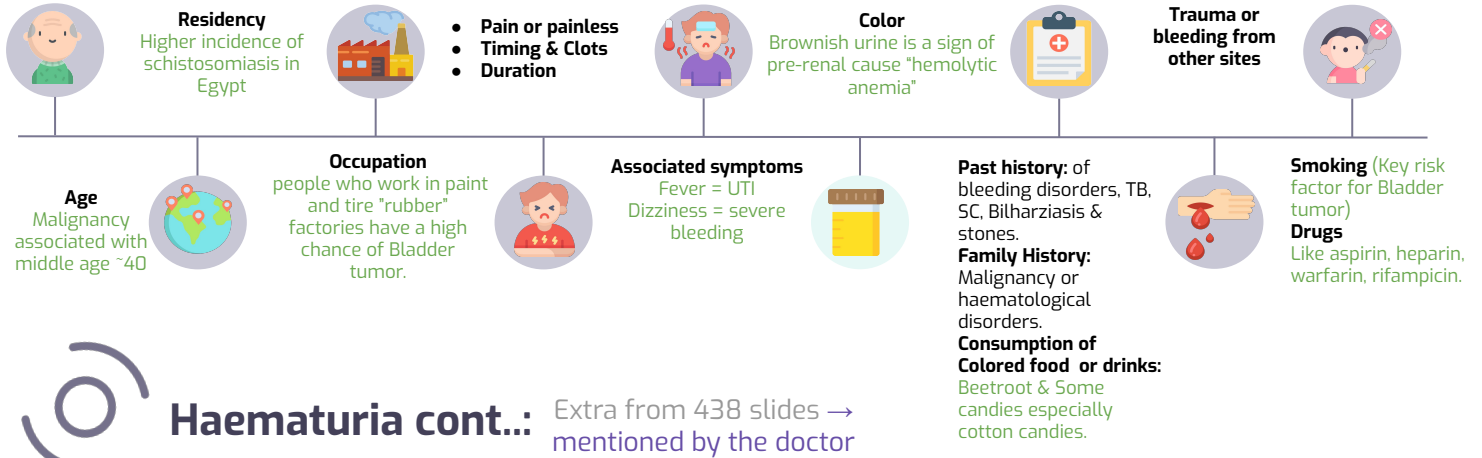
Imaging





Huge mass → Cancer



History: Extra from 438 slides



Haematuria cont.: Extra from 438 slides → mentioned by the doctor

Causes of Haematuria Vary According To	
Patient's Age	_____
Symptomatic or Asymptomatic	<ul style="list-style-type: none"> - Painful → indicates renal stones or UTI. - Painless → indicates malignancy.
Existence of Malignancy Risk Factors	E.g. smoking , as it's the most common risk factor for renal tumors (Painless, gross hematuria).
The Type: gross & Microscopic 	<ul style="list-style-type: none"> • Any patient presenting with GROSS hematuria (whether the risk factors are present or not) should undergo cystoscopy and imaging (cystoscopy is endoscopy of the urinary bladder via the urethra). • If the patient is presenting with MICROSCOPIC hematuria in the presence of risk factors then the patient should undergo both cystoscopy and imaging, but if the risk factors are absent then you'll do imaging only.
Timing 	<ol style="list-style-type: none"> 1. Initial "before urine" = suspect urethra (post-renal). 2. Terminal "after" = suspect neck of bladder or sphincters or bilharziasis. 3. Total "along with urine" = suspect kidney or ureter (renal). Same as 442 notes
Presence of Clots	<ul style="list-style-type: none"> • One of the most important determinant is the presence of clots & its amount, it indicates significant bleeding. Same as 442 • If it were highly coagulated or long clots = most likely from upper urinary tract (kidney, ureter) • If it wasn't coagulated, or little coagulation or small clots = most likely from lower UT (Urethra, Prostate) • Disorganized = from the bladder



Urinary Retention

Case 2:

A 60-year-old male presented to the emergency with abdominal pain and inability to void for 1 day (We normally go to the bathroom every four hours).



Acute Urinary Retention

Definition

Sudden, severe Painful inability to void and **lower abdominal distention**, with relief of pain following drainage of the bladder by catheterization. More common in Men than in Women (in women urinary incontinence (involuntary leakage of urine) is more common than urinary retention due to females' short urethra) Same as 442.

Causes

In men

- **Benign prostatic enlargement (BPE) due to BPH** (The most common cause). (Obstruction in more common in males)
- Carcinoma of the prostate
- Prostatic abscess
- **Urethral stricture** (Second most common cause)
- Stones
- Constipation (In children)
-

In women (Rare)

- Pelvic prolapse (cystocele, rectocele, uterine)
- Pelvic masses (e.g., ovarian masses)
- Urethral stenosis
- Urethral diverticulum
- Post surgery for 'stress' incontinence (Transvaginal tape (sling) in those with stress incontinence is very common) - if this procedure is overdone it will cause urinary retention
- **Post operational: spinal or epidural, pelvic surgery, morphine.**

Case 2 cont.:

A 60-year-old male presented to the emergency with abdominal pain and inability to void for 1 day (We normally go to the bathroom every four hours). LUTS for 2 years. No other significant history.

Next? Physical Examination



Physical Examination

- General Examination.
- Abdominal Examination (palpate the bladder, & check the urethral opening).
- DRE(per-rectal examination → for the prostate)



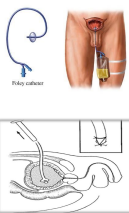
Urinary retention cont..:

Case 2 cont..:

A 60-year-old male presented to the emergency with abdominal pain and inability to void for 1 day(We normally go to the bathroom every four hours). LUTS for 2 years. No other significant history. Examination revealed palpable tender bladder, DRE (large nodular prostate).



Next? Managements (Investigation and treatment)

Investigation	<ul style="list-style-type: none"> ● CBC (for infection). ● UA and CS. ● Ultrasound for prostate size ● Renal Profile. ● PSA for the BPH.
Management- Treatment	
<p>1. Initial management is to drain urine by catheterization before completing the workup:</p> <div style="display: flex; align-items: flex-start;">  <div style="margin-left: 10px;"> <p>First option: Urethral catheter</p> <p>Second option: Suprapubic catheter -through skin- (if urethral catheter failed) (Apply local anesthesia first)</p> </div> </div>	<p>2. Late management is to treat underlying cause. Treating BPH.</p>

Chronic Urinary Retention	
Definition	<ul style="list-style-type: none"> ● Chronic Urinary Retention: Obstruction develops slowly, the bladder is distended (stretched) very gradually over weeks/months, Pain is not a feature (Unless if Acute-on-Chronic occurred) ● Usually associated with <ul style="list-style-type: none"> ○ Reduced renal function ○ Upper tract dilatation & diabetes (neuropathy)





Urinary retention cont..:

*Was briefly mentioned by the doctor, all extra from 438 slides

Presentation	Management
<ul style="list-style-type: none"> • LUTS ★ Overflow incontinence. • Palpable Bladder with no pain. • Symptoms of renal failure (nausea and malaise, Hyperkalemia and high creatinine) • Pyelonephritis • Hydronephrosis (swelling of the kidney due to a build-up of urine). 	<ul style="list-style-type: none"> • Treatment is directed to renal support (treat the renal failure first!). • Bladder drainage (Catheter at home). • Late Treatment of underlying cause. • Treat the electrolyte imbalance.



LUTS (Lower urinary tract symptoms):

Extra from 438 slides Was mentioned by the doctor → IMP to differentiate between them



Storage (Irritative)

Frequency: may be caused by an actual decrease in the capacity of the bladder or by a decrease in the functional capacity of the bladder

Urgency: a sudden uncontrollable desire to void (storage problem).

Nocturia: night-time frequency may be a result of renal disorders leading to a decrease in the concentrating ability of the kidney, or due to excessive intake of fluids, caffeine or alcohol before bedtime.

incontinence: passage of urine occurs without warning and without any precipitating factors. Urge incontinence is associated with urgency and is seen in acute inflammatory conditions, patients with upper motor neuron injuries and in individuals with an overactive bladder.

Pain

Voiding (Obstructive)

- **Weak stream:** poor stream, they have to strain and increase pressure.
- **Intermittency:** Urine starts and stops, starts and stops
- **Straining to void**
 - **Hesitancy:** poor stream (delay in starting the stream) and dribbling (obstruction symptoms).
- **Incomplete Emptying**
- **Urinary Retention**
 - **Oliguria:** decreased urinary output.
 - **anuria:** complete absence of urine output
- **Post void dribbling**



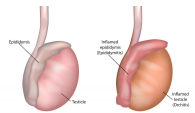
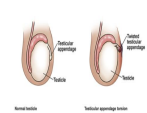
Testicular Torsion

Case 3

A 15-year-old patient came with scrotal pain for 1 hour.

What's next?

- General urology questions
- Eliminate DDx
 - HPI
 - Medical & surgical history
 - Social & family history
 - Systematic review

DDx of Scrotal Pain	
Category	DDx
Infectious or Inflammatory	<ul style="list-style-type: none"> • Acute epididymitis/epididymo-orchitis. (Most common) • Fournier's Gangrene. • Mumps Orchitis. • Appendicitis. • Nephrolithiasis. 
Vascular	<ul style="list-style-type: none"> • Testicular torsion. (Most important). • AAA. (abdominal aortic aneurysm) • Torsion of appendix testis. • varicocele. 
Iatrogenic	<ul style="list-style-type: none"> • Post-vasectomy pain.
Neoplasm	<ul style="list-style-type: none"> • Testicular germ cell tumor.
Idiopathic	<ul style="list-style-type: none"> • Idiopathic scrotal Edema.
Congenital	<ul style="list-style-type: none"> • Testicular torsion.
Anatomy, Allergic or Autoimmune	<ul style="list-style-type: none"> • IgA vasculitis.
Trauma	<ul style="list-style-type: none"> • Testicular rupture. • Testicular Hematoma.
Degenerative /Environmental/Endocrine	-

Acute Scrotum:

- **Acute Scrotum:** An emergency situation requiring prompt evaluation, differential diagnosis, and potentially immediate surgical exploration.





Acute scrotum cont.:

DDx of Acute Scrotum:

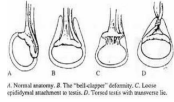
1- Testicular torsion (torsion of the spermatic cord): Most serious

- Irreversible ischemic injury to the testicular parenchyma may begin as soon as 4 hours. (4-6 hrs till it dies)
- Testicular salvage ↓ as duration of torsion ↑. (Ischemia then necrosis)

2- Epididymitis: more common

In testicular torsion, Redness of the skin and a mild pyrexia may result in the condition being confused with epididymo-orchitis in the older patient; however, in epididymo-orchitis there will usually be dysuria associated with the accompanying urinary infection. Elevation of the testis reduces the pain in epididymo-orchitis while it makes it worse in torsion.

3- Other differentials: as mentioned in the table above

Definition	<ul style="list-style-type: none"> ● The testis rotates multiple 360° turns around itself and blocks the blood flow to itself, which will result in ischemia. If surgery is done within 6 hours the testis will be salvageable., if not the chance of testis death will be high. ● Irreversible ischemic injury > 4 hours (salvageability 6 hours).
Bell Clapper Deformity	<ul style="list-style-type: none"> ● Normally tunica vaginalis is attached to the testis from below (A), but in a bell-clapper deformity, it's attached at a higher point. ● Bell-clapper deformity is also present in the other testis of the same patient, that's why we treat both sides. If only the Twisted side is treated, the other side is prone to torsion in the future. ● Predisposing factor in testicular torsion. ● Seen bilaterally in 66-100% 
Presentation	<ul style="list-style-type: none"> ● Young male with scrotal pain, severe, sudden and short duration. ● Common in teenagers (12-18). ● Rare after 25. ● Can occur in children and neonates. ● Symptoms (438): <ul style="list-style-type: none"> ○ Acute onset of scrotal pain located in the scrotum & referred to the ipsilateral lower quadrant of the abdomen. ○ Majority with history of prior episodes of severe, self-limited scrotal pain and swelling (Alarming pain that goes on & off, not in all patients). ○ Nausea/Vomiting. ○ Children might not complain of testicular pain. ○ Dysuria and other bladder symptoms are usually absent. (sign of scrotum infections "orchitis or epididymitis).

Case 3 - Continuation

A 15-year-old patient came with scrotal pain for 1 hour. In the left side, sudden, radiates to lower abdomen, no LUTS, no fever, no trauma.

What's next?

- Physical examination
 - General exam
 - Abdominal exam
 - Genital (cremasteric)





Testicular torsion cont.:

Physical Examination

- Severe tenderness, redness (not erythematous initially although it may become so with a prolonged history) and hotness
- The affected testis **is high riding**.
- **Transverse -not vertical-** orientation
- **Cremasteric reflex is absent in torsion.**
- (438):
 - Acute hydrocele or massive scrotal edema.
 - Tender larger than other side.
 - **Elevation of the scrotum causes more pain** (to differentiate from epididymitis).

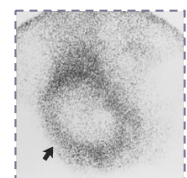
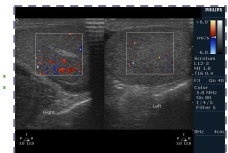
Case 3 - Continuation

A **15-year-old** patient came with scrotal pain for **1 hour**. In the left side, sudden, radiates to lower abdomen, no LUTS, no fever, no trauma. **Examination shows tender, swollen left testis, high laying negative cremasteric reflex, elevation causes more pain. What's next?** can be diagnosed by clinically → doesn't require imaging, but US can be don when needed.

- Investigations
- Treatment: can be immediate with no confirmation. **If there's clinical suspicion, you want to save the testis from dying. Surgery Immediately**

Investigations

- To aid in differential diagnosis of the acute scrotum or to confirm the **absence** of torsion of the cord.
- **US doppler** (Will show you decreased blood flow): (438):
 - Is the best test.
 - Assessment of anatomy and determining the presence or absence of blood flow.
 - Sensitivity: 88.9% specificity of 98.8%
 - Operator dependent (Operator have to direct the device toward the blood flow).
 - **red color is sign of proper blood flow**(left), **Torsion confirmed if there's no flow** (Right).
 - Shows the cortex of the testes, with high sensitivity and specificity.
 - Usually done before the OR
- **Nuclear medicine** (not used, Historical) (438):
 - Assessment of testicular blood flow.
 - A sensitivity of 90%, & specificity of 89%.
 - False impression from hyperemia of scrotal wall.
- No need to do investigation in such patient because you can take him directly to OR, you can use ultrasound or nuclear medicine, although we don't use nuclear medicine anymore because its time consuming.
- If you're in doubt of your diagnosis you can do doppler ultrasound and it'll confirm it.



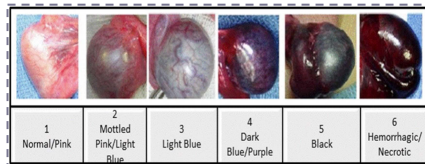


Testicular torsion cont..:

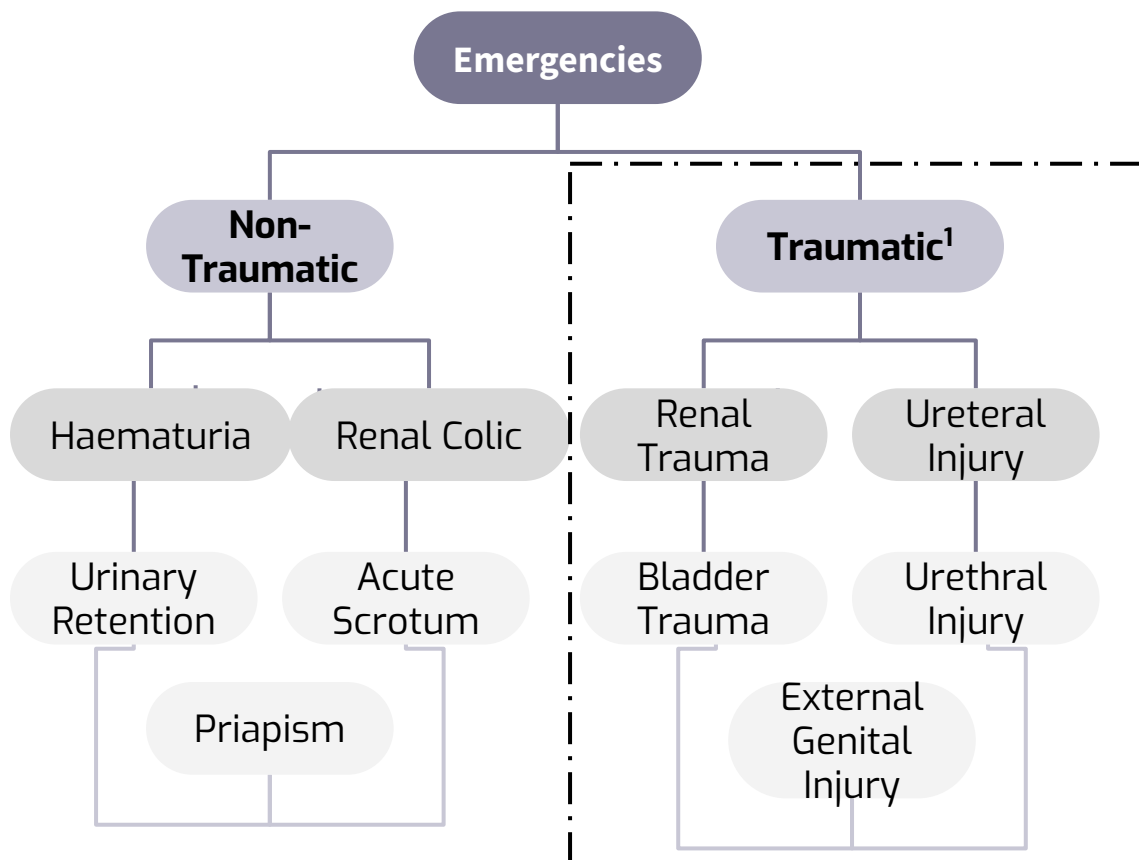
Treatment

- Can be immediate with no confirmation
- **Surgical** (We just fix it in position with sutures, so you don't have torsion again in the future) the first option for the patient. Note: surgical exploration not manual detorsion.
- **Bilateral Orchidopexy** (fixing the other testes so it doesn't rotate in future)
- **(+/-Orchiectomy)** (if it passes 6 hours, without improvement in the blood flow)
(438):
 - A scrotal incision.
 - The affected side should be examined first (The cord should be detorsed (Untwisted, left for some time, if the "black color" of testis changed & improved, then you can save the testis.
 - Testes with marginal viability should be placed in warm and **re-examined after several minutes**.
 - A necrotic testis should be removed.
 - If the testis is to be preserved, it should be fixed.
 - The contralateral testis must be fixed to prevent subsequent torsion (Bell-clapper deformity if occurred in one testis, usually it occurs in the other one. You have to examine both testicles).

Extra



Traumatic Urological Emergencies





Traumatic urological emergencies cont.:


Case 4

A **25**-year-old male was involved in a MVA. Hemodynamically stable. Seen and assessed by trauma team. ABCDE done. Patient is having pelvic fracture stabilized by external fixation. **Foley catheter insertion failed**

- ❖ **DDx?** Urethral destruction (tear) **What's next?** (Ascending urethrogram) and SPC
- Ascending urethrogram
- Other signs

Urethral Injury



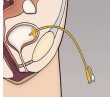
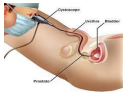
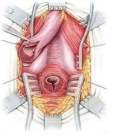
Causes	<p>Male urethral injuries are divided into two types anterior (penile/bulbar) and posterior (membranous/prostatic) urethral injuries. There are a variety of causes:</p> <ul style="list-style-type: none"> ● blunt trauma: due to shearing/straddle injuries ● posterior urethral injury is caused by a crushing force to the pelvis (e.g MVC) and is associated with <u>pelvic fractures</u> (~10%) and <u>bladder injury</u>. ● anterior urethral injury is usually caused by a straddle injury and is an isolated injury. ● penetrating trauma: e.g. stab wounds, gunshot wounds, dog bites more commonly affect the anterior urethra. ● iatrogenic ● catheterization, <u>Foley catheter</u> removal without balloon deflation, cystoscopy. ● post-surgical (e.g. surgery for <u>benign prostatic hyperplasia</u>). ● In women, partial rupture at the anterior position is the most common urethral injury associated with pelvic fracture.
Signs	<ul style="list-style-type: none"> ● Urinary retention or palpable bladder . ● Bleeding from urethral meatus (Not haematuria, only blood without urine). ● Inability to pass urethral catheter/to void (The most common sign). ● high riding prostate (When you per rectal examination you'll find the prostate high in position which will indicate urethral injury). ● Perineal hematoma (If you have perineal hematoma you have to investigate for urethral injury).
Investigation	<p>Urethrogram</p> <ul style="list-style-type: none"> ● (You inject the contrast material to the anterior urethra and then you'll see extravasation of the contrast) ● Med438: (Retrograde urethrography)(Ascending urethrogram) 

- ❖ **What's next?**
- Suprapubic catheter
- Definitive treatment
 - Realignment
 - Urethroplasty





Urethral injury cont..:

Management	Suprapubic catheter 
	Definitive Treatment <ul style="list-style-type: none"> • Realignment: (advantage: non-invasive) align the two ends of the urethra then insert a foley catheter until healed (6 weeks), majority come back with stricture <p>Realignment is when you insert a catheter that passes through the injured urethra under vision not blindly, if you insert the catheter blindly you might injure the urethra and make a complete tear.</p> <ul style="list-style-type: none"> • Urethroplasty: anastomose the damage (reconstruction) We can do urethroplasty after 3 months.. best way with 3 months waiting period. correct answer i about the definitive treatment.  
Anterior urethral injury (438)	
Posterior urethral injury (438)	
<p>1-Contusion:</p> <ul style="list-style-type: none"> • No extravasation of contrast. • Tx: A small-gauge urethral catheter for one week. <p>2-Partial rupture:</p> <ul style="list-style-type: none"> • extravasation of contrast, with contrast also present in the bladder. • Tx: <ul style="list-style-type: none"> - No blind insertion of urethral catheterization (may be by using cystoscopy and guide wire) (you may worsen the injury by mistake). - Majority can be managed by suprapubic urinary diversion (catheter) for one week. - Penetrating partial disruption (e.g., knife, gunshot wound), primary (immediate) repair. <p>3-Complete rupture:</p> <ul style="list-style-type: none"> • No filling of the posterior urethra or bladder. • Tx: <ul style="list-style-type: none"> - patient is unstable: a suprapubic catheter. - patient is stable: the urethra may either be immediately repaired or a suprapubic catheter. <p>4- Penetrating Anterior Urethral Injuries:</p> <ul style="list-style-type: none"> • are generally managed by surgical debridement and repair 	<p>1- Type I: stretch injury with intact urethra</p> <ul style="list-style-type: none"> • Tx: Stenting in urethral catheter <p>2-Type II:</p> <ul style="list-style-type: none"> • 25% of posterior urethral injuries • Partial tear but some continuity remains • Tx: Stenting in urethral catheter <p>3-Type III:</p> <ul style="list-style-type: none"> • 75% of posterior urethral injuries • Complete tear with no evidence of continuity • TX: <ul style="list-style-type: none"> - Patient is at varying risk of urethral stricture, urinary incontinence, and erectile dysfunction (ED). - Initial management with suprapubic cystostomy and attempting primary repair at 7 to 10 days after injury.

Bladder Injury

Case 5:


A **25**-year-old male was involved in a MVA. Hemodynamically stable. Seen and assessed by trauma team. ABCDE done. Patient is having pelvic fracture stabilized by external fixation. **Patient is having hematuria** (meaning urethra is intact) **DDx?** (bladder), **What's next?**

- Upper tract imaging: CT urography, (Kidney → flank pain, stab wound).
- Bladder imaging: cystogram (Pelvic fracture, lower abdominal injury).



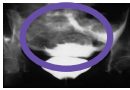


Bladder Injury cont.:

<p>Causes</p>	<p>1.External:</p> <ul style="list-style-type: none"> • Penetrating trauma to the lower abdomen or back • Blunt pelvic trauma—in association with pelvic fracture or 'minor' trauma in a drunkard patient • Rapid deceleration injury seat belt injury with full bladder in the absence of a pelvic fracture (Injury to both breast and bladder) <p>2.Iatrogenic:</p> <ul style="list-style-type: none"> • Transurethral resection of bladder tumor (TURBT) • Cystoscopy bladder biopsy • Cystolitholapaxy • Caesarean section, especially as an emergency (Very common) • Pelvic surgery
<p>Symptoms</p>	<ul style="list-style-type: none"> • classic triad suggestive of a bladder rupture : <ul style="list-style-type: none"> ○ Suprapubic pain and tenderness. ○ Difficulty or inability in passing urine. ○ With or w/o Haematuria.
<p>Types</p>	<p>Extraperitoneal</p>
<p>Definition</p>	<p>Peritoneum is intact and urine escapes into the space around the bladder (Between bladder and peritoneum).</p>
<p>Investigations</p>	<p>Hematuria</p> <ul style="list-style-type: none"> - Upper tract imaging > CT urography. - Bladder imaging > cystogram <p>Flames shaped extravasation around the lower part of bladder, this is called extraperitoneal meaning that urine is leaking outside the peritoneal space.</p> 
<p>Treatment</p>	<p>Management for this patient is just keeping the catheter and repeat the study in 1-2 weeks and it'll heal by itself and give him antibiotics to prevent infection.</p> <ul style="list-style-type: none"> - Open repair + (if not healed after 2 or 3 weeks).

Case 6:

A 25-year-old male received a blow to the lower abdomen. Hemodynamically stable. Seen and assessed by trauma team. ABCDE done. **Patient is having hematuria and lower abdominal pain (bladder suspicious). DDX? ,What's next?**

<p>Types</p>	<p>Intraperitoneal</p>
<p>Definition</p>	<p>When the bladder is full during this accident, the superior border of the bladder lies at peritoneum and any force that comes anteriorly will rupture upward inside the peritoneum (438); which cause 1- Ileus 2-Localized peritonitis. ex. A patient had road traffic accident (RTA) with seatbelt on, it'll rupture his/her bladder.</p>
<p>Investigations</p>	<p>Same as extraperitoneal; cystogram you can see the contrast is leaking and penetrating the bowel this is intraperitoneal bladder injury. Note that the contrast is leaking upward → intra-peritoneal injury</p> 
<p>Treatment</p>	<p>In these patients, you have to open them and repair it because if we don't repair it the intraperitoneal injury will not close and can cause chemical peritonitis so you have to repair them immediately.</p> <p>why open repair:</p> <ul style="list-style-type: none"> - Unlikely to heal spontaneously. - Usually large. - Leakage causes peritonitis. - Associated other organ injury.

Renal Injury

Case 7:

A **30-year-old** male received a **stab** to the left thoracic region. Hemodynamically stable. Seen and assessed by trauma team. ABCDE done. Left chest tube was inserted. **Patient having hematuria.** **DDx?** , **What's next?** **Surgery (OR)**

Causes

- **Most common: blunt** (direct blow or acceleration/ deceleration, e.g., MVA, falls from a height/onto flank) **or could be penetrating** (knives, gunshots, iatrogenic, e.g., percutaneous nephrolithotomy (PCNL)) **but the most common presentation is blunt trauma usually present with stabs**
- The kidneys relatively protected from traumatic injuries.
- considerable degree of force is usually required to injure a kidney.
- **Depends on the mechanism of injury we will think which organ is injured but sometimes you have to evaluate the kidney and the bladder but in this case it's very clear that the injury in the kidney,**

Investigation

Indication for renal imaging:

- **Macroscopic haematuria.**
- Penetrating chest, flank, and abdominal wounds.
- Microscopic (>5 red blood cells (RBCs) per high powered field) or dipstick.
- **Hypotensive patient** (SBP <90mmHg).
- A history of a rapid acceleration or deceleration.
- Any child with microscopic or dipstick haematuria who has sustained trauma **for children no need to have hypotension to do imaging.**
- **First study: CT scan with contrast and delayed images.** CT scan alone with/without contrast won't evaluate the kidney well because it's called CT scan urography **Delayed images contrast you will see inside the collecting system.**
- **Triphasic CT scan (urography):**
First you do CT without contrast then CT with contrast and then you'll wait for 15-30 sec and do one imaging and see the contrast in blood vessels and tissues and then wait for 10 min and do another image to see the contrast in the urinary system. **same as 442.**
- **IVU (Intravenous urogram)**
 - Replaced by the contrast enhanced CT.
 - On-table IVU (intraoperative) if patient is transferred immediately to the operating theater without having a CT scan & retroperitoneal hematoma is found.
 - We do it in emergencies only.
 - We don't do it so often, it's an old way in which we inject contrast and see how the kidneys clears it. when the patient is very hypotensive and we take to the OR and we don't know the reason we use it to check the kidney.
- **Renal Ultrasound**
 - Good option but not the best modality, we prefer it in those who cannot tolerate radiation "as pediatrics"
 - **Advantages:**
 - o can certainly establish the presence of two kidneys
 - o the presence of a retroperitoneal hematoma
 - o power Doppler can identify the presence of blood flow in the renal vessels
 - **Disadvantages:**
 - o cannot accurately identify parenchymal tears, collecting system injuries, or extravasations of urine until a later stage when a urine collection has had time to accumulate.

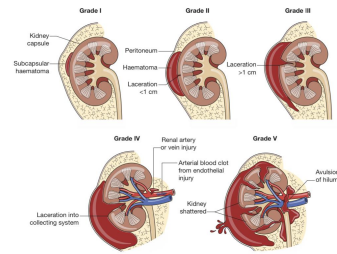
Phase	Time	Indications
No contrast	-	Kidney/reticular stones, arterial calcifications
Arterial	20 - 30 sec	Abdominal bleeding, aortic aneurysm, arterial stenosis/occlusions, hypovascular liver metastases, pancreatic tumors
Portal venous	60 - 80 sec	Screening, hypovascular liver metastases, abscess formation, venous thrombosis
Nephrogenic	80 - 100 sec	Kidney tumors, kidney trauma
Equilibrium /delayed	5 - 10 min	Urinary obstruction or leaks, characterization of liver tumors



Renal Injury cont..:

Grading

- There are **Five grades** of renal injury you can look it up or leave it:
 - **Grade I** : no parenchymal injury, small hematoma around the kidney
 - **Grade 2**: If you have **< 1 cm** ulceration in the kidney but didn't reach the collecting system, when you do CT scan you can say there is an ulceration but you can't see contrast extravasation
 - **Grade 3**: If the ulceration is **more than 1 cm** but blood didn't reach the collecting system (calyx of the kidney).
 - **Grade 4**: The blood is **reaching the collecting system** you can see contrast extravasation (with urinary extravasation).
 - **Grade 5**: Most severe injury **complete occlusion/completely fractured** (If kidney teared into pieces).



Grade 5
this picture is CT scan with contrast, because you can see the changes and enhancement of the organs you can't grade the injury because you need delayed images, here I can see the perireteric hematoma and ulceration but I can't say what is the grade of the injury it could be grade 4 or grade 3



This is delayed image you can see contrast in the collecting system and the contrast leaking outside this is grade 4, we do the conservative management but after two days we will repeat the imaging to make sure that it'll heal, if it didn't heal we will do the urine diversion.

Management

- The grades don't correlate with the management, in patients with renal injury management depend on Clinical scenario.
- Grade I, II, III, and even IV treated conservatively (As long as the patient BP is stable), While Grade V treated surgically right away if the patient is unstable (hemodynamically unstable- systolic blood pressure \leq 90 mmHg) and hasn't improved after being bedrest
 - The kidneys are in the retroperitoneal space, so when the bleeding happens the pressure keeps it controlled, if you opened the space and intervened you will end up releasing the pressure and actually causing more bleeding and you may lose the kidney.

Stages I, II, & III usually heal by themselves

Conservative management only for stable patients

1. Bed rest (to contain the existing bleeding, usually for 2-3 weeks).
2. serial Hb CBC (HCT)
3. Vital signs monitoring.
4. Follow up US &/or CT. (in 2-3 days)
5. Wide Bore IV line (2 Large IV access).

If the patient developed increased hematuria. Hb dropped from 11 to 8:

Surgical exploration

- Persistent bleeding (persistent tachycardia and/or hypotension failing to respond to appropriate fluid and blood replacement).
- If the patient is already open because of unrelated injury like liver injury, we do the kidneys exploration
- **Expanding perirenal hematoma** (again the patient will show signs of continued bleeding)
- **Pulsatile perirenal hematoma**

(The kidney is retroperitoneal organs so if you see hematoma and this hematoma is stable you don't need to open retroperitoneal space except in case of expanding or pulsatile hematoma then you need to explore it).

If the patient is unstable:

- Next? Usually we will do transfusion but if he continue to bleed the first management is **Angioembolization**, which is (interventional radiologists access peripheral arteries under image guidance to selectively occlude the leaking blood vessel)

Case 8:

A 24-year-old male presented with left flank pain for 2 days.



01 Clinical Features

- **The most common urological emergency** (in Saudi Arabia cases are seen daily).
- One of the most common causes of differentials associated with "Acute Abdomen"
- Renal colic isn't a disease **it's a symptom**
- Patient present with **sudden, severe pain** –the second in severity after having babies-
- **Colicky** (starts and stops abruptly, pain is on & off) in character, **Radiate** from flank down to groin (look for lower quadrant & scrotum differentials)
- May change in location, from the **flank** to the groin, (the location of the pain does not provide a good indication of the position of the stone = Mean if the if the stone is in the ureteropelvic junction (UPJ) or the proximal ureter, you may find the pain radiate to groin or scrotum or labia)
- The patient **cannot get comfortable**, and may **rolled around**
- Associated with nausea / Vomiting, and fever if got infected.
- Severe cases associated with past history of renal colics, patients will tell you that I know this is a stone & give me a treatment.

02 Differential diagnosis

- **Most common** : stones , pyelonephritis, stromal and musculoskeletal
- Acute appendicitis (Pain is constant, localized & get worse with movement (colics patient will be moving and rolling in bed.)
- Burst peptic ulcer.
- Radiculitis (pseudo-renal) (nerve or nerve root is pinched, irritated or inflamed. common in lower back)
- Leaking (ruptured) abdominal aortic aneurysms.
- Myocardial infarction or Pneumonia or **Testicular torsion** (The pain is mainly in the genitalia.).
- Ovarian pathology (e.g., **twisted ovarian cyst**) or Ectopic pregnancy
- Inflammatory Bowel Disease (Crohn's, ulcerative colitis) or Bowel obstruction or Diverticulitis

03 Work-up

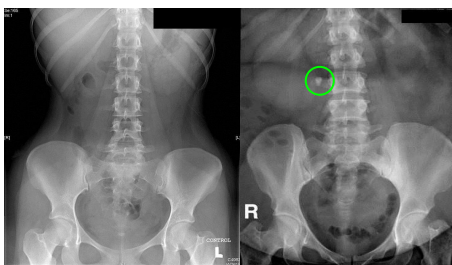
Extra from 438 slides:

- Start with history "first 2 lines in clinical features is the typical presentation"
 - History may be mixed with other complications as UTI > Presence of fever
 - Or if there's complete obstruction, the leading symptoms will be "persistent" pain rather than colicky as the continuous peristalsis tries to push the colic forward.
- Examination nothing significant but:
 - patient tends to move around in an attempt to find a comfortable position.
 - Check for tenderness



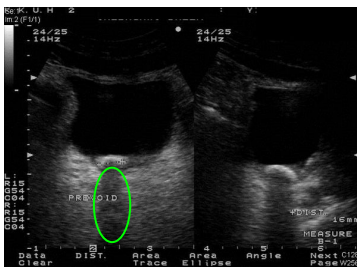
04 Investigations

- Always start with laboratory work up then imaging
 - **CBC**
 - **Renal profile** (most of pts will have normal values due to the other functional kidney)
 - **Pregnancy test:** pain may be due to pregnancy nothing more.
 - MSU (Mid stream urine, most likely you will find RBCs in the urine).
 - Urinalysis & culture: to detect complications (usual findings: pyuria, microscopic hematuria).
 - (crystals, high creatinine, Hyperkalemia)
 - Radiological testing (imaging).
 - **U/S:** Acoustic shadowing.
 - **KUB (X-Ray):** not sensitive nor specific, you can't determine whether the stone is inside or outside the kidney. But, It can be used as starting point, it is a good option to rule out gallbladder stones. Also it's used for **follow up**
- ★ **Helical CT: Without contrast**, Best modality, **GOLD STANDARD**



Kidney, ureter, bladder (KUB) X-Ray

- This is an abdominal X Ray.
- You **can't** Determine the location of Radiopaque stones.
- Same area as gallbladder
- 90% of kidney stones are radiopaque
- In comparison, 90% of gallbladder stones are radiolucent



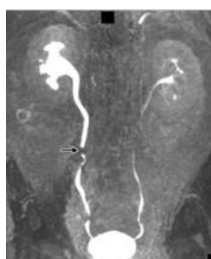
Renal U/S (RUS)

- **Hyperechogenic area** with **Acoustic shadow** indicate stones.
- Shows hydronephrosis but can't detect stones



Intravenous urography (IVU)

- You can see the stones blocking the ureter
- Not used anymore because the contrast is nephrotoxic. Also it's Time consuming, high radiation exposure



MRU

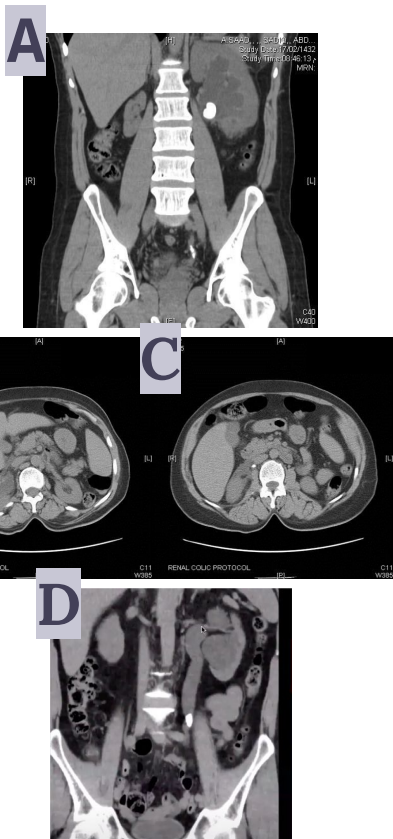




Helical -spiral- CT-scan without contrast



- The gold standard the best radiological investigation in renal colic.
- Greater specificity (95%) and sensitivity (97%).
- Can identify other non-stone causes of flank pain.
- **No need for contrast administration.**
- Faster, taking just a few minutes
- The cost of CTU is almost equivalent to that of IVU.
- You can determine the location of the stone
- Picture A&C = renal pelvis stones
- Picture B = renal stone
- Pregnant? do MRI
- Picture D = small stone in the distal ureter which lead to hydronephrosis

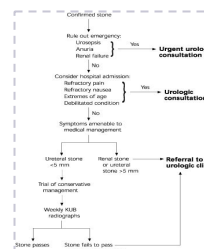


05 Management (Medical or surgical)



Medical (conservatively)

- Majority of patients treated by this way
- **Hydration** (mainly drinking, or I.V if needed)
 - **5mm Stone or less:** 'watchful waiting' with analgesic supplements (the best approach) ; 95% of 5mm or less stones **pass spontaneously**
- **Analgesia AKA Pain relievers** (Depending on the severity)
 - NSAIDs. Paracetamol of mild, or stronger E.g. Brufen, voltaren
 - Intramuscular or intravenous injection, by mouth, or per rectum.
 - +/- Opiate analgesics (pethidine or morphine).
 - Be careful some opiates addicts can come to ER and act for the sake of this
- **Expulsion therapy (Alpha-blockers)**
 - Help to relax smooth muscle of ureter "for ureter stones, not for kidney stones"
- **In mild cases,** give paracetamol if needed, advice for hydration, send home & reschedule for follow-up 2 weeks later.





05 Management



Surgical When to intervene (indication)?

- To Relieve Obstruction and/or Remove the stone.
- Indications for admission and Intervention:**
 - Failure of medical therapy (Obstruction Unrelieved)** (not to exceed 4 weeks!=Necrosis) "patient came after 2 weeks & the obstruction haven't relieved"
 - Persistent pain not responding to oral analgesia**"Comes back to clinic before the scheduled 2 weeks".
 - Infection (Association With **Fever**) (fever highly suggests pyelonephritis which requires drainage because it may cause septicemia)
 - Renal Function Impairment** (creatinine & Potassium) caused by stone (Solitary kidney obstructed by a stone, bilateral ureteric stones).
 - Personal Or Occupational Reasons** (Pilots as example or doctors, or even those who live in poor countries that aren't be able to reach health services if the symptoms exacerbate)
 - Persistent nausea and vomiting (should be more than one episode)

(Extra from 438 slides)



Before treatment After treatment

Case 2: (cont.)

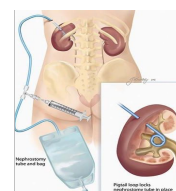
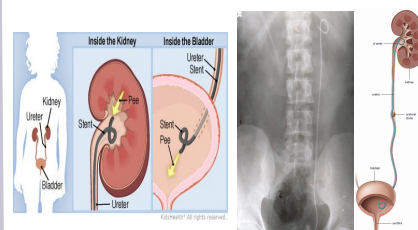
- Same patient presented with **fever** and increased left flank pain
CBC: Elevated
Renal profile : Normal
CT: Same

Treatment:

- Hydration
- Analgesia
- UA and C/S and blood C/S
- Broad spectrum antibiotics
- Urine diversion** because Antibiotic levels are low with obstruction and Sepsis if definitive therapy
- Patient maybe developed UTI thus stone shouldn't be manipulated to avoid sepsis So, **Urine is diverted first**

Temporary urine diversion

- Insertion of JJ stent (DJ stent):**
 - A.K.A urinary stent, which's a thin tube that gets inserted into the ureter to divert the urine flow.
- In patients with acute obstruction and sepsis (infected obstructed kidney) or renal impairment, decompression of the kidney either via insertion of a ureteric stent or percutaneous
- A ureteral stent is a small plastic tube placed inside the ureter to help urine (pee) pass from a kidney into the bladder.
- Percutaneous nephrostomy tube:**
 - Another method to divert urine flow in **septic patients** in which a needle is inserted through the skin to drain the urine until sepsis regress.



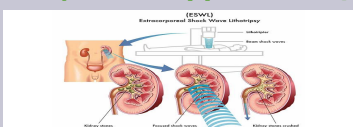


Open Surgery (Very limited)



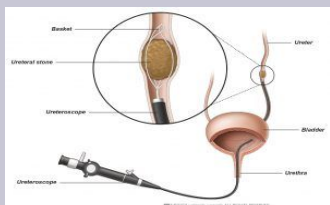
- Open stone surgery other than total nephrectomy is incredibly **infrequently undertaken** in the modern era. In the past, pyelolithotomy, ureterolithotomy and nephrolithotomy with cooling of the kidney were sometimes indicated.

Extracorporeal Shock Waves Lithotripsy (ESWL) (Used for small stones in the kidney or the upper ureter)



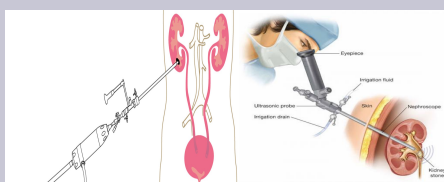
- Extracorporeal shockwave lithotripsy (ESWL), the technique of focusing external shock waves to break up stones, has revolutionised the treatment of renal and ureteric stones. Stones visualised on x-ray or US can be treated by ESWL, especially those that are single and up to 2 cm in size.

Ureteroscopy (UPS- laser) (very common)



- Other stones can be visualised directly by ureterorenoscopy (URS), and the stones broken up using a holmium laser or removed intact using a Dormia wire basket.
- It involves the passage of a small telescope, called a ureteroscope, through the urethra and bladder and into the ureter to the point where the stone is located. Then the stone is fragmented with a laser.

Percutaneous Nephrolithotomy (PCNL or PNL) (For large stones)



- Some stones in the kidney that are unlikely to pass, even if broken up, are best treated by direct puncture of the kidney, insertion of a sheath and removal under vision with a nephroscope with or without ultrasonic disaggregation (percutaneous nephrolithotomy).
- The surgery consists of making a small incision in the back, through which a hollow tube is placed to provide access to the inside part of the kidney that contains the stone(s). Using a rigid metal telescope, the stones are removed directly or broken into fragments which are then removed.

Laproscopy Extraction (Rarely used)



- Vesical calculi can be treated endoscopically like ureteric calculi, using a stone-crushing device, pneumatic lithotrite or holmium laser. Alternatively, large stones can be dealt with through an open suprapubic cystolithotomy, or by suprapubic insertion of a nephroscope and the use of ultrasonic shattering.





Quiz!

Q1: A 36-year-old man presents to the ER with a renal colic. His vital signs are normal and urinalysis shows microscopic hematuria. A radiograph reveals a 1.5-cm stone. Which of the following is the most appropriate management?

1. Hydration & analgesics
2. alpha-adrenergic blocker
3. Extracorporeal lithotripsy
4. Percutaneous nephrostomy tube

Q2: A 10-year-old boy presents to the ER with pain in the left testicle. The pain was acute in onset and began 1 hour ago. On physical examination, he is noted to have a high-riding, firm, and markedly tender left testis. The right testicle is normal. Urinalysis is unremarkable. Which of the following is the most appropriate management?

1. Orchiopexy of the left testicle
2. Orchiectomy of the left testicle
3. Orchiopexy of the bilateral testicles
4. Manual detorsion of left testicle with external rotation toward the thigh; orchiopexy if the condition recurs

Q3: A 30-year-old PhD student presents with acute-onset colicky left loin pain and describes a history suggestive of urinary calculi. Which one of the following would be the initial investigation of choice to determine the presence of a calculus in the renal tract?

1. DMSA scan
2. KUB radiograph
3. IV urogram
4. DTPA scan

Q4: A 45-year-old female patient complains of nagging pain in her right loin and urinary frequency for several months. On examination she has tenderness in her loin over the kidney. Urine examination shows red blood cells and a growth of *Proteus* and staphylococci. What is the diagnosis?

1. Renal stone
2. Hyper Nephroma
3. Pyonephroma
4. Ureteric calculus

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Quiz!

Q5: Which of the following statements are false?

1. Microscopic hematuria isn't always abnormal
2. Hematuria at the start of urinary stream indicates a cause in the lower urinary tract
3. Hematuria where the urine is uniformly mixed with the blood points to a cause in the upper urinary tract
4. Terminal hematuria is caused by bladder irritation or infection.

Q6: A pedestrian is hit by a speeding car. Radiologic studies obtained in the ER, including a RUG, are consistent with a pelvic fracture with a rupture of the urethra superior to the urogenital diaphragm. Which of the following is the most appropriate next step?

1. Immediate percutaneous nephrostomy
2. Immediate placement of foley catheter through urethra into bladder to align and stent injured portions
3. Immediate reconstruction of ruptured urethra after initial stabilization
4. Immediate placement of a suprapubic cystostomy tube

Q7: The left ureter is partially transected (50% of circumference) during the course of a difficult operation on an unstable, critically ill patient. Which of the following is the most appropriate next step given the patient's unstable condition?

1. Placement of external stent through proximal ureteral stump with delayed reconstruction
2. Ipsilateral nephrectomy
3. Placement of a closed-suction drain adjacent to the injury
4. Bridging the proximal ureter up to the skin as a ureterostomy

Q8: A 20-year-old fit young man had a game of rugby, following which he passed frank blood in his urine in the changing room. He felt some discomfort in his left loin. On going home, his haematuria became worse and he noticed some fullness in his left loin. He then came to the A&E department. His blood pressure was 110/60 mmHg, pulse 110/min and he had fullness in his left loin.

1. Congenital (Idiopathic) hydronephrosis
2. Hyper Nephroma
3. Pyonephroma
4. Ureteric calculus

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القادة

محمد الغامدي

في الدوسري

رزان المهنا

وعد أبو نخاع

نوف الضلعان

الأعضاء

راكان الرميان

سارة آل الشيخ

شكر خاص لتيم الجراحة دفعة ٤٣٩

حسبي الله لا إله إلا هو عليه توكلت وهو رب العرش العظيم.
اللهم إني أستودعك ما قرأت وما حفظت وما تعلمت فرده لي عند حاجتي إليه إنك على كل شيء قدير.



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